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# Competitiveness of Finland's textile and fashion industry in international markets



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Solveig Roschier, Millariia Wikman, Silla Aaltonen, Minna Jyrälä,  
Annu Markkula Gaia Consulting Oy

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## Competitiveness of Finland's textile and fashion industry in international markets

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### Abstract

This study set out to better understand the position and opportunities of Finland in the international competitive environment in the textile and fashion industry. The study attempts to provide more understanding on Finland's strengths and to compile a better picture of the current developments in the industry and the potential of the Finnish knowhow in international markets.

Based on the findings, the Finnish textile and fashion industry holds keys to leverage the systems-level transition for improved competitiveness in international markets. This study identifies three main areas of competitiveness potential for Finland: 1) New material solutions, including both bio-based and recycled fibres, 2) Automated data-driven circular economy, including both automated recycling processes and better supply chain optimisation, and 3) design for sustainable textile and fashion industry, including design of recyclable and durable textiles.

The study also highlights two enabling factors, cross-boundary collaboration and sustainable brand building, that need to be strengthened to realize the competitiveness potential offered by the three areas. Potential development actions are recommended to target competence development in these fields, as they hold the key for Finland's improved competitiveness and role as a leader in the systems-level transformation of the textile and fashion industry.

<b>Keywords</b>	enterprises, means of livelihood, textile industry, circular economy, competitiveness		
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### Tiivistelmä

Tällä tutkimuksella pyrittiin ymmärtämään paremmin Suomen asemaa ja mahdollisuuksia tekstiili- ja muotiteollisuuden kansainvälisessä kilpailuympäristössä. Tutkimuksella pyritään lisäämään ymmärrystä Suomen vahvuuksista ja kokoamaan parempi kuva alan tämänhetkisestä kehityksestä ja suomalaisen osaamisen mahdollisuuksista.

Tulosten perusteella suomalaisella tekstiili- ja muotiteollisuudella on avaimet hyödyntää järjestelmätason muutosta kilpailukyvyyn parantamiseksi kansainvälisillä markkinoilla. Tässä tutkimuksessa tunnistetaan kolme Suomen kilpailukyky potentiaalin pääaluetta:

- 1) Uudet materiaaliratkaisut, mukaan lukien sekä biopohjaiset että kierrätyskuidut,
- 2) Automatisoitu datapohjainen kiertotalous, joka sisältää sekä automatisoidut kierrätysprosessit että toimitusketjun parempi optimointi, ja
- 3) suunnittelu ja design kestäväille tekstiili- ja muotiteollisuudelle, mukaan lukien kierrätettävät ja kestävät tekstiilit.

Selvitys nostaa esiin myös kaksi mahdollistavaa tekijää, eli rajat ylittävä yhteistyö ja kestävä brändin rakentaminen, joita on vahvistettava kolmen alueen tarjoaman kilpailukyky potentiaalin toteuttamiseksi. Kehittämistoimenpiteitä suositellaan kohdistamaan osaamisen kehittämiseen näillä aloilla, sillä ne ovat avainasemassa Suomen kilpailukyvyyn paranemisessa ja roolissa tekstiili- ja muotiteollisuuden järjestelmätason muutoksen edelläkävijänä.

<b>Asiasanat</b>	yritykset, elinkeinot, tekstiiliteollisuus, kiertotalous, kilpailukyky		
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## Den finska textilindustrins och modeindustrins konkurrenskraft på internationella marknader

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### Referat

Syftet med denna studie var att få en bättre inblick i Finlands ställning och möjligheter i konkurrensen på den internationella textil- och modeindustrins marknader. Med hjälp av studien vill vi öka förståelsen för Finlands starka sidor och sammanställa en lägesbild av den aktuella utvecklingen inom branschen och den finländska kompetensens möjligheter.

På basis av resultaten har den finska textil- och modeindustrin alla förutsättningar att dra nytta av branschens förändringar på systemnivå och förbättra sin konkurrenskraft på internationella marknader. I studien fastställs tre huvudsakliga områden för Finlands tillväxtpotential:

- 1) nya materiallösningar, till exempel biobaserade material och returfiber
- 2) automatiserad datadriven cirkulär ekonomi, som omfattar såväl automatiserade återvinningsprocesser och optimering av leveranskedjan
- 3) planering och design för en hållbar industri, inklusive återvunna och hållbara textilier.

Studien lyfter fram två faktorer som gör detta möjligt: samarbete över gränserna och ett hållbart varumärke. Dessa måste stärkas ytterligare för att potentialen ska kunna utnyttjas fullt ut. Studien rekommenderar att åtgärder vidtas för att utveckla kompetensen inom dessa områden eftersom de är avgörande för att Finlands konkurrenskraft ska bli bättre och för att Finland ska kunna vara en föregångare i förändringen på systemnivå inom textil- och modeindustrin.

<b>Nyckelord</b>	företag, näringsgrenar, cirkulär ekonomi, textilindustrin, konkurrenskraft, grön omställning		
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# 1 Executive summary

The textile and fashion industry is in the midst of a significant transformation driven by sustainability. The industry, that is one of the biggest industries in the world, currently still operates in a mostly linear operating model with complex supply chains. With increased awareness of the negative external impacts of the industry and economic loss, the textile and fashion industry is on the brink of a system level change towards a circular economy-based value chain

This study set out to better understand the position and opportunities of Finland in the international competitive environment in the textile and fashion industry. The study has sought to provide more understanding on Finland's strengths and to compile a better picture of the current developments in the sector in Finland and the potential of the Finnish knowhow in the international market.

The study has examined the Finnish textile and fashion industry with a particular focus on woven and knitted textiles and clothing, and raw materials and processing phases used for producing these goods. Nonwoven textiles, although one of the most rapidly growing sectors in the textiles market, have been largely excluded from the scope of this study. However, as nonwovens are used in various textile applications, such as clothing, some of the findings are also relevant for nonwoven textiles and their value networks.

A key contributor to the identified changes is recent and upcoming regulation. New policy initiatives and upcoming legislative changes such as the European Green Deal, the EU Strategy for Sustainable and Circular Textiles and Corporate Sustainability Reporting Directive, among several others, are highly likely to direct companies to use more bio-based and recycled raw materials, as well as design products to be more durable and recyclable.

Sustainability is undoubtedly among the biggest change drivers of the textile and fashion industry. Sustainability driven disruptions are providing new opportunities along the value chain that will change the industry. New value creation models, alternative material sources, new textile innovations and environmentally friendly production methods in addition to data enhanced supply chain optimization, along with several others are emerging from these value chain altering disruptions.

Europe and Finland hold competences that support in grasping the emerging opportunities. Europe has a legacy as a leading textile and fashion hub and is home to prestigious fashion brands and brand conglomerates. European fashion education is also



considered world class with several top fashion schools located in the region. Finland, despite experiencing the relocation of the industrial production of textile and fashion products to countries with lower production costs, particularly to Asia, has in recent years seen increased interest and activity within the industry. Finland is known for its fashion design education, sustainable bio-based and recycled fibres, and novel innovations regarding sustainable production and recycling methods.

Based on the findings of this study the Finnish textile and fashion industry holds the keys to leverage the sustainability transition for improved competitiveness in international markets. Finland's competences support the ability to create innovations to help accelerate the industry's green transition. This study identifies three main areas of competitiveness potential for Finland:

1. The first area for competitiveness is new material solutions, including both bio-based and recycled fibres. Their demand is likely to soar, as the industry will need to seek more sustainable raw materials in wake of meeting planetary boundaries with a significant expected growth in demand.
2. The second area for competitiveness is automated data-driven circular economy, including both automated recycling processes and better supply chain optimisation. High volumes of textile waste, tightening textile waste regulation in the EU and limited natural resources require new circular solutions and value creation models.
3. The third area for competitiveness is design for sustainable textile and fashion industry, including design of recyclable and durable textiles. As the industry transitions to a circular value chain, holders of circular design knowledge will hold a competitive edge.

While Finland has the potential to become a notable player in the current transformation towards a sustainable textile and fashion industry, the study identified two enabling factors that need to be strengthened in order to realize the competitiveness potential offered by the three areas. Crossboundary collaboration within the different parts of the value chain and beyond the limits of the industry is required to enable the development of novel solutions and products that support circularity. Sustainable brand building on the other hand, are required for the developed solutions and products to realize their full potential by attracting the attention of a global audience. Potential development actions are recommended to be targeted to support competence development in these fields, as they hold the key for Finland's improved competitiveness and role as a leader in the systems-level transformation of the textile and fashion industry.

## 2 Background, objectives and methods

This chapter describes the background, objectives, methods and materials used in this study. In addition, the chapter summarises the end results and provides an overview on the structure of this report.

### 2.1 Background

As noted in recent studies<sup>1 2</sup>, Finland can have potential to become a notable player in the current transformation towards a sustainable textile and fashion industry<sup>3</sup>. This ongoing transformation of the textile and fashion industry may enable new business and jobs to be created in Finland. It has been estimated that almost 17 000 new jobs and at least an estimated one billion euros of investments could result from this transition<sup>4</sup>, and that Finland's expertise in bio-based raw materials and smart technologies, also relevant in the context of the textile and fashion industry, would be among the best in the world.<sup>5 6</sup>

Finland has had a well-established Finnish fashion and textile industry until the 1980s. Like several other European countries, also Finland has experienced the relocation of the industrial production of textile and fashion products to countries with lower production costs, particularly to Asia. This transition was particularly strong after the Finnish Great Depression of the early 1990s.<sup>7</sup>

The recent years, however, have seen an increasing interest in new business opportunities in this industry. This interest has largely built on the ongoing and strengthening global quest for environmental and social sustainability in business.

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1 Kamppuri et al. 2021

2 OwlGroup 2022

3 The textile and fashion industry in this study is defined broadly to cover all woven and knitted textile and fashion products. Technical textiles are primarily excluded from the scope of this study. Some of the findings of this study have, however, relevance to the technical textiles industry as well.

4 Kamppuri et al. 2021

5 Kamppuri et al. 2021

6 OwlGroup 2022

7 Tekstiiliteollisuusmuseo 2006

During the recent years, the Finnish textile and fashion industry has witnessed numerous new initiatives and technologies to emerge. The low-carbon roadmap for the sector was created in 2020<sup>8</sup> and a roadmap with circular textile economy and recycling of textiles was published in 2021<sup>9</sup>. Furthermore, a vision roadmap for the industry, *Finland as a forerunner in sustainable and knowledge-based textile industry - Roadmap for 2035*, was published in 2021<sup>10</sup>, and in 2022 a report *International growth of Finnish B2C Fashion – Bottlenecks and needed action* was published about the potential of the Finnish fashion industry brands and their growth possibilities<sup>11</sup>.

In addition, Finnish fashion and textile companies have been active in exploring more sustainable business models<sup>12,13</sup>, and several new sustainability-driven companies have been established in the production of circular and bio-based textile fibres, including companies such as Spinnova, Infinited Fiber Company, Rester and Pure Waste Textiles. Finnish fashion design education is also ranked among the best ones in the world<sup>14</sup>, and young Finnish designers have good reputation globally, receiving global rewards and working for global fashion brands<sup>15</sup>. Moreover, stock exchange-listed well-established corporations from other sectors such as forest and energy industries are already converting their existing technologies and industrial facilities to the production of bio-based and circular textile fibres.<sup>16</sup> Furthermore, universities and research institutions have been active in advancing applied research across different disciplines for different activities from recycling processes to bio-based dyes. For example the FINIX research project, a consortium of four academic partners, researches several areas from recycled cellulose-based fibres to new design strategies and service-intensive business models<sup>17</sup>. The FINIX research project has been active since 2019, and in August 2022 they received funding for the next three years.<sup>18</sup> Other examples of recent research projects are CHEMARTS, a long-term strategic collaboration between two Aalto University schools to

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8 Heino et al. 2020

9 Heikkilä et al. 2021

10 Kamppuri et al. 2021

11 Korkman et al. 2022

12 Kamppuri et al. 2021

13 OwlGroup 2022

14 Ireland, S. 2022

15 Aalto University 2019

16 Examples of these companies are Metsä Fibre, Fortum and Valmet.

17 FINIX

18 FINIX 2022

research the performance and design of advanced cellulosic materials for innovative uses<sup>19</sup> and Aalto University Bioinnovation Center, which focuses on innovations in sustainable bio-based materials, especially in textiles and packaging<sup>20</sup>.

At the European level, the European Commission has identified textiles and fashion as one of the priority product categories for the European circular economy in the Circular Economy Action Plan (CEAP) that was published in 2020.<sup>21</sup> In March 2022 the Commission also published the EU's strategy for sustainable and circular textiles. This strategy aims at creating a more sustainable and more competitive textile sector in Europe.<sup>22</sup> The strategy implements the commitments of the European Green Deal<sup>23</sup> and the European Industrial Strategy<sup>24</sup>, which together with the CEAP aim at developing the EU's competitiveness in digitalisation and green transition to a climate-neutral and circular economy. To advance the Strategy, the EU is creating a Textiles Ecosystem Transition Pathway by inviting stakeholders to a co-creation process to define what digital and green transition, and increasing resilience mean for the textile sector ecosystem, and what specific actions and commitments are needed to accompany the transition<sup>25</sup>.

The fashion industry especially is a creative industry operating at the intersection of arts, business and technology. The European Commission acknowledges that the fashion and textile industry is an essential part of business innovations, and the industry has potential to contribute to the European re-industrialisation, but this potential is often overlooked.<sup>26</sup> In 2019 the European Commission funded Ioncell<sup>®</sup>, technology utilising used textiles or pulp to generate new textile fibres. Also the Commission is currently working on increasing fashion and high-end industries' competitiveness, especially to support in increasing shortages of skilled workers and difficulties for fashion small and medium-sized enterprises (SMEs) to access finance<sup>27</sup>. The cultural and creative dimension of the industry is brought to the European Green Deal in the New European Bauhaus, which will also provide funding of about €85 million dedicated to New European Bauhaus projects from EU programmes<sup>28</sup>.

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19 CHEMARTS

20 Aalto University Bioinnovation Center

21 European Commission a

22 European Commission 2022b

23 European Commission b

24 European Commission c

25 European Commission d

26 European Commission e

27 European Commission f

28 European Commission 2021

It is against this background that it has become important to understand better the position and opportunities of Finland in the international competitive environment in the textile and fashion industry. In particular, more understanding is needed on Finland's strengths in the context of international competition in relation to the sustainable raw material base, technology expertise and innovations, business skills, and design competencies that could accelerate the EU's green transition and support global sustainable development. This understanding is needed to create a better picture of the current developments in the sector in Finland and the potential of the Finnish knowhow in the international market.

This report responds to this gap. The report addresses the current market situation and trends in the fashion and textile market, scenarios for the market, and Finnish and European competences to finally address the competitiveness of the Finnish fashion and textile industries in the global context.

The report has been prepared by Gaia Consulting Ltd for the Ministry of Economic Affairs and Employment of Finland.

## 2.2 Objectives and methods

The aim of this study was to obtain a more detailed picture of Finland's competitiveness in the international value networks of the textile and fashion industry. This included addressing the possibilities of taking part in the creation of added value in the changing global textile market.

Finnish textile and fashion companies currently operate in the following main sectors:

- clothing and accessories
- interior and home textiles
- technical textiles
- protective clothing and workwear
- materials (threads, yarns, fabrics)
- services
- sports and outdoor products
- industrial textiles and non-wovens
- raw materials
- dyeing and finishing services
- healthcare and hygiene products.<sup>29</sup>

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<sup>29</sup> Finnish Textile & Fashion a

The study examines the Finnish textile and fashion industry with a particular focus on woven and knitted textiles and clothing, and raw materials and processing phases used for producing these goods.<sup>30</sup> These goods include for example finished fashion clothing, basic clothing, accessories, home textiles and workwear. The main geographical focus of this study is Europe.

Nonwoven textiles are mainly excluded from the scope of this study. Nonwoven is a term used to designate fabrics that are neither knitted nor woven. As nonwovens are used in various textile applications such as clothing (<https://textilelearner.net/uses-of-non-woven-fabrics/>, <https://www.textileschool.com/352/non-woven-fabrics/>, <https://www.textileschool.com/352/non-woven-fabrics/>), some of the findings are also relevant for nonwoven textiles and their value networks. It should also be noted that one of the most rapidly growing sectors of the textile market is nonwovens (<https://www.fibre2fashion.com/industry-article/7285/applications-for-nonwovens-in-technical-textiles>). As the textile and fashion industry growth potential that is described in this study excludes non-wovens, it should be emphasised that the total growth potential of the sector in is highly likely to be more significant than described in this study, and that nonwovens are likely to have significant growth potential also in the Finnish context.

The study answers the following four main research questions:

- What is the current situation, and which change trends there are in the textile and fashion industries in the international market?
- What is the impact of regulation and the EU's textile strategy on the market?
- What competence there is in Finland and Europe?
- What is the growth potential of the Finnish textile and fashion industry?

The methods of the study included the following: 1) desktop analyses, 2) expert interviews and 3) a virtual event for stakeholders.

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<sup>30</sup> A more detailed description of the value chains for these products is presented in Chapter 3.

The materials for the desktop analysis included publicly available high-quality articles and data bases. The desktop analysis was complemented with 15 national and international subject matter expert interviews. The particular focus of the interviews was to address in more detail research questions 3 (“What competence there is in Finland and Europe?”) and 4 (“What is the growth potential of the Finnish textile and fashion industry?”). The interviewees represented textile fibre producing companies, fibre technology companies, branded consumer goods companies, workwear producers and service providers, textile manufacturing companies, research and innovation collaboration platforms and ecosystems, financing, industry associations and research institutions.<sup>31</sup> The results of the study were presented to 40 stakeholders in a virtual webinar event, and the stakeholders were able to provide their views of the results.

In addition to this report, the end results of this study include a 2-page summary and a PowerPoint presentation on the project results.

## 2.3 Structure of the report

The report is structured as follows. The next chapter, Chapter 3, focuses on current situation and upcoming change trends in the textile and fashion industries in the international market driven by regulative changes. In addition to providing an overview of the global textiles market and Europe’s position in this market, the chapter covers current and upcoming legislation that will be relevant for the textile and fashion sector from sustainability and competitiveness perspectives.

Chapter 4 displays potential outlooks for the textile and fashion industry and presents three change scenarios for the year 2035. The chapter begins by identifying changes that the sustainability perspectives can bring about in this market, and continues to examine other forces that can change current global value chains and value creation in the textile and fashion industry. The final part of the chapter presents three change scenarios that have been built for this study to better understand the possibilities of Europe and Finland in the global competition.

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31 For the list of interviewees/organisations that were interviewed, see Appendix 1. The interview questions are listed in Appendix 2.

Chapter 5 addresses the growth potential of the Finnish textile and fashion industry. The chapter builds on the previous chapters, additional desktop research on competitiveness and competences, and the interviews conducted for this study. The chapter starts with an analysis on textile sectors competencies in Europe and Finland proceeding then to examine the competitiveness potential of Finnish actors in global value chains.

The final chapter, Chapter 6, presents the conclusions of this study.



## 3 Current situation and upcoming change trends in the textile and fashion industries in the international market

This chapter addresses the current situation and upcoming change trends in the textile and fashion industries in the international market. The focus of the chapter is on the global fashion and textile market and Europe's position in this market; regulation; changes that sustainability perspectives can bring to this market; and other forces that can change current global value chains and value creation in the textile and fashion industries. In addition, the chapter addresses current and upcoming regulation that will be relevant for the textile and fashion sector from sustainability and competitiveness perspectives. The final part of the chapter presents three change scenarios that have been built for this study to better understand the possibilities of Europe and Finland in the global competition.

### 3.1 Global fashion and textile market

Textiles are an integral part of people's lives – they provide clothing, accessories, furniture, bed linen, and are used as composites in for example car manufacturing and construction among many other things. The fashion and textile industry is among the largest industries globally, employing millions of people across the textile value chain. While there are some geographical areas having more textile production, the entire industry can be described as a highly global industry with both consumption and production scattering around the world.

The global textile industry has continuously grown and since 1975 the textile fibre production has almost tripled.<sup>32</sup> However, this growth is not without challenges, and the textile and fashion industry is facing several sustainability related challenges ranging from human rights to water consumption, and from constant overproduction to the use of chemicals.

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32 European Environmental Agency 2019

Today, the global fashion and textile market operates predominantly in a linear way<sup>33</sup>. This means that new natural resources are used as an input for production, and the products and textiles most often end up as waste after only a short period of use. Globally, less than 10 percent of the global textile market is composed of recycled materials and over 40 million tons of textiles end up as waste annually. Most of this textile waste is either incinerated or ends up in landfills.<sup>34</sup>

While many factors influence a large amount of annual textile waste, one key problem of the market is continuous overproduction. Currently, almost 30% of the produced textiles remain unsold at stores<sup>35</sup> leading to both unsustainable operating model, and significant uncaptured monetary value and financial losses. According to Ellen MacArthur Foundation, more than USD 500 billion of value is lost annually due to underusing clothing and underutilizing recycling.<sup>36</sup> Overproduction is a consequence of fast fashion, where new selections are brought to the stores weekly. However, the industry is becoming polarised as some fast fashion brands are providing increasingly more styles while other brands are reducing their seasons.<sup>37</sup> An example from fast fashion is a Chinese online store Shein, who report adding 2 000 new styles to its online store daily.<sup>38</sup> While H&M and Inditex are undoubtedly large fast fashion companies, during 2022 Shein has passed them and is now worth more than H&M and Inditex combined.<sup>39</sup> A brand representing an opposite trend is Gucci, who announced to reduce from five to two shows per year and provide two “seasonless” lines a year<sup>40</sup>.

While the operating model in the textile and fashion industry is mostly linear, the supply and value chains are highly complex and stretched.<sup>41</sup> Different parts of the value chain are divided and spread over countries and continents and transparency through the entire chain is most often missing.<sup>42</sup> For example, producing a garment requires production of fibre, spinning, weaving and dyeing and it is common that the brand or retailer does not know all of the suppliers contributing to the manufacturing and production of the garment. Figure 1 below illustrates a simplified linear value chain for the sector with a focus on environmental sustainability dimensions during a product’s life cycle.

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33 Ellen MacArthur Foundation 2017

34 McKinsey

35 Fashinza

36 Ellen MacArthur Foundation 2017

37 McKinsey 2021

38 Insider 2022

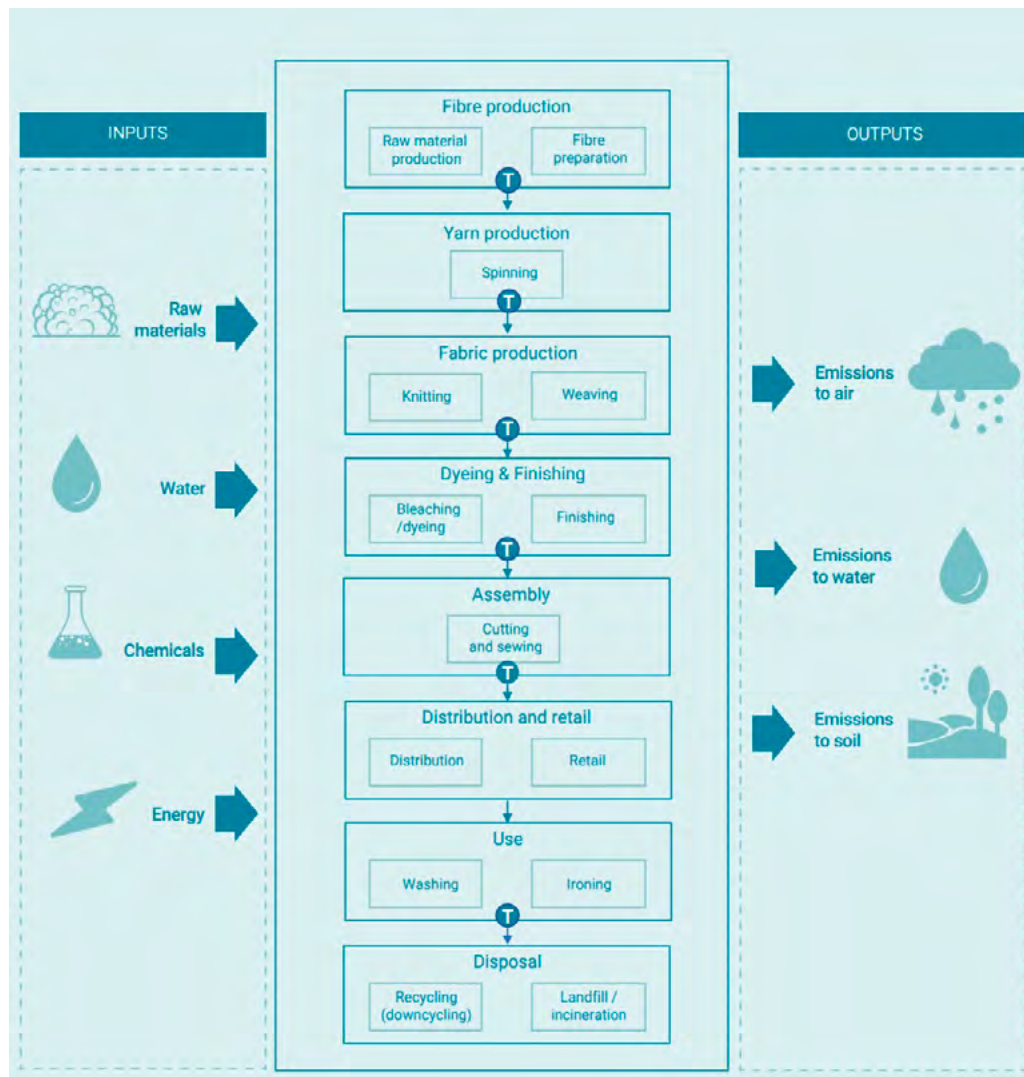
39 Insider 2022

40 Roberts-Islam, B. 2020

41 Dickson et al. 2012

42 Hilger, J. 2008

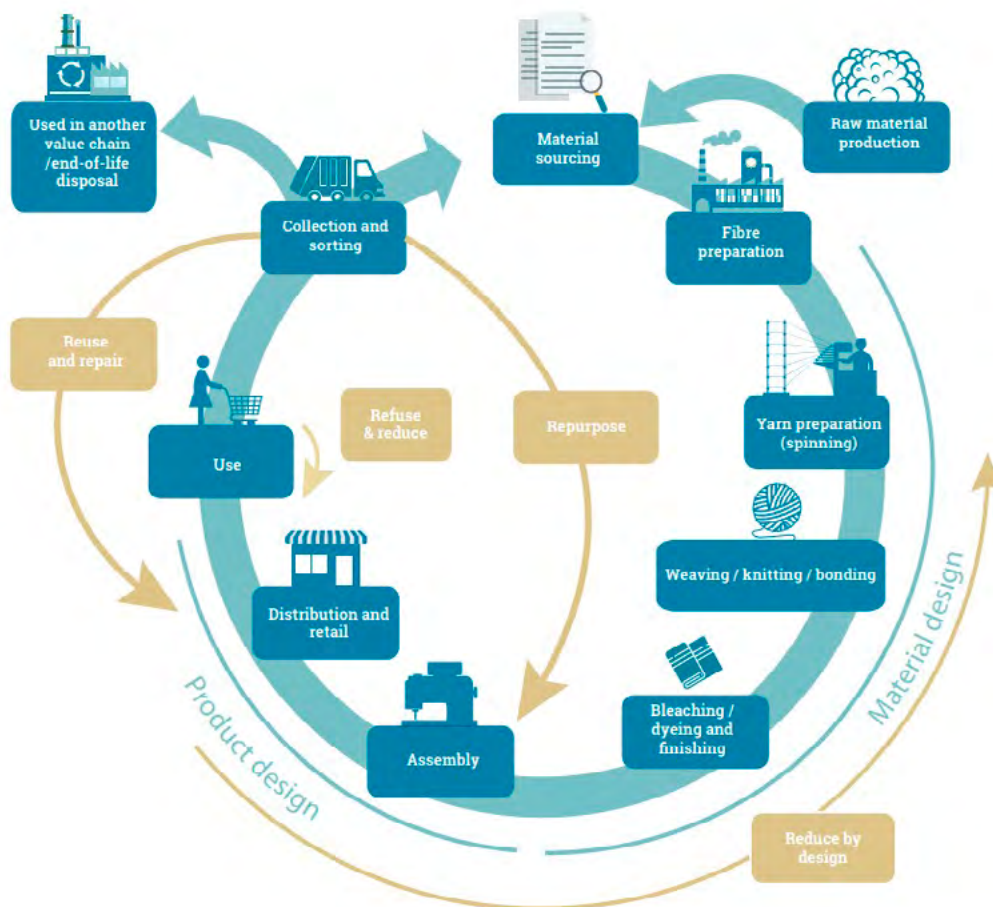
**Figure 1.** The life cycle of the global apparel system. Source: United Nations Environment Programme (2020) (The dotted line in the figure marks exclusions from the model. "T" refers to transport and was included where indicated in the study of Quantis.)



Increasingly, the textile value chain is also presented in a circular manner. In the circular textile value chain, the materials are not disposed of after use, but they remain in the value chain circulating as long as possible with the highest possible value. With textiles, the highest value is to keep the final product (e.g. a garment) in its existing form before moving the product forward in the value chain to collection and sorting. With circular business models, companies create, capture, and deliver value with the value creation logic designed to improve resource efficiency through contributing to extending useful

life of products and parts (e.g., through long-life design, repair and remanufacturing) and closing material loops.<sup>43</sup> Figure 2 below illustrates a simplified version of activities in circular textile value chain.

**Figure 2.** Representation of activities taking place in a circular textile value chain. Source: United Nations Environment Programme (2020)<sup>44</sup>

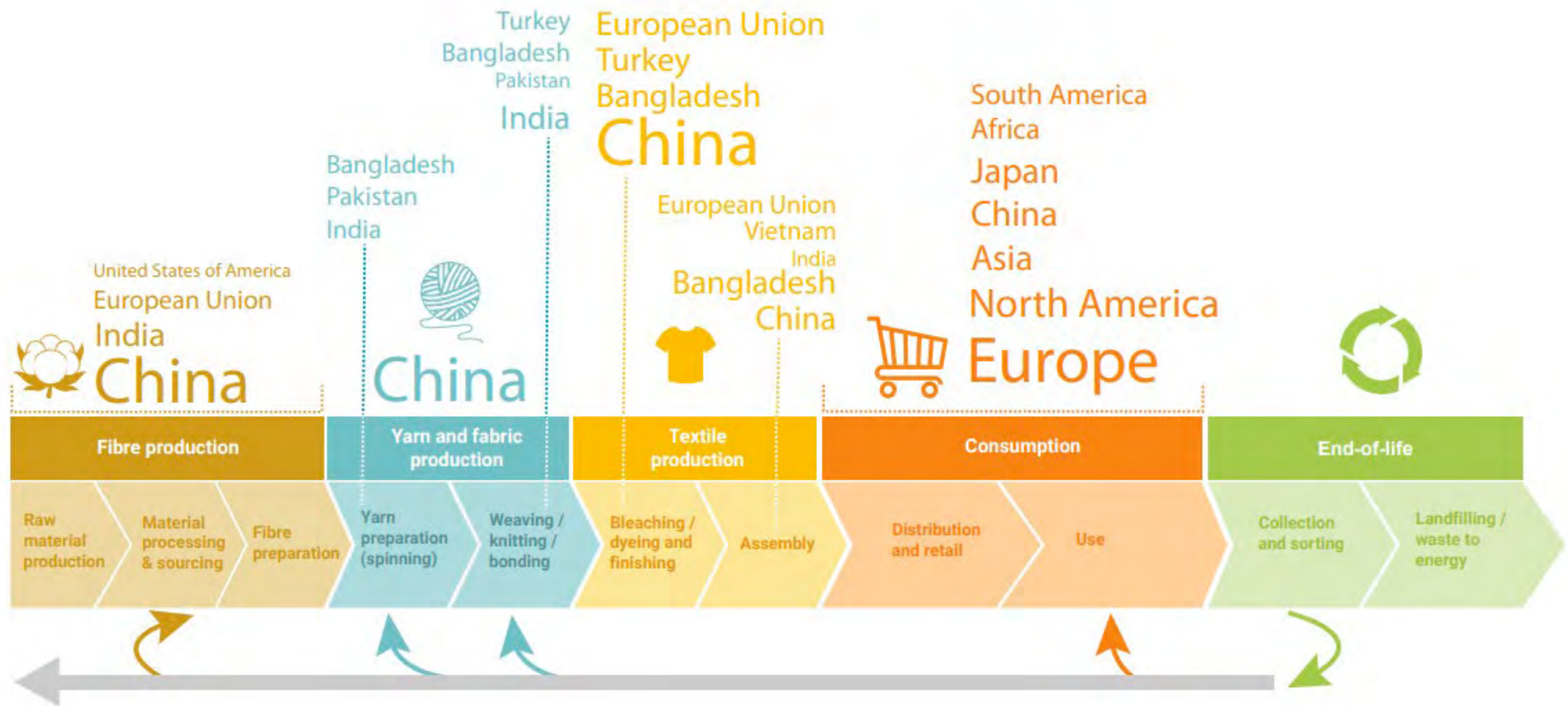


While the current textile value chains are highly global, different parts of the activities have weightings towards specific geographic areas. For example, fibre, yarn and fabric production takes mostly place in Asia, especially in China and India. In textile consumption and end-of-life, the geographic area diversifies, with Europe having the largest consumption followed by North America. The figure below illustrates textile value chain parts with the most significant players for each value chain activity.

43 Nussholz, J. L. 2017

44 United Nations Environment Program 2020

Figure 3. Geographical breakdown of global apparel production and consumption. Source: United Nations Environment Programme (2020)<sup>45</sup>



45 United Nations Environment Program 2020

Finnish textile and fashion companies participate currently in many activities in the value chain either in actual production or in ongoing research projects. Most of the companies that are part of the Finnish Textile & Fashion operate mainly in clothing and accessories (51%), technical textiles (13%), home textiles (12%) and only 9% of Finnish textile and fashion companies are mainly work with yarn and fabric production or dyeing and finishing.<sup>46</sup> According to estimates by Finnish Textiles and Fashion, around 20% of textiles value is from manufacturing and materials, 20% brand value, 40% retail and remaining 20% other (e.g., taxes).<sup>47</sup> It should be noted that these figures are highly estimative, and that for global value creation and capturing, similar figures were not available.

The COVID-19 pandemic has had a significant impact on the textile and fashion industry. It caused lockdowns and supply chain problems to the global fashion and textile market and changed significantly customers' consumption behaviour by shifting shopping to happen increasingly online<sup>48</sup> In Finland, the turnover of clothing manufacturing decreased 23% while clothing and footwear retailing companies saw a reduction of 72% compared to 2019. According to a study from McKinsey, the fashion sales are expected to recover from the pandemic by 2022.<sup>49</sup> Looking ahead, the entire global fashion and textile industry is to reach USD 1 420.3 billion by 2030 from the current USD 1 032 billion.<sup>50</sup> Table 1 presents the market size on a global, European and Finnish level.

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46 Finnish Textile & Fashion b

47 Finnish Textile & Fashion c

48 Finnish Textile & Fashion 2020

49 McKinsey

50 Research And Markets 2022

**Table 1.** Key figures of the textile and fashion industry

2021 Key figures	Definition of textiles	Market size, in billion EUR	Employment	Clothing vs textiles
Global <sup>51,52</sup>	Clothing and textiles	1000 (USD)	250 million	60% of companies clothing companies 40% textiles
Europe <sup>53</sup>	Clothing and textiles	147	1,3 million	67% of companies clothing companies 33% textiles
Finland <sup>54</sup>	Clothing and textiles	1,5	5000	48% of companies clothing companies 52% textiles

The fashion industry is worth between USD 1.7 trillion and USD 2.5 trillion according to two different research reports by Euromonitor and McKinsey.<sup>55</sup> The textile and fashion industry has also significant sustainability impacts from social to environmental issues. Also, social issues, such as human rights, living wage and workers' rights raise as concerns, especially in areas where most of the raw material production and manufacturing takes place.<sup>56</sup> Solving the social issues in the industry has been challenging due to the lack of transparency and complex supply chains.

In addition to the social issues, the industry has various significant environmental impacts. During a textile's lifecycle, water is used in raw material production, manufacturing and use phase, and the production process uses a lot of varying chemicals. Approximately 3 500 substances have been identified to be used in textile production.<sup>57</sup> A lot of the chemicals used are classified as hazardous, both to people and the environment, and they end up in the water circulation, contributing to water pollution.<sup>58</sup> Water pollution puts aquatic ecosystems at risk and can also contaminate drinking water and expose humans to risks.

51 Ellen MacArthur Foundation 2017

52 Research And Markets 2022

53 Euratex 2022

54 STT Info 2021

55 Fashion United a

56 White et al. 2017

57 United Nations Environment Programme 2020

58 European Commission g

Europe is home to significant and well-known textile and clothing brands as well as textile production. Within textile brands, the most globally valued European textile companies are mostly from Central Europe: Louis Vuitton (France), GUCCI (Italy), Chanel (France), Adidas (Germany) and Hermès (France)<sup>59</sup>. The largest European brand conglomerates include LVMH (with Louis Vuitton, Bulgari, Chaumet, Tiffany & Co, Tag Heuer), Inditex (with Zara, Massimo Dutti, Bershka) and Kering (with Balenciaga, Gucci, Saint Laurent).<sup>60</sup> However, while there are huge textile and fashion conglomerates in Europe, the market overall consists mostly of SME-companies (small- and medium-sized). Based on the number of employees, 99.8% of total textile and fashion companies in Europe are micro and SME enterprises.<sup>61</sup> While most of the textile production takes place in Asia, the biggest producers in the European Union are Italy, France, Germany, Spain and Portugal. Together, they account for about three-quarters of EU production.<sup>62</sup> Germany, Belgium, Austria and the Netherlands contribute especially to the production of technical textiles, while Southern European countries contribute more to total clothing production. In addition to the EU, Turkey is a significant player in the textile industry. Turkey has a long history of textile manufacturing, and in 2020 it ranked the fourth largest exporter of textiles worldwide. Most of the Turkish exports arrive in Europe, especially in Germany, Spain and the United Kingdom.<sup>63</sup>

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59 Statista

60 Fashion United b

61 Euratex 2022

62 European Commission h

63 Statista 2022a



## 3.2 Regulatory landscape

### EU strategy for sustainable and circular textiles

The EU strategy for sustainable and circular textiles<sup>64</sup> was published in March 2022. The strategy addresses both the production and consumption of textiles. It implements the commitments of several recent EU policy initiatives: the European Green Deal<sup>65</sup>, the Circular Economy Action Plan (CEAP)<sup>66</sup> and the European Industrial Strategy<sup>67</sup>. All these initiatives aim at developing EU's competitiveness in digitalisation and the green transition. The initiatives also support the UN Sustainable Development Goals (SDGs) that are driving global action towards more sustainable world, considering the intertwined social, economic and ecological perspectives of development<sup>68</sup>.

The goal of the EU strategy for sustainable and circular textiles is to create a greener, more competitive sector that is also more resistant to unanticipated global events.<sup>69</sup>

The EU Commission's 2030 Vision concerning textiles is that

- all textile products placed on the EU market are durable, repairable and recyclable, to a great extent made of recycled fibres, free of hazardous substances, produced in respect of social rights and the environment
- "fast fashion is out of fashion" and consumers benefit longer from high quality affordable textiles
- profitable re-use and repair services are widely available
- the textiles sector is competitive, resilient and innovative with producers taking responsibility for their products along the value chain with sufficient capacities for recycling and minimal incineration and landfilling.<sup>70</sup>

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64 European Commission 2022

65 European Commission b

66 European Commission a

67 European Commission c

68 United Nations a

69 European Commission i

70 European Commission i

The Strategy lays out a forward-looking set of actions. The Commission will

- set design requirements for textiles to make them last longer, easier to repair and recycle
- introduce clearer information on textiles and a digital product passport
- empower consumers and tackle greenwashing by ensuring the accuracy of companies' green claims
- stop overproduction and overconsumption, and discourage the destruction of unsold or returned textiles
- harmonise EU Extended Producer Responsibility rules for textiles and economic incentives to make products more sustainable
- address the unintentional release of microplastics from synthetic textiles
- address the challenges from the export of textile waste by adopting an EU Toolbox against counterfeiting by 2023
- publish a transition pathway by the end of 2022 or at the beginning of 2023 - an action plan for actors in the textiles ecosystem to successfully achieve the green and digital transitions and increase its resilience.<sup>71</sup>

### Other relevant regulation

The EU has aligned laws in all EU countries with Textile Regulation (EU) No 1007/2011. This regulation addresses fibre names and related labelling and marking of the fibre composition of textile products.<sup>72</sup>

Other current regulation related to textiles and clothing includes the following: General Product Safety Directive (GPSD); Market Surveillance; Unfair Commercial Practices; Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH); Personal Protective Equipment (PPE) Directive; Toy Safety Directive; Industrial Emissions Directive; the establishment of the criteria for the award of the EU Ecolabel for textile products; Single-Use Plastics Directive (SUPD)<sup>73</sup>; and Green Public Procurement (GPP) on textiles.<sup>74</sup>

A major legislative undertaking currently under process, and highly relevant for textiles and clothing, is the proposal for a new Ecodesign for Sustainable Products Regulation (ESPR) that was published in March 2022. The proposal builds on the EU's initiative on

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71 European Commission i

72 European Commission i

73 European Commission j

74 European Commission k

Sustainable Product Policy<sup>75</sup> and will revise the current Ecodesign Directive that currently only covers energy-related products. The role of the ESPR is to act as the cornerstone of the Commission's approach to more environmentally sustainable and circular products. The ESPR is set to create a universal basis for product design, labeling and reporting requirements that would help reduce the negative lifecycle environmental impacts of products and improve the functioning of the internal market.

The introduction of ESPR will set eco-design performance and information requirements for textiles and several other product categories. The information requirements will also include the application of a digital product passport (DPP) that would include comprehensive data about each product, its raw materials, components, sourcing, dangerous chemicals, recyclability, repairability, reusability and disassembly. With a DPP, the Commission aims at helping end-users to make sustainable choices about their consumption and accelerating business-to-business circular solutions and the green transition.<sup>76</sup>

In addition, the revision of the Waste Framework Directive (WFD)<sup>77</sup> in 2023 will influence the textile and fashion industry. The revised WFD is to set basic concepts and definitions related to waste management, recycling, and recovery, and a waste hierarchy for the EU Member States. The Directive's revision focuses on introducing and implementing, in particular, the following: Extended Producer Responsibility (EPR)<sup>78</sup>, Polluter Pays Principle (PPP)<sup>79</sup> and separate collection of waste. The EPR makes producers operationally and financially responsible for the end-of-use phase of the products they put on the market. It also aims to introduce economic incentives such as eco-modulation fees. The PPP places the responsibility of covering costs related to environmental damages caused by polluter's actions or operations. The separate collection of waste mandates Member States to separately collect waste produced by households by 2025.<sup>80</sup> The WFD revision also aims to set a mandatory step to prepare textile waste for reuse.<sup>81</sup> In Finland, separate collection of textile waste will start already in 2023.<sup>82</sup>

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75 European Commission I

76 European Parliament 2022

77 European Commission m

78 PwC 2022

79 European Court of Auditors 2021

80 Fashion for Good 2022

81 Fashion for Good 2022

82 Business Finland

Furthermore, several other upcoming EU-level initiatives will have relevance for the textile and fashion industry. These include the development of Product Environmental Footprint (PEF) under the European Commission's Single Market for Green Products Initiative<sup>83</sup>, the Commission's initiative on substantiating green claims<sup>84</sup> and the proposal for a directive on Empowering Consumers for the Green Transition<sup>85</sup>.

In addition, recent EU initiatives on corporate governance and reporting will have impact on the textile and fashion industry. The initiative on sustainable corporate governance aims to improve the EU regulatory framework on company law and corporate governance. In particular, the initiative aims to enable companies to focus on long-term sustainable value creation rather than short-term benefits.<sup>86</sup> Regarding reporting, the Commission has already adopted a proposal for a Corporate Sustainability Reporting Directive (CSRD). The CSRD directive extends the scope of mandatory sustainability reporting to cover a larger number of organisations. In addition to all large companies also medium-size companies listed on regulated markets are required to report on material sustainability topics in the future.<sup>87</sup> Finally, the development of EU's classification system for sustainable economic activities, the "EU taxonomy", is already under way. The taxonomy is intended to provide companies, investors, and policymakers with appropriate definitions for which economic activities can be considered environmentally sustainable. It will have influence on investments and financing also in the textile and fashion industry.<sup>88</sup>

### Implications for the textile and fashion product industry

The European Green Deal<sup>89</sup>, the Circular Economy Action Plan (CEAP)<sup>90</sup> and the European Industrial Strategy<sup>91</sup> and the EU strategy for sustainable and circular textiles<sup>92</sup> will have a major impact on the textile and fashion market and related industries in the EU in the coming years. These initiatives will tighten and expand current legislation in several aspects with the overall aim to ensure competitive and evidence-based green transition in the EU region.

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83 European Commission k

84 European Commission o

85 European Commission 2022a

86 European Commission p

87 European Commission q

88 European Commission r

89 European Commission b

90 European Commission a

91 European Commission c

92 European Commission i

The EU strategy for sustainable and circular textiles refers to potential upcoming obligations for recycled materials in textile and fashion products.<sup>93</sup> As part of the Green Deal, the EU is expected to introduce quotas for minimum usage of recycled content in products, which is likely to increase the demand and supply for higher-quality recycled materials as low-quality recycled materials do not meet the functional qualities of products that are required for products to qualify as more durable in use. This is likely to lead to price increases in these materials.

The revised Waste Framework Directive (WFD) in turn, will have an important role in defining how waste is defined. The EU Joint Research Center (JCR) is currently investigating factors influencing the quality of recycled materials and the definition of recycling.<sup>94</sup>

The share of recycled materials in future textile and fashion products may increase not only because of waste legislation revisions. The share may also increase due to changes in customer behaviour. In both cases, the sellers of the products will face increasing pressure to be able to transparently verify the origin of product raw materials. This development is strengthened by the development of Product Environmental Footprint (PEF) under the European Commission's Single Market for Green Products Initiative<sup>95</sup>, the Commission's initiative on substantiating green claims<sup>96</sup> and the proposal for a directive on Empowering Consumers for the Green Transition<sup>97</sup>.

Overall, these policy initiatives, upcoming legislative changes and market-based demand for more sustainable products are highly likely to direct companies to use more bio-based and recycled raw materials as well as design textile and fashion products to be more durable and recyclable.<sup>98</sup> This market development is further enforced by the development of the EU taxonomy that will have a significant influence on investments and financing in the EU region. The taxonomy will have a central role in supporting the Commission's goal to develop EU's competitiveness in digitalisation and the green transition with the overall aim of reaching a climate-neutral and circular economic system.

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93 European Commission i

94 Joint Research Centre

95 European Commission n

96 European Commission o

97 European Commission 2022a

98 Kamppuri et al. 2021

## 4 Potential outlooks for the textile and fashion industry

### 4.1 How does the sustainability perspective change the market?

Sustainability is a global megatrend, bringing changes across industries. In the textile and fashion industry, due to its strong consumer focus, the known sustainability challenges bring strong pressure to change the industry. In the following paragraphs, the following three main sustainability topics acting as main change drivers to the industry are introduced: environmental issues, social issues and customer behavior.

The global textile and fashion industry carries significant environmental impacts, but is also strongly dependent on the environment. In this review, **environmental issues** are divided into two: 1) climate change and 2) other environmental issues, including water, chemicals, waste and biodiversity.

**Climate change** is one of today's largest megatrends changing all industries. According to climate science, the current pathway is going to increase climate warming between 2.1 and 2.9 degrees Celsius.<sup>99</sup> For the textile industry, as already introduced in the previous chapter, global warming brings challenges e.g. in water availability and draught and organic raw materials. Further, according to the Textile Exchange, the global warming cannot be limited to 1.5C without rethinking growth. These factors may create challenges for the textile industry, but simultaneously it enables new opportunities. To tackle climate change, there are already numerous textile and fashion companies committing to ambitious climate targets, including targets to reach net zero by 2050.<sup>100</sup> The current linear business model in the industry does not adequately support the global strive towards limiting global warming to 1.5 degrees.

EU-level regulation aiming to limit global warming to 1.5C and reach net zero by 2050 will further impact the European textile and fashion market with increased and tightened regulation. The regulation was introduced more in the previous section, but

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99 Bloomberg 2022

100 Science Based Targets Initiative

the implications to market are significant. Increased regulation requires companies to add resources to comply with the regulation, and it may put EU textile and fashion companies in an unequal position with non-EU companies.

Textile and clothing companies need to find new business models and innovations to create value while battling climate change and building resilience against climate change. One example of this type of innovation is CO<sub>2</sub>-fibres where textiles are used to capture and store carbon.<sup>101</sup> Limited resources, e.g. access to land areas will also impose companies to rethink their business models. The current linear model exploits natural resources tremendously, and for textile and fashion companies to build resilience and contribute to the fight against climate change, changes are inevitable.

**Other environmental issues emerging in the textile and fashion industry are water, chemicals, waste and biodiversity.** Raw material production, especially when growing cotton and other fibres, requires land and large amounts of water. Raw material production, especially when growing cotton and other fibres, requires land and large amounts of water. For example, producing one t-shirt requires 2 700 litres of water, which would provide enough drinking water for one person for 2.5 years.<sup>102</sup> Further, around 20 per cent of the world's wastewater comes from the dyeing and treatment of textile.<sup>103</sup> The textile industry is aware of its significant water related impacts and are increasingly setting targets to reduce less water in the value chain.

The entire textile production is chemical intensive, and especially in raw materials production and finishing, the use of chemicals increases. The industry uses and releases hazardous chemicals which have significant human health and environmental impacts.<sup>104</sup> For example incineration can lead to harmful emissions and chemical use advance water and soil pollution, which drive habitat loss and endanger species. While chemicals are vital and challenging to replace in some textile production (e.g. sports clothing, and dyeing and finishing process), the industry especially in Europe aims to improve chemical management in textile production. Globally OEKO-TEX Standard certificates indicate to consumers that each component of a textile article has been tested for harmful substances. In 2021, the number of OEKO-TEX certificates grew 17% to reach over 28 000.<sup>105</sup>

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101 Textile Exchange

102 European Parliament 2020

103 Stockholm International Water Institute SIWI

104 United Nations Environment Programme 2020

105 Euratex 2022

Another significant impact from the textile and fashion industry is waste. Textile production process creates cutting waste, but the bigger source of waste is the systematic overproduction and consumers' short use-phases. A lot of resources are extracted to produce textiles and fashion, but it is estimated that half of the produced fashion is disposed within a year. Of this textile waste, almost 73% are incinerated or end up in landfills. The current linear, take-make-dispose model has led to significant waste amounts with low recycling rate. Ellen MacArthur Foundation describes this as a root cause for massive and ever-expanding pressure on resources.<sup>106</sup>

The above-described environmental factors are linked to each other, and all of them have an impact on biodiversity: soil degradation, conversion of natural ecosystems, and waterway pollution. For example, a significant amount of textile waste ends in landfills which releases pollutants to the landfills' surroundings, threatening the habitat.<sup>107</sup> According to one study, the development of a landfill site can lead to a loss of 30 to 300 species per hectare.<sup>108</sup> Water and chemicals have similar type of impact, and it is estimated that 25% of industrial water pollution comes for textile dyeing and treatment.<sup>109</sup>

These multifaced environmental issues require textile and fashion industry to significantly consider their current operating model. A circular economy and closed-loop textile system is seen as an impactful and needed solution to the multiple environmental challenges of the industry. Circular economy has already created many new business models to the industry, from fibre-to-fibre recycling to clothing rentals and from second-hand textile platforms to producing clothing from hotel linen. In addition to circular business models, new innovations, especially improving resource-efficiency are needed. While the market may face challenges with the available resources, new business models and innovations spur new areas for value creation. For example a global chemicals company Kemira has developed an eco-friendly chemical for dyeing fibre, and a collaborating with a fibre company Spinnova to benefit both the textile industry and the environment.<sup>110</sup>

The second broader sustainability perspective changing the market is **social issues**. The global textile supply chains are long and complex, and today a lot of production takes place in Asia, where in many countries textile workers' social issues have emerged. These negative social issues are poor working conditions with long working hours and low

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106 Ellen MacArthur Foundation 2017

107 Mckinsey 2020

108 Sciencing 2018

109 Mckinsey 2020

110 Spinnova



wages and in some cases even modern slavery and child labour.<sup>111</sup> The workers in factories may also be subject to hazardous chemicals used in production, or other unsafe working environments. In addition to social issues within the textile factories, the surroundings may suffer from the negative environmental management in the factories.<sup>112</sup> However, while the textile and fashion industry and its value chains have serious social issues, often they lack transparency. However, EU-level regulation and consumers' increasing awareness require textile and fashion companies to better know their value chain and take a stand on social issues.

Social issues in the global textile and fashion industry are not a new phenomenon. They have been part of the industry for a long time, and companies have been taking actions to reduce their negative social impacts. However, the increased pressure from consumers and legislation will put even more pressure on textile and fashion companies regarding their supply chains. Companies need to increase transparency across the entire value chain to meet customer expectations and regulations. For EU textile and fashion companies to maintain their license to operate in the eyes of the consumers and society, they need to ensure sufficient resources to increase transparency. As the EU market is mostly consisting of micro- and SME companies, meeting the tightening regulations will most likely need great efforts and new resources. For non-EU textile and fashion companies, they need to also comply with the EU regulation to be able to access the EU market.

Finally, the third significant sustainability perspective changing the global textile and clothing market is **customer behavior**. Awareness and need for more sustainable solutions have increased among consumers, and customers' awareness has been identified as a significant driver for many companies to adopt more sustainable and circular business models. Especially millennials are increasingly aware of the textile and clothing industry's sustainability impacts, and this has led them to be more conscious consumers.<sup>113</sup> According to statistics, consumers increasingly prefer sustainable options and are willing to pay 10-25% more for sustainable fashion compared to normal fashion.<sup>114,115</sup>

In addition to environmentally and socially responsible consumption, a shift towards values-led consumerism is visible in younger generations. Further, they are moving away from possessions to experiences and sharing, rather than owning. Sharing economy, which has disrupted e.g. accommodation (AirBnB), is emerging also in fashion with

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111 International Labour Office ILO 2016

112 United Nations Environment Programme 2020

113 Henninger et al. 2017

114 Statista 2022b

115 Business Finland

clothing rental services and second-hand marketplaces.<sup>116</sup> It is estimated that by 2025 resale market will reach USD 57 billion in sales, while second-hand sales will grow 11 times faster than the overall clothing retail sector over the next five years.<sup>117</sup>

These changes in the customer behaviour, are strongly linked to their expectations on how companies take sustainability into account. These factors will require the market to take sustainability and transparency more into account and communicate it to customers on a clear and credible manner. Further, demand for sharing economy and as-a-service models is expected to increase. These create new business models from cloth renting to repair service offerings. In addition to these new value creation models, there are already many second-hand platforms and stores, and the second-hand sales are expected to grow 11 times faster than the overall clothing retail sector. Traditional retail platforms, such as Zalando, have also accessed the second-hand market and has a separate section selling second-hand clothing. Currently, Zalando's Pre-owned section has over 300 000 items from various brands.<sup>118</sup>

All sustainability forces changing the textile and fashion market also significantly change the **B2B textile market**. Increased regulation will influence B2B companies similarly to B2C companies, and especially questions regarding transparency and traceability are equally important for all value chain players. Further, B2B companies experience increasing pressure from B2C companies, who are experiencing the customer demands in the front line. End-customers are also not the only ones requiring responsibility and sustainability from textile companies. Employees, especially in developed countries, are also preferring employers who take sustainability seriously. In the textile industry, this can mean more sustainable raw materials or high investments to social issues.

While the B2B market will also need to rethink their business models and find new innovations, there are some areas where B2B companies are ahead of B2C companies. For example, in work clothing, rental models are already an established way of working in many industries. For example Finnish work clothing company Image Wear provides rental clothing for industrial operations, restaurant business and healthcare sector. This model lengthens the life cycle of a specific work garment and reduces the need to produce increasingly more work wear. Further, Image Wear reports to take care of the recycling once the products' are at the end of their life cycle and that the materials are recycled back to new materials.<sup>119</sup>

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116 European Commission 2019

117 McKinsey

118 Zalando

119 Image Wear

## 4.2 Other forces changing current global value chains and value creation

In addition to sustainability perspectives changing the textile market, three other aspects changing the market can be identified: 1) global population growth and rising income levels, 2) digitalisation and 3) closeness to markets (striving to take production closer to the end market). This section introduces further these aspects, and how they are likely to change the global textile value chains and value creation.

**Global population growth and rising income levels** are key drivers for textile demand. By 2030, the world population is projected to reach 8.5 billion with India and China expected to be the most populous countries.<sup>120</sup> In the textile industry, the Asia-Pacific region is expected to continue to be the largest market, accounting for more than 60% of global demand in 2025. India and China are projected to be the two largest markets in the region, with a combined share of over 40%.<sup>121</sup>

Rapid urbanization in emerging countries, including India, Bangladesh, Vietnam, and Brazil, is expected to drive the demand for textiles further.<sup>122</sup> According to Fashion United, it is expected that global consumer spending on clothing and footwear will increase 26% from 2021 to be USD 2 572 billion. In the US, households spend on average 3.5% of their annual expenditures on apparel, footwear, and related products, whereas the figure is 4.1% in Europe.<sup>123</sup> Hence, the global population growth and rising income levels across the globe, are expected to contribute to the growth of global textile demand.

Another significant change force is **digitalisation**, which drives changes across the textile value chain from automated production to ecommerce and from smart textiles to brands entering metaverse. To ensure clarity, when reviewing the impacts of digitalisation on the textile industry, it is divided here into two parts: 1) digitalisation in the textile production process and 2) digitalisation in consumer behaviour.

In the textile production process, digitalisation and technology have brought and continue to bring significant opportunities. It has increased automated machinery and enabled it to optimally forecast the demand. While digitalisation has brought opportunities to specific parts of the value chain, at the same time it has also caused challenges for example in the form of data not flowing across the value chain partners

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120 United Nations b

121 Indexbox 2022

122 Grand View Research

123 Fashion United a

and thus hindering traceability. On the European level, digital product passports<sup>124</sup> aim to bridge this gap and include comprehensive data about each product, its raw materials, components, sourcing and chemicals, among other things.

In addition to the flow of data in the value chain, data is integrated into textiles themselves. Smart textiles and fibres are textiles, that are embedded with technology to enhance the properties and qualities of the textile. This includes sensors to trace different data points, such as heart rate or location. The data can be used to optimise performance or trace items.<sup>125</sup> For example, in hotel linen, these data points can provide information on when the bed sheets were washed the last time, or where on the hotel floors the linen is located. This will bring efficiency to housekeeping when eliminating the need to search for missing textiles and enabling automation of inventories.<sup>126</sup>

While the textile and fashion industry already uses digitalisation in the manufacturing processes, all potential from digitalisation is not yet utilised. While digitalisation can make production processes more efficient, it can bring even further changes and opportunities to the market by reducing the need for physical labour demand. In the future, this could allow new geographic areas to increase textile production, as the need for physical labour could reduce with technological developments. In addition, digitalisation in production could allow for increased mass-customisation. Using digitalisation in mass-customisation could support textile and fashion companies in identifying and meeting varying customer needs. This would mean further utilisation of digitalisation to depict demand and increase flexibility both in production operations, as well as when serving customer expectations. For the market, it could mean new geographic areas for textile production, and new business models to identify and provide more mass-customisation.

Digitalisation is also an integral part of many consumers' everyday life. Consumers use increasingly online stores, and it is expected to grow as much as 60% from 2021 by 2025.<sup>127</sup> The industry faced significant changes due to COVID when consumers were not physically able to visit stores and shifted their purchasing online.<sup>128</sup>

In addition to convenience in online shopping, consumers are often able to receive more personalised shopping experiences with targeted ads and item suggestions. However, this is not without challenges: as companies gather an even wider array of data from

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124 The European Commission's DPP initiative is addressed in detail in Section 3.2.

125 Indexbox 2022

126 Lindström

127 Fashion United a

128 Just Style 2022

consumers, data collection and handling must be conducted properly and safely. Hence, cyber resilience becomes increasingly important when consumers shift their purchasing online and share more and more personal data.<sup>129</sup>

The final point of digitalisation in the textile industry is social shopping and metaverse mindset. There are brands such as Gucci who have entered the world of metaverse to attract and find new ways to engage with the younger population. In a metaverse, these brands provide non-fungible tokens (NFTs), gaming, and virtual fashion. NFTs are unique digital assets, e.g. a photo, audio or other digital item representing art, music or in-game items. Companies entering the metaverse see it as a new way to socialise with consumers in more innovative and creative ways, while it also enables a new platform to shop. In addition to the metaverse, social platforms such as Snapchat and TikTok also provide brands with new ways to engage with their customers and strengthen their brands and provide seamless shopping experiences with in-app purchase journeys and livestreaming.<sup>130</sup>

These digitalisation factors in consumer behaviour create new expectations for textile and fashion brands. Consumers increasingly expect that online shopping opportunities are available, with an increased demand for personalised shopping experiences. Hence, the entire market is expected to be able to serve the customers also online. For textile and fashion companies this may require new IT investments to meet customer expectations and to provide convenient, personalised and safe online shopping.

The third and final key force changing the market is **supply chain factors**. Firstly, due to COVID-19 pandemic, followed by the supply chain challenges in Suez Canal and finally the geopolitical tensions, textile companies have faced a need to rethink their supply chains. With long and complex supply chains, many companies operating in the textile sector are rethinking their sourcing strategies and implementing new supply chain management technologies to build resilience and ensure their product flows.<sup>131</sup> Further, current global instabilities, including the rising energy prices, ongoing Russia-Ukraine war and tensions between China and Taiwan, are increasing prices e.g., for cotton, and overall shifting the geopolitical landscape. These challenges can contribute the textile and fashion market with a lower demand for textiles, as they are often seen as non-essential items. In a longer term, these factors may shift production closer to end-markets to build resilience against global geopolitical tensions.

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129 McKinsey

130 McKinsey

131 McKinsey

Discussions regarding the circular economy also reinforce the idea of operating closer to markets: with the increasing shipping costs and emissions from transportation, it is inefficient to transfer huge amounts of textile waste first outside of Europe and then back. Currently, the export of used clothes from Europe mostly ends up in Eastern European countries, Asia and Africa, and the amount of textile waste is only expected to grow.<sup>132</sup> Hence, smaller local factories can emerge in the future to address challenges with long and complex supply chains, as well as to bring new opportunities emerging from the circular economy.

### 4.3 International and European change scenarios

As highlighted in the previous chapters, the textile and fashion industry is affected by numerous change forces and the rapidly changing world is generating multiple uncertainties that will impact the future of the industry. To identify possible changes in the industry, this study set out to create three alternative scenarios. Nine uncertainty factors were identified to impact the future of textiles and fashion based on the change forces identified in the desk-top study as well as inputs from interviews. Three development options were prepared for each uncertainty factor to display the alternative directions for future developments. The uncertainty factors and their development options are displayed in Table 2 below.

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132 European Commission g

**Table 2.** Futures Table of identified uncertainty factors and their development options

Changing climate	Fresh water supply	Availability of land grown raw materials	Amount of income to dispense	Tightness of regulation	Demand	Utilization of digitalization	Supply chains on the move	Workforce availability
The world is united in combatting climate change	Strong regional players with abundance of fresh water	(Traditional) biobased raw materials become scarce as large land areas are conserved	Steady growth of middle class and income levels	Europe is the most strictly regulated production location in the world	Market polarization with some using a greater portion of their income on textiles while some significantly limit purchases	Supply chain optimization through data	New innovations made possible by improved cooperation across industries	Production processes in Europe suffer from a lack of employees
Europe is yet to see the full effects of climate change. Investments pour in due to its stability	A looming global fresh water crisis– water is reserved for drinking only	Biodiversity loss stopped through regulation and consumer vigilance. Land area conservation has not been required	High inflation has significantly impacted the PPP. Extra expenses have been minimized.	Regulation targeting the end-use of textiles takes effect and circulation of resources becomes mandatory	Fast fashion is unavailable. Companies are focused on producing slow fashion with limited lines	Manufacturing of smart textiles with safety and comfort features	Circular economy based industrial parks emerge in Europe	Automisation solves the lack of employees and enables bringing supply chains nearer to home markets
Major climate crisis is at hand, and there is no coordination of efforts between countries	Abundance of fresh water secured through technological innovations	Significant loss of biodiversity has wiped out many species of plants and animals, jeopardizing nature's services	Increases in income inequality and a diminishing middle class has resulted in concentration of wealth	China and the US place significant environmental restrictions on the manufacturing of textiles	Sharing economy gains preference among consumers and demand is directed away from purchasing to renting services	Technology enabled fibre recycling	A decentralised supply chain across various countries and smaller units	Europe is the world's textile hub for professionals around the globe and attracts top talent

Dark blue Scenario 1: Europe of new materials

Green Scenario 2: World of decentralized production

Light blue Scenario 3: Flourishing circular textile economy

These uncertainty factors and their development options form the basis of the three change scenarios prepared for the year 2035.

## Scenario 1: Europe of new materials

A race for new textile materials has begun with Europe in the lead, as traditional biobased raw materials have become scarce. While climate change has slowly intensified, Europe is yet to experience the full effects of the warming globe. Europe has become the world's textile hub, producing most of the world's alternative fibres and attracting textiles professionals from around the world. Investments and skilled labour are pouring in due to the region's relative stability and novel innovations spurred by cooperation across industries.

The ongoing climate change has prompted actions around the globe to limit the adverse effects, significantly altering the textiles industry. Vast land areas have been conserved around the globe, leading to scarcity of traditional biobased raw materials. Demand for new man-made cellulosic textile materials has consequently soared. In addition, China and the United States placed significant environmental restrictions on the manufacturing of textiles in the early 2030's in response to the effects of climate change.

Europe, that implemented similar restrictions already in the early 2020's, has now been able to reap the benefits of the ensued technological innovations and cross-industrial collaboration. Europe is the leading producer of alternative fibre materials, such as polymers. In addition to the development of new raw materials, European smart textiles with added comfort and safety features are in great demand around the warming world.

While exports of European textile brands speed up from Europe to the rest of the world, the internal market is stalling. The European domestic market is facing a period of stagnating growth due to rapidly increased income inequality and a diminishing middle class. Wide adoption of automation and job creation focused on jobs requiring highly skilled labourforce have increased economic polarization. Wealth is concentrated to a small portion of the population, while many are left with less money to spend than previously. New value creation models based on the sharing economy and reuse pick up speed in Europe to offer alternative and less costly means to utilize textiles and fashion.

**European textile market size:** Stagnation

**Europe's position:** Moderate/Strong

**Opportunities for Europe & Finland:** development of new non-biobased raw materials, smart textiles, and new sharing economy based business models



## Scenario 2: World of decentralized production

Small, decentralized production units have provided an answer to textile and fashion companies seeking to secure supply of their products in a rapidly changing, even unpredictable world. Climate change has significantly impacted the entire globe, and the global temperatures have been rising rapidly. Rising temperatures have resulted in the progression of biodiversity loss and a shortage of fresh water. The ensued environmental crisis has led to a decline in the supply of traditional biobased raw materials. New material sources have consequently largely replaced traditional materials in the textile and fashion industry and the range of textile materials has expanded.

To combat the environmental crisis, Europe has implemented strict environmental regulations making it the most regulated production and consumption region on the globe. Tight regulations and the lack of traditional inputs has significantly impacted the entire value chain of the textile and fashion industry. Small decentralized production units have emerged, and production has been mostly transferred outside Europe. Tight regulations coupled with Europe's still ongoing shortage of manpower has made production in Europe unattractive for companies.

Europe's high inflation rate and the consequent decline in consumers' purchasing power has hit the European textile and fashion industry hard. As a result of these changes the industry has witnessed lower production volumes and the emergence of slow fashion at more affordable prices. Technological advancements have enabled better control and optimization of the increasingly fragmented supply chain. Data is strongly integrated with the entire value chain of the textiles industry, helping companies optimize the use of limited inputs and forecast demand. What used to be the privilege of global conglomerates such as Inditex has become available for smaller companies as well. Declining sales volumes and improved digitisation provided an opportunity for smaller companies to emerge and gain market share from large actors.

**European textile market size:** Significant decrease

**Europe's position:** Weak

**Opportunities for Europe & Finland:** data-based supply chain optimization technology and new material sources

### Scenario 3: Flourishing circular textile economy

Circular economy is booming because of the successful efforts to combat climate change. The world has been effective in limiting global warming through active measures and collaboration. Circular business models were widely adopted in Europe as a means to decrease dependencies from other regions and to meet the ambitious climate goals of the 2020's. Consumer awareness regarding the effects of consumption habits rose at the same time, providing an additional pull to the rapid changes in the textile and fashion industry.

In addition to the pull factors, environmental regulation has provided a significant push for the restructuring of the industry. New regulation has taken effect that makes circulation of fibres mandatory. The announcement of the regulation prompted the development of technology for improved fibre-to-fibre recycling and the establishment of circular economy based industrial parks to Europe.

Europe is attracting investments from abroad. Despite polarization of consumer behaviour, domestic demand has remained at a high level. This is mainly attributable to Europe's growing middle class and steadily increasing income levels. Circular economy is also visible in consumer behaviour. New circular business models, such as reuse services for clothing have become widely popular, significantly improving the utilization rate of textiles. Europe is widely seen as a stable market and region for investments with abundant production inputs, purchasing power and technological know-how.

**European textile market size:** Growth

**Europe's position:** Strong

**Opportunities for Europe & Finland:** automated production methods and textile recycling technologies

## 5 Growth potential of the Finnish textile and fashion industry

This chapter addresses the growth potential of the Finnish textile and fashion industry. The chapter builds on the previous chapters, additional desktop research on competitiveness and competences, and the interviews conducted for this study. The chapter starts with an analysis on textile and fashion industry's competencies in Europe and Finland, proceeding then to examine competitiveness potential, and ending with opportunities and threats identified for European and Finnish actors in global value chains.

### 5.1 Competences in Europe and Finland

Europe, with its long legacy as a world's leading textile and fashion hub, holds a wide variety of competences that it can leverage also in the future. In addition to housing many of the most valuable (premium) fashion brands and conglomerates, Europe is home to top **design, financial and management skills** alongside with the most sophisticated **research network**. Although most of the production has shifted from Europe to Asia over the last decades, the whole value chain and the competence of producing garments, although to some degree scattered, still exists in Europe. European production that mostly takes place in Portugal, Italy, and Turkey, is considered to be of **high quality**.<sup>133 134</sup>

Europe, which is considered a **leader in advancing sustainable development** due to current and future EU legislation, strategies and programmes, has subsequently the opportunity to become a global leader in sustainable textiles and fashion. Additionally, consumers in Europe are more interested in sustainability, which increases demand for sustainable European production and materials. Europe is also **developing innovations to enable the green transition** and is the global leader what comes to recycling textiles.

The strong **expertise and long history in bio-based raw materials**, especially in cellulose-based fibres, and smart technologies in Finland are valuable for the green transition. For example, Finland is one of the most interesting countries internationally for **developing new cellulose-based textile fibre innovations**. Finland has relatively many companies and research institutions developing and commercialising new fibres using different manufacturing methods, such as Infinited Fiber Company, Spinnova,

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133 European Commission h

134 Statista 2022a

Aalto University, University of Helsinki, VTT Technical Research Centre of Finland, Fortum and Metsä Spring<sup>135</sup>. In addition to strong expertise in cellulose-based materials, Finland has experience with **utilising agricultural primary production and by-products** in developing these new textile fibres.

Finland has valuable knowledge and expertise to address the challenges of **sustainable development and the implementation of circular economy in the textile industry**. This expertise has been gained in particular by investing for example in long-term projects such as Telavalue, which is a cooperation network on textile recycling seeking to develop the collection, sorting and refining processes of end-of-life textiles. As a result, Finland holds strong ongoing scientific and technological development regarding for example collection, sorting and development of **innovative recycling technologies**.

An example of the above development is **technical machinery and knowledge on opening fibre**, which is a crucial part of the textile recycling process. The Nordic countries' first industrial end-of-life textile refinement plant, opened in Paimio in 2021, produces recycled fibre, which can be used for various industrial applications, including yarn and fabric, insulating materials for construction and shipping industries, acoustic panels, composites, non-woven and filter materials, and other technical textiles, such as geotextiles<sup>136</sup>. Also, Rester and LSJH have developed **optical identification technology** what is used for sorting material into various fibre classes to ensure the quality of the raw material and the resulting fibre products<sup>137</sup>.

There is a growing demand for non-toxic and less harmful chemicals to be used in the textile and fashion industry across the globe. Especially the demand for chemicals that reduce water consumption in textile production is increasing in countries such as China, India and Vietnam, where water security is a concern<sup>138</sup>. Finland holds well-recognized **chemical expertise** that has been used to develop **new innovations to replace harmful chemicals** used in the sector. For example Kemira, a Finnish chemicals corporation with global presence, has developed an eco-friendly chemical for dyeing fibres<sup>139</sup> and is actively developing new solutions to drive more environmentally sound textile production. Finnish

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135 Finnish Textile & Fashion d

136 LSJH 2020

137 LSJH 2020

138 FMIBlog 2022

139 Spinnova

research institutions and companies are also involved in research projects such as the EU-funded GRETE (Green chemicals and technologies for the wood-to-textile value chain) project<sup>140</sup> and BioColour (Bio-based Dyes and Pigments for Colour Palette)<sup>141</sup>.

Finnish **fashion design** has gained international recognition and interest. Aalto University is one of the world's most prestigious fashion design universities, with fashion degree programmes ranked among the best in the world<sup>142</sup>. Finnish fashion designers have gained success in various international competitions such as d'Hyères and Designers' Nest. Design is an essential factor in creating more sustainable products that support the principles of circular design.<sup>143</sup>

In addition to skills residing specifically within the textile and fashion industry, Finland is known for high level expertise in skills such as **finance, management, service design, digital, and other technical skills** that are used for the benefit of other sectors, for instance in technology and gaming companies. If Finland is able to bring these skills also for the benefit of the Finnish textile and fashion industry, they would provide significant strengthening of the competitiveness of the sector.

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140 GRETE

141 BioColour

142 Aalto University 2021

143 Kamppuri et al. 2021

**Table 3.** Competence areas of Europe and Finland in support of the textile and fashion industry

Part in the value chain	Competence area	Background	
Across value chain	Sustainable business development	Europe is considered a leader in advancing sustainable development due to current and future EU legislation, strategies and programmes.  Similarly, Finland has e.g. ambitious climate targets and strategic programme to promote a circular economy advancing further the implementation of sustainable business.	European Union, Finland 
Design and R&D	Design skills and design education	Europe has a long legacy as a leading textile hub with most valuable premium fashion brands and top fashion schools.  Finnish fashion design education is ranked among the best in the world, and young designers have a good reputation globally, receiving global rewards.	European Union, Finland 
Raw material production	Fibre innovations and knowledge	Finland has a long history and good technical knowledge of bio-based fibres, especially cellulose. Additionally there are relatively many players in relation to Finland's geographic size.	Finland 
Dyeing	New more sustainable chemicals	Existing chemical expertise, and new innovations to replace harmful chemicals. E.g. Kemira has developed an eco-friendly chemical for dyeing fibres and is actively developing new solutions to more environmentally sound textile productions.	Finland 
Recycling	Recycling technologies and knowledge	Strong technological development in textile waste collection, sorting and development of innovative recycling technologies, including experience on optical identification technology.	Finland 
Recycled fibres	Technologies for recycled fibres	Technical machinery know-how and knowledge on opening fibre. The first industrial end-of-life textile refinement plant in the Nordics, opened in Paimio in 2021.	Finland 

## 5.2 Competence gaps in Europe and Finland

To assess the most significant competence gaps in the textile and fashion industry in Finland, the competences have been analyzed using the circular textile value chain by UNEP as a frame (Figure 2).

As mentioned previously, like several other European countries, Finland has also experienced the relocation of the industrial production of textile and fashion products to countries with lower production costs. Parallel to this development, the education of textile experts and engineers has vanished and with it Finland has lost comprehensive and concurrent knowledge of the value chain. In the production of raw materials, industrial textile manufacturing is **lacking textile experts with hands-on experience from textile manufacturing**. Although there are several fibre producers in Finland, there is a lack of competences in the following production/manufacturing stages. Yarn production, yarn spinning and cloth weaving, all the way to the assembly including sewing have largely disappeared from Finland.

The number of companies specialising in the dyeing of yarns and fabrics in Finland is also low<sup>144</sup>. In addition, the Finnish raw material base is very limited. Domestic raw material for textile fibre rests greatly on the utilization of forest-based cellulose, while other natural fibres are to a large extent lacking<sup>145</sup>. Finnish fibre expertise is thus mostly based around novel cellulose-based and recycled textile fibres.

At the European level, the industry overall is not equipped for the circular transformation and is still practically linear in its value chain. The textile and fashion industry is in general **behind in digitalization, circular technology and recycling infrastructure** compared to many other industries. Although Europe and Finland are considered a leader in sustainable development and circular economy actions, and are ahead especially compared to Asia, deeper knowledge and resources to develop system-level recycling technology in the context of the textile and fashion industry are needed. Particularly, the infrastructure for efficient recycling practices for textile collection and sorting needed to ensure that the recycled fibres are of high-quality, is lacking. For instance, properties of recycled (cotton) fibres are currently lower than those of virgin (cotton) ones, hence the technology should be developed further to increase the quality of recycled fibres.

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144 Owalgroup 2022

145 Kamppuri et al. 2021

Weak **branding and fashion management** skills is a major obstacle for gaining successful commercialization of Finnish textile and fashion companies and innovations. Companies commercializing new cellulose-based textile fibre innovations have recently created successful joint venture agreements with global textile and fashion brands; not to mention similar success stories in other sectors such as the gaming industry and Kone. However overall, the Finnish fashion companies, with a few exceptions, have not yet been able to achieve a significant share of turnover from exports<sup>146</sup>. The Finnish domestic market is small, so international markets and exports are needed to keep the business in Finland<sup>147</sup>.

Finland has a wide range of expertise, in particular in the field of IT, that could enable solving problems and meeting the needs in the textile and fashion industry. However, **lack of cooperation between the textile and fashion industry and other industries** is preventing the expertise to become harnessed for use and benefit of the textile and fashion industry. For example, cooperation between the fashion and textile industry and IT companies to jointly develop solutions could increase the optimization and transparency of the entire textile value chain and thus bring competitive advantage. One contributing factor to this situation is the industry's weak attractiveness. The **appreciation and development of the textile and fashion** industry in Finland lags behind for example when compared to other Nordic countries<sup>148</sup>. The industry's conservative appearance manifests in the difficulty to attract labor force and investments.

### 5.3 Examination of the competitiveness potential of Finnish actors in global value chains

The textile and fashion industry is in the midst of a significant transformation driven by sustainability. The linear take-make-use-dispose model is largely still in place in the textile and fashion industry. This is not only placing significant strain on the environment, but also its economic viability has been placed under question. In 2017 it was estimated that more than USD 100 billion worth of materials was lost each year due to less than 1% of clothing material being recycled<sup>149</sup>. With increased awareness of the negative external impacts of the industry and economic loss, the textile and fashion industry is on the brink of a system level change towards a circular economy-based value chain.

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146 Owalgroup 2022

147 Kamppuri et al. 2021

148 Owalgroup 2022

149 Ellen MacArthur Foundation 2017

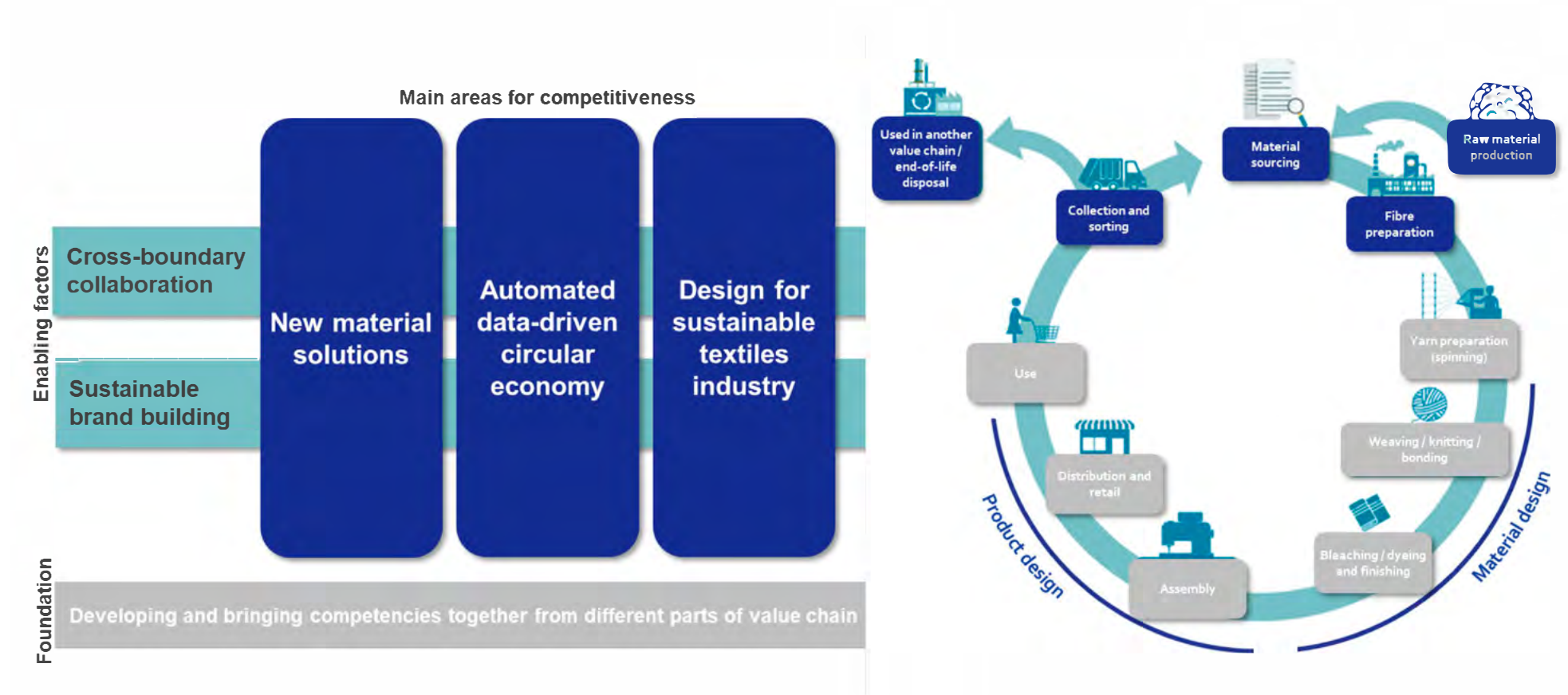


The transformation towards a sustainable textile and fashion industry presents significant opportunities. The most significant opportunities within the industry are linked to four disruptions: value chains shifting towards circular economy, changes in material base, merger between technology and textiles, and increasing consumer power. These disruptions are offering ample opportunities within new value creation models, new types of materials, smart textiles and textile innovations, data enhanced supply chain optimization and environmentally friendly production methods.

Finland is well-equipped to grasp the presented opportunities and take a role as a driving force in the transformation. As mentioned previously, Finnish fashion and textile companies have been active in exploring more sustainable business models, and several new sustainability-driven companies have been established in the production of circular and bio-based textile fibres. Finnish competences, when harnessed to address the rising challenges, enable Finland to become a notable larger-than-its-size player in the current transformation towards a sustainable textile and fashion industry.

In the context of this aforementioned system level change, this study identifies *three main areas of competitiveness potential* for Finland: 1) **new material solutions**, 2) **automated data-driven circular economy** and 3) **Design for sustainable textiles industry**. In addition to these main areas for competitiveness, *two enabling factors* arise that are crucial for realising the potential within these areas and improving Finland's competitiveness. These factors are **cross-boundary collaboration** and **sustainable brand building**, including fashion management and commercialisation skills. This section will introduce in more detail the identified areas for competitiveness and factors identified to harness the potential in Finnish textile and fashion industry. Figure 5 below illustrates the areas of competitiveness potential along with the enabling factors, and highlights parts of the value chain where these main areas and enabling factors for competitiveness were identified in this study.

Figure 4. Main areas of competitiveness for Finland and required enabling factors



The first area of competitiveness, **new material solutions**, draws from Finland's profound material knowledge.

Global textile fibre production is expected to grow 34% to 146 million tonnes in 2030, and to meet the planetary boundaries the need for more sustainable raw materials is evident. Global environmental issues, such as climate change and water scarcity combined with tightening regulation in the EU and increased customer awareness, are significant drivers in the market to increase the demand for more sustainable fibres. This creates growth opportunities regarding new material solutions, including both bio-based and recycled fibres for Finland to grasp.

Finland's long experience and deep expertise with **bio-based materials** make Finland one of the leading countries in the field. Finland has been one of the pioneers in the field and there are already successful examples of new innovations, such as Spinnova® and Fortum's straw based Bio2™Textiles, which harness this expertise for the production of sustainable textile fibres from alternative sources of raw materials. Although their applications are diverse, many of the bio-based innovations build upon utilizing wood-based fibres. Relative to its size, Finland has the most forest-dependent and forest-sector reliant economy in the world, according to the Ministry of Agriculture and Forestry in Finland<sup>150</sup>. The forest sector has been searching for new ways to utilize forest fibres for better value add. Forest-fibre based textiles offer an enticing opportunity to improve the refinement value of the raw material and increase value add for Finland.

In addition to developing the utilization of new sources of raw materials, Finland has already developed technology to regenerate fibres from textiles. These **recycled material innovations** also provide Finland with significant growth opportunities and advance Finland's position as a leader in the new circular textile and fashion industry. Innovative companies operating with new fibre technologies capable of high-quality fibre-to-fibre recycling are emerging to meet this emerging demand. In addition to leveraging technological competences, both Spinnova and Infinited Fibre Company have actively collaborated with global textile brands and created successful partnerships. This has increased the awareness of the companies and their novel solutions, increasing the demand for their fibres, which exceeds their current production capacities.

Attachment to the global textile and fashion value chain is critical for competitiveness. Whereas bio-based, and especially forest-based fibres provide a potential opportunity to establish large-scale production also in Finland, due to the availability of resources, large scale production of recycled materials is likely to be established elsewhere. Finland

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150 Maa- ja metsätalousministeriö

produces only approximately 1% of Europe's textile waste and is geographically distant from the main sources of textile waste. Also for bio-based fibres, opportunities for broader scalability and commercialisation come mostly through collaborations and partnerships outside Finland. Although regionally close value chains are important for ensuring local demand for these new fibre solutions, Finland's competitiveness potential is mainly seen to lie in the development of solutions to be utilized elsewhere.

The second area of competitiveness, **automated data-driven circular economy**, builds upon Finland's exceptional technological knowledge and development.

Digitalization and technology are crucial elements in enabling the aforementioned system level change in the textile and fashion industry. Despite the area being new and rapidly developing with numerous opportunities waiting to emerge, technological applications, such as blockchain, IoT and extended reality, are being used and developed to enable circular processes, redirect consumption patterns, and enable transparency and connectivity required to meet the complex demands of circular supply chains. Although existing potential is widely acknowledged, the integration of technology within the textile and fashion industry is still in early stages and offers numerous opportunities for boosting competitiveness.

Finland's strong technological capabilities provide a great platform to grasp the presenting opportunities. Finland is ranked 7<sup>th</sup> in the IMD World Digital Competitiveness Ranking 2022<sup>151</sup> and holds capabilities required for the development of collection infrastructure and automated sorting, in addition to supply chain optimization. By the year 2025, all EU member countries are required to organize separate textile waste collection and sorting. Finland has pushed to roll out implementation already in 2023, making it among the first countries to adopt the policy. As a result, Finland is likely to gain speed in the development of **collection infrastructure and automated sorting**, which is required to advance circular economy and increase the volume of regenerated fibres from textile waste.

Finland also has a strong footing in **supply chain optimization**. Examples of success stories include RELEX Solutions, a supply chain and retail planning platform provider, who has already developed supply chain planning solutions for globally operating groceries and allowed the grocery stores to reduce their food waste and better optimise complex inventory processes. Further, RELEX Solutions's platform improves visibility and alignment across the entire supply network with information sharing and collaborative

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151 IMD World Competitiveness Center

planning.<sup>152</sup> As described in the earlier sections, overproduction of textiles is a significant global challenge and systemic challenge for the industry. With better understanding of consumers' purchasing habits and demands, the production of products can be optimised, limiting the need for raw materials and reducing overproduction.

Although prominent in country-level competitiveness, technological capabilities have so far been underutilized for the purposes of the Finnish textile and fashion industry. Developing technological solutions for the purpose of the textile and fashion industry would allow better use of resources and minimising environmental impacts, without compromising the customer needs. Finnish IT and data competences can bring competitiveness across the value chain if cross-sectoral collaboration between the textile and fashion and IT industries is developed and deepened.

The third area of competitiveness, **design for sustainable textile and fashion industry**, draws from Finland's world class design education and competences.

As mentioned by the Technology Industries of Finland, "the circular economy begins with design"<sup>153</sup>. Design is an essential factor in the transformation of the textile and fashion industry, as it is vital for ensuring that products being made support the principles of circular design. The design phase determines the types of fabric being used, the accessories added, and the item's function and aesthetics, among others. These all contribute to the overall sustainability of a garment and thus the design phase is in key position to reduce textile waste.

The need for **recyclable and durable textiles** will grow rapidly in the coming years, placing attention on the design phase that determines the life-cycle of textile products. The trend is enforced by EU regulation, such as the Circular Economy Action Plan and the Eco-design for Sustainable products, that push for circular products – including textiles. Currently textile recycling is hindered by the use of blended fibres, buttons and zippers. Over the coming years technology will develop to overcome some of these challenges through improved sorting capabilities, and new value creation models based on reuse and repurposing will emerge for extending the life-cycle of textiles. However, as the design of textiles dictates what the product will ultimately become, the design phase undoubtedly remains in key position to maximize recyclability and reuse of textiles, through the choice of fabrics and style.

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152 RELEX

153 Technology Industries of Finland 2020

Finland is in a great position to leverage its strengths within the area. Finland is credited for its world leading fashion design education. Aalto University is one of the world's most prestigious fashion design universities, with fashion degree programmes ranked among the best in the world. Finnish designers have also gained merit in international competitions over the years, with Jenny Hytönen becoming the latest addition by winning both the grand prize and public prize at the Festival d'Hyères in 2022.

### Two enabling factors

The overall competitiveness of Finland's textile and fashion industry is determined by the ability to bring the three aforementioned areas of competitiveness together. Individually the areas present mostly scattered opportunities that do not fully utilize the potential offered by the on-going systems level transition of the industry. Thus, based on the study findings, two enabling factors, cross-boundary collaboration and sustainable brand building, are critical for Finland to realize the full potential from the transformation.

Although there undoubtedly is untapped potential in all individual parts of the industrial value chain, the greatest potential for Finland is presented by the ability to bring the different parts of the value chain together. Successful **cross-boundary collaboration** requires understanding of the interdependencies between different parts of the value chain and even between industries. An example of this is the cooperation between design, manufacturing and fibre-recycling that enables the production of recyclable textiles with the desired qualities. The development of sustainable solutions and products for the needs of a sustainable fashion and textiles industry thus requires access to all parts of the textile and fashion industry value chain, as well as improved collaboration with other industries and the technology in particular.

Mere solutions are however not enough. **Sustainable brand building** capabilities, including fashion management and commercialization skills, are required for the developed solutions and products to realize their full potential. When integrated already at the beginning of the design process, brand-building enables solutions that meet and even direct demand. It is through sustainable brand building that the developed solutions for a more sustainable textiles and fashion industry are able to attract the attention of a global audience and become widely implemented.

Whereas the identified three competitiveness areas build upon Finland's existing competences, the enabling factors represent the most significant competence gaps. Development actions are recommended to be targeted primarily to strengthening these enablers. A solid foundation for the competitiveness of the industry could be achieved through activities that help develop and bring competencies together from different parts of value chain.

## 6 Conclusions

This study set out to better understand the position and opportunities of Finland in the international competitive environment in the textile and fashion industry. The study has sought to provide more understanding on Finland's strengths and to compile a better picture of the current developments in the sector in Finland and the potential of the Finnish knowhow in the international market.

The study has examined the Finnish textile and fashion industry with a particular focus on woven and knitted textiles and clothing, and raw materials and processing phases used for producing these goods. Nonwoven textiles, although one of the most rapidly growing sectors in the textiles market, have been largely excluded from the scope of this study. However, as nonwovens are used in various textile applications, such as clothing, some of the findings are also relevant for nonwoven textiles and their value networks.

The textile and fashion industry is one of the biggest industries in the world. The industry has witnessed long-term growth, tripling its size since the 1970's and currently employing roughly 250 million employees. The industry is characterized by a mixture of global brand conglomerates in addition to numerous micro companies and SMEs. The value chain is facing significant environmental and social issues that are shaping the industry's future. Despite being in the midst of significant changes, the industry currently still operates in a mostly linear operating model with complex supply chains.

Recent and upcoming regulation significantly impacts the operating environment and competitive landscape. New policy initiatives and upcoming legislative changes such as the European Green Deal, the EU Strategy for Sustainable and Circular Textiles and Corporate Sustainability Reporting Directive, among several others, are highly likely to direct companies to use more bio-based and recycled raw materials as well as design products to be more durable and recyclable.

Sustainability is undoubtedly among the biggest change drivers of the textile and fashion industry. Sustainability driven disruptions are providing new opportunities along the value chain that will change the industry. New value creation models, alternative material sources, new textile innovations and environmentally friendly production methods in addition to data enhanced supply chain optimization, along with several others are emerging as such sustainability driven value chain altering disruptions.

Europe and especially Finland are well-equipped to grasp the presented opportunities and take a role as a driving force in the transformation. Finnish fashion and textile companies have been active in exploring more sustainable business models, and several

new sustainability-driven companies have been established in the production of circular and bio-based textile fibres. Finnish competences, when harnessed to address the rising challenges, enable Finland to become a notable larger-than-its-size player in the current transformation towards a sustainable textile and fashion industry.

In addition, Europe has a legacy as a leading textile and fashion hub and is home to prestigious fashion brands and brand conglomerates. European fashion education is also considered world class with several top fashion schools located in the region. Finland, despite experiencing the relocation of the industrial production of textile and fashion products to countries with lower production costs, particularly to Asia, has in recent years seen increased interest and activity within the industry. Finland is known for its fashion design education, sustainable bio-based and recycled fibres, and novel innovations regarding sustainable production and recycling methods.

Based on the findings of this study the Finnish textile and fashion industry holds the keys to leverage the systems-level sustainability transition for improved competitiveness in international markets. Finland's competences support the ability to create innovations to help accelerate the industry's green transition. This study identifies three main areas of competitiveness potential for Finland, in addition to two key factors required to enable growth. The first area for competitiveness is new material solutions, including both bio-based and recycled fibres. Their demand is likely to soar, as the industry will need to seek more sustainable raw materials in wake of meeting planetary boundaries with a significant expected growth in demand. The second area for competitiveness is automated data-driven circular economy, including both automated recycling processes and better supply chain optimisation. High volumes of textile waste, tightening textile waste regulation in the EU and limited natural resources require new circular solutions and value creation models. The third area for competitiveness is design for sustainable textile and fashion industry, including design of recyclable and durable textiles. As the industry transitions to a circular value chain, holders of circular design knowledge will hold a competitive edge.

While Finland has the potential to become a notable player in the current transformation towards a sustainable textile and fashion industry, the study identified two enabling factors that need to be strengthened in order to realize the competitiveness potential offered by the three areas. Cross-boundary collaboration within the different parts of the value chain and beyond the limits of the industry is required to enable the development of novel solutions and products that support circularity. Sustainable brand building on the other hand, are required for the developed solutions and products to realize their full potential by attracting the attention of a global audience. Potential development actions are recommended to be targeted to support competence development in these fields, as they hold the key for Finland's improved competitiveness and role as a leader in the



## Annex 1. Interviewed companies

A total of 14 companies and 15 people were interviewed, as two people from VTT were interviewed. The companies and individuals interviewed are listed below, with the exception of one European consumer textile and fashion company who did not wish to disclose the information.

Organization	Name	Position/role
Bestseller	Claus Teillmann Petersen	Bestseller Sustainability / Senior Human Rights Specialist
Business Finland	Marika Ollaranta	Head of Decarbonizing Industries
The European Textile and Apparel Confederation (EURATEX)	Mauro Scalia	Director Sustainable Businesses
Infited Fiber Company	Tanja Karila	Chief Marketing Officer
Lindström Oy	Pasi Saarinen	Vice President, Finland
Metsä Spring	Katariina Kemppainen	VP, Group R&D
Rester Oy	Anna-Kaisa Huttunen	Director of Partnerships
Spinnova Oyj	Pia Qvintus	Business Development Director
STJM	Anne Ruokamo	Chief Advisor
Sun Tekstil	Utku Varol	Sustainability Manager
The European Technology Platform for the Future of Textiles and Clothing	Lutz Walter	Secretary General
Valmet	Mika Lahtinen	Director Research and Development
VTT	Ali Harlin	Research Professor
VTT	Pirjo Heikkilä	Senior Scientist

## Annex 2. Interview questions

Topics for discussion:

1. What is the position of Europe in global competition in the fashion and textile sector?
2. Which factors could support the international growth of the European textile and fashion industry?
  - a. What are the strengths of the European textile industries in the global context (e.g. technology, location, availability of materials, competences, end products, design, branding)?
  - b. What are the weaknesses of the European textile industries in global context (e.g. technology, location, availability of materials, competences, end products, design, branding)?
  - c. In which parts of the value chain/product life cycle and in which types of products do you see most growth potential for European textile sector companies?
3. How does the sustainability perspective change consumer and/or B2B markets in this sector?
4. What kind of new value creation models in the textile and fashion industry could emerge in the future? In which parts of the value chain/product life cycle and in which products?
5. What special expertise can Europe offer for the entire value chain?
  - a. What are the most significant skills gaps? Mitkä ovat merkittävimmät puutteet osaamisessa? In which parts of the value chain/product life cycle and in which products?
  - b. Do you see as a possibility that necessary expertise could be transferred to Europe? What expertise in that case, in particular, and from where?

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