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SiT
Sustainability in TCLF

D3.1.
2 MODULAR CURRICULA

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Abstract:	The SiT project has developed two innovative curricula to support the green transition in the Textile, Clothing, Leather, and Footwear (TCLF) sector: **Bio-textile Technician (EQF 5)** and **Recycling Manager (EQF 6)**. Both are based on research identifying current skill gaps and training needs and follow a **modular, learner-centred approach**, allowing participants to create personalized learning paths across eight interdisciplinary modules. An introductory module on **Sustainability Fundamentals** ensures a shared foundation for all learners. The curricula were developed in line with **European quality frameworks** (EQAVET, ESG, and EQF) to facilitate **international recognition** through transparent and validated learning outcomes. The report outlines the methodology, development process, and structure of each curriculum, including their learning outcomes, content, methods, and objectives.
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PROJECT SUMMARY

The **Sustainability in Textile, Clothing, Leather, and Footwear (SiT)** project is a collaborative initiative aimed at driving the green transition within the TCLF sector by bridging the gap between education, training, and industry needs. Bringing together 15 partners from eight EU countries, the project integrates vocational education and training, higher education, and business representatives to create a sustainable and innovative ecosystem for the industry.

At its core, SiT seeks to identify the key skills needed for the green transition of the TCLF sector, ensuring that both existing and emerging competencies align with sustainable and circular economy models. By developing innovative and multidisciplinary curricula for two emerging professions of Bio-textile technician and Recycling Manager, the project will equip students, professionals, and small and medium-sized enterprises (SMEs) with the knowledge necessary to navigate this transformation. A particular focus is placed on upskilling and reskilling the workforce, providing TCLF professionals, entrepreneurs, and workers with functional, transversal, and green competencies that enhance their employability and adaptability in an evolving market.

The project also emphasizes the co-creation of knowledge, fostering collaboration between academic institutions, businesses, and policymakers to develop sustainable business models and educational frameworks that drive innovation. To ensure long-term impact, SiT will establish local hubs and an interactive platform to connect stakeholders, provide valuable resources, and facilitate the sustainable transformation of SMEs and start-ups within the TCLF sector.

By promoting circular economy principles, green production techniques, and sustainable business strategies, the project aims to strengthen the competitiveness of the European TCLF industry while contributing to environmental sustainability. In alignment with the EU Strategy for Sustainable and Circular Textiles, SiT will help transform the sector into a more resilient and responsible industry, creating new employment opportunities and fostering a culture of sustainable innovation across Europe.

1. INTRODUCTION

1.1. Scope

The SiT project has developed two innovative curricula aimed at equipping learners with the skills needed for the green transition in the Textile, Clothing, Leather, and Footwear (TCLF) sector.

The present report introduces two new curricula for training for the emerging professions of a) Bio-textile technician (EQF5) and b) Recycling Manager (EQF6) developed in the frame of the SiT project. The defined curricula are based on extensive research on identified skill gaps and professional training needs in (SiT Training Structure Report, 2023). The goal of the two new curricula is to respond to the current training needs in the TCLF sector, considering the current and future trends in the field. Both curricula are designed to accommodate the individual needs of each learner through a modular approach. This means that learners have the freedom to choose the specific modules they wish to study and create their own

personalized learning paths. Each curriculum is interdisciplinary and structured into eight (8) modules and each module includes 3-5 thematic units.

Based on the feedback collected during workshops and focus groups, the partnership decided to enrich the curriculum with an **introductory module on sustainability fundamentals**. This module provides a clear overview of the basic principles of sustainability, which will then be explored in greater depth throughout the specialized modules. In this way, all learners—regardless of their background—can build a common foundation before engaging with the more advanced aspects of sustainable practices in the TCLF sector.

The SiT project targets the recognition of the curricula in different countries at the European level. International recognition of qualifications is based on transparency through a common agreement on the Learning Outcomes (Los) included in the developed curricula and their identification and validation among partners and relevant stakeholders in each country. The curricula development process was implemented in accordance with the European quality frameworks, European Quality Assurance in Vocational Education and Training (EQAVET) and The Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG), where applicable. The European Qualifications Framework (EQF) contributed appropriate qualification descriptions. This report shortly describes the methodology and explains the curricula development process. It presents the structure of each curriculum in modules. Each module descriptor shows the learning outcomes, course content, EQF level, training and assessment methods, duration, and general objective.

1.2. Audience of the Document

The audience of the SiT Modular Curricula is a) the SiT project partners who shall undertake the implementation of the project's training, b) other HEIs and VET providers that could provide the full training scheme or implement parts of the training courses, c) trainers who will deliver the training courses. The document serves as a source of the training curriculum to be undertaken by the project participants in the piloting of the SiT training.

2. METHODOLOGY OF DESIGNING AND DEVELOPING THE CURRICULA

This structure is based on the insights gained from the field research, ensuring that the training programs are innovative and responsive to the sector's changing needs, steering the industry toward more environmentally friendly practices. The report outlines emerging trends and challenges, describing the specific skills and competencies required to effectively address these issues. To ensure that the SiT training programs align with current demands, the report maps the identified skills within existing frameworks such as the European Qualifications Framework (EQF), National Qualifications Framework (NQF), and European Skills, Competences, Qualifications and Occupations (ESCO) model.[1]

[1] At this stage it is important to stress the fact that in the sections dedicated to regulatory knowledge, these regulations may vary from country to country, and each region integrates local regulations with European provisions. The modules that will be developed in the later phase of the project for each profession will provide national guidance on national regulations as well.

2.1. Key methodologies included

Surveys: Online surveys were designed and distributed to different target groups, including small and medium sized enterprises (SME) representatives and higher education/vocational education (HE/VET) trainers.Interviews: Semi-structured interviews were conducted with focus group representatives from each target group.Data Mapping: An accompanying activity in the research involved mapping specific skills against established frameworks to ensure alignment with existing standards and to facilitate their application within the sector, such as the European Qualifications Framework (EQF) and European Skills, Competences, Qualifications and Occupations (ESCO) systems.

The basis for the developed curricula is the preliminary analysis carried out by the SiT project partners and the identification of two emerging professions in the TCLF sector:

2.2. Definition of the Learning Outcomes

The qualifications and LOs for the two curricula were defined by applying the European Qualification Framework (EQF). The EQF is an 8-level, learning outcomes-based framework for all types of qualifications that serves as a translation tool between different national qualifications frameworks. This framework helps improve transparency, comparability, and portability of people's qualifications. It also makes it possible to compare qualifications from different countries and institutions (Council of the European Union, 2017). Each qualification level describes the educational qualifications in terms of knowledge (theoretical and practical), skills (cognitive and practical) and competences (responsibility and autonomy).

EQF Level Knowledge Skills Competence In the context of EQF, knowledge is described as theoretical and/or factual. In the context of EQF, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments). In the context of the EQF, competence is described in terms of responsibility and autonomy. Responsibility and Autonomy are described as the ability of the learner to apply knowledge and skills autonomously and with responsibility.

Table 1. Descriptions of the qualifications for levels 5 and 6 (Council of the European Union, 2017).

EQF Level	Knowledge	Skills	Competence
Level 5	Comprehensive, specialised, factual, and theoretical knowledge within a field of work or study and awareness of the boundaries of that knowledge.	A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems.	Exercise management and supervision in work or study contexts with unpredictable change; review and develop performance of self and others.
Level 6	Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles.	Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study.	Manage and transform complex and unpredictable work or study contexts requiring new strategic approaches; contribute to professional knowledge and practice; review strategic performance of teams.

The identified LOs for EQF 5 and EQF 6 level were used and adapted for the development of the two modular curricula for continuous vocational training (c-VET) and higher education (HE). The LOs were validated and enhanced collaboratively and utilizing the specific knowledge of the consortium partners and project`s stakeholders

2.3. Definition of the Training Methods

Overall, the two curricula intend to fit the career goals of those entering the TCLF sector and professionals already working in the field. The modular curricula and the 8 modules in each one of them are focused on developing the trainee's competences instead of pure conceptual knowledge and skills. Competence-based curriculum emphasises learner-centred teaching and learning, which is applied in the training's pedagogical approaches (described in detail in the Training Toolkit). In a learner-centred approach, the trainer is a facilitator of learning rather than a presenter of information. Learners are at the centre of the learning process and are active creators of their knowledge. Learning is a process enacted by the learner in an environment that provides learning opportunities. (Damsa & de Lange, 2019.) An important element of the SiT training is combining various available online resources, face-to-face instructions, and real-life practical activities. Thus, the training utilises three different learning environments (types) and respective teaching methods supporting them, while project-based learning is an inherent part in all these types of training. The three types of training are combined followingly in each module of both curricula:

Table 2. The learning environments(types) of the SiT training for each curricula

Training Type	Hours	Description

E-learning (MOOC)	40-60 hours	• Asynchronous online individual learning • Studying and reflecting on course material • Activities and peer collaboration via the online platform • Short project activities
Face-to-Face Learning	30 - 40 hours	• Synchronous teaching in live or online environments • In-person instruction • Group work, assignments, and projects
Work-Based Learning	up to two months	• Group work and projects in real TCLF environments

The purpose of this staged approach and the different learning environments is to provide the learners with learning opportunities through engaging material, activities, and projects. Learners solve problems and formulate and answer questions of their choice through practical activities such as discussions, brainstorming, and projects. By applying this structure and approach, the learners' problem-solving and competences are developed. They are exposed to different activities that improve their functional, green, digital, transversal, and soft skills.

2.4 Definition of the Assessment

The SiT training is divided into three learning environments, which offer different techniques and opportunities for learning. Usually, assessment is carried out at the end of a programme, but the determined staged approach requires assessment also during the programme. This emphasises “Assessment as Learning”, placing more value for learning practices where the learners are not just receiving but seeking feedback (Dann, 2014). When the learning outcomes are measured, assessment focuses on an individual's achievement of the stated learning outcomes (Biggs, 1996). The SiT training’s staged approach and the use of different learning environments require use of several assessment methods to measure and indicate the stated learning outcomes, such as tests and practical assessments, projects, and final assignments. The assessment of SiT training is divided into two types: formative and summative assessment.

- Formative assessment is a process of assessing learners' learning while they are in the process of learning. It usually involves providing feedback on their assignments, participation in group works and discussion, and other work as they are creating them.

- The summative assessment aims to evaluate learning at the end of the learning process, and it is usually in the form of a final exam, assignment, or project at the conclusion of a study module. Summative assessment can also serve as a formative assessment when in-between exams are included along with the final exam in a study module.

Consequently, there is a need for multi-source feedback using several kinds of tools. This means that trainers and learners, as well as the workplaces, are all part of the evaluation at

each stage of the study training. SiT assessment includes the following structure, types, and tools:

● MOOC: quizzes (one study module includes a quiz per each thematic unit).

● Face-to-face learning: case studies, group work, activities, projects, assignments, peer evaluation, quizzes, etc.

● Work-based learning: feedback from supervisors and trainers using discussions, task performance assessments, questionnaires etc.

3.Bio-Textile Technician

3.1. Key Competencies

The responsibilities of a Bio-Textile Technician revolve around the creation of innovative textiles from bio-based raw materials, managing processes such as fabric production and yarn development, with a strong emphasis on environmental sustainability. The survey identified several competencies that are essential for Bio-Textile Technicians to succeed in their role. These competencies can be divided into technical skills, soft skills, and knowledge of regulatory standards.

3.2. Technical Competencies

Bio-Textile Technicians require expertise in bio-based materials, biotechnology, and textile production techniques, combining traditional methods with sustainable innovations. They must apply quality control and testing, conduct life cycle assessments to minimize

environmental impact, and use their chemistry knowledge to optimize processes such as dyeing and material development.

3.3. Soft Skills

Bio-Textile Technicians need strong problem-solving and critical thinking skills to address sustainability challenges, along with creativity and innovation to develop new materials. Success in this field also depends on effective communication and collaboration, strong time management to balance projects, and adaptability to evolving technologies, markets, and regulations.

3.4. Regulatory Knowledge

Bio-Textile Technicians must ensure safe handling of chemicals, uphold supply chain transparency, and understand sustainability certifications. They are also responsible for supporting ethical labor practices by aligning with social compliance standards.

3.5. Training and Professional Development

The survey also highlighted **a clear preference for hands-on, practical training as the most beneficial form of professional development for individuals working with bio-based materials**. Respondents emphasized the importance of gaining experience through **a real-work environment** which allows professionals to refine their skills in actual production environments. **Collaboration with research institutions and industry partners** was another favored approach, as it provides opportunities for innovation and problem-solving in real-life scenarios. While **practical training was prioritized**, **online courses and certifications** were also recognized as valuable for professionals seeking to deepen their theoretical knowledge, particularly for those who may not have the flexibility to attend in-person training sessions. This suggests a need for diverse training opportunities that can accommodate various learning preferences and professional schedules. This mapping considers the insights and priorities highlighted in both the interviews and survey documents, reflecting the growing importance of sustainable practices in the textile industry and the need for specialized skills to meet these challenges.

3.6. Competency Mapping Table for a Bio-Textile Technician

This mapping considers the insights and priorities highlighted in **both the interviews and survey documents**.

Competence Category	Competence/Skills	Description
	Knowledge of bio-based materials and processing techniques	Expertise in identifying, processing, and utilizing bio- based, biodegradable, and renewable materials.
	Textile production techniques (weaving,	Proficiency in using traditional and modern textile production methods, integrating eco-friendly materials into traditional processes.

Functional Competencies	knitting, non-woven)	
	Bio-technology and bioengineering expertise	Applying scientific principles to develop bio- fibers and optimize their properties for textile production.
	Quality control and testing methods	Ensuring that bio- textiles meet safety, durability, and environmental standards through rigorous quality control processes.
	Life Cycle Assessment (LCA)	Assessing the environmental impact of textiles throughout their lifecycle, from production to disposal.
	Proficiency in chemistry (organic and inorganic)	Knowledge of chemical processes used in sustainable textile production, including dyeing and material treatment.
	Machinery operation and maintenance	Ability to operate and maintain both traditional and modern textile machinery for bio- based material production.
	Process optimization and efficiency	Implementing efficient processes to minimize waste, reduce energy consumption, and optimize resource usage in textile production.
	Environmental regulations and standards	Understanding and complying with environmental regulations and standards, including chemical safety and waste management.
Green Competencies	Sustainable sourcing and supply chain transparency	Managing and ensuring transparency in the sourcing of bio- materials, promoting ethical and eco-friendly supply chains.
	Energy efficiency and renewable energy	Utilizing renewable energy sources and improving energy efficiency in production processes to reduce environmental impact.
	Sustainable innovation and research	Continuously researching and implementing sustainable innovations in textile production, focusing on bio- material development.
	Problem-solving and decision-making	Tackling sustainability and technical challenges in production processes, making informed decisions to drive innovation.
Transversal Competencies	Critical thinking and analytical skills	Analyzing complex data and situations to develop innovative, sustainable solutions for textile production.
	Creativity and innovation	Developing creative approaches to overcome challenges, fostering innovation in bio- textile materials and processes.
	Communication and collaboration	Effective communication and collaboration with teams, stakeholders, and clients to achieve sustainability goals.
	Leadership and team management	Leading teams in implementing sustainable textile production processes, ensuring alignment with environmental objectives.
	Time management and organizational skills	Managing deadlines and resources effectively to meet project goals without compromising sustainability standards.
	Adaptability and continuous learning	Adapting to industry changes and continuously learning new techniques and technologies in the evolving field of bio-textiles.

	Digital literacy and technological proficiency	Using digital tools and technologies to enhance textile production efficiency, quality control, and innovation.

3.7. Skills required to meet the competencies needed for a Bio-Textile Technician according to the ESCO model

A Bio-Textile Technician **specializes** in creating and innovating sustainable textiles using bio-based materials. These professionals work with renewable resources, biodegradable textiles, and production techniques to promote sustainability in the textile industry. Their work involves development of bio-fibers, the implementation of sustainable production methods, and ensuring environmentally friendly processes in textile manufacturing. The role also requires collaboration with research institutions, industry stakeholders, and adherence to regulations concerning environmental standards and product life cycles.

The **primary objective** of the Bio-Textile Technician is to engineer textiles that are not only environmentally sustainable but also robust and of superior quality. By doing so, they help the fashion industry transition from resource-intensive, environmentally detrimental manufacturing practices to innovative approaches that align with growing consumer demand for sustainability.

3.8. Curriculum structure for a Bio-Textile Technician (EQF level 5)

The curriculum for a **Bio-Textile Technician** in TCLF sector includes relevant competences in the field of textiles/clothing enterprises, textiles/clothes related small crafts, combining interdisciplinary both technical, soft and digital skills. It contains eight (8) study modules. Plus one introductory module on sustainability fundamentals. This is the distribution of learning environments per each module

Module	MOOC (hrs)	Face-to-Face (hrs)	WBL (hrs)	Total (hrs)
Sustainability fundamentals - introductory module	4	4	18	26
Bio-based textile material properties and processing techniques	6	6	14	26
Chemistry for textile processing and dyeing with less environmental impact	6	6	14	26
Sustainable Production of Textile/ Clothing products	6	6	14	26

Sustainable sourcing and supply chain for bio-based textile materials	6	6	14	26
Basic principles of biotechnology and bioengineering for bio-based textile materials	6	6	14	26
Quality Control and testing methods for bio-based textile products	6	6	14	26
Digitalization in fashion eco-system through digital design, simulation and visualization in fashion industry	6	6	14	26
Adaptability, communication skills and creative thinking in fashion industry	6	6	14	26
Total hours / ECTS credits	**52**	**52**	**130**	**234 / 9**

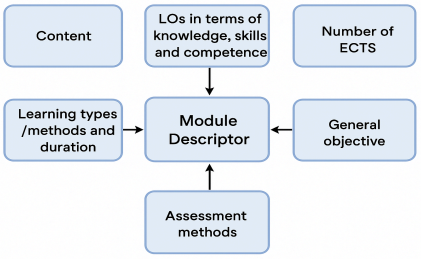
Learners can select and complete the modules according to their preferences and needs for acquiring new competences. The structure for the curriculum of a **Bio-Textile Technician** (EQF5) is the following:

Table 2. Curriculum structure for a Bio-Textile Technician (EQF5)

No. of Module	Bio-Textile Technician (EQF 5)	Skills required to meet the competencies needed according to ESCO model:
M0	**Sustainability fundamentals**	- Understanding sustainable principles - Applying sustainable production practices
M1	**Bio-based textile material properties and processing techniques**	▪ Ability to develop and optimize bio-based materials for specific textile applications (e.g., technical textiles for performance, fashion textiles, etc.) ▪ Understanding of policies related to bio-based materials, including the EU's regulations on renewable resources and biodegradable materials
M2	**Chemistry for textile processing and dyeing with less environmental impact**	▪ Knowledge of green chemistry principles and the ability to select eco-friendly chemical alternatives for textile treatment and finishing ▪ Proficiency in natural dyeing processes and the use of plant-based or microbial dyes for sustainable textile coloring
M3	**Sustainable Production of Textile/ Clothing products**	▪ Expertise in reducing water and energy consumption during textile production processes ▪ Awareness of global developments in sustainable fashion, including slow fashion, circular fashion, and the zero-waste movement

		▪ Knowledge of global best practices in circular economy models specific to textiles
M4	**Sustainable sourcing and supply chain for bio-based textile materials**	▪ Capability to implement closed-loop recycling systems, where waste materials are reused within the production cycle ▪ Familiarity with blockchain technology for ensuring supply chain transparency and material traceability
M5	**Basic principles of biotechnology and bioengineering for bio-based textile materials**	▪ Familiarity with the latest advancements in bio- fabrication, including the use of microorganisms in material production ▪ Skills in integrating nanotechnology with bio-textiles for enhanced properties like strength, flexibility, or water resistance
M6	**Quality Control and testing methods for bio-based textile products**	▪ Expertise in managing quality across different stages of production to ensure consistent performance in bio-textiles ▪ Skills in advanced testing methods for biodegradability and compostability of bio-textiles ▪ Familiarity with international environmental certifications and their application in bio-textile production
M7	**Digitalization in fashion eco-system through digital design, simulation and visualization in fashion industry**	▪ Skills in designing products for disassembly, ensuring that textiles can be efficiently deconstructed and repurposed at the end of their life ▪ Proficiency in using industry-specific software for material simulations, digital textile printing.
M8	**Adaptability, communication skills and creative thinking in fashion industry**	▪ Knowledge of sustainable development goals (SDGs) and how the textile industry contributes to these global objectives ▪ Understanding of consumer trends toward sustainable products and the role of marketing and branding in promoting bio-textile products ▪ Expertise in incorporating innovative design methods that align with bio-textile material properties while also ensuring aesthetic appeal ▪ Ability to integrate new bio-based materials and processing technologies into existing production systems.

Each module is presented in the next sections. Each module descriptor includes:



TITLE	
EQF LEVEL	
ECTS CREDITS	
LEARNING METHODS AND DURATION	e-learning/face-to-face/work-based learning
ASSESSMENT METHODS	
GENERAL OBJECTIVE	

LEARNING OUTCOMES

Learning outcomes *The learning outcomes, specific knowledge, skills and competences of an appropriate level, which the learners will acquire with the successful completion of the module, are described.*
Knowledge **Skills** **Competences**

COURSE CONTENT

4.Recycling Manager

4.1. Key Competencies

Recycling Manager in TCLF can play a pivotal role within the textile industry, particularly as companies adopt more sustainable and circular economy practices. The profession is still relatively new, and awareness of this role among small and medium-sized enterprises (SMEs) remains limited. However, the growing focus on waste management, material recovery, and recycling processes highlights the importance of this profession. The survey outlined several essential competencies for a textile Recycling Managers, divided into three broad categories: technical skills, soft skills, and regulatory knowledge.

4.2. Technical Competencies

Recycling Managers need strong knowledge of recycling technologies, material science, and waste management regulations, alongside Circular Economy principles. They must also master supply chain management to coordinate collection and redistribution efficiently. Proficiency in chemistry and chemical engineering is key for advanced recycling processes, while broader sustainability practices remain an important supporting competence.

4.3. Soft Skills

Recycling Managers require strong problem-solving and critical thinking abilities to address operational challenges and align decisions with sustainability goals. Effective communication and teamwork are essential for coordinating across diverse stakeholders. They must also demonstrate adaptability to evolving regulations and technologies, strong time management to handle tight deadlines, and leadership skills to guide teams toward circular economy objectives.

4.4. Regulatory Knowledge

Recycling Managers must ensure compliance with chemical safety and environmental regulations, while also understanding sustainability certifications and maintaining transparency across the supply chain. They should promote ethical labor practices through social compliance standards, and integrate energy efficiency and renewable energy considerations to strengthen sustainability in recycling processes.

4.5. Training and Professional Development

The survey explored training and development opportunities for a **Recycling Manager**, with hands-on training and practical experience rated as the most valuable methods. Many respondents emphasized that real-world applications are crucial for mastering recycling processes. Collaboration with research institutions and industry partners was also seen as highly beneficial, as it fosters innovation and keeps professionals up-to-date with the latest developments in recycling technologies. Certifications and technical workshops were recognized as important for professional development. Survey results indicated that while online courses were seen as less effective compared to hands-on training, it is still crucial to explore solutions for delivering as many of the key competencies and knowledge areas as possible through online platforms. This would ensure broader access to training while maintaining the practical and technical focus necessary for the role.

4.6. Competency Mapping Table for a textile Recycling Manager

This mapping considers the insights and priorities highlighted in **both the semi-structured interviews and survey documents**.

Competence Category	Competences/Skills	Description
	Knowledge of Recycling Technologies	Updated with the latest recycling technologies for effective operation.
	Material Science	Understanding the properties and lifecycle of textile materials for effective recovery and reuse.
	Waste Management Regulations and Circular Economy Principles	Comprehensive knowledge of national and international waste management regulations for the circular economy.

Functional Competencies	Supply Chain Management	Coordination of logistical challenges in collecting, sorting, and redistributing textile waste.
	Sustainability Practices	Understanding and implementing broader sustainability practices in recycling processes.
	Chemistry and Chemical Engineering	Proficiency in chemical analysis and polymer recycling to optimize material recovery efficiency.
	Process optimization and efficiency	Implementing process improvements to minimize waste, reduce energy consumption, and optimize resource usage.
	Machinery operation and maintenance	Ability to operate and maintain modern recycling machinery to ensure smooth production.
	Quality control and testing methods	Ensuring recycled materials meet quality and durability standards through thorough testing methods.
Green Competences	Environmental regulations and standards	Knowledge of environmental and chemical safety regulations in recycling operations.
	Sustainable sourcing and supply chain transparency	Managing sourcing processes to ensure transparency and compliance with eco-friendly standards.
	Energy efficiency and renewable energy	Utilizing renewable energy sources and improving energy efficiency to reduce environmental impact.
	Sustainable innovation and research	Continuously researching and implementing innovations in recycling processes and materials.
	Life Cycle Assessment (LCA)	Assessing the environmental impact of textiles throughout their lifecycle from production to disposal.
Transversal Competences	Problem-solving and decision-making	Diagnosing and solving issues in recycling processes to ensure efficiency and alignment with sustainability goals.
	Critical thinking and analytical skills	Analyzing data to develop innovative solutions for textile recycling challenges.
	Creativity and innovation	Developing creative approaches to overcome recycling challenges, fostering innovations in recycling methods.
	Communication and collaboration	Collaborating with teams, stakeholders, and clients to achieve recycling and sustainability goals.
	Leadership and team management	Leading recycling projects while ensuring alignment with environmental objectives.
	Time management and organizational skills	Managing time and resources effectively to meet project deadlines in recycling operations.
	Adaptability and continuous learning	Adapting to new recycling techniques and regulations, ensuring continuous improvement.

	Digital literacy and technological proficiency	Using digital tools and technologies to enhance recycling operations and efficiency.

4.7. Skills required to meet the competencies needed for a Textile Recycling Manager according to the ESCO model

A textile Recycling Manager **oversees and optimizes** textile recycling processes. Their **role** involves managing the collection, sorting, and repurposing of textile waste, ensuring adherence to environmental regulations and sustainability goals. This professional **works** closely with stakeholders across the supply chain to improve recycling efficiency, integrate circular economy principles, and reduce the environmental impact of textile production and waste.

A textile Recycling Manager **plays a critical role** in promoting zero-waste production and optimizing the reuse of materials throughout the textile and fashion sectors. They **evaluate** manufacturing workflows to devise strategies for recycling, reusing, or upcycling textile waste, thereby prolonging the life cycle of materials and curbing the volume of textile waste directed to landfills. For instance, they may facilitate the conversion of discarded garments into new fibers or repurpose textile scraps into alternative products. Textile Recycling Manager's efforts are fundamental in mitigating the environmental footprint of the fashion industry and advancing the principles of the circular economy, where materials are continuously repurposed rather than discarded after a single use. Their contribution ensures that production processes become more sustainable and that the reuse of textiles becomes a standard practice, significantly reducing resource consumption.

A textile Recycling Manager is becoming a pivotal figure in ensuring the circularity of the textile supply chain. This role **focuses on implementing systems that efficiently recycle textiles, reduce waste, and extend the life cycle of materials.** Textile Recycling Managers work across the supply chain, ensuring that textiles are collected, sorted, and processed in ways that minimize environmental impact while maximizing resource recovery. The role also involves ensuring compliance with regulations and standards for waste management and recycling, making it critical for businesses aiming to align with circular economy principles.

4.8. Curriculum structure for a Textile Recycling Manager (EQF level 6)

The curriculum for a **Recycling Manager** in the TCLF sector includes relevant competences in the field of textiles/clothing enterprises, textiles/clothes related small crafts, combining interdisciplinary both technical, soft and digital skills. It contains eight (8) study modules plus one introductory module.

Learners can select and complete the modules according to their preferences and needs for acquiring new competences.

This is the distribution of learning environments per each module

Module	MOOC (hrs)	Face-to-Face (hrs)	WBL (hrs)	Total (hrs)
Sustainability fundamentals - introductory module	4	4	18	26
Sustainability and Circular Economy in Textile/Fashion Industry – an Overview	6	6	14	26
Management of Recycling Process Regulatory Compliance	6	6	14	26
Closed-loop concept in Textile/Fashion Production	6	6	14	26
Textile Recycling Technologies and Supply Chain Management	6	6	14	26
Environmental Regulations and Chemical Safety Standards in Textile Processes	6	6	14	26
Environmental Impact and Carbon Footprint of the TCLF Industry	6	6	14	26
Critical Thinking and Problem-solving in Fashion Industry	6	6	14	26
Leadership and Management in Textile/ Fashion Industry	6	6	14	26
Total hours / ECTS credits	52	52	130	234 / 9

The structure for the curriculum of a **Textile Recycling Manager** (EQF6) is the following:

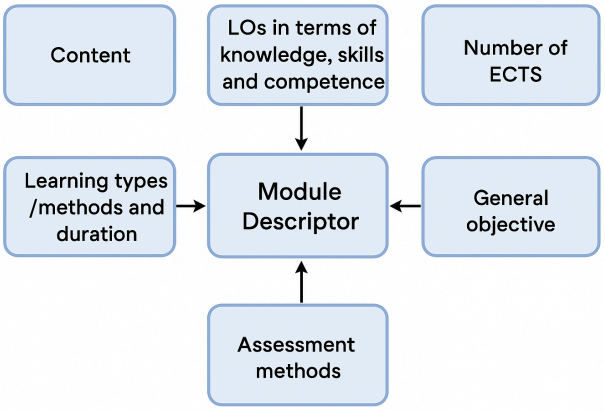
Table 3. Curriculum structure for a Textile Recycling Manager (EQF6)

No. of Module	Textile Recycling Manager (EQF 6)	Skills required to meet the competencies needed according to ESCO model:
M0	**Sustainability fundamentals**	- Ability to evaluate the ecological footprint of textile production and recycling processes - identify opportunities for sustainable improvement.

M1	**Sustainability and Circular Economy in Textile/Fashion Industry – an Overview**	▪ Knowledge of sustainability concept and circular economy models, including product lifecycle management, EU Green Deal, Circular Economy Action Plan, the Eco-Design Directive. ▪ Implement sustainable recycling practices that align with circular economy principles
M2	**Management of Recycling Process Regulatory Compliance**	▪ Organize and coordinate textile waste recycling, from collection through processing to final redistribution ▪ Understanding of the waste hierarchy (reduce, reuse, recycle) and how it applies to textiles ▪ Ensure operations meet local, national, and international waste management regulations
M3	**Closed-loop concept in Textile/Fashion Production**	▪ Awareness of sustainable textile production practices, focusing on reducing water and energy usage and minimizing chemical inputs ▪ Understand the properties and lifecycle of textile materials to optimize their recovery, reuse, and recycling ▪ Apply knowledge of natural and synthetic fibers in recycling processes
M4	**Textile Recycling Technologies and Supply Chain Management**	▪ Familiarity with textile recycling technologies such as mechanical and chemical recycling, fiber regeneration ▪ Skills in managing logistics for textile waste collection, sorting, and redistribution, ensuring efficiency throughout the recycling process ▪ Collaborate with suppliers, manufacturers, and stakeholders to enhance the recycling supply chain ▪ Develop and implement innovative approaches to improve textile recycling methods, including exploring new materials and techniques for better recovery
M5	**Environmental Regulations and Chemical Safety Standards in Textile Processes**	▪ Awareness of sustainable textile production practices, focusing on reducing water and energy usage and minimizing chemical inputs ▪ Knowledge of different textile certifications, standards, regulations and directives
M6	**Environmental Impact and Carbon Footprint of the TCLF Industry**	▪ Familiarity with the environmental impacts of textile production and recycling, including life cycle assessments (LCA) ▪ Ability to evaluate and minimize the carbon footprint and energy use in recycling operations
M7	**Critical Thinking and Problem-solving in Fashion Industry**	▪ Identify challenges in recycling operations, analyze root causes, and develop innovative solutions to overcome them

		▪ Apply critical thinking to optimize resource use, improve recycling efficiency, and address unforeseen issues in the supply chain ▪ Stay open to learning and integrating new practices that can enhance recycling processes and sustainability outcomes
M8	**Leadership and Management in Textile/ Fashion Industry**	▪ Lead teams effectively to foster a collaborative environment and ensure productivity in recycling operations ▪ Motivate and guide staff to embrace sustainability initiatives and continuously improve recycling processes ▪ Foster a culture of continuous improvement within the recycling team

Each module is presented in the next sections. Each module descriptor includes:



TITLE	
EQF LEVEL	
ECTS CREDITS	
LEARNING METHODS AND DURATION	e-learning/ face-to-face/work-based learning
ASSESSMENT METHODS	
GENERAL OBJECTIVE	

LEARNING OUTCOMES

Learning outcomes *The learning outcomes, specific knowledge, skills and competences of an appropriate level, which the learners will acquire with the successful completion of the module, are described.*
Knowledge **Skills** **Competences**

COURSE CONTENT

5.The SiT TCLF GreenComp Framework

According to the overall results of the survey, and in line with the existing GreenComp framework, the **SiT TCLF GreenComp Framework** is developed and divided into **4 Competence Areas** which are sub-divided into topics and sub-topics (*See document: Training Structure Report, D2.2; WP2: Training structure Analysis*). Within these areas, the framework defines the knowledge and skills required for the two emerging professions of the Bio-Textile Technician and the Recycling Manager. These 4 competence areas are:

1. **Environmental regulations and standards within TCLF sector**
2. **Circular Economy and sustainability**
3. **Innovations with circular design**
4. **Sustainable supply chain management**

Each competence area is introduced with a description **summarizing the key knowledge, key skills, responsibilities and attitudes** for both the **Bio-Textile Technician** and the **Recycling Manager**.

	Bio-Textile Technician (EQF Level 5)	**Textile Recycling Manager (EQF Level 6)**
1. Environmental regulations and standards within TCLF sector		
Key Knowledge:	Focuses on understanding regulations around sustainable textile production, particularly regarding circular economy strategies and chemicals regulation (EU Green Deal, Circular Economy Action Plan, the Eco-Design Directive).	In-depth understanding of EU regulations related to EU Green Deal, Circular Economy Action Plan, the Eco-Design Directive, EPR/ESPR and chemicals, with a strong focus on managing waste streams and ensuring the business meets its environmental obligations.
Key Skills:	Involves applying design and production strategies that comply with EU sustainability regulations, green claims, and EPR/ESPR guidelines. The technician plays an active role in ensuring bio- textiles adhere to non-toxic and waste reduction policies.	Overseeing large-scale recycling initiatives and leading efforts to minimize the environmental impact of textiles through compliance with EU legal standards, particularly in managing chemicals, sustainability claims, and EPR/ESPR systems.
Responsibilities:	Implement sustainable production techniques, avoid greenwashing in sustainability claims, and use tools to verify compliance with regulatory frameworks.	Lead the company's compliance efforts with EPR/ESPR policies, supervise waste management and recycling operations, and manage the accurate representation of sustainability claims to avoid greenwashing.

Attitudes:	Committed to ethical responsibility and proactive sustainability mindset on operational level.	Strategic view on compliance and sustainability leadership.
2. Circular Economy and sustainability		
Key Knowledge:	Focuses on understanding the sustainable properties of bio- textiles, including bio- based materials like biodegradable fabrics and lab-grown textiles.	In-depth understanding of recycling systems, circular business models, and material recovery processes. Strong focus on ensuring that materials are reused efficiently through advanced recycling technologies and sustainable production.
Key Skills:	Involves applying sustainable design and production methods such as zero-waste design, eco-friendly dyeing processes, and life cycle thinking. They are responsible for ensuring that bio- textiles meet both design and sustainability requirements.	Involves managing the transition to circular economy practices across large-scale operations, integrating technologies like chemical recycling, and ensuring compliance with environmental standards.
Responsibilities:	Implement and maintain sustainable production techniques, support the development of innovative textiles, and use tools like Life Cycle Assessments (LCA) to track the environmental impact of bio- textile products.	Lead recycling initiatives, supervise sustainable sourcing and product recovery, and oversee the adoption of circular business models across the organization. Manage teams, providing strategic oversight on how materials are sourced, used, and recycled.
Attitudes:	Focused on innovative sustainable design and production.	Strategic view on initiatives that focus on circular economy strategies and advanced recycling technologies.
3. Innovations with circular design		
Key Knowledge:	The technician gains theoretical knowledge of circular fashion concepts and uses digital tools for bio-textile product development.	Focuses on understanding the larger circular economy principles and managing product lifecycle processes. They also need knowledge of digital innovations to oversee design and development.
Key Skills:	Involves applying circular design principles, such as design for disassembly or reuse, to develop innovative and sustainable bio- textile products. The technician plays a role in optimizing designs for longevity and recyclability. Experiments with bio-based materials, works on integrating them into new designs, and assists with sustainable material sourcing decisions.	The textile recycling manager applies circular economy strategies in managing the lifecycle of fashion products, ensuring that both production and post-production recycling processes are optimized. This role also involves using digital tools to enhance sustainability throughout the supply chain. Manages the company's strategy for adopting sustainable materials, ensuring the sourcing and recycling processes are aligned with circular economy principles. Oversees long-term material life cycle strategies to minimize waste.
Responsibilities:	Ensure bio- textile products are developed with circularity in mind, from material sourcing to production processes. They also use digital	Lead the company's strategic direction in circular fashion design and oversee the recycling and reuse processes across the product's lifecycle. The Textile Recycling Manager ensures that products are designed to

	innovations to support product lifecycle improvements.	be fully recyclable and compliant with circular economy goals.
Attitudes:	Commitment to circular fashion principles, openness to new technologies.	Readiness to align production and recycling processes with circular economy strategies and technological advancements.
4. Sustainable supply chain management		
Key Knowledge:	Focuses on understanding of ethical sourcing principles and sustainable practices specific to bio- textiles, has familiarity with supplier certifications and standards relevant to sustainable sourcing, possesses knowledge of the traceability systems and technologies used to track materials in the supply chain	Possesses in-depth understanding of ethical sourcing practices and supplier engagement strategies for sustainable supply chains, knows auditing processes and assessment criteria for evaluating supplier sustainability, has knowledge of tools and technologies for tracing materials in the supply chain, including software and reporting frameworks, is aware of industry standards and regulations governing sustainability and recycling practices
Key Skills:	Include the ability to evaluate and select suppliers based on sustainability and ethical criteria and conduct supplier assessments and audits to ensure compliance with sustainability standards, implement traceability systems for monitoring bio- textile materials from sourcing to production, has strong communication skills for preparing sustainability reports and effectively sharing information with stakeholders	Ability to lead supplier assessments and audits, ability to develop and maintain relationships with sustainable suppliers and stakeholders, can apply analytical skills for evaluating supply chain practices and identifying areas for improvement in sustainability, capability to oversee the preparation and dissemination of sustainability reports that accurately reflect supply chain practices
Responsibilities:	Assists in sourcing bio- textile materials, ensuring they meet ethical and sustainable sourcing criteria, conduct supplier audits to verify compliance with established sustainability standards, implement tracking systems for materials to ensure traceability throughout the supply chain, collaborate with other teams to communicate sustainability practices and support sustainability reporting efforts	Manages the strategic selection of sustainable suppliers and ensure compliance with ethical sourcing policies, leads supplier audits and assessments to evaluate and enhance sustainable practices in the supply chain, ensures comprehensive tracking of materials and monitor compliance with sustainability initiatives across the supply chain, develop sustainability reporting processes and communicate findings to relevant stakeholders, promoting transparency and accountability
Attitudes:	Commitment to ensuring that bio-textile materials meet ethical and sustainable standards	Committed to promoting transparency, accountability, and continuous improvement in ethical sourcing and sustainability

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