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SiT

Sustainability in TCLF

ANNEX 1 to the Training Structure Report

Country Overviews

based on semi-structured interviews conducted in

Germany, Italy, Spain, Estonia, Greece, Bulgaria and Croatia

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SECTION 1. Introduction

This Annex 1 to the Training Structure Report offers an in-depth look at the evolving roles of Recycling Managers and Bio- Textile Technicians, drawing on insights from three interviews with key figures in the field from 7 participating countries of the project SiT. The project partners, with the exception of Slovakia, were invited to conduct surveys in their respective countries, interviewing three key individuals of their choice, each representing the SME, VET, or HE sector. The interviewees—SME experts, VET, and HE specialists—were chosen for their deep involvement in sustainability and innovation within the textile and circular economy sectors.

The interview questions were jointly agreed upon in advance by the consortium (the original questionnaires are archived and available in the project partners' document repository). Both handwritten notes and recordings serve as evidence of the interviews. The interviews were conducted during the period from May 20 to August 31, 2024. The interviews were conducted in the local language, and the quotes provided here are translations from the original.

Their views are crucial in understanding the significance of these emerging professions, as they provide a firsthand perspective on the evolving challenges and opportunities shaping these roles in today's market. The information gives an overall picture of why these professions are vital in the context of sustainable development. By analyzing their responsibilities, challenges, and the broader market dynamics, this overview aims to highlight the pressing need for new expertise in circular economy practices and textile technology. The findings will also shed light on labor market trends, educational needs, and future growth opportunities within these sectors.

SECTION 2. Description of the task

Although the respondents were asked the same questions during the interviews, the project partners had the flexibility to approach the overview of their country relatively freely. The WP2 leader provided a suggested framework to structure the overview in order to standardize the results for the reader.

The suggested structure of the task was as follows:

COUNTRY (NAME) OVERVIEW - In total 1,5- 2 pages per country based on three interviews.

1. **Introduction (1-2 paragraphs)**

• Explain who was interviewed (e.g., industry experts, employers, specialists) and why their opinions are important.

2. New professions and their significance (3-4 paragraphs)

• Based on the interviews, explain why circular economy specialists and textile technologists are necessary today. Refer to the thoughts of the interviewees.

• Include short quotes that highlight the importance of these professions.

3. Job responsibilities and challenges (3-4 paragraphs)

• Through the interviewees, describe the main tasks of circular economy specialists and textile technologists: What skills are most important?

• Highlight the main challenges these specialists face in your country.

4. Labor market developments and education (3 paragraphs)

• Based on the interview information, explain the demand for these professions and what educational opportunities are available.

• Include interviewees' opinions on how to train future specialists and what programs are needed.

5. Future perspectives (2 paragraphs)

• Based on the interviews, highlight future developments and trends. What might be the future opportunities in circular economy and textile technology?

• Include quotes that emphasize either optimism or caution.

6. Conclusion (1 paragraph)

• Conclude with thoughts on how your country or society could support these fields in the future

SECTION 3. Country Overviews

3.1 COUNTRY OVERVIEW – GERMANY

3.1.1 Introduction

Elisa Goldmann is a student consultant, research coordinator for entrepreneurship and sustainability at Fachhochschule des Mittelstandes (FHM) based in Bielefeld, Germany. FHM is one of the leading private universities in Germany and has a clear focus on SMEs.

Mara Michel, owner of .futurize TREND.FORSCHUNG, is a consultant and specialized journalist, and serves as Managing Director of the VDMD. Mara advises international clients on trends in interiors, fashion, and consumer goods and writes for lifestyle magazines and delivers trend lectures, aiming to elevate fashion's status in Germany beyond mere functionality to a reflection of individuality and aesthetics.

René Lang is a fashion designer and CEO of designformen, as well as the President of the VDMD, the leading professional association for fashion and textile designers in Germany. René is committed to promoting the professionalism of designers among industry, trade, media, politics, and the public, with the goal of enhancing the industrial and creative strength of the entire textile sector.

3.1.2. New professions and their significance

Elisa Goldmann: "*Implementing sustainability in fashion and education is incredibly important but also very complex*". Elisa Goldmanntherefore highlights the importance of specific profiles, especially for consultancy purposes. While many companies are willing to implement sustainable practices, they often cannot afford specialized staff. Therefore, consultants who are experts in these areas such as certification and frameworks become increasingly important, particularly because it is a constantly changing field.

René Lang: "*Bio- textile technicians play a key role in the production of textiles that comply with environmental and social standards […] This is not only important for the protection of the*

environment and social justice, but also for consumer confidence and the reputation of the organic textile industry. RL emphasizes that such professions are essential in order to meet environmental and social standards. This underscores the importance of sustainability in fostering ethical practices within the textile sector."

René Lang told, that textile Recycling Managers play a key role in minimizing the environmental impacts by developing efficient recycling processes and promoting sustainable textiles. Mara Michel agrees with this affirmation, claiming that these are the cornerstones of the TCLF sector for our future.

3.1.1. Job responsibilities and challenges

Elisa Goldmann: "*The topic of circular economy is difficult to implement for many companies because it seems rather abstract. Many therefore have only focused on sustainability without making their products truly recyclable. When designing products, entrepreneurs need to consider right from the start how products can be designed not only sustainably, but also in terms of the circular economy, especially in the fashion industry. The main focus is on how to combine materials and use technologies to later break down products into their individual parts and return them to the cycle. Companies need to consider this as a holistic approach, otherwise "Greenwashing", e.g. labeling a product as sustainable because parts of it are from recycled materials, becomes a problem because consumers cannot assess whether a product or only parts are sustainable*."

The topic poses major challenges for many small and medium-sized companies, especially fashion labels, because there are many hurdles to overcome even if these companies want to produce sustainably. Certification oftentimes is expensive and complicated, and may require a certain production volume which is unattainable for small companies who then have to make do with lower-cost but less comprehensive certifications. There are few technical systems that could support these companies.

Elisa Goldmann emphasizes the importance of technical knowledge for profiles like a Recycling Manager, who needs to understand how fabrics and clothing items can be reintroduced into the cycle. On the other hand, a general understanding of the importance of the topic and a willingness to engage with certifications, frameworks, and guidelines on a European level is crucial.

According to Mara Michel, all of the mentioned skills *(in the question: problem-solving, critical thinking, collaboration and teamwork, adaptability and flexibility, communication skills, creativity)* are equally important, as only interaction and networking can lead to good, meaningful sustainability results. "*...It is also important to keep up to date with new technologies for sustainable materials on the relevant platforms and then incorporate them into your own work processes*", she indicated.

René Lang offers a balance between soft and hard skills: Communication skills, collaboration and teamwork are therefore crucial to create synergies and achieve common goals. Bio- textile engineers must not only have technical know-how, but also a genuine interest in sustainability and a sense of responsibility for the protection of the environment and social justice. A comprehensive understanding of various textile fibers, their properties, and recycling behaviors is essential, along with knowledge of textile manufacturing processes and common recycling technologies. Professionals should grasp the principles of the circular economy and apply them to develop effective strategies for textile waste. Familiarity with the legal and political framework governing textile recycling is crucial, as is the ability to lead teams, collaborate with industry stakeholders, and communicate effectively with suppliers and customers. Additionally, managing recycling projects requires a balance of cost, quality, and sustainability considerations.

3.1.4. Labor market developments and education

Elisa Goldmann: "*Green Competences are in high demand and graduates increasingly expect to be able to work in companies that are intensively involved in sustainability. This means that there is an effort for more sustainable fashion from future entrepreneurs and a higher demand for sustainable products from the consumer side. Still, it is difficult for educational institutions to focus on this aspect in basic training like a bachelor's program, where the focus is often on individual sustainable aspects, such as certain textiles. Here, a master's degree could offer further in-depth knowledge or practical experience in the profession itself.* " FHM actively tries to incorporate systematic thinking in their students' practical projects with companies, e.g. how to handle surplus production. However, this is not generally applicable to German HEIs: Sustainability is rarely structurally anchored in the curriculum of fashion degrees. This could be due to the fact that the higher education system is very strict, especially when it comes to the

accreditation of study programs, and it can take years to implement such measures. Another problem is that frameworks and guidelines are frequently outdated when it comes to sustainability. Often, companies designate a staff member who is not specifically trained in the field of circular economy and/or sustainability. While these employees may well be able to grow into expertise over time, specific further education offers would be very helpful to gain additional professional confidence.

According to Elisa Goldmann, for this target group, online training on an interactive platform and with elements such as video tutorials and presentations could be ideal. The materials, such as, presentations should be transferable so teachers can use them in lectures in small excerpts. It would be important that learning success controls are integrated. "*After completing the course and successfully participating in the tests, for example with a success rate of 80% or similar, a certificate of achievement should be issued. In addition, ECS points could also be awarded, which is particularly relevant at universities, but possibly less so in other areas. […] The focus should be on conveying the content in a clear and understandable way and then checking it with a final test*", told Elsa Goldmann.

Mara Michel told, that Schools and universities are on the way to becoming more sustainable. Everyone recognizes the importance. Often there is still a lack of teachers to implement this. Here, too, funding programs would be enormously important, as schools are unable to cope with this from their own financial resources.

Workshops, lectures, seminars, internships, platforms that summarize and describe the latest research results. This requires funding - I would prioritize everything."

René Lang: "*Vocational and university education in Germany already provides a good basis for developing the necessary skills for bio- textile technicians. […] The level of skills of current employees in the field of bio- textile technology is good overall, but not yet sufficient for the future. There is still room for improvement. It is important that training in this area is further developed and professionalized in order to meet the growing demand for qualified specialists."*

3.1.5. Future perspectives

Elisa Goldmann: "*I believe the key is to formulate curricula as concretely as possible and at the same time to make them flexible so as not to exclude future developments. This gives both students and teachers the opportunity to deal with and integrate current topics*."

One solution Elisa Goldmann sees is that several smaller companies who cannot afford staff specifically for sustainability aspects, can jointly hire consultants.

Elisa Goldmann: "*I believe it is incredibly important to offer consultancy, especially in the area of certification opportunities. This is really a wide field, as new developments are constantly appearing, with which even medium-sized labels are sometimes overwhelmed. It is basically about consultations in the field of circular economy, where you can go to ensure that European framework directives are implemented in an understandable way. It's important that someone can guide companies through these processes, as it's often difficult to make sense of the voluminous documents. An expert could understand the content and help companies put it into practice. […] New developments are constantly being added. It's not like an apprenticeship or further education, where you graduate once and then know everything you need for the next 20 years. The industry is very dynamic, so it's crucial to give people the tools to keep up to date*."

Mara Michel is somehow skeptical because of the resources that schools have to create new opportunities: "*Schools and universities are on the way to becoming more sustainable. Everyone recognizes the importance. Often there is still a lack of teachers to implement this. Here, too, funding programs would be enormously important, as schools are unable to cope with this from their own financial resources*."

3.1.6. Conclusion

Germany, as one of the most advanced countries in Europe and a leader in sustainability, is well-positioned to further support bio- textiles and recycling in fashion. The nation already exhibits a consciousness regarding environmental issues, as evidenced by the interviews, which highlight the existing knowledge about enhancing education centers and supporting small and medium enterprises. Allocating resources to these institutions, improving further education programs with specific sustainability-focused curricula, and establishing roles within companies that stay updated on evolving legislation are crucial steps forward. Additionally, given Germany's federal structure,

ensuring that high-quality education and knowledge about sustainable practices is maintained across all federal states is vital for a cohesive approach to fostering innovation and sustainability in the fashion industry.

3.2. COUNTRY OVERVIEW – ITALY

3.2.1. Introduction

- Interview 1 - Città solare

Città So.la.re. is a multi-purpose social cooperative. Dedicated to job placement and social integration through training and educational, work and social recovery of disadvantaged people, it operates in cooperation with economic-productive forces, public and private entities, other social cooperatives and voluntary associations in the area, according to the principle of subsidiarity. The activities carried out are developed in different areas: environmental, tourism, housing, personal and labor services, hospitality, cleaning.

This interview was chosen because of the relationship and privileged point of view that the cooperative has with workers in the field of collection and processing of used garments, because of the knowledge it has of what is happening in the area in terms of circular economy and the main actors involved, and because of the general knowledge and sensitivity to the topic.

- Interview 2 CIOFS

CIOFS is a professional training institution that offers projects, training and interventions specifically for fashion and textile production, including in the area of innovative materials and techniques. This interview was chosen because of the privileged point of view that the institution has on the current situation in the field of training and professional growth in Italy, as well as the great ability it has to read the needs of companies from the perspective of job demands.

- Interview 3 Matech- Divisione Galileo Visionary

Matech is the research and development division of Galileo Visionary District, Padua Science and Technology Park, and is dedicated to new materials and advanced technologies, offering research

and development services on technical issues on new materials and innovative technologies especially eco sustainable materials and eco design.

3.2.2. New professions and their significance

1. Reuse, including of textiles, and related technologies, as well as the vast topic of the circular economy, are areas of interest and debate that cut across so many situations in the
2. lives, not just work, of the entire Italian population. Inserted within environmental protection, it is inevitable that content and knowledge in these areas will be increasingly present in our daily lives, including at work. Environmental sustainability is the real challenge for the future.
3. At the same time, the circular economy and the textile sector touch and fit into professional fields that are also very different from each other: there is no single professional category; in fact, specialists actually work in more than one field and, more importantly, these fields include different professions. This is a key concept: there is not just one profession, there are many professions inherent in circular economy, reuse and similar. These issues cut across professions that are different from each other; people with very different professions, from extremely technical, to manual, can work in these areas. Importantly, they all require some degree of knowledge of the subject. Indeed, there are some things that everyone needs to know (such as, for example, how the circular economy works) and instead other very specific things that require targeted training.
4. There is no doubt that there are many job opportunities in this area and these will grow over time.
5. The circular economy sector is also crucial because it can be linked to improving people's working conditions; the two themes are necessarily to be developed together.

We can conclude by saying that the labor market often lacks people who are structured to perform tasks in these areas, partly because training needs to be renewed and adapted to the target audience, also considering that there are many people who are also frail and who need not only to be supported professionally but also humanly and socially, and the two need to go in parallel.

• Include short quotes that highlight the importance of these professions.

"Dal momento che le risorse fossili sono in esaurimento, il futuro è legato allo sviluppo di questo tipo di materiali in ogni settore. In molti ambiti il processo è ancora alle origini, quindi il mercato risulta ancora non ben sviluppato ma non c'è alternativa. Probabilmente, è dal concetto di riciclo che si prenderanno sempre più le distanze: anche nel settore della plastica il trend è in calo"
Interview 3. Since fossil resources are being depleted, the future lies in the development of these kinds of materials in every area. In many areas the process is still in its infancy, so the market is still not well developed, but there is no alternative. It is probably from the concept of recycling that we will increasingly distance ourselves: even in the plastics sector the trend is declining - interview 3.

3.2.3. Job responsibilities and challenges

Through interview 1 we were able to highlight the main skills required in the field of collection and sorting workers, and interviews 2 and 3 allowed us to broaden the reasoning to other sectors. The skills needed are:

1. flexibility, that is, the ability to activate a change in one's work habits and beyond to facilitate adaptation to new job profiles;
2. communication skills, including to the community, since some of the professional roles associated with these professions put people in the position of having to engage in dialogue with citizens, among whom some may also have attitudes hostile to regulations related to the circular economy and reuse;
3. skills in ecology, to know how to field correct actions themselves and be able to explain them to the people they meet;
4. knowledge of the entire circular economy cycle in order to be able to explain the importance of individual steps. Also, to be able to understand the value of what you are doing, you need to have the whole process clearly in mind;
5. awareness of the rules and ways to manage risk and safeguard their own safety.

Then there is a specific paragraph pertaining to the skills needed for personnel and/or process managers, particularly but not only for those working in social cooperatives. For a manager, it is necessary not only to know the whole process of circular economy or textile production, thus

technical skills, but also to have some social consciousness and specific social skills. We can say that the main skills for filling these roles are therefore:

1. staff management skills, including with frail workers or those with specific needs;
2. communication and language skills, being able to adapt to the wide variety of profiles and people in the workplace;
3. ability to deal with various stakeholders, both political and technical, also aware that not everyone has the same level of knowledge on the subject;
4. understanding of the term sustainability and circular economy in its totality;
5. great knowledge of rules, laws and regulations that govern the market and sustainability in general;
6. knowledge of the market and its offerings.

In similar matters, even in companies it is essential to have a manager who must have a great deal of training on the entire production chain, and know the regulations and communication skills for everyone. At the technical level s/he must:

- know fabric wefts and textures;

-learn about fabrics;

- know about making-up technology.

Then there are some specific skills for working in the company. From the words of interview 3, it is indeed important for a technician to have a deep knowledge of the company he or she works for... "*It is essential to know the difference between the different types of products in order to understand their limitations as well, in order to find the right balance. Definitely, it is essential to know the complete life cycle of a product: on the subject, there is still a lot of confusion. In a word, the expertise needed is knowledge.*"

Finally, in general, we can say that the sector is characterized by the need for continuous updating. This is a great challenge especially for small companies, which sometimes struggle to understand the great complexity of the sustainability issue, and tend to underestimate the relevant regulations: companies often think that small economic investments are enough to "fix" the environmental issue.

• Highlight the main challenges these specialists face in your country.

1. difficulty on the part of some sectors of the managerial, productive or other class to understand the new ways of managing work in this field, due to their attachment to old models of thinking and working. For example, the average age of the population working in fashion is very high, and this has a connection with training and preparation: people who have been working longer need to be trained to keep up with the new generations;
2. technical difficulties: some textile materials are no longer as recoverable as in the past because of their low quality, materials have changed over time, and technology must also evolve at the same time;
3. lack of solid industry-referenced regulations, which particularly puts companies in doubt about the best and necessary processes to use;
4. need to broaden and increase knowledge of the production process of purchased fibers and the necessary certifications. To date, this is done by trial and error. Companies are not aware of all the variables related to traceability certifications, but it is important that they are also prepared for their legal and image protection;
5. risk, if proper training is not done to the population as well, that wrong messages will be passed and there will also be clashes within the community because these new professions on the one hand are not understood, i.e., it is not understood what they do, and on the other hand, for example, those who are involved in the collection of reuse materials may have difficulty interfacing with the community and the population in carrying out their work. For this reason, too, it is therefore important that there be a cross-sectional understanding and dissemination of knowledge on these issues throughout the population and civil society;
6. misconceptions with respect to "waste." It depends on the industry, but the challenge for the future is also this: to make sure that waste products have the same final technical quality as the product from which they came and, above all, that they do not have to be supplemented with virgin material. At present, a 100% recycled product practically does not exist. That is the direction but there is still a long way to go.

Moreover, in the waste hierarchy, reuse is more virtuous than recycling, so the future moves in that direction. From interview 3: "*Recycling can be harnessed so that new products can be*

obtained. Therefore, we need to rethink the end-of-life of the product. It is not necessary for the whole process to take place within the same company; therefore, the issue of traceability returns along with the more strictly regulatory issue."

At the company level, it is also pointed out that the cost of training weighs solely on companies. In addition, more training on techniques and pollution is considered necessary, including in BIO for companies. At present, there are not many opportunities for companies to do this kind of training, and those that exist are little known. A change in mentality is also needed at the level of communication and dissemination.

At the academic and training level, on the other hand, even universities and faculty are not always up to date on the issues involved.

3.2.4. Labor market developments and education

The demand for professional profiles working in the sector is varied, ranging from people who collect used materials, to people who process the chemical materials needed for processing and manufacturing.

Respondents confirm that it is currently difficult to find staff, for a number of causes:

- lack of knowledge of the market;
- lack of workers in a general way in Italy;
- apparent unattractiveness of these sectors for young people.

In Interview 3, attention is drawn to the creation of the figure of sustainability technician, a professional figure that is almost totally lacking. At most, there are sustainability technicians in some companies, but it is too generic a figure. It is important for this role to enter and establish iitself in companies. Change is also needed at the grassroots: it is important that consumers also change their habits.

Training on the topic is very differentiated at the moment, and it is often difficult to find systematic information on educational possibilities. Moreover, in addition to training institutions, necessarily a part of it must be carried out entirely at the work setting, particularly alongside experienced personnel.

Furthermore, exchange between companies, including in relation to ways of working, is crucial both for the growth of the individual, the industry, and for total innovation. It should be emphasized more to all stakeholders that investment in training now leads to savings in the future.

Finally, training is currently being done by various entities, but this should be more tailored to the target audience and this is still not happening.

Characteristics the training should have:

1. Experiential.

Seminar activities allow for the development of direct and thus more specific dialogue.

Collaboration with research institutions is important. One idea for a collaboration between business and the world of research, could involve doctoral tracks, for example. (Interview 3)

Some content cannot be learned except directly in the workplace because time is needed to understand it. (Interview 1)

0. Specifics on safety in this area.

In reports to used material collection workers: specific training on road safety is among the programs needed. (Interview 1)

0. Related to the circular economy

Finally, it is emphasized that it would take more knowledge of the general workings of the circular economy throughout the community to make people understand its value and want to enter the field.

3.2.5. Future perspectives

In the future, it is hoped to:

- more room for creativity, including in the use and utilization of reused materials but also in the area of inventing “new workers.”

- increase dialogue with different realities and stakeholders with respect to the importance of the topic and the need to collaborate.

There is a general difficulty of environmental settings to find workers. Interview 1.

Often, concrete actions related to sustainability are delegated to figures within companies, who are not exclusively competent on the subject. The importance of sustainability, the responsibility for which cannot be relegated to technical or product development offices, is underestimated. Larger

companies were the first to take steps, but it is only recently that the mode of their intervention has become systemic. Unfortunately, there is a wide range of offerings on the market, but there is a lack of selection criteria, so companies are still moving based on a vague and superficial concept of sustainability. Many, however, are beginning to understand the importance of an organic and systematic approach. Interview 3

3.2.6. Conclusion

There are many challenges that need to be addressed by the industry:

- Economic sustainability of the supply chain. The interviews highlighted how it is necessary to find an economic system that allows for the economic sustainability of existing interventions. At the moment, in fact, this is not always possible, in part because of the discrepancy in revenues from the reuse world (a fundamental sphere of the circular economy) and the cost of the labor needed to carry out the activities;

-young people represent a key to the success of any initiative and intervention in this sphere: from a certain point of view they have internalized some concepts of environmental sustainability also thanks to the attention that is paid to these issues by the younger generation and the education that is done at school. At the same time, particularly with regard to “fast fashion,” young people are potentially among the biggest users of this market. Finally, in the area of education, young people are the ones who most have the way, intention, time, and need to invest in their own professional growth;

- precisely because of the key role of young people and people in training, greater involvement and communication between schools, training institutions and the world of work would be desirable;

- exchange and training between various entities, including those doing the same work, should be encouraged, for an exchange of knowledge and experience but also for the enhancement of workers, who can on the one hand show their work to others and at the same time learn from others;

- fast fashion also affects the quality of reuse: it is often overlooked that in addition to being short-lived, these goods are also of low value (quantity and quality);

- training on circular economy should also be given to municipal governments.

3.3. COUNTRY OVERVIEW – SPAIN

3.3.1. Introduction

The interviews conducted with professionals from TCLF sectors provided valuable insights into their industries and the importance of their perspectives.

Federica Massa Saluzzo (EADA Business School). A professor of strategic management with a focus on sustainability and intersectoral collaborations. She also directs sustainability master's programs.Her research and experience in sustainable fashion, along with her collaborations with organizations like the Sustainable Fashion Association, offer critical insights into how education and systemic collaborations can drive sustainability in industries like textiles and fashion. Her opinions help frame the larger systemic issues in sustainability and how institutions can foster meaningful change.

Jordi Vidal Valls (Leather Cluster Barcelona). Executive Director with decades of experience in the leather industry, having worked on technical improvements and sustainability initiatives. His in-depth knowledge of the leather industry's challenges and advancements in sustainability, such as reducing chemical use and improving processes, is crucial. He also highlights the importance of incorporating cross-sector knowledge (e.g., biology, biotechnology) to meet the evolving sustainability needs of the leather and textile industries.

Paloma Garcia López (The Circular Project) Founder and Director of The Circular Project and various sustainable fashion initiatives, with extensive experience in promoting circular economy practices. Paloma's leadership in circular fashion projects and her work on promoting sustainability and innovation in the textile industry make her views vital. She emphasizes the importance of green skills, traceability, and adapting to regulatory changes, particularly in terms of how businesses can transition towards circular economy models.

These industry experts provide diverse perspectives on sustainability, green skills, and the future of their respective fields, making their opinions crucial for understanding how to implement systemic changes in industries moving towards sustainability

3.3.2. New professions and their significance

Based on the interviews with Federica Massa Saluzzo, Jordi Vidal Valls, and Paloma Garcia López, the necessity of circular economy specialists and textile technologists today is evident for several reasons:

- Circular Economy Specialists:

Paloma Garcia López stresses the increasing legislative pressures, particularly in Europe, where producers are now responsible for the entire lifecycle of their products, from creation to disposal. Circular economy specialists are necessary to guide companies through this transformation, ensuring they not only comply with regulations but also transition to sustainable practices. Paloma highlights the importance of traceability and waste reduction, which are key pillars of the circular economy, as companies need to manage not just production but also the disposal and potential reuse of materials. Circular economy specialists help businesses innovate and adapt circular models that can reduce environmental impact and drive sustainability.

Additionally, Federica Massa Saluzzo emphasizes systemic collaboration across sectors to tackle overproduction and consumption. Circular economy specialists play a crucial role here by integrating businesses, researchers, and policymakers to implement holistic, sustainable solutions. They focus on reducing waste, promoting reuse, and creating closed-loop systems that address the root causes of unsustainable consumption.

- Textile Technologists:

Jordi Vidal Valls underscores the pressing need for innovation in the textile and leather industries, particularly with the emergence of new bio- based materials. Textile technologists are critical because they bring the scientific and technical expertise required to develop and refine sustainable alternatives to traditional materials, such as bio- based textiles or vegan leathers. As the industry moves away from fossil fuel-based textiles like polyester, textile technologists are needed to experiment with and improve bio- materials, ensuring they meet performance standards while being environmentally friendly.

Feerica Massa Saluzzo also notes the importance of bridging research and industry, where textile technologists can play a pivotal role in developing materials that reduce the fashion industry's overproduction and environmental footprint. As she points out, simply using recycled or sustainable materials is not enough if the overall system still leads to massive waste; thus, technologists must innovate across the entire supply chain.

In summary, circular economy specialists are necessary to help companies navigate new regulations, reduce waste, and foster systemic change, while textile technologists are crucial for developing sustainable materials and improving production processes to meet modern sustainability standards. Both roles are essential in transforming industries to operate more sustainably and responsibly.

Paloma Garcia López highlights the growing need for expertise in circular models, stating: "One of the biggest challenges right now is traceability... they first have to start reducing the textile waste they generate", emphasizing the role of specialists in waste reduction and managing extended product life cycles. Federica Massa Saluzzo stresses the importance of systemic collaboration, noting that "systemic collaboration is the key for driving sustainability across sectors". Jordi Vidal Valls underscores the need for innovation in bio- based materials, saying: "We need much more biology and applied physics to transformation processes", pointing to the role of technologists in evolving the textile and leather industries.

3.3.3. Job responsibilities and challenges

Main Tasks of Circular Economy Specialists:

1. Implementing Circular Systems: Circular economy specialists are responsible for designing and implementing systems that reduce waste and promote reuse. They help businesses transition from a linear to a circular economy, focusing on waste reduction, resource efficiency, and sustainable practices. Paloma Garcia López highlights their task
2. of reducing textile waste and implementing traceability systems: "They first have to start reducing the textile waste they generate and also the chemicals in that waste". This requires them to track and manage product life cycles.
3. Ensuring Compliance with Regulations: Specialists help businesses navigate increasingly strict regulations on sustainability. They ensure companies comply with extended producer

4. responsibility (EPR) rules, meaning companies are responsible for their products throughout their entire lifecycle. Paloma notes, "Now, you will be responsible for that textile waste, and your responsibility extends upstream and downstream", showing the importance of managing environmental impacts at all stages.
5. Fostering Collaboration: They work across sectors, bringing together stakeholders to create sustainable solutions, including businesses, government bodies, and research institutions. Federica Massa Saluzzo mentions that "*systemic collaboration is the key*" to tackling sustainability challenges.

Skills for Circular Economy Specialists:

Systems Thinking: The ability to view problems holistically, understanding how different components interact within a system. Knowledge of Regulations: Deep understanding of current and emerging regulations around sustainability, particularly waste management and EPR. Problem-Solving and Critical Thinking: Skills to create innovative solutions for waste reduction and resource optimization. Communication and Leadership: The ability to advocate for circular practices and lead cross-functional teams towards sustainability goals.

Main Tasks of Textile Technologists:

1. Material Innovation: Textile technologists focus on researching and developing new sustainable materials, such as bio- based textiles. They are responsible for finding alternatives to traditional materials, such as plastics, to reduce environmental impact.
   Jordi Vidal Valls states, "*We need much more biology and applied physics to transformation processes*", emphasizing the need to innovate in textile production.
2. Improving Production Processes: They optimize production methods to reduce the use of harmful chemicals, energy, and water. This includes developing techniques to make textiles more durable and environmentally friendly. Paloma Garcia López discusses the
3. importance of ensuring product durability: "*They also need to work a lot on innovation and design applied to textiles*".
4. Testing and Quality Control: Textile technologists are involved in the testing of new materials to ensure they meet quality standards for durability, safety, and performance. Federica Massa Saluzzo highlights the challenge of overproduction and ensuring the

longevity of materials: "You can use all the sustainable material you want, but if... the majority is thrown away, we are hitting a small problem".

Skills for Textile Technologists: Technical Knowledge of Materials: Strong expertise in chemistry, biology, and materials science to understand how to develop and test new materials. Innovation and Creativity: Ability to innovate by developing sustainable alternatives to conventional textiles. Attention to Detail: Ensuring that new materials and processes meet both environmental and performance standards. Collaboration: Working with other sectors, such as research institutions and industries, to implement new technologies and processes.

Based on the interviews with Paloma Garcia López, Jordi Vidal Valls, and Federica Massa Saluzzo, the main challenges that circular economy specialists and textile technologists face in the country (Spain) are:

Overproduction and Waste: Federica Massa Saluzzo mentions that overproduction remains a core issue in the fashion and textile industries. Despite efforts to create sustainable materials, the challenge lies in addressing the overall system, where much of what is produced is discarded: "*30% of what is produced is thrown away even before it is launched on the market, and 60% of everything sold globally is discarded before the first year of life*".

Material Innovation and Adoption: Developing new sustainable materials is a key challenge, particularly bio- based textiles. Jordi Vidal Valls notes that many materials marketed as sustainable alternatives, like "vegan leathers," often contain high levels of plastics, such as

polyurethane. This creates a challenge for textile technologists to develop truly sustainable alternatives: "*In the best cases, [vegan materials] contain 60% polyurethane, but in others up to 90%*".

Data Opacity: Lack of reliable data and transparency in supply chains and environmental impacts is another major hurdle. Jordi Vidal emphasizes this when discussing the challenges in Catalonia: "*There is great opacity, and data is lacking... even important industry players were unable to obtain information from laundries*".

3.3.4. Labor market developments and education

The demand for circular economy specialists and textile technologists is rapidly increasing due to the growing focus on sustainability, particularly in the textile and fashion industries. As Paloma

Garcia López highlights, stricter regulations in Europe, such as Extended Producer Responsibility (EPR), are pushing companies to manage the full lifecycle of their products, from production to waste management. Businesses need circular economy specialists to help them navigate these regulations, implement waste reduction strategies, and transition to more sustainable, closed-loop systems. The demand is further driven by the need for companies to trace their supply chains and ensure they are meeting both environmental standards and market expectations.

Textile technologists are also in high demand as industries seek to innovate with sustainable materials. According to Jordi Vidal Valls, the textile and leather sectors face increasing pressure to replace conventional, often environmentally harmful materials like plastics with bio- based alternatives. Textile technologists are needed to research and develop these new materials while ensuring they meet the technical requirements of luxury and high-performance products. This profession is essential for the future of the fashion industry as it shifts towards sustainable practices, with companies needing skilled professionals who understand material science, biotechnology, and sustainable production methods.

In terms of educational opportunities, there is a growing focus on sustainability programs in business and technical education. Federica Massa Saluzzo from EADA Business School highlights the importance of systemic collaboration and interdisciplinary learning in sustainability education. Educational institutions are integrating sustainability concepts into their curricula, offering programs that combine business, environmental sciences, and technical training. Specialized programs in sustainable fashion, circular economy, and biotechnology for textiles are emerging, providing students with the skills necessary to excel in these professions. Workshops, hands-on training, and collaborations with industry partners are also becoming more common, allowing future professionals to gain the technical and strategic expertise needed to lead in these evolving fields.

The interviewees emphasize the need for interdisciplinary and hands-on training for future specialists in sustainability and textiles. Federica Massa Saluzzo advocates for programs that combine theoretical foundations with technical expertise through collaborations with research institutes, fostering critical thinking and innovative solutions Paloma Garcia López stresses the importance of continuous training in green skills and circular processes, while also encouraging leadership and communication development to drive cultural change within companies. Jordi

Vidal Valls highlights the need for specialists to integrate knowledge from biotechnology, chemistry, and applied sciences to innovate with sustainable materials and adapt to emerging industry trends.

3.3.5. Future perspectives

The interviews highlight several future developments and trends in both the circular economy and textile technology. One key trend is the growing emphasis on bio- based materials and sustainable innovations. As Jordi Vidal Valls points out, the 21st century will focus heavily on the integration of biotechnology into materials: "*We need much more biology and applied physics to transformation processes*". This opens opportunities for textile technologists to develop new materials that are not only sustainable but also perform as well as, or better than, traditional textiles. Similarly, the push for circular economy models, driven by stricter regulations on waste and sustainability, will create demand for specialists who can guide companies in reducing waste and closing the loop on resource use. As Paloma Garcia López mentions, companies are beginning to recognize that "circularizing processes" is not just a regulatory requirement but also a competitive advantage.

However, there are also challenges and cautious optimism regarding these developments. Federica Massa Saluzzo warns that simply adopting sustainable materials or processes isn't enough if the overall system of overproduction and waste is not addressed: "*You can use all the sustainable material you want, but if... the majority is thrown away, we are hitting a small problem*". This indicates that while the future holds significant opportunities in developing sustainable technologies, companies must take a more systemic approach to truly transform industries. The success of these future opportunities will depend on overcoming resistance to change, improving traceability, and creating collaboration across industries.

3.3.6. Conclusion

Based on the interviews, supporting the fields of circular economy and textile technology in the future will require a combination of regulatory reinforcement, education, and collaborative innovation. As Paloma Garcia López mentions, stricter regulations, such as Extended Producer Responsibility (EPR), are already pushing companies to take responsibility for their entire product

lifecycle. Governments and institutions must continue enforcing these regulations while providing incentives for businesses to adopt sustainable practices. Additionally, fostering a culture of sustainability and innovation through education is crucial, as Federica Massa Saluzzo highlights the need for interdisciplinary training that prepares future professionals to lead systemic changes. Moreover, collaborative efforts between businesses, research institutions, and government bodies will be essential for driving advancements in these fields. As Jordi Vidal Valls points out, importing knowledge from other sectors, such as biotechnology and applied sciences, will help the textile and fashion industries innovate and meet the growing demand for sustainable materials. By supporting research initiatives, funding innovative projects, and promoting cross-sector partnerships, society can empower both circular economy specialists and textile technologists to develop solutions that not only comply with regulations but also pave the way for a more sustainable and resilient future.

3.4. COUNTRY OVERVIEW – ESTONIA

3.4.1. Introduction

The analysis was based on interviews conducted with key figures from three significant organizations in Estonia: Protex Balt AS, Haapsalu Vocational Education Center (VET), and the University of Tartu Viljandi Culture Academy. The interviewees hold relevant roles within the textile industry, providing insights on topics such as circular economy, textile technology, and education. These specialists offer a well-rounded perspective on the importance of new professions, their responsibilities, and the challenges in integrating sustainability into the textile industry.

Linda Männik, the sales manager of Protex Balt AS, provides insight into the practical applications of sustainability in production and the emerging roles of circular economy specialists. Marju Heldema from Haapsalu VET offers a viewpoint from the educational side, particularly regarding how vocational training needs to evolve to meet the industry's sustainability demands. Finally, Ave Matsin from Viljandi Culture Academy focuses on the integration of traditional textile techniques

with modern sustainable practices, emphasizing the significance of education in driving the future of the textile industry. These interviews highlight the evolving nature of the textile industry in Estonia and the growing demand for professionals who are adept at implementing sustainable practices.

3.4.2. New Professions and Their Significance

The emergence of new roles, such as circular economy specialists and bio- textile technologists, is becoming crucial in today's textile and fashion industry. According to the interviewees, these roles are pivotal in facilitating the transition toward sustainable production methods. Linda Männik states: "*Biotextile specialists focus on developing new materials from renewable resources, which are key to replacing environmentally harmful synthetics. Their work ensures that the industry can gradually move away from petroleum-based fibers toward biodegradable and eco-friendly alternatives*".

Circular economy specialists are essential in extending the lifecycle of textile materials through recycling and reprocessing systems. They contribute to minimizing waste and promoting a closed-loop system, where materials are reused rather than discarded. This is particularly important in addressing overproduction and overconsumption issues in the industry, which was stated by both Ave Matsin and Marju Heldema. All the interviewees stress that, as environmental consciousness grows, these professionals will become increasingly central to ensuring that the textile industry can meet sustainability targets and consumer demands for environmentally responsible products.

Challenges faced by these professionals include a lack of established systems for textile waste collection and recycling, as Linda Männik refers. Additionally, while there is growing awareness of sustainability, the skills and knowledge necessary for its implementation are still lacking in many parts of the industry. This gap is particularly noticeable between generations, where older workers may not have the same environmental awareness as younger professionals, but younger workers often lack practical skills, which was stated by both - Marju Heldema and Ave Matsin. Overproduction and ineffective waste management systems further complicate the efforts to shift toward more sustainable practices.

3.4.3. Job responsibilities and challenges

Circular economy and bio- textile specialists require a range of technical skills and knowledge. According to Linda Männik, bio- textile specialists must possess a deep understanding of material properties and production processes, as well as the ability to innovate continuously. Similarly, Marju Heldema and Ave Matsin stressed that these specialists need to be familiar with sustainable production techniques, material life cycles, and environmental regulations.

A key challenge highlighted by the interviewees is the gap between theoretical knowledge and practical application. Linda Männik mentioned the difficulty of implementing sustainable practices due to technological limitations and outdated systems. Marju Heldema further noted that while students are enthusiastic about sustainability, they often lack the hands-on experience required to translate these principles into practice. Ave Matsin added that many professionals struggle with integrating sustainability into fast-paced production environments dominated by cost-cutting measures.

Moreover, the rapid pace of innovation in the field poses another challenge. Linda Männik and Marju Heldema highlighted the difficulty of staying updated with the latest advancements in bio-textiles and recycling technologies. This necessitates continuous learning and adaptability on the part of professionals working in these fields.

3.4.4. Labor market developments and education

The demand for circular economy and bio- textile specialists is expected to rise as sustainability becomes a central concern for the textile industry. According to Linda Männik, companies like Protex Balt are actively seeking experts who can lead the transition to greener production methods. Marju Heldema and Ave Matsin also stressed that educational institutions need to adapt their programs to better prepare students for these roles. Given the relatively small size of Estonia's textile industry, there is an opportunity for the country to position itself as a leader in niche areas, such as sustainable textile innovations and traditional craftsmanship. This can provide Estonia with a competitive edge in international markets, despite its small production capacity.

Existing educational programs do not adequately equip students with the necessary practical skills. Marju Heldema emphasized the importance of integrating real-world applications into curricula, particularly in areas such as waste management, material selection, and sustainable production

methods. Ave Matsin pointed out that while awareness of sustainability is growing among younger generations, more specialized training is needed to bridge the gap between theory and practice. As she stated, "a*lthough we teach our students the fundamentals, the fast pace of the industry often leaves them struggling to apply these skills effectively in real-world settings*".

Additionally, all interviewees advocated for more collaboration between industry and educational institutions. Linda Männik suggested that companies should play a more active role in training future specialists by offering internships and hands-on learning opportunities. Ave Matsin added that partnerships with research institutions could foster innovation and help keep professionals up to date with the latest developments in sustainable textiles

3.4.5. Future perspectives

Looking ahead, the future of circular economy and bio- textile professions appears promising but filled with challenges. Linda Männik expressed cautious optimism, noting that while there is increasing interest in sustainable practices, significant investment and technological advancement are still needed. Marju Heldema shared this view, emphasizing that the shift toward sustainability will require both systemic changes in industry and a more informed consumer base. Matsin was more optimistic about the potential for innovation, particularly in the integration of traditional techniques with modern sustainable practices. She suggested that the future of textile production could involve a blend of old and new methods, creating products that are both environmentally friendly and culturally significant.

However, all interviewees agreed that the success of these professions will depend on the willingness of the industry to embrace sustainability, as well as the ability of educational systems to adapt to new market demands. In addition to these factors, the relatively small size of Estonia's textile industry presents both a challenge and an opportunity. The industry must be agile and focus on niche markets where innovation and sustainability can provide a competitive edge. The country's ability to capitalize on its unique strengths, such as its heritage in textile craftsmanship combined with modern sustainable innovations, will be key to its positioning in the global market.

3.4.6. Conclusion

In conclusion, the interviews underscore the importance of supporting circular economy and bio-textile professions through education, industry collaboration, and continued innovation. To advance these fields, it is crucial to bridge the gap between theoretical knowledge and practical application. This requires investments in both educational programs and industry infrastructure. Moreover, given that Estonia's textile industry is relatively small, it is vital to focus on niche areas where Estonia can excel, such as integrating traditional techniques with sustainable practices. Estonia's future in sustainable textiles will depend on cultivating a skilled workforce capable of navigating the challenges and opportunities presented by the evolving textile industry, while making the most of the country's unique strengths in this sector.

3.5. COUNTRY OVERVIEW - GREECE

3.5.1. Introduction

The interviews were conducted with experts, employers, and specialists from the TCLF sector and provided useful information on the current situation and trends as well as the future needs to develop textile professionals and educators towards sustainable solutions and circular economy. Their opinions are crucial because they represent the evolving demands of their respective industries, where sustainability and innovation are no longer optional but essential for future growth. These experts provided valuable insights into the growing need for specialized skills and their industries and challenges.

Evita Stavrou (Craftopia Creative Hub), Business Owner, Interview The insights presented are based on interviews conducted with a diverse range of professionals from the textiles, clothing, leather, and footwear (TCLF) sector in Greece. These include individuals from large and small businesses, such as Cosmos Sport and Siel, as well as smaller entrepreneurial ventures. The interviewees bring a combination of practical experience and strategic insight, making their perspectives particularly valuable in understanding the evolving demands of the industry, especially in light of sustainability challenges. Their input is critical as they operate at various levels of the industry, providing a comprehensive view of the current state of the sector, the

emerging need for specialized roles like circular economy experts and textile technologists, and the labor market readiness to meet these demands.

3.5.2. New professions and their significance

Based on the interviews, explain why circular economy specialists and textile technologists are necessary today. Refer to the thoughts of the interviewees. According to the interviewees, circular economy specialists and textile technologists are pivotal in addressing today's pressing environmental challenges. The industry expert in recycling highlighted the need for professionals who can innovate and implement sustainable waste management systems, noting that traditional waste disposal is rapidly becoming obsolete. A recycling specialist now ensures that materials are reused efficiently, contributing to a zero-waste economy. The specialists emphasized that the demand for sustainable textiles has surged in response to consumer awareness of fast fashion's environmental impact. Textile technologists with a focus on bio- based materials are crucial because they help reduce the carbon footprint of the fashion industry. This profession is vital for shifting from synthetic to biodegradable and renewable materials, which is critical in the fight against pollution and resource depletion.

Circular economy specialists state the green skills in the textile industry are fundamental. The sector of the textile and fashion industry to which the textile industry belongs is considered the second or third polluting industry on the planet at the moment. In this context, changing how and how much we pollute the atmosphere or how we manage waste is extremely important to continue existing as human beings. The challenging part is that there are already industrial/manufacturing units in a production line, and adapting the existing system to these changes is costly and energy-consuming both in terms of human resources, time and finances. Especially in Greece where businesses face a hostile tax system and struggle to survive, the sustainability part is considered a luxury. A luxury in terms of financial sustainability but a necessity in terms of environmental and ecological sustainability practices is not just a trend but a necessity. These new professions are at the forefront of innovation, driving industries toward a more sustainable future. Evita Stavrou: "*It is crucial to evolve our process to reach zero ecological impact as much as possible.....It's not just about collecting waste anymore; it's about rethinking how products are designed, used, and disposed of*". These professionals need a deep understanding of materials, recycling processes, and

legislation. Their main challenge, however, lies in public and industry reluctance to adopt new systems. People are not always willing to change, and it's a significant barrier. The growing emphasis on sustainability has created a pressing need for new professional roles within the TCLF sector. According to the interviewees, specialists in the circular economy and textile technologists are indispensable to driving the industry´s transformation towards more sustainable practices. These roles are crucial in ensuring that companies can meet the increasingly stringent environmental regulations and consumer expectations for sustainable products. One anonymous respondent highlighted: "*We need experts who understand how to integrate circular economy principles into every stage of the supply chain—from sourcing raw materials to product design and waste management&quo"*. This underlines the importance of having dedicated professionals who can oversee and manage the lifecycle of products in an environmentally friendly manner. Textile technologists are also considered vital due to their role in innovating material usage and ensuring that the manufacturing process is optimized for both efficiency and sustainability. Also, it was noted that the future of textiles lies in sustainable materials, and we need specialists who can work with these materials while maintaining product quality. These professions are not only important for meeting regulatory demands but are also seen as a competitive advantage for businesses aiming to lead the market in sustainable products.

3.5.3. Job responsibilities and challenges

A bio- textile technician needs specific areas of knowledge about textile and clothing materials and processes. In addition, they need to be advanced in the application of the processing and creation of textile products, to have specialized abilities in the composition of bio-textile products, which means scientific and technological training. It is necessary to know the catalyst materials and machines that must be used to implement the process. Finally, a technician must maintain a connection with scientific methods if he is part of R&D to develop innovative products and processes. In this way, they will understand in which part of the production they should be involved and make the quality control, coordinate the program of production and purchase of raw materials. A bio- textile technician should know how to implement automatic control systems in the various production stages for the bio- textile industry, the organization of production processes and quality

control, and the dyeing of bio- textile fibers and fabrics, - in order to still be considered a bio-textile, - work safety and protection environmental production.

The main challenges these specialists are facing today are market volatility and stress, global supply chain disruptions as well as consumer trends and fast fashion. As Evita Stavrou refers, challenges could be financial, time cost, and also the entropy which is connected to the resistance to every new change that brings delays and reactions. Moreover, the technological equipment and building infrastructure that exists in the business is playing a vital role to be able to cope with these changes. If many changes are needed it can be a limiting factor for entrepreneurs. The primary responsibilities of circular economy specialists involved overseeing the implementation of sustainable practices across the entire supply chain. They are tasked with reducing waste, increasing the use of recycled materials, and ensuring that the production process aligns with environmental regulations. These specialists must be knowledgeable about the latest green technologies and processes, as well as possess strong project management skills to implement these changes effectively.

Textile technologists, on the other hand, focus on developing and utilizing sustainable materials. Their expertise is crucial in innovating fabric production methods that minimize environmental impact without compromising quality. These professionals need a deep understanding of both traditional and innovative materials, as well as the ability to adapt to rapidly changing technologies in textile manufacturing. One of the key challenges highlighted by the interviewees is the high cost of implementing green technologies. It was stated by a respondent that the financial burden of adopting these new technologies can be overwhelming, especially for smaller companies that do not have the resources to invest in the latest sustainable practices. Another challenge is the lack of technical expertise. Many companies struggle to find professionals with the right skill set to implement sustainable practices." We need more training programs that focus on the practical application of sustainable technologies in the TCLF sector as emphasized by participants.

3.5.4. Labor market developments and education

The role of the textile Recycling Manager in the industries must evolve into an organic position in every business in the upcoming years. As there is a general manager, there must also be a Recycling Manager. It is a part of the sustainability of an economic and environmental business.

Managers in textile recycling activities must know recycling technologies, fabric compositions, material development, and waste management regulations. However, nowadays the sector is not developed in Greece. Clearly, there is a need for specialized training and educational programs. First of all, a training should be given to the directors, managers, and owners of the textile industries so that they understand what green specialization means, how a person specialized in this field can help them, and what is the profit i.e. the economic impact beyond from the environmental as well as what financial tools they have to make the transition. Educational institutions should start with some meetings and study visits in the industry, discussing with the owners, managers and human resources managers to identify the different departments and specialties that are available in the businesses, and how the crafts work in order to develop green skills. To achieve that they need to reach out to Greece, to the specific region and based on this develop a suitable curriculum. The demand for circular economy specialists and textile technologists is growing rapidly, driven by both regulatory pressures and consumer demand for sustainable products. However, according to the interviewees, there are not enough professionals with the right skills to fill these roles. It was highlighted that there is a significant gap between the industry's needs and the skills currently available in the labor market. The lack of qualified professionals is a concern, as companies face increasing pressure to meet sustainability goals. In terms of education, there are limited opportunities for specialized training in sustainable practices within the TCLF sector in Greece. Many professionals rely on international programs or self-learning to acquire the necessary skills. The interviewees agreed that more local education and training programs are needed to support the development of future specialists. They need targeted programs that focus on practical skills and real-world applications.

3.5.5. Future perspectives

As far as academia is concerned Evita Stavrou highlighted that they have not adjusted to what the industry needs regarding the circular economy and ecology, and further actions should be taken towards that direction. However, there are also challenges and cautious optimism regarding these developments. Business owners and employees must coordinate their common actions. Employees should understand why they are asked to implement the changes in question, why the production process has changed, why different steps have been added to the implementation of the tasks, why

waste must be separated, etc. Otherwise, they will not follow a change simply because it has been pointed out to them. The reason must be understood and they can communicate it in their circle. Looking ahead, the interviewees expressed optimism about the potential for growth in sustainable practices within the TCLF sector. Many believe that the demand for sustainable products will continue to rise, creating more opportunities for professionals in circular economy roles and textile technology. A **respondent** mentioned: "S*ustainability is no longer a choice; it's a necessity. Those who can adapt will thrive".* This indicates that companies that invest in sustainability now will likely reap the benefits in the future, both in terms of market competitiveness and regulatory compliance.

However, there is also a note of caution. The financial and technical barriers to adopting sustainable practices remain significant, and businesses will need to find ways to overcome these challenges. Without support from both the government and industry, smaller companies may struggle to keep up.

3.5.6. Conclusion

Over the last years, Greece has started to understand the importance of undertaking greener and sustainable businesses. The need to train the employees and the necessity to add new professions, such as Recycling Manager or Bio- Textile Technicians are not widely spread in the Greek business mentality. On the other side experts and academia highlight how important it is to build a skilled workforce capable of navigating the challenges and opportunities and evolving textile industries. To support the growth of the TCLF sector in Greece, more investment is needed in education and training programs that focus on sustainability and green technologies. Additionally, financial incentives or support from the government could help smaller companies overcome the cost barriers associated with implementing these practices. With the right support, Greece has the potential to become a leader in sustainable textiles and circular economy practices in Europe.

3.6. COUNTRY OVERVIEW - BULGARIA

3.6.1. Introduction

The following summary draws on insights from three interviews with professionals across the textile and education sectors in Bulgaria. Interviewees include a representative from the business - Radina Konstantinova, owner of RADA Design LTD; management in the education sector in the face of Lyudmila Naceva, Principal at the High School of Textile and Fashion Design in Varna; and Lyudmila Naceva, PhD, a teacher at the National Academy of Arts (NAA). These individuals represent a range of perspectives—from business owners to educators—and their views provide a broad understanding of the evolving demands within the textile industry, particularly as they relate to sustainability and green skills. Their opinions are crucial for understanding the challenges and opportunities in transitioning toward a more sustainable textile sector.

3.6.2. New Professions and Their Significance

Circular economy specialists and textile technologists are becoming increasingly important as the textile, clothing, leather, and footwear (TCLF) industries face growing pressure to adopt sustainable practices. All three interviewees emphasized the need for professionals who are skilled in green technologies and practices, capable of guiding the industry towards reduced waste and sustainable material usage.

According to the business sector (Radina Konstantinova), one of the key challenges is the overproduction of low-quality clothing that contributes to environmental degradation. She stresses the importance of Bio- Textile Technicians, stating: "*Problem-solving, creativity, and collaboration are my top three skills needed for a team to make innovations in the field*." Principal Lyudmila Naceva highlights the increasing necessity for green skills to address environmental concerns, saying: "*Acquiring green skills and competences provokes critical thinking, environmental sustainability, and research thinking.*" She emphasizes that educators and industry leaders must work together to instill these competencies in the next generation of professionals. NAA teacher Teodora Spasova also notes the importance of a strong foundation in sustainability, suggesting that future textile technologists need: "...e*xtensive experience with the nature of natural*

fibers and their stability"..to create sustainable bio- textiles. These emerging professions are key to reducing waste and creating longer-lasting, eco-friendly textiles.

3.6.3. Job Responsibilities and Challenges

The main responsibilities of circular economy specialists and textile technologists revolve around managing the lifecycle of textiles, from sustainable sourcing and production to recycling and waste management. Entrepreneurs and educators both highlight the importance of understanding recycling processes, with Radina Konstantinova stressing the need to handle materials with care and ensure the safety of the environment throughout the recycling process. A key challenge these professionals face in Bulgaria is the low level of social responsibility and awareness regarding sustainable practices. Lyudmila Naceva notes: "*Low awareness, consumerism, and the low prices of Chinese goods*" hinder the adoption of sustainable practices in the textile industry. Additionally, Lyudmila Naceva points out that while green skills are gaining attention: "*We are just at the beginning of a new era in the textile industry*," indicating that there is still much progress to be made.

Textile technologists must also have a strong understanding of materials and processes. Radina Konstantinova highlights the importance of "bio fibers and textile development, data analysis, and regulatory knowledge" as essential competencies. Similarly, Teodora Spasova emphasizes the need for deep knowledge of sustainability principles and regulatory standards, which are critical for ensuring that textiles meet eco-friendly criteria.

3.6.4. Labor Market Developments and Education

The demand for circular economy specialists and textile technologists is on the rise, driven by global trends toward sustainability. According to the interviewees, educational institutions must play a central role in preparing future professionals for these roles. Radina Konstantinova believes that training should begin in universities, stressing: "I*t is important for our future.*"

Naceva suggests that integrating green skills into the curriculum can be achieved through various methods, including project activities, competitions, and specialized teacher training. She also notes that vocational education currently does not provide adequate training in sustainability-focused skills, which leaves a gap in the labor market for qualified professionals. Teodora Spasova echoes

this sentiment, advocating for the development of new disciplines and the enrichment of existing ones to include more green skills.

Hands-on training and practical experience, such as workshops and collaborations with research institutions, are deemed critical by all three interviewees. Radina Konstantinova and Teodora Spasova agree that professional development opportunities should prioritize these methods to keep up with innovation in the industry.

3.6.5. Future Perspectives

The future of the textile industry in Bulgaria, according to the interviewees, will see a greater focus on sustainable materials and circular economy principles. Radina Konstantinova envisions an increased role for bio- based materials, particularly in advanced technologies like 3D printing. However, she also emphasizes the importance of collaboration with research institutions to drive these innovations forward.

Spasova remains cautiously optimistic, noting that while bio- textile professions are still developing in Bulgaria, they will become more common as sustainability becomes a greater priority. She expresses hope that the education system will continue to evolve to provide deeper knowledge in sustainable textile production.

Lyudmila Naceva adds that the role of Recycling Managers and other circular economy professionals will expand in the coming years as public awareness about textile sustainability increases. Raising public awareness about the sustainability of textiles and their recycling will be essential for driving change in the industry.

3.6.6. Conclusion

In conclusion, Bulgaria's textile industry is at the threshold of significant changes as the need for sustainability becomes more pronounced. Supporting the development of green skills and professions such as circular economy specialists and textile technologists will require efforts from both the educational sector and the industry itself. By fostering awareness, improving educational programs, and encouraging collaboration between institutions and companies, Bulgaria can better prepare its workforce to meet the sustainability challenges of the future.

3.7. COUNTRY OVERVIEW – CROATIA

3.7.1. Introduction

The analysis was based on interviews conducted with key figures from three different organizations in Croatia: University of Zagreb – Faculty of textile technology (HE), Secondary school for fashion design Rijeka (VET) and Obrt Lun Zagreb (SME).

Sanja Ercegović Ražić teaches at the Faculty of textile technology and is involved with several projects on development of new curricula for higher education. This interview encapsulates Sanja's insights on the need for specialized training, lifelong learning, and the industry's shift towards advanced, sustainable practices. Antonija Bukša is the headmistress at the vocational schooling Rijeka. Ms. Bukša is committed to providing opportunities for students to learn and think independently, incorporating green industries and activities into their education. She collaborates with colleagues to ensure the relevance and quality of new educational programs, fostering a proactive and entrepreneurial mindset among students. Martina Bobovčan Marcelić is an entrepreneur in textiles from Zagreb. Martina indicates that there is a gap between the current skills of employees and the needed competencies for sustainability. Ongoing education and training are necessary to bridge this gap. Martina believes that vocational training and university education need significant improvements to align with industry demands for green skills and sustainability practices. These interviews highlight the evolving nature of the textile industry in Croatia and the growing demand for professionals who are adept at implementing sustainable practices.

3.7.2. New Professions and Their Significance

The interviews highlight several emerging professions and their significance in the textile sector, focusing on Bio- Textile Technicians and Recycling Managers. These are the key points: Bio-Textile Technician - This role is crucial due to the rising demand for sustainable and eco-friendly textiles. Bio- Textile Technicians need specialized knowledge of biodegradable materials, sustainable production methods, and compliance with environmental standards. However, Sanja Ercegović Ražić points out that while technical skills are essential, these professionals may require further education to manage projects independently or introduce new technologies.

Recycling Manager - The importance of this role is tied to waste reduction and the growing need for textile recycling. Recycling Managers must possess higher-level qualifications to handle the complexity of decision-making in recycling processes. This reflects the industry's focus on addressing the global challenge of textile waste.

Martina envisions an increasing role for bio- based materials in the industry, driven by: growing consumer demand for sustainable products, advancements in material science and technology and stricter environmental regulations. Finally, the significance of green skills and education are stressed as across the textile sector, professionals must be equipped with green skills to meet sustainability goals. This includes expertise in eco-friendly materials, recycling technologies, and lifecycle analysis. These roles underscore the transformation happening within the textile industry, where both technical and soft skills, such as critical thinking and problem-solving, are essential for navigating the shift toward sustainability.

3.7.3. Job responsibilities and challenges

According to the interviews, Bio- Textile Technicians requires sustainable material knowledge since they are responsible for working with bio- based textiles, understanding the properties of these materials, and ensuring compliance with environmental regulations during production, knowledge of process management as they must be proficient in textile manufacturing processes and recycling technologies, though they may not be expected to independently manage projects unless they have additional education. Lifelong education and modular training are essential for bio- textile technicians to adapt to evolving industry standards and technologies. Recycling Managers requires knowledge of waste management oversight since they play a critical role in implementing textile recycling models, managing waste, and developing solutions to reduce the environmental impact of textile production, decision-making and strategic competencies as they are responsible for making strategic decisions related to recycling processes and must be familiar with global environmental regulations and best practices. Due to the complexity of the role, Recycling Managers are expected to have higher-level qualifications (e.g., postgraduate degrees) in fields related to sustainability and recycling, according to professor Sanja Ercegović Ražić. According to the participants in the interviews, these professionals are tasked with integrating green practices into various stages of production, from sourcing eco-friendly materials to reducing

emissions and waste and they often work with research institutions and companies to stay updated on the latest innovations in sustainability, ensuring the workforce is trained to use the newest green technologies.

Challenges can be divided into:

Technological and Educational Gaps:

There is a significant skills gap between current employee capabilities and the advanced knowledge required for sustainable textile production and recycling technologies. Both Bio-Textile Technicians and Recycling Managers need continuous upskilling to keep pace with the rapidly changing industry.

Complex Supply Chains:

Managing sustainability across the entire textile supply chain is difficult due to its global nature, with many layers of production, sourcing, and distribution making waste management and resource use challenging.

Market Saturation with Low-Quality Textiles:

The industry is struggling with the dominance of cheap, low-quality textiles that flood the market, making it hard to promote and sustain high-quality, eco-friendly alternatives.

Resistance to Change: Some traditional business models in the textile sector are resistant to adopting green skills and sustainable practices due to costs, lack of awareness, or insufficient infrastructure to support recycling and sustainable material production.

These responsibilities and challenges show the need for continuous learning and adaptation as the textile sector evolves toward sustainability and advanced technologies.

3.7.4. Labor market developments and education

The textile sector is undergoing significant changes due to the need for sustainability and technological advancement, which directly impacts labor market demands. Key developments include: demand for green skills (the industry is increasingly focused on hiring professionals with green skills, particularly those related to sustainable production, waste management, and eco-friendly materials. These skills are critical for meeting both regulatory and environmental requirements), shift towards higher qualifications (roles such as Bio- Textile Technicians and Recycling Managers require specialized training and, in some cases, postgraduate education to

handle the complexities of recycling processes and sustainability initiatives. Higher education institutions and vocational programs should adjust their curricula to better prepare students for these roles, technological transformation (the integration of digital technologies and automation is reshaping job profiles in the textile industry, requiring workers to be proficient in digital skills, data analysis, and technology management to stay competitive).

Educational institutions should be responding to labor market shifts by:

Modular Learning and Lifelong Education: Both Bio- Textile Technicians and Recycling Managers need continuous upskilling to keep pace with new sustainable practices and recycling technologies. Modular programs offer flexibility, allowing professionals to learn new skills based on industry needs.

Introduction of Green and Digital Skills: Schools and universities are starting to incorporate sustainability topics and digital literacy into their programs, which are vital for modern textile workers. Educational initiatives should aim to provide students with a blend of technical and soft skills, like problem-solving and adaptability, to ensure they are well-equipped for evolving job roles and work on such projects is also vital.

Collaboration with Industry: hands-on experience with new technologies is essential

Overall, there is a clear emphasis on upgrading education to meet the demands of an evolving textile labor market, focusing on sustainability, technology, and lifelong learning.

3.7.5. Future perspectives

The future of the textile sector is increasingly tied to sustainability and the adoption of green technologies, creating new opportunities for professionals with specialized skills in areas like bio-textiles and recycling management. The labor market will demand workers who are not only adept with digital tools and automation but also equipped with green skills to meet rising environmental standards. As textile waste and resource consumption remain global challenges, the need for recycling innovations and eco-friendly production methods will intensify, driving industry growth in high-value, sustainable textiles. Education and vocational training will have to continue evolving, focusing on lifelong learning and modular teaching to help professionals stay current in an industry transitioning to more sustainable practices and advanced technologies. All three ladies express their concern with the current status of textile industry, especially in Croatia, although they

feel that with smart guidance and investment in education and technology, the obstacles could be overcome. What is also important is the integration of traditional techniques within SME-s that represent a difference from the mainstream production with modern sustainable practices.

The textile industry in Croatia has experienced significant shifts in recent years, grappling with challenges such as declining interest in traditional textile professions and competition from low-cost, mass-produced textiles. However, the sector still holds importance, especially in terms of creativity and innovation.

3.7.6. Conclusion

In conclusion, the textile industry in Croatia is at a crossroads, facing both challenges and opportunities as it adapts to sustainability trends and the rise of green technologies. While there is a noted decline in traditional textile roles, the sector could evolve with the introduction of Bio-Textile Technicians and Recycling Managers. Education should adapt through lifelong learning modular teaching to ensure the workforce is prepared for the advanced technologies and sustainable practices needed to meet global industry standards. With these developments, Croatia could participate in a more sustainable and high-value textile production future.

SUMMARY

The interviews from Germany, Italy, Spain, Estonia, Bulgaria, Greece, and Croatia provide different but similar views on the future of sustainability in the textile industry, especially when it comes to bio- textiles and the circular economy. One common theme across all countries is that sustainability is now seen as a necessity, not just an option. There is a growing focus on green skills, recycling management, and using bio- based materials.

In Germany, making sustainability a key part of education and industry practices is seen as essential. This involves having flexible learning programs that help students and workers keep up with changing sustainability standards. However, one challenge Germany shares with other European countries is that schools and universities do not have enough resources to achieve these

new educational goals. Another issue is that SMEs often do not have the staff or knowledge to manage sustainability efforts, so they need outside experts to help.

Italy, like Germany, understands the importance of education and teamwork in promoting sustainability. But Italy faces a unique challenge: balancing the costs of labor with the low profits from reusing and recycling materials, which is key to the circular economy. Italy also stresses the importance of involving young people in this process. Young people are major consumers of fast fashion, but they can also play a big role in promoting sustainability through education and career development.

Spain, similar to Germany and Italy, focuses on education and rules that support sustainability. Spanish experts highlighted the role of biotechnology in creating new, eco-friendly materials. However, Spain, like Italy, points out that using sustainable materials alone won't be enough—there needs to be a bigger change in how industries work, including addressing overproduction and waste.

Estonia, a smaller country in the textile industry, is an interesting case because it combines traditional skills with modern sustainability practices. Estonia's smaller industry can be both a challenge and an advantage. The country needs to be flexible and focus on niche markets where innovation and sustainability can give it a competitive edge. Like other countries, Estonia also stresses the importance of research, collaboration, and education in moving toward sustainability.

Bulgaria and Greece face similar challenges in making their textile industries more sustainable. In Bulgaria, there is a strong focus on education and raising public awareness about sustainability. Bulgaria also wants to create more jobs in areas like recycling management. Greece, on the other hand, sees potential for growth in sustainability, but experts say that smaller companies need more help from the government, especially financial support, to keep up with the changes. Croatia, like Estonia, is dealing with a decline in traditional textile jobs while trying to modernize the industry. Croatia's textile sector is at a turning point, as it faces the challenge of mixing new technologies with sustainability, while also keeping its traditional skills alive. Like other countries, Croatia sees education as a key way to overcome these obstacles. There is a need for continuous learning and flexible teaching to make sure the workforce is ready for new industry demands.

Overall, the main themes that come up in all these countries are the importance of education in supporting sustainability, the need for teamwork between different groups, and the role of

government in helping companies deal with financial and regulatory challenges. Each country has its own specific difficulties, such as economic concerns about the circular economy, smaller industry, and need for more public awareness. However, there is a shared understanding that the future of the textile industry depends on making systemic changes, fostering innovation, and developing a skilled workforce that can adapt to the changing landscape of sustainability.