GREEN TEXTILE TRANSITION

SURVEY OF THE SITUATION AND SUSTAINABILITY CHALLENGES OF THE HUNGARIAN TCLF SECTOR

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Content

Foreword

A key question for the future is how to sustain economic development. Sustainability requires efforts in three areas; development should be achieved in economy and society, and also in the area of environmental protection. Developing only one of them is not enough. It should be understood that the development of one area has an impact on the others. However, economic development is tolerable only if its scale and spatial distribution are fair (facilitate the development of regions lagging behind) and provide a livable environment.

The textile industry (with the closely related clothing industry) has an important role in the sustainability of the light industry, as it is heavily resource-intensive, has a significant impact on the environment, provides livelihood for masses of people, and has an impact on social and economic development through both fashion trends and the development of areas of use other than clothing.

The textile and clothing industry is considered to be the most polluting industry in the world, so it is important that this sector should be able to achieve rapid changes in this area in the future, by using effective tools. Companies have a key role to play in the practical implementation of sustainable development and resource management. Such change requires manufacturers to optimize their technologies, working conditions and sourcing channels in terms of environmental protection, occupational safety and social responsibility. Environmental awareness, renewal plans, innovative solutions and circular economy set as a target are associated with the improvement of workplace quality, changes in the occupational structure and the emergence of new occupations within this sector.

The literature uses different terms for the light industry. In Hungary, the sector of the textile, clothing, leather and leather product manufacturing industry, as well as the footwear industry as a whole, is still called “light industry”. This term is now used only in a few Eastern, former socialist countries, and is uncommon in Western European and global international practice. The terms “fashion industry” and “creative industry” are now also widely used, but these cover a wider area than the above-mentioned four sub-sectors. In this publication, we use the acronym “TCLF” or the term “light industry” for this sector in accordance with international literature, or the name of the given sector, e.g. “textile and clothing industry”. It should be noted that in publications issued by the EU committees and institutions, the textile and clothing industry is often referred to as “fashion and textiles” or simply “textiles”.

About this document and the project supporting its publication

This document, which was prepared in the framework of the TEX2GREEN project implemented in a consortium formed by the Association of Hungarian Light Industry (MKSZ) and the Trade Union of Mine, Energy and Industry Workers (BDSZ), aims to develop labor market adaptability and sustainability in the clothing sector.
Project ID: GINOP-5.3.5-18-2018-00048.

The purpose of the project is to prepare analyses, studies and proposals to support the process of sustainable development, develop an online database of the light industry, involve and inform employers and employees in the sector, and strengthen the capacity and power of representation of social partners in order to support this.

This information document and the background studies prepared during the project, as well as the questionnaire survey performed will help achieve the above objectives. The results of the project and the full text of the studies are available in Hungarian on the project website: https://www.tex2green.hu/hu/letoltesek. Companies now also prepare sustainability and CSR reports, for which the online questionnaire[1] developed in the project for the self-assessment of sustainability performance can be helpful.

This document gives an overview of the current situation of the Hungarian sector, the results of the survey conducted among the actors of the sector, and describes the major challenges related to sustainability. To help transition, it presents technological, innovative solutions, tools and good practices that can help the implementation and operation of environmental management systems, and contribute to the improvement of corporate material and energy balances, and even the development of environmental and social indicators.

The chapter on the possibilities of branding eco-friendly textile, leather and clothing products and their production provides comprehensive knowledge that allows companies to responsibly decide which voluntary certification is best for them in the interest of differentiating themselves from their competitors. Further, in the interest of transition, it is necessary to develop the adaptability of workers to the labor market and new requirements for vocational training, which substantially determines the labor supply. The chapter on education in circular economic approach provides methodological information that can be applied in education.

Target group of the project and regions involved in the project

The managers, officials and employees of clothing companies operating in the Hungarian regions Southern Great Plain and Western Transdanubia and of the consortium members; also, the results of the project will be utilized by clothing companies in the Northern Great Plain, Southern Great Plain and indirectly by businesses in other light industry sectors (textile, leather, leather product, footwear) as well as by companies producing hire textiles, and hire textiles with laundry services.

1 https://www.tex2green.hu/hu/onertekelo-kerdoiv

EXECUTIVE SUMMARY

Sustainability is a rather complex concept; each segment of the circular economy, each link in the chain from manufacture to utilisation, is crucial for its implementation.

Following the European Commission's update of the 2020 New Industrial Strategy, the European Social Partners for the Textile, Clothing, Leather, and Footwear (TCLF) sub-sectors also came together to call for support for a strategy to help guide the TCLF industries through the current green and digital transition while facing tough global competition, stressing the need to protect jobs in Europe.

This publication aims to help domestic businesses and education to supply professionals for this sector by providing information necessary for changing direction. It describes the best techniques available from the point of view of environmental protection and sustainability; the results of legislation associated with putting the economy on a circular path and the educational methodology of the circular model; it covers the changes that took place in the domestic sector after the turn of the millennium, and analyses its current situation.

The domestic light industry, similarly to the European one, faces many challenges, but it has also ***strengths*** **that can be built on to shape its future:**

1. Strong industry traditions; a significant professional culture.
2. Remarkable adaptability and learning skills.
3. Large-scale international embeddedness, outstanding export orientation.
4. Relatively balanced significance of the 4 subsectors of the TCLF sector.
5. Increasing sectoral organisational efforts at various points of the value chains.
6. Central and East European (i.e. central) location allowing flexible production.
7. Investment-friendly, stable and secure economic environment. Lowest corporate tax rate in Europe: 9%.
8. Attractive target for equity investors despite its rising labour costs.
9. Good infrastructural features: extensive motorway network and internet coverage: 3rd fastest 4G mobile internet globally and 5G also available already for business users.
10. Logistical advantages: Western and Eastern European as well as Baltic and Balkan states that are easy to access.

Key areas of the Hungarian light industry **(based on TEÁOR, the Hungarian unified sectoral classification system of economic activities):**

- textiles: manufacture of made-up textile articles, except apparel (1392),
- clothing: manufacture of other outerwear (1414), underwear (1414),
- leather and footwear: manufacture of luggage, handbags and the like, saddlery and harness (1512), of footwear (1520).

In terms of foreign trade balance, there are strong surpluses on two product groups (ITO), namely leather products that have undergone major internal restructuring (42), where automotive leather products have become dominant, and cotton, felt and nonwoven textiles, special yarns, twine, cordage, ropes and cables and articles thereof (56).

In our days, the light industry employs around 50 thousand people. Taking into account the estimated headcount of employees of enterprises not included in the data of the Hungarian Central Statistical Office, i.e. those with less than 4 employees and active in related areas, but not assigned to this sector based on their core activity, TCLF affects a significantly higher number of employees. The local employment share of this sector is significant in 4 counties: In Vas, Tolna, Szabolcs-Szatmár-Bereg and Jász-Nagykun-Szolnok county it corresponds to 3-3.5 times the national average.

This sector is part of the creative industry which is important for the national economy; it is linked in several ways to the fashion industrial ecosystem (fashion design, product development, manufacture of raw materials and finished products, trade, media), hallmarked by many innovative businesses, market players representing high quality, and educational institutions with considerable traditions. The domestic clothing industry is predominated by SMEs working for the biggest fashion brands. Despite the large exposure of the sector due to the still high share of wage labour and imported raw materials, many successful companies have been able to upgrade and manufacture *products with a higher value added* (subcontracting in more demanding market segments) as well as high-quality *own products*. The strategic functions of the value chain (product development, design, production organisation, marketing, related services) have also been developed, which not only provides better earning opportunities, but also reduces dependence on external orders. The conditions of up-to-date manufacture have been established, the use of modern production and enterprise management (ERP) and CAD/CAM systems has become common, and online real-time business communication within the product chain has been implemented, enabling fast, accurate and cost-effective customer service. Thanks to efficient production based on modern technology, the sector can now play a regional lead role in the development and manufacture of small and medium series and sample collections.

By its resolution of 22 July 2021, the Government approved the strategy of the Hungarian fashion industry, developed with the active contribution of the Hungarian Fashion and Design Agency (MDDÜ). The strategy highlighted several factors, such as the importance of long-term strategic thinking, central inter-organisational coordination, effective marketing communication, innovation focus, focus on export capability, quality and accessible domestic production, quality education up to the international standards and collaboration between different actors in the economy.[2]

The future competitiveness and environmental and social sustainability of the domestic light industry are interlinked: a restructuring of the products and activities, and a more attractive image are both preconditions and expected consequences of employing qualified and motivated young workforce. Hungary can be the target as well as the beneficiary of many fashion industrial investments which, in turn, would contribute to economic growth and increasing the rate of employment. The experts participating in the TEX2GREEN project summarised the actions to be implemented also in Hungary in the form of eight proposals in order to transition the Hungarian TCLF sector to a circular, green and digital economy, in line with European aspirations in the form of eight recommendations. The recommendations listed here are available in their complete form in Hungarian on the project website: ***https://www.tex2green.hu/hu/letoltesek.***

2 Government Resolution No. 1429/2021. (VII.2.) Korm. on the adoption of the National Fashion Industry Strategy 2030

Recommendations for decision makers:

1. *Developing a green public procurement strategy*

As soon as possible, on the one hand, a general national green public procurement action plan and criteria system must be developed; on the other hand, on the basis of the already specified general green public procurement criteria, sector-specific national green public procurement regulations, or at least a public procurement guide, must be drafted and the relevant content must be implemented in a consistent way.

2. *By-product regulations*

The legal status of by-products should be settled; this is a member state obligation according to Article 5(1) of the Framework Directive, and has not yet been addressed. Irrespective of the EU-level regulation specifying the detailed criteria of by-products, the domestic regulation of the criteria of by-product status should be provided as soon as possible in order to make industrial production circular.

3. *Improving the quality of waste streams in separate collection*

By having regard to the fact that Act II of 2021 provides for the separate collection of textiles waste from 01 January 2025, it is necessary to develop detailed rules that can eliminate the bad experience associated with selective collection and ensure cleaner quality collection in order to boost the secondary raw material market.

4. *Informing consumers about leather authenticity*

It would be advisable to review the domestic legislation in order to satisfactorily resolve the issues of leather authenticity also there, either by creating a new legislation specifically regulating the composition and appropriate labelling of leather and leather products (following the Italian example), or through the appropriate amendment of the existing legislation, with a particular focus on the provisions of the following:

- Decree of the Minister of National Development and Economy No. 24/2008 (XI. 18.) NFGM on certain requirements for marketing footwear to consumers,
- Act CLV of 1997 on consumer protection,
- Act XLVIII of 2008 on the basic requirements and certain restrictions of commercial advertising activities.

5. *Reducing environmental factors*

Removing environmentally critical textile industrial technologies from production requires significant financial input. Tenders for supporting this activity would greatly speed up transition. It would also be important to continue and extend corrective action in the case of unfounded articles published in certain public media, misrepresenting the sector by saying untrue things about the circumstances prevailing there. It is to be achieved that such contents mention also the increasingly widespread environmentally friendly technologies and the voluntary certification of the manufacturing processes and products of the textiles and clothing industry.

6. *Development of waste regulations for periods of epidemics*

Given that professionals are anticipating new waves of diseases and epidemics, it would be urgent to develop specific legislation on the collection and treatment of potentially

contaminated waste from households and other non-healthcare facilities as well as guidelines for the management of contaminated textiles.

7. Sustainability certification

It would be important to use effective means against unethical conduct and expect credible evidence issued by transparent, independent institutions to demonstrate sustainability commitments. Such means include voluntary certification representing a competitive advantage, mentioned in the publication and presented in detail in the project studies, widely used in the TCLF sector.

8. Education for sustainability

The circular economy approach requires project-based education. Such education provides an opportunity for the development of various competencies in projects implemented jointly with external partners, thus meeting the expectations of the labour market to ensure the interconnection of educational institution and employers, and realise practical training. Supporting this would be an important step forward for the sake of a sustainable future.

Nowadays, the sector is relegated to the more peripheral regions of the country and it has narrowing chances, at national and regional level, to hire what would be critical masses for manufacturing employment. With the shrinkage of the light industry as a whole and the weakening of its local concentrations, the need for cooperation by the subsectors and their organisation at national level, as well as for a more prominent appearance in the domestic creative industry strategy necessarily arises. Partnership between the Association of Hungarian Light Industry (MKSZ) and the Trade Union of Mine, Energy and Industry Workers (BDSZ) aims at the national-level organisation of the sector and the exploitation of the benefits of networking.

1. Impact of the EU regulation of the circular economy on the textile industry

Today, the main direction of innovation is to find solutions that further sustainability by modifying and improving existing processes, saving environmental resources and reducing CO_2 emissions. To this end, laws have been enacted in many countries, including Hungary, which require measures in order to achieve sustainable development.

The European Union has taken over the UN Sustainable Development Goals adopted in 2015, and has declared the implementation of the circular economy to be a key focus.[3]

The **Action Plan for Circular Economy** focused on creating a carbon-neutral, resource-efficient and competitive economy.[4]

The communication adopted in December 2019 on **the European Green Deal**[5] formulated a harmonized strategy to achieve a resource-efficient, competitive, resource-independent and climate-neutral economy with the active participation of economic actors and consumers, and the involvement of private capital. The report on New Circular Action Plan[6] adopted in 2021 calls for further action to implement a carbon-neutral, environmentally sustainable, non-toxic and fully circular economy by 2050.

The Green Deal, the New Circular Action Plan and the Industrial Strategy have identified textiles as a priority sector, emphasizing that while the textile industry is the fourth most influential category in terms of primary raw materials and water use, less than 1% of the world's textile products is processed into a new textile product. Another problem is that the EU is characterized by a textile sector mostly consisting of SMEs, but 60% of the value of clothing articles is produced elsewhere, so localization should be exploited and production be brought back to the EU as much as possible.[7]

The Commission has addressed the impact of COVID-19 on the textile sector in several working papers, and identified all weaknesses and needs for action highlighted by the pandemic.[8]

3 Csiffáry Nóra-Szóráth Zoltán: Hozd Magad Körforgásba! [Nóra Csiffáry-Zoltán Szóráth: Get Circural!] (PGOQ1487), 2019. p. 3
4 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Closing the loop - An EU action plan for the Circular Economy, COM (2015) 614 final
5 COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS The European Green Deal, Brussels, 11.12.2019
6 COM(202)98 final
7 Industrial Strategy p. 2
8 https://ec.europa.eu/commission/presscorner/detail/en/ip_20_940

To address the identified problems and put the textile sector on the path of circular economy, the New Circular Action Plan aims to develop a comprehensive EU textile strategy in order to boost the EU market for sustainable and circular textiles, including textile recycling, while maintaining the sector's competitiveness, and to manage fast fashion and encourage new business models.

This is achieved through a comprehensive package of measures, including:

- the application of the new sustainable product framework to textiles, including the elaboration of eco-design measures to ensure that textile products should be suitable for circulation, ensure the use of secondary raw materials, address the presence of hazardous chemicals and empower business and private consumers to choose sustainable textiles and to have easy access to reuse and repair services;
- the improvement of the business and regulatory environment for sustainable and circular textiles in the EU, particularly by encouraging and supporting product-service models, circular materials and production processes, and increasing transparency through international cooperation;
- provision of guidance for the implementation of separate collection of textile waste at a high level, to be ensured by Member States by 2025;
- encouragement of the sorting, re-use and recycling of textiles, including through innovation, the promotion of industrial applications and regulatory measures such as extended producer responsibility.

The development of a comprehensive sustainable EU textile strategy is expected to be completed in 2021, and its adoption is forecast for the third quarter of 2021, after a social debate.[9]

Green public procurement

The development of green public procurement plays a key role in achieving transition to a circular economy. In June 2017, the Commission adopted its guidance document for **EU Green Public Procurement (GPP) Criteria for Textile Products and Services**[10], in which the requirements are worded in such a way that an organization, if it deems it appropriate, can incorporate these criteria into the tender dossier, with minimal editing. The application of these requirements is voluntary.

Waste regulation, development of the secondary raw materials market, circular waste regulation

In order to achieve a high level of material recovery, all waste must be taken into account, and re-use and recycling as well as the development of the secondary raw materials market should be encouraged.

The **Circular Economy Action Plan** notes that only about 40% of household waste generated in the EU is recycled. However, increasing these rates requires significant legislative and industrial developments, the extension of extended producer responsibility

9 https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12822-EU-strategy-for-sustainable-textiles

10 COMMISSION GUIDANCE DOCUMENT EU Green Public Procurement (GPP) Criteria for Textile Products and Services, SWD (2017) 231 final

to additional waste streams (textiles, furniture, bio-based products), the encouragement and increasing the efficiency of selective collection, the proper application of economic incentives and the reshaping of the EU support policy.

In April 2018, a revised legislative package on waste was adopted to facilitate the ***prevention of waste generation*** and, inter alia, ***extends the selective collection system,*** which is to be implemented by 2025 for household textile products, thus promoting the better quality of secondary raw materials.

Creating a market for secondary raw materials

The proper settlement of the issue of secondary raw materials is the central driver of the circular economy: ideally, all the waste should be recovered in some way in a circular economy, in other words, waste from primary raw materials should be returned to production as a secondary raw material, thus triggering the inclusion of new primary raw materials in the production processes. Due to this, the success of transition to a circular economy largely depends on the successful operation of the secondary raw materials market. Secondary raw materials currently account for only a small proportion of the materials used in the EU.[11]
The main obstacles to the use of secondary raw materials include:

a) Uncertain quality of materials

One of the main obstacles to the spreading of secondary raw materials is the uncertain quality of such materials; in the absence of EU-level standards, it is difficult to inspect contamination levels or suitability for high-level recycling. Due to the above, the aim is to develop appropriate quality standards at EU level and introduce criteria for recycled materials.

b) Clarification of the rules on the termination of waste status

In order to ensure clarity and competitiveness in the secondary raw materials market, it is essential to clearly define the point from which secondary raw materials should no longer be considered waste in the legal sense. Another related matter is the proper legal management of the by-product, the settlement of which has been referred to the competence of the Member States under the Waste Framework Directive; however, in order to ensure a level playing field, it needs to be handled at EU level.

c) Increasing water efficiency

In order to address growing water scarcity, in addition to water efficiency measures, the focus should be placed on the re-use of treated wastewater under safe and cost-effective conditions. This is especially important for water-intensive sectors such as the textile industry.

d) Promoting material cycles free of toxic substances

Although REACH encourages transition to safe chemicals through the gradual replacement of hazardous substances, the safety of secondary raw materials is jeopardized if recycled substances contain chemicals of concern. The Commission encourages increased confidence in the use of secondary raw materials in a number of

11 EU Circular Economy Action Plan, p. 13.

ways. These are discussed in detail in the **sustainability strategy for chemicals**,[12] issued in October 2020 which also responds to challenges due to the COVID-19 pandemic.

e) Development of the demand side

For some raw materials (paper, metals) the demand is already high, while for other materials, this area needs to be developed. In this process, the private sector has a key role in creating demand, but this must be facilitated by economic incentives and by increasing confidence in secondary raw materials, by appropriate standardization and the provision of information.

Regulation and support of the circular economy in Hungary

The development of Hungary's environmental regulation has been continuously characterized by compliance with the EU requirements and the mapping of the requirements contained in them in Hungary. This is no different with the development of the Hungarian legislation background for transition to a circular economy.

The requirements of the circular economy package published in the Official Journal of the EU (OJ) on 14 June 2018 and effective from 4 July 2018 had to be adopted into national legislation and presented in national laws by the Member States by 5 July 2020; accordingly, intensive legal harmonization work has started in Hungary as well, as part of which changes in domestic legislation affecting the textile industry have also taken place:

- Act XCI of 2020 on Prohibiting the Placement of Certain Disposable Plastics on the Market,
- Act II of 2021. on the Amendment of Certain Laws on Energy and Waste Management,
- Government Decree No. 24/2021 (III. 12.) on the Designation of the Waste Management Authority.

The elaboration of a new National Waste Management Plan, including the National Prevention Program, was started in 2021. This is expected to designate the tasks to be carried out in this area for another 7 years; therefore, the plans must address the measures needed to deal with waste from the textile and clothing industry.

By its Government Decree No 1429/2021 (VII. 2.), the Government adopted National Fashion Industry Strategy 2030, which also covers the textile industry.

The transition to a climate-neutral economy is an important challenge for the future, which will be a time- and resource-demanding process. New technologies to be developed[13], which are currently unknown, and the requirements and implementation of the Hungarian legislation governing the use of EU funds for the 2021-2027 budget period will have an important role to play in this.[14]

12 COM (2020) 667 final
13 National Clean Development Strategy, p. 10. https://ec.europa.eu/clima/sites/lts/lts_en_en.pdf
14 Government Decree No. 256/2021 (V. 18.) on the Procedure for the Use of Grants from Certain European Union Funds in the 2021-2027 Programming period and the Government Decree regulating the domestic use of funds from the Recovery and Resilience Facility

2. Environmental challenges in the Textile and Clothing Industry

The textile and clothing industry is the second most active industry globally. The European textile and clothing industry, which is part of the global supply chain in our region, employs 1.7 million people and generates an annual turnover of 181 billion Euros. The approximately 176,000 enterprises in this sector are predominantly small and medium enterprises.

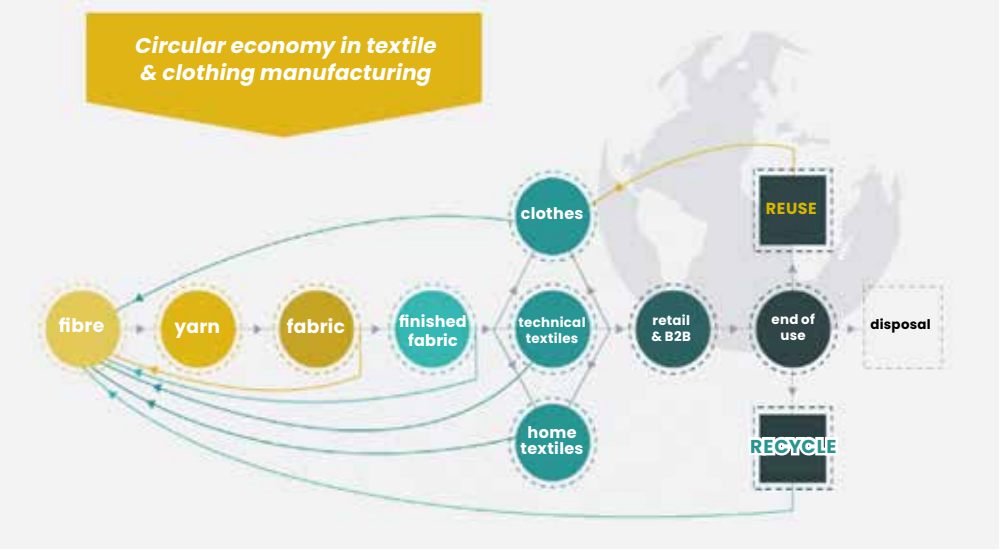


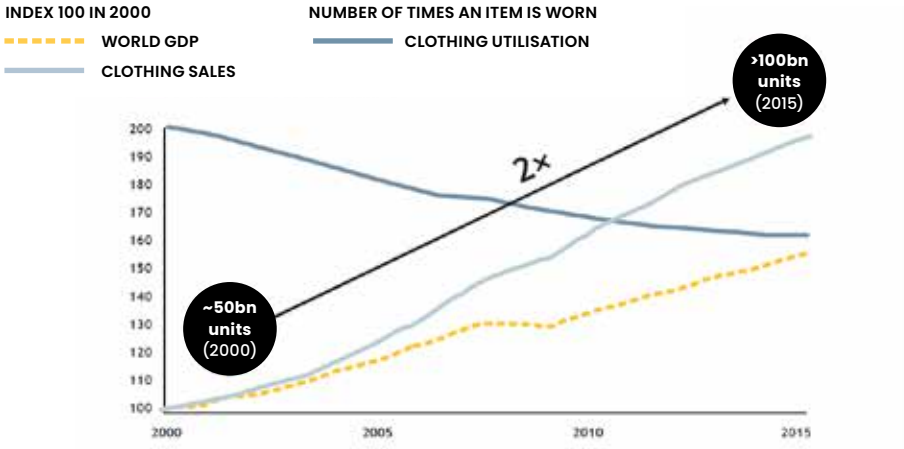
Figure 1. Process of the textile value chain and the possibilities of circulation

In the ENTeR project supported by the INTERREG program[15] it was found that switching to circulation requires an increase in recycling rates, the closing of material cycles, transition to environmentally friendly manufacturing technologies, the use of recyclable materials, eco-design, the promotion of textile-based composites and IT-based waste reduction.

2.1. Effects of textile overproduction and overconsumption

Textiles are essential in everyday life; we need clothes and textiles worldwide, we use them and get rid of them. Over the past 15 years, the production of garments has roughly doubled due to the global increase of the middle class population, which has increased per capita sales in developed economies[16] (Figure 2).

15 https://www.interreg-central.eu/Content.Node/3.html
16 Ellen MacArthur Foundation „ A new Textiles Economy: Redesigning Fashion's Future", 2017, https://ellenmacarthurfoundation.org/a-new-textiles-economy



Average numbers of times a garment is worn before it casses to be used. Source: Euromonitor International Apparel & Footwear 2016 Edition (volume sales trends 2005-2015), World Bank, World development indicators - GD (2017)

Figure 2. Growth of the sale and decline of the use of clothing items between 2000 and 2015[17]

The amount of fiber produced annually reaches 100 million tons globally, increasing by 3-4% every year. Textile production is responsible for 10% of the global CO_2 emissions and, according to some reports with controversial figures, is the second most polluting sector in the world, generating a complex and problematic waste stream.[18 19]

At the same time, the utilization of clothing items decreased by 36% by 2015 compared to the data measured at the turn of the millennium.[20] Globally, consumers suffer a loss of 460 billion dollars each year by disposing garments that could have been worn longer, and in some cases, garments only worn seven to ten times are estimated to have the same destiny.[21] Unfortunately, there are many examples of unsold stocks, luxury items being destroyed. Today, not only food but increasingly more clothes unnecessarily purchased and never worn land in trash.

Numerous textile manufacturing processes, such as finishing (bleaching, dyeing, printing, etc.) and the manufacturing of the finished product, are extremely resource intensive. The tightening of legislation on energy efficiency, CO_2 emissions, water use, wastewater quality and air pollution will encourage the industry to introduce better technologies in order to combine economic and ecological benefits while complying with legal requirements.[22]

In addition to the efforts of the manufacturing sector, the behavior of end users and buyers has also changed over the years (more than half of the fashion items are now disposed of within a year), with large amounts of used textiles accumulating, potentially

17 Euromonitor International Apparel & Footwear 2016 Edition (volume sales trends 2005 – 2015)
18 5J. Conca. Making climate change fashionable – The garment industry takes on global warming. https://www.forbes.com/sites/jamesconca/2015/12/03/making-climate-change-fashionable-the-garment-industry-takes-on-global-warming/#e-79b22379e41
19 Nia C Bell, Peter Lee, Kate Riley, Steve Slater "Tackling Problematic Textile Waste Streams", Oakdene Hollins Ltd, Aylesbury, UK, 2017
20 Circular Fibres Initiative analysis based on Euromonitor International Apparel & Footwear 2016 Edition (volume sales trends 2005–2015).
21 Morgan, L.R. and Birtwistle, G., An investigation of young fashion consumers' disposal habits (2009)
22 EURATEX – "Prospering in the Circular Economy", Policy Brief, 2017

reusable as raw materials. The goal is to implement a closed recycling cycle in which resources are not consumed but used (Figure 3).

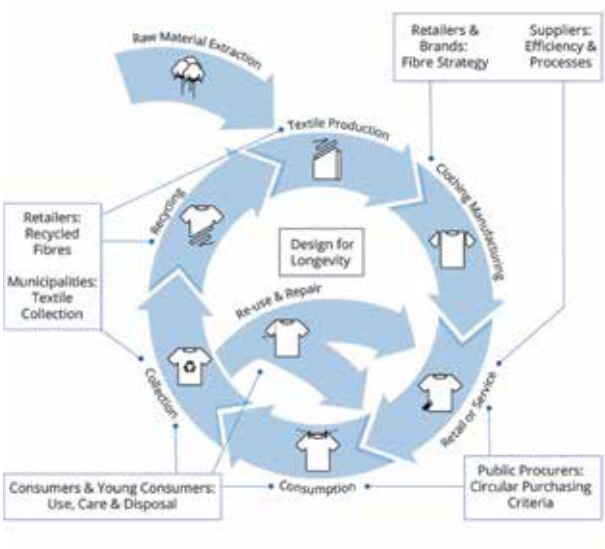


Figure 3. The circular textile and clothing model

In 2015, more than six million tons of clothing were sold in the EU; in 2015, the ecological footprint of the clothing industry in the EU was 195 million tons of CO_2, while the water footprint was 46,400 million m^3.[23]

The EU textile industry is estimated to generate 16 million tons of waste per year. According to a report published by 'Friends of the Earth Europe', only 25% of textile waste is recycled.[24] Most of the waste is landfilled or incinerated, which has a significant environmental impact and entails high costs. The valuable resources contained in the waste are also lost.

In the clothing industry as a whole, only 13% of the total material input is recycled in some way after being used as clothing. Less than 1% of the materials used in the manufacture of clothing are recycled as clothing again[25] (Figure 4).

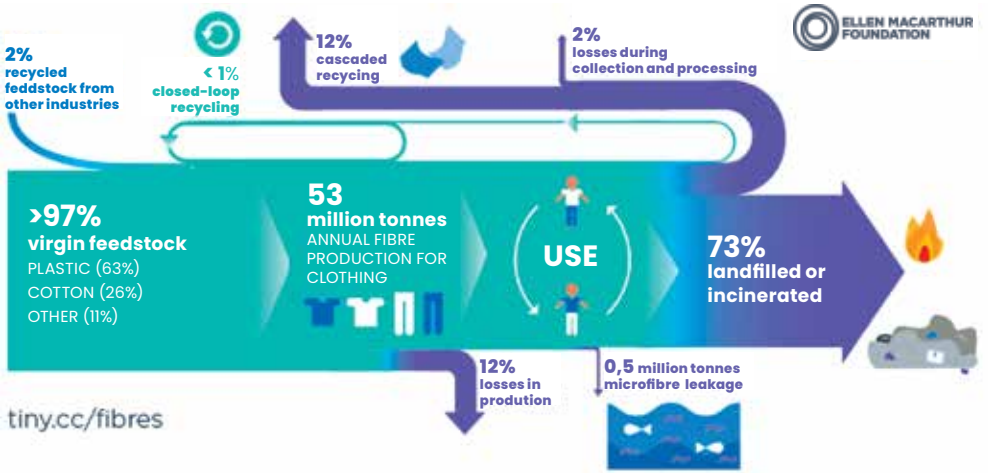


Figure 4. Global material flow in the clothing industry[26]

23 Life Project ECAP - "Mapping clothing impacts in Europe: the environmental cost", 2017; http://www.ecap.eu.com/wp-content/uploads/2018/07/Mapping-clothing-impacts-in-Europe.pdf
24 Friends of the Earth Europe – "Less is more, Resource efficiency through waste collection, recycling and reuse of aluminum, cotton and lithium in Europe"; 2013
25 Wicker, A., Fast fashion is creating an environmental crisis, Newsweek, 2016
26 Ellen MacArthur Foundation "A new Textiles Economy: Redesigning Fashion's Future", 2017, https://ellenmacarthurfoundation.org/a-new-textiles-economy

2.2 Initiatives to reorient the textile and clothing industry

A significant part of the fashion industry is now committed to moving towards a circular economy; at the same time, the systems and tools to support transition to a circular model are currently inadequate.

Joint commitment is needed on part of the supply chain operators. In the future, designers, manufacturers and consumers will have an increasing responsibility for preventing waste generation.

Strategic goals should be set; it is important to develop and strengthen new competitive technologies, business models and communication, to sensitize market demand and consumers towards recycled products or goods made from recycled materials, and to improve environmental awareness through educational campaigns.

International proclamation to put the textile industry on the path of circular economy[27]; In 2019, European professional associations (EURATEX, FESI, GFA and SAC) released a manifesto identifying the key areas to focus on in their efforts to work together in the interest of a true circular economy. The document "Manifesto to Deliver a Circular Economy in Textiles" makes a number of findings on the general framework conditions.

2.3 Sustainability challenges, technological and business solutions in the textile and clothing industry

Sustainable development was formulated by the United Nations Organization in its 1987 Brundtland Report. The essence of this is a development process and an organizational concept that satisfy current needs without compromising the ability of future generations to meet their needs. It is necessary to maintain all the capabilities of natural structures and resources that form the basis of nature and society, and the wear and tear of the environment must be avoided in such a way that neither economic development nor social equality and justice should be compromised (Figure 5).

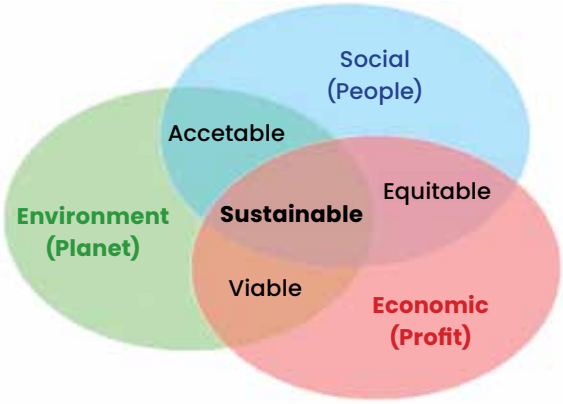


Figure 5. Basic pillars of sustainability

27 https://www.globalfashionagenda.com/policy-hub-established-to-further-the-circular-manifestos-work/

Ecological footprint and best available techniques of textile production

The analysis of the ecological footprint of textile production should be started with the raw materials of the textile industry, the fibers.

The **natural fibers of plant origin**, e.g. **organic cotton** has a smaller ecological footprint in terms of growing conditions than traditionally grown cotton. As an example, traditionally grown cotton for a T-shirt and for a pair of jeans requires 150 g and 340 g of pesticide, respectively, during cotton production. Various solutions are known and used to reduce agricultural chemicals (fertilizers, pesticides).

Due to the shift toward renewable raw materials, it is becoming important to optimize the processing and the use properties of natural **bast fibers** (flax, hemp) that can be produced in Europe (e.g. their use in composites is also widespread). Hungary used to be a major hemp producer and processor. Thanks to our favorable climatic and soil conditions, it can be grown in accordance with the needs. Hungary could produce unique Hungarian textile products containing hemp. Due to the shift toward renewable raw materials, bamboo and sugarcane fibers and partly peat fiber are now widely used.

Wool is the most commonly used of the **natural fiber of animal origin**; it mostly contains insecticides in a sheared form. Also, pesticides can get on the fur. Non-biodegradable and toxic compounds cause water pollution when washing the greasy wool. In case of the so-called **organic wool**, the use of environmentally harmful insecticides and pesticides in animal husbandry is completely avoided in a certified manner. In the production of *Bombix mori* **silk**, which is a smaller volume than wool production, the chemicals used to protect the mulberries, which are necessary to feed the caterpillars, and the effluent generated during processing present a major environmental burden.

The ecological footprint of **man-made fibers** is affected by whether the fiber is made from renewable or fossil raw materials. More than half of the textiles produced in the world are made from man-made fibers. According to a study, 79.1 million tons of fibers were produced worldwide in 2011, of which 61.3% were man-made fibers.

Viscose is the best known of the **chemical fibers of natural origin** (regenerated). Xanthogenation during the wet spinning process in the production of viscose involve several environmentally polluting chemicals (carbon disulfide, sodium hydroxide, sulfuric acid) (the production of such chemicals is also harmful to the environment). The Lenzing company produces **lyocell fiber** (Tencel) by environmentally friendly and patented technology. During the formation of the lyocell fiber, the transient chemical transformation used in viscose production, such as xanthogenation, is omitted. A further advantage of the lyocell fiber is that the solvent used in its production is largely recoverable during the process. Compared to viscose, lyocell is characterized by higher dry and wet strength and a lower tendency to crease (Figure 6).

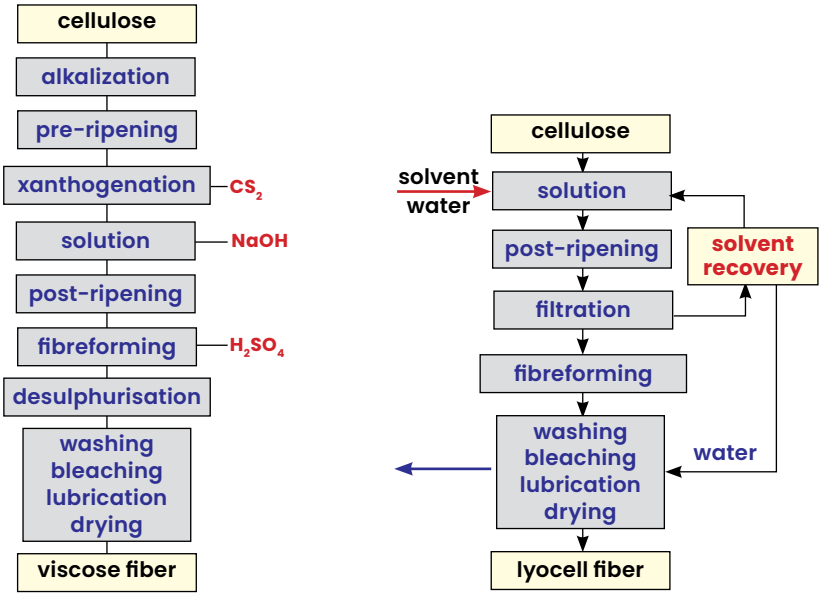


Figure 6. Environmental effects of lyocell and viscose fiber production

Another group of biodegradables, that is, compostable chemical fibers is **biopolymers**, which are synthesized from natural materials (e.g. cellulose, collagen, casein or soy protein). The raw material (lactic acid) of the best known biopolymer fiber, polylactide (PLA), is produced microbiologically (by fermentation) from sugar or starch solution. The polylactid polymer formed from lactic acid, produced by fermentation, not only provides a fibrous material that is excellent from the point of view of the textile industry, but also becomes biodegradable at the end of the life cycle of the textile product, and can thus be recycled indefinitely.

Another group of man-made fibers is **synthetic fibers**; their total amount in global fiber production is now much higher than that of natural fibers. Their environmental impact is significant because they come from non-renewable sources, more energy is needed in the production phase, greenhouse gas emissions are significantly higher during production, their forming requires significant amounts of chemicals (thus posing various health and toxicological hazards[28]), and are not biodegradable.

Fiber obtained by mechanical or chemical recycling present a big challenge in the transition to circular economy. For example, chemically recycled polyester fibers result from fiber solvolysis, in which the ester bonds in the polymer chain are broken down into monomers, using various solvents (water, acid, alcohols, possibly amines). However, the equivalence of chemically recycled PET fibers with newly produced fibers is still hindered by various factors. Monomers recovered from waste by chemical recycling are often mixed into the raw material during fiber production. Currently, recycled PET fibers are mainly used for some technical textiles (e.g. non-woven fabrics, nets, low-demand composite reinforcement frames, etc.).

28 Subramanian Senthilkannan Muthu:Assessing the Environmental Impact of Textiles and the Clothing Supply Chain, Woodhead Publishing Series in Textiles: Number 157., Woodhead Publishing Limited in association with The Textile Institute, 2014, ISBN 978-1-78242-104-7

Reducing pollution in the case of environmentally critical textile technologies

In its Best Available Techniques (BAT) Reference Documents (BREFs), the European Commission provides guidance on best waste management and resource efficiency practices in industrial sectors and guidance on established practice to help disseminate good practice. In the textile and clothing industry, textile fabric production is the most environmentally harmful, so the professional working group examines the following factors in the forthcoming new TX BREF document:

- industry emissions (air and water pollution),
- use of chemicals,
- the volume of waste and by-products generated in the textile industry,
- energy and water use.

It can be stated that a high percentage of the total emission load from textile processes can be attributed to materials that are already contained in the raw material before it enters the final process of the value chain (finishing). In general, these are as follows:

- sizing agents,
- pretreatment agents, spinning oil,
- impurities in the natural fibers, and associated materials.[29]

Finishing is the most critical textile technology in terms of environmental impact. Certain technological processes (e.g. washing, bleaching, dyeing) are highly water and energy intensive; water is significantly polluted during water operations (e.g. sizing materials, dyes and other chemicals, as well as fibers released from the fabric may get into the water), further, environmentally harmful gases, vapors, and (e.g. during raising and shearing) dust and loose fibers (flakes) may be released into the air during the technological processes. The production processes as well as the cultivation/breeding of fibers constituting the raw materials and the production of synthetic fibers all have numerous environmental impacts. The operation of the sector entails increased energy and water demands, mainly in terms of the textile finishing processes; noise and vibration loads are typical, and there is also light pollution due to the multi-shift workflow. Air pollution also occurs, and environmental impacts from transportation and harmful effects from further energy conversions appear as indirect loads (Figure 7-8).

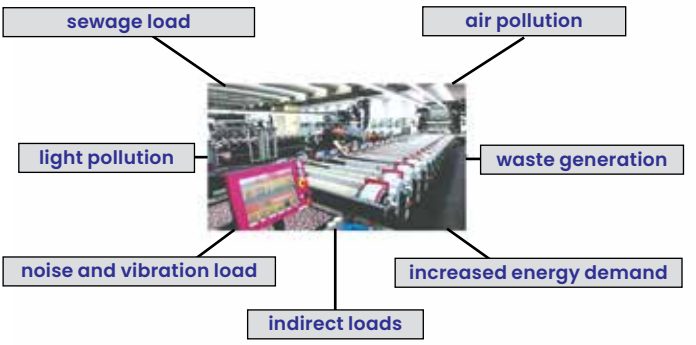


Figure 7. Environmental loads caused by the textile industry

29 https://eippcb.jrc.ec.europa.eu/reference/

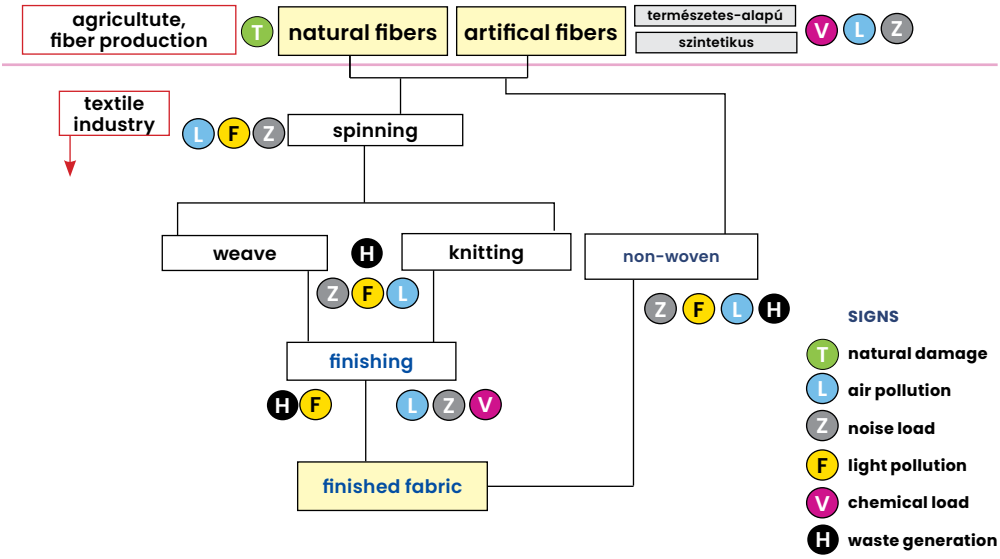


Figure 8. Process and environmental loads caused by textile production

In the spinning process and in the texturing of artificial or synthetic fibers, air, noise and vibration loads are the main causes of adverse environmental impacts. With the commissioning and optimal installation of modern machines, and with **efficient air handling systems**, these loads can be mitigated.

The use of biodegradable auxiliaries during spinning and fabric formation has now become a basic requirement. In the weaving preparation, a result can be achieved mainly by using a special sizing material, which leads to a significant reduction of the effluent load during sizing in the finishing plant. The **recovery and recycling of the sizing material** not only has economic benefits but is also environmentally friendly.

In the refining treatment of cotton yarn and fabric, in mercerization, the environmental impact can be reduced by installing an **alkali evaporator** for recycling. In this way, after filtration, the sodium hydroxide solution can be concentrated, and the obtained solution can be used again after dilution. The **alkaline creping** process is highly environmentally harmful; during the washing-rinsing process, the excess alkali causes a pH load and the thickener causes organic matter enrichment in the effluent. The so-called **woven crepe** was introduced in order to avoid this; so plain white, uni-dyed and colored woven fabrics can be produced by using special yarns and a unique weaving technology.

Environmentally friendly technologies in dyeing and printing

The compilation of optimal and accurate dyeing baths (dyeing of loose fiber, yarn, thread, fabric, piece goods) is ensured by objective color measurement and **instrumental formula calculations**. This achieves "perfect at first" dyeing, and significantly reduces wastewater load. In addition to the environmental load from the individual dyes, of the applied chemicals, the reduction of the electrolyte volume has become the main focus of development.

Those modern **direct dyestuffs** are preferred that are not on the ban list due to their structure (harmful azo dyes) and, on the other hand, in the case of which even the wet color fastness achieved with reactive dyes can be ensured by using a unique after-treatment option and excipient. The recovery of direct dyes with cyclodextrin is possible.

Reactive dyestuffs play a key role in the dyeing of cellulose-based products. Modern reactive dyes, e.g. heterobifunctional dyes contain several reactive groups, so dye exhaustion is higher, fixation is higher, and the increase of absorption requires the addition of less electrolyte (salt) (marked LS - low salt). With high fixation (HF=high fixation) types, much less dye enters the wastewater. Modern reactive dyes are AOX-free and, with one or two exceptions, do not contain heavy metals. A number of dyes have also been developed to replace certain dispersion dyes and pigments that pose a health risk.

E-control dyeing process also contribute to the multidirectional safeguarding of the environment. Electronic process support helps reduce dyehouse substandards and waste generation, and color fidelity can be safely achieved in repeated productions.

In textile printing, in addition to instrumental calculation, other printing paste optimizations are also possible. Appropriate software helps the system provide important information to the **automatic color kitchen operation.** All this also reduces the generation of production waste, which reduces the environmental load from printing. **Digital textile printing** is a material and environmental friendly process. With the digital process, not only dyestuffs or pigment but also functional substances can be applied. Large-scale printing orders are usually preceded by sample roll production. Intermediate **digital textile printing** with the direct method (directly on the fabric) helps significantly reduce material costs during sample roll production, and minimize textile waste (Figure 9).

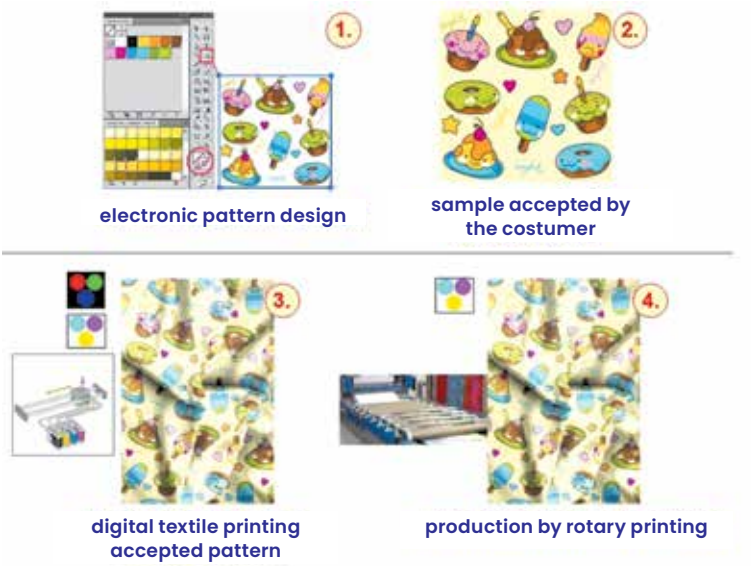


Figure 9. Waste reduction in sample roll production with digital textile printing

Of the **environmentally friendly** finishing processes, the main focus is the size stabilization of cotton and cotton-type fabrics. Sanforizing and compacting are mechanical procedures intended to reduce the shrinking of finished woven and knitted fabrics, without using any chemical substances. Mechanical methods are not only environmentally friendly, but enable the setting of low shrinkage values.

Additives for refining finishes are important additions that are mainly used to help reduce the negative effects. The use of so many chemicals is clearly environmentally harmful. Long-lasting chemical finish is predominantly made with **synthetic resins**, of which low-formaldehyde or formaldehyde-free finishing agents are now most commonly used (although up to twice the amount is needed when using formaldehyde-free finishing agents).

Reducing of water consumption and waste water

Textile production, especially finishing requires significant volume of industrial water of specific quality. The economical management of water resources is a key aspect, so the application of technologies and machines with lower specific water consumption is also important in this sector. For some raw water treatment processes (purification, water softening) it is advantageous to use chemical-free technology with reverse osmosis pressure.

Technologically, wastewater load can be reduced by favoring mechanical finishing, using dyes with a new structure and biodegradable auxiliaries, and baths with a lower electrolyte content, reducing residual baths and printing paste, and the further dissemination of biotechnological processes (e.g. enzymatic treatment). Environmental load can be reduced by efficient effluent treatment, such as neutralization, chemical/photo-oxidation or decolorization by anaerobic decomposition, use of a heat exchanger (for heat recovery), biological treatment, aeration, use of end-of-pipe techniques (cleaning of partial flows), use of filter systems and sorption materials, etc.

Reduction of energy consumption

Energy-intensive textile finishing processes basically require electricity, natural gas, steam, compressed air, water and fuel. Production plants must have a sustainable energy and climate action plan.

Saving electricity can mostly be achieved by the use of frequency-controlled asynchronous motors and other electronic units, which are widely used in the driving of machines. LED light sources are preferred for lighting, and from renewable energy sources, the use of green electricity produced from solar energy is also important. The energy needs of direct gas-heated drying-stretching-heat-fixing machines (“frames”) can be reduced, especially if they are adapted to the typical fabric width. In the case of steam generating boilers, automatic power and combustion control is essential (with the latter, the carbon dioxide content of the flue gas can be kept at an acceptable level). In the procurement of raw materials and chemicals, railway and water transport should be preferred for the transport of semi-finished and finished products (Figure 10).

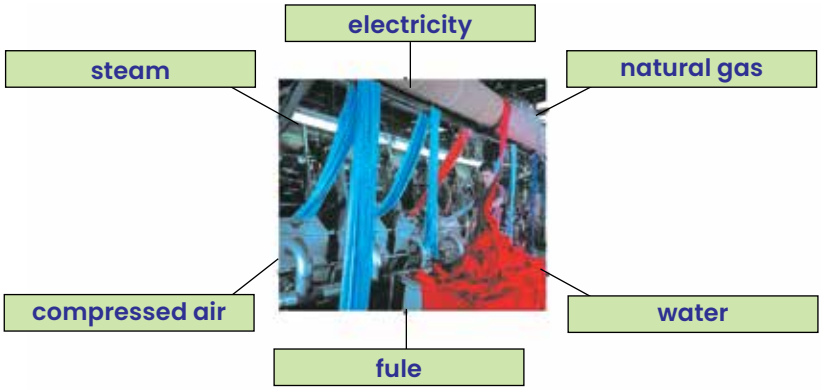


Figure 10. Energies used in the finishing plant and their use

Energy consumption can mostly be reduced during coloring, e.g. by using a lower bath ratio to reduce water and steam consumption, closed-system energy-efficient dyeing equipment, low dyeing temperatures, performing preparation-bleaching and dyeing in one bath. Heat generation can also be ensured by geothermal energy in plants suitable for this.

Advantages of using enzymes in the textile industry

Enzymatic technologies are advantageous, because enzymes are completely biodegradable, act only on the required material, their mechanism of action is well controlled by the main status indicators, and special surface modifying effects can be achieved in addition to conventional technological processes. Their widespread use is summarized in Figure 11.

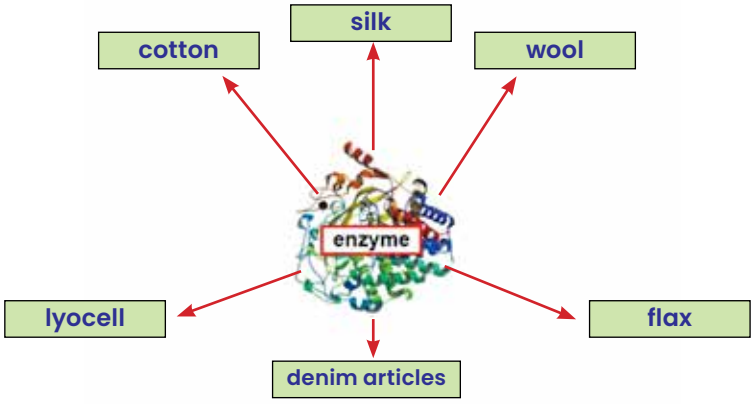


Figure 11. Examples of the use of enzymes in the textile industry

Emerging technologies in the textile industry to protect the environment

In the case of supercritical carbon dioxide dyeing, a liquid-like gas replaces the water of the conventional dyeing bath. In the medium with high solvent performance, there is no need for coloring auxiliaries or chemicals, and energy consumption is halved. At the end of dyeing, the carbon dioxide emitted as a gas is recovered with an efficiency of 95%, and stored as a liquid suitable for reuse (the process is nearly a closed system).

Primarily **nanofiber nonwoven** are useful for the screening of tiny, environmentally harmful particles. By using different nano-sized particles mostly in man-made fibers, electrical and thermal conductivity, antimicrobial, antistatic properties, increased strength and toughness can be achieved. In the case of targeted nanomaterials, resistance to chemicals and biological effects can also be developed. In connection with the use of nanoscale graphene, research is underway to develop materials for heat protective clothing.

One of the outstanding areas of future-oriented, environmentally friendly processes is **plasma treatment** performed on textile products in various stages of production. Plasma treatments do not involve exhaustion or saturation processes by using various excipients and chemical baths, there is no need for water and significant heat energy, there is no air pollution, and no hazardous waste is generated (Figure 12).

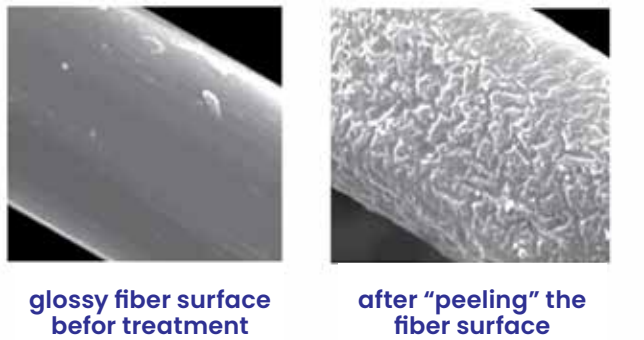


Figure 12. Effect of plasma treatment on polyester fiber

Chemical surface modification of the fibers using plasma allows the durable application of a very thin film layer. Plasma polymerization can be accomplished using plasma-excited gaseous monomers (e.g. to achieve oil and soil repellency, hydrophobization, flame retardancy and combustion reduction). Such treatment can also be performed on finished ready-made products, and functional capacity also extends to accessories.

In large-scale washing, environmental load can be reduced by the reduction of water consumption (from 7 l/kg to 1.5-2.5 l/kg), e.g. by water recycling. For hot water extraction, it is advantageous to utilize hot wastewater with a heat exchanger, and to ensure accurate detergent and auxiliary dosing with an automatic pump system and program control. The use of biodegradable detergents and auxiliaries is increasingly expected. In **dry cleaning**, the replacement of perchlorethylene is becoming an increasingly urgent task as it is carcinogenic and mutagenic, and not biodegradable.

The cause of **microplastic contamination** caused by washing is that a large amount of fiber fragments get into the wastewater (e.g. 700 thousand fibers in case of a 6 kg load), mainly from textiles with a polyester composition. The volume of micro-plastic emission can be reduced with a shorter washing program and centrifuging at a lower speed, ensuring an optimal washing machine load, using liquid detergents that cause less fabric friction, washing at a lower temperature and through efficient filtration of particles from the water released by washing machine.

2.4. Textile waste management, processing possibilities

There is no standard developed recycling process for non-hazardous textile waste. In waste management, priority should be given to waste prevention and waste reduction, the re-use in unchanged form has the least impact on the environment. Recycling keeps materials in circulation, but operates as an independent industry, thus causing a significant environmental load. Waste should be collected separately and utilized as a means of energy, in accordance with the principles of closed-loop recovery. Product liability, longevity, reusability, proper and safe recovery are important considerations.

Upcycling

By recycling, it is possible to produce a value-reducing product (downcycling) or a value-adding product (upcyling). Downcycling means the manufacturing of a product that has a fundamentally different function and typically a lower value than the recycled raw material, while upcycling means the manufacturing of items for personal use, such as clothes, shoes, bags or yarns from the secondary row material or other waste.

Textile waste treatment and recycling

In general, the T&C sector in Europe is currently undergoing a structural transformation, moving from the production of classic clothing products to the production of technical textiles for high-performance areas of utilization. As a result, textile waste is also changing in terms of the type of raw materials (high-performance textile fibers), the composition of the textile materials, the quality of their surface (functional coatings), the use of electronic components in smart textiles, and so on.

Textile waste is classified as production and household waste (consumer and post-consumer textile waste) (Figure 13).

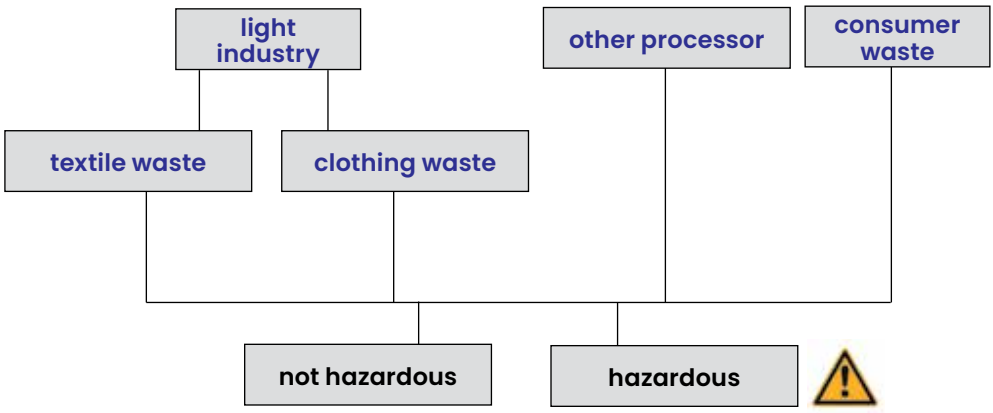


Figure 13. Types of textile waste by origin

Production textile waste, which mostly belongs to the hazardous category, can be produced as a result of forced process shutdown due to technical equipment failure (resulting in lubricant getting on the fabric), fabric line interruption (special chemicals and auxiliaries can accumulate concentrated on the fabric during troubleshooting), and persistent energy supply problems (Figure 14).

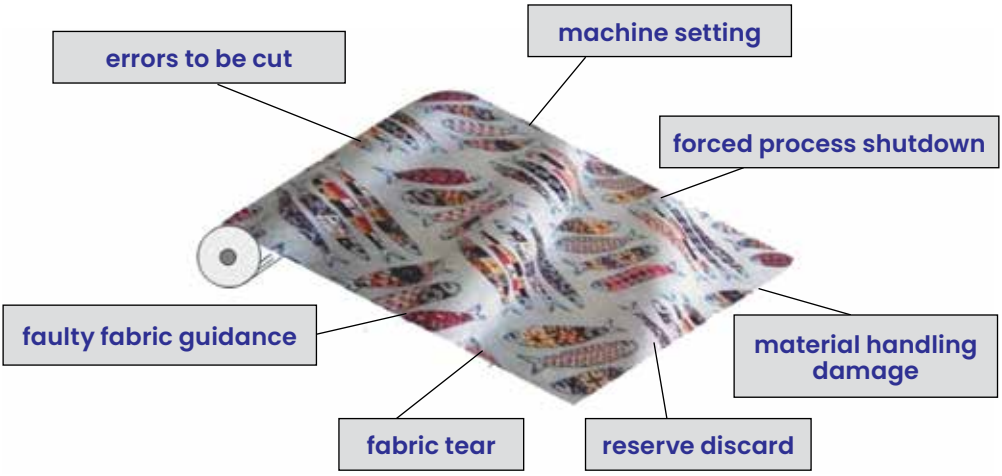


Figure 14. Examples of the generation of production textile waste

Significant overconsumption compared to other commodities obviously contributes to the problem of municipal waste.

Reuse

Plenty of excess clothing is passed on as donations by those driven by good intentions; this is functional reuse, during which waste is temporarily prevented.

Sorting

The sorting of the goods collected determines the direction in which the recycling of the garment moves. The more precisely the sorting serves the buyer's needs, the bigger volume of high-quality goods can be recycled, ideally for reuse as second-hand goods (Figure 15).

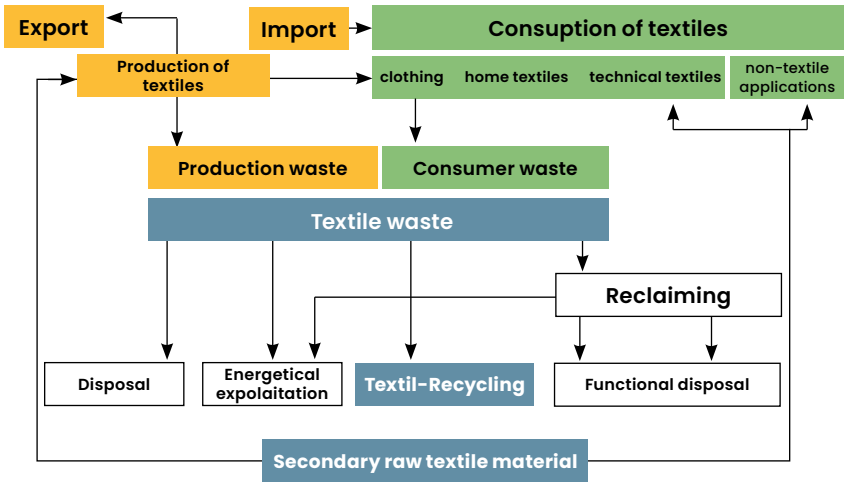


Figure 15. Textile waste material flow cycle[30]

30 https://textilevaluechain.in/in-depth-analysis/articles/textile-articles/textiles-waste-recycling/

Textiles and clothing products that are not suitable for re-use are selected for further processing as secondary raw materials, primarily by raw material, color and production method. For manual or machine sorting, accessories are removed from them: buttons, buckles, zippers, etc. There are different technological solutions for opening and tearing; this operation can be done by knives, opening machines or carding machines. The torn yarn pieces are reclassified, and recycled in this way.

Disposal

Most of the textile waste that cannot be utilized in any other way is deposited, together with household waste, in municipal landfills or used to obtain thermal energy by incineration. From non-recyclable textile waste, selected textile products made from natural raw materials can be composted. The organic matter content of textiles made from raw materials of plant and animal origin can be degraded by microorganisms under appropriate conditions.

Treatment of textile waste in Hungary

The most significant companies operating in the processing of domestic textile waste are Temaforg Kft., Tesa Kft. and Textrade Kft. The company Temaforg Kft. in Kunszentmiklós has a capacity of 4-5 thousand tons per year and mostly produce nonwoven from imported secondary raw materials. Their product range includes geotextiles, raw materials from the furniture industry fillings, industrial wipes and felts.

The efficiency of textile waste collection in Hungary (0.8–0.9 kg/person/year) significantly lags behind the performance of Western European countries (Germany, Switzerland, Great Britain) (8–9 kg/person/year). In order to facilitate further development and achieve the goals of circular economy, implementation of the principle of producer responsibility in this area and the supporting role of the state, primarily in technological development, are essential.[31]

31 Mihály Hartay: A textilhulladék képződés megelőzése, újrahasználat és hasznosítás a gyakorlatban [Prevention, reuse and recovery of textile waste in practice]

3. Environmental and Sustainability Certificates, Good Practices in the TCLF sector

There are very diverse interpretations in the literature on this subject. However, it is important to know that sustainability is a very complex concept, and manufacturing is only one segment of it.

In the sea of sustainability needs, comparable decisions verified by third parties and based on strict criteria are essential. Fulfilling the requirements for the award of various distinctive signs serves this purpose. These signs help manufacturers, distributors and end consumers take the ecological impacts of production into account.

Various distinctive signs, trademarks, labels (logos) may be used to certify that a textile, clothing or leather product is not harmful to health and/or the environment. In order to obtain authorization for their use, the product or the manufacturing processes must be inspected by designated and authorized institutions in order to verify that they meet the requirements for certification (e.g. they do not contain harmful substances, or the production process can be classified as environmentally friendly).[32]

There is an almost unrecognizably enormous amount of "green" distinguishing marks (according to "http://www.ecolabelindex.com", their number is close to 500), and one of their essential characteristics is that their popularity is very different for the different product groups (Figure 16).

Figure 16. Some examples of distinctive marks

Of the three well-known trademarks shown in the Figure 16, the three that are most common in the textile and clothing industry are highlighted and compared below: bluesign®, OEKO-TEX® and GOTS.

Although the EU ecolabel ("Ecolabel") is widely known and is used to emphasize environmental friendliness, it is used by relatively few manufacturers in our industry. The requirements for EU certification for the different product groups can be found in detail on the website of the European Commission.[33]

32 Lázár Károly: A textil- és ruhaipar a fenntartható fejlődés szolgálatában [Károly Lázár: Textile and clothing industry for sustainable development], Magyar Textiltechnika, Volume LXIV, Issue No. 2011/2
33 https://ec.europa.eu/environment/ecolabel/

Figure 17. Some statistical data of the OEKO-TEX® distinctive mark[34]

As shown by the data in Figure 17, 24,205 textile and clothing products had an OEKO-TEX® certification in 2019/2020. This is more than three times the EU ecolabel in our industry.

The biggest difficulty for consumers is to navigate in the multitude of distinctive marks, as no sufficient and easily accessible description is available about them.

Navigation through distinguishing marks is facilitated by the possibility of comparing environmental and sustainability certificates from various points of view at the https://sustainabilitymap.org website. This platform is operated by the International Trade Center (ITC), an agency of the United Nations and WTO. This platform organizes transparently, in a manner approved by ITC, the sustainability certifications for all actors in the supply chain, and provides technical assistance and advice to businesses, making it easier for them to find business partners. It also provides a means for self-assessment, and shows how well a business meets the requirements of the standards. The five evaluation aspects of the analysis are based on a comparison of environmental, social, managerial, quality and ethical requirements.[35]

The ITC analysis below[48] compares the standards of GOTS, bluesign® and STeP by OEKO-TEX® based on five aspects.

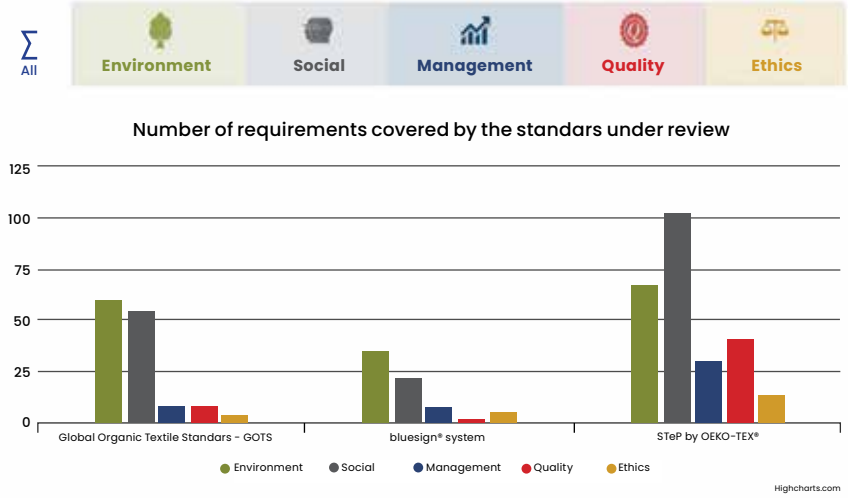


Figure 18. Comparison of the marks under review according to the system of five requirements[36]

34 Trust, Safety, Sustainability since 1992. OEKO-TEX® Annual Report 2019/2020
35 International Trade Centre Database, Sustainability Map, Market overview, 2018
36 International Trade Centre Database, Sustainability Map, Market overview, 2018

Figure 18 shows a summary test diagram of the system of requirements for the five aspects. It is clear from the figure that overall, the requirements of the STeP by OEKO-TEX® label are the most comprehensive.

Special mention should be made of the 2020 report of the European Apparel and Textile Confederation, EURATEX[37], which, in addition to bluesign® and the ZDHC program (Zero Discharge of Hazardous Chemicals), highlights the growth indicators of the use of the OEKO-TEX® label tested by 18 independent institutes in Europe and 1 in Japan. The report emphasizes that European products account for 30% of the labels, even though the European population represents only 7% of the world's population.

3.1 The OEKO-TEX® Certification System

The comprehensive OEKO-TEX® certification system has been developed in recent years, and in addition to textile products, now it also monitors the harmful substances from leather products (LETAHER STANDARD by OEKO-TEX®) and dyes, excipients (ECO PASSPORT by OEKO-TEX®), and examines the complete manufacturing chain.[38] As a result, this system contains now the most popular label of sustainability for manufacturers, distributors and consumers as well. The elements of the system are shown in Figure 19.

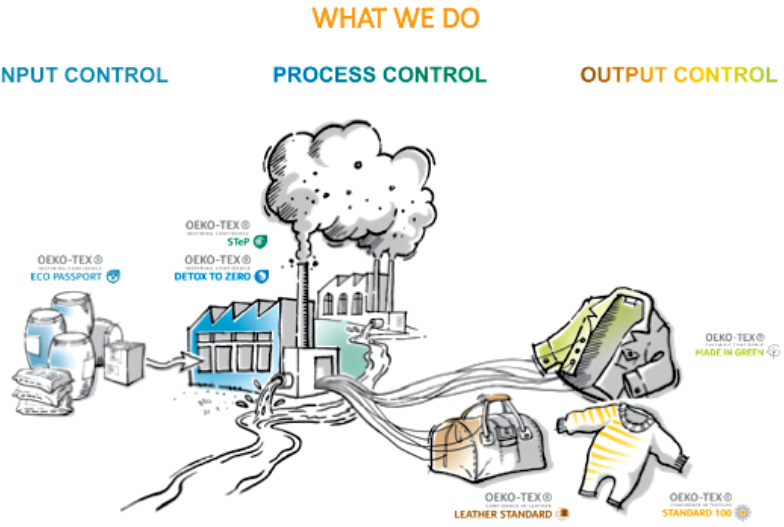


Figure 19. Structure of the OEKO-TEX® certification system

The STANDARD 100 by OEKO-TEX® certificate

The STANDARD 100 by OEKO-TEX® label is widely used as one of the best-known types of the voluntary certification scheme for "reliable and not harmful" textile products. The label shown in Figure 20 is available on the market in several languages, including Hungarian. In addition to the words "Confidence in textiles; Tested for harmful substances", the label also informs the consumer of the name of the certification body and the number of the certificate.

37 Facts and Key Figures on the European Textile and Clothing Industry, EURATEX 2020
38 www.oeko-tex.com

Figure 20. Information shown by the STANDARD 100 by OEKO-TEX® label

The STANDARD 100 by OEKO-TEX® label warrants for a given textile and apparel product that it is a product tested for substances harmful to health. Actually, the inscription "Confidence in textiles; Tested form harmful substances" may only be applied on a product as a result of a serious review and inspection system.

Compliance is checked and certified by a designated specialist institute (according to the specific requirements of the voluntary scheme in question). Annual laboratory tests and on-site audits (repeated every three years) are held to verify that the product eligible for the label continues to meet the voluntarily agreed criteria.

There are currently more than 140,000 such certificates globally, making this label the most well-known and widely used test mark for harmful substances worldwide. Since 1994, INNOVATEXT Zrt., which is entitled to issue certificates, has been a member of the International OEKO-TEX® organization, which was founded in 1992.

The tightening of requirements for sustainable textile and leather manufacturing has made it clear that the certification of products for harmful accompanying materials alone is no longer enough. This led to the development of the certification system called STeP by OEKO-TEX®, which initially only covered textile and apparel manufacturing but now also includes leather production.

The MADE IN GREEN by OEKO-TEX® certification system

As was already mentioned, it is difficult for consumers to navigate through the interpretation of the various distinctive marks. This is why the International OEKO-TEX® organization has created the "MADE IN GREEN by OEKO-TEX®" label that acknowledges the added value. It can be applied to textile and leather products that are made by certified sustainable textile and leather manufacturing (STeP by OEKO-TEX®), and according to the tests performed based on the STANDARD 100 by OEKO-TEX®, contain substances harmful to health only to the extent permitted by that standard.

Figure 21 shows the requirements for obtaining the "MADE IN GREEN by OEKO-TEX® distinctive mark.

Figure 21. Components of the "MADE IN GREEN by OEKO-TEX® label

Companies now also prepare sustainability and CSR reports, for which the questionnaire developed in the project to self-assess sustainability performance can be helpful. This questionnaire is available in Hungarian at: **https://www.tex2green.hu/hu/onertekelo-kerdoiv.**

3.2 Other examples of good practice for the sustainable and circular economy transformation of the textile, clothing, leather and footwear industry

In response to the sector's sustainability challenges, over the last 1,5-2 decades textile and clothing companies, professional, consumer and non-governmental organizations, think tanks and, of course, consumers have increasingly addressed the sector's negative environmental, social and health issues and the possible answers to them. In addition to product development, the use of environmentally friendly technologies and materials, and the working conditions and rights of the employees of the supplier companies, these voluntary initiatives and programs also cover animal welfare and ethical issues. Professional, civil, international and industry organizations have also implemented their own programs, initiatives and various kinds of collaboration, involving many companies and organizations, from the biggest fashion brands to small startups. These programs bring together fashion professionals, textile and clothing engineers, designers, environmental and social activists on a platform to be able to develop and implement common solutions and practices. Participation in these programs can be voluntary, invitational or subject to a (sponsorship) fee, but the results and reports are in most cases available online for free.

Some examples of the best-known industry movements and initiatives:

- Action, Collaboration, Transformation[39],
- Better Cotton Initiative[40],
- Clean Clothes Campaign[41],
- Fashion Revolution[42] and its national movement,
- Fashion Transparency Index[43],

39 https://actonlivingwages.com/
40 https://bettercotton.org/
41 www.cleanclothes.org
42 www.fashionrevolution.org
43 www.globalfashionagenda.com

- OECD „Due Diligence Guidance for Responsible Supply Chains in the Garment & Footwear Sector"[44],
- Relooping Fashion[45],
- Roadmap to Zero[46],
- Sustainable Apparel Coalition[47],
- The Fashion Pact.[48]

Creating a sustainable, circular textile and clothing industry requires new kinds of expertise, knowledge and thinking. From product design, technical implementation and the development of business models and to marketing and communication to consumers, in almost every phase there is a need for training and further training the right professionals. In addition to standards and certifications, various indexes, benchmarks and software are available to industry players to measure, compare and improve their sustainability performance. We introduce four examples below.

The **Fashion Transparency Index** (FTI) has been issued by Fashion Revolution in the form of a report every year since 2016. Based on a questionnaire and publicly available information on the supply chain, FTI **ranks companies based on the degree of transparency**. In 2020, the 250 biggest global fashion brands and retail chains were ranked based on their turnover. In 2020, the following companies and fashion brands ranked top five in the FTI: H&M, C&A, Adidas/Reebok, Esprit, Patagonia.[49]

The **Made-By Environmental Benchmark for Fibres**[50] is a database developed by Common Objective **to compare the environmental impacts of the fibers most commonly used by the textile and clothing industry**. Currently, 28 types of textile fibers are ranked based on six parameters: greenhouse gas emissions, human toxicity, environmental toxicity, energy and water use, land use. Based on these parameters, each fiber is scored and classified into five categories, Class A to Class E, where Class A is highest.

Circular.fashion[51] is a sustainability agency that provides product and system innovation solutions for the development of the circular textile industry. Circular Design Software, a digital platform developed by the agency, **makes it possible for fashion brands to design circular and sustainable products efficiently by the lean method**. The software covers hundreds of circular raw materials, design guides, and technical product specifications to help planning the circular life cycle of products for raw material manufacturers, fashion brands, and re-users. Products made in this way receive a digital label that provides consumers with information about the recycling options for the products.

Textile Toolbox[52] a web project of the British Center for Circular Design is **an open website platform for designers and experts to learn about design ideas based on the principles of a circular economy**. The platform serves as a tool for research and

44 https://mneguidelines.oecd.org/OECD-Due-Diligence-Guidance-Garment-Footwear.pdf
45 www.reloopingfashion.org
46 https://www.roadmaptozero.com
47 www.apparelcoalition.org
48 https://thefashionpact.org
49 https://www.fashionrevolution.org/about/transparency/
50 https://www.commonobjective.co/article/made-by-environmental-benchmark-for-fibres
51 https://circular.fashion/tools/
52 http://www.textiletoolbox.com/

community engagement, where design, as a key driver of the textile and fashion industry, can be explored and used for a system-wide change with a strategic approach. Additional good examples can be found in the detailed study in Hungarian language made as part of the GINOP project, which can be downloaded at: **https://www.tex2green.hu/files/fajl/kriza_vegeleges.pdf.**

3.3 Some comments on the assessment of sustainability

Since the 1980s, there has been a series of misleading campaigns called "greenwashing", in which companies or brands present themselves to be environmentally conscious, environmentally friendly, responsible for the natural and human environment, while credibly verified solutions to achieve sustainability goals have been totally absent in their organization, production technology, raw material use or employment. In the following, we would like to highlight some problems to help understand that sustainability can only be interpreted in a complex way.

In the latest eco-conscious trend in fashion, clothing is now made from recycled materials. However, there is no credible information on the proportion of this in the product, or on its source: municipal or industrial waste. There is still a long way to go before it becomes possible to verify the fact of recycling for a textile product not only on the basis of documentation but also by analytical methods, and to be able to issue an authentic certificate reflecting the proportion of recycled materials. In the case of a 'desirable' recycled product, the energy needs of, harmful emissions caused by, or impact on climate change of the manufacture of such product are often ignored. Another problem is that for the environmental footprint of a product, it is not taken into account that its raw material is actually waste generated by another industry. Campaigns generated by animal rights activists currently aim to totally discredit the leather industry, leaving leather, produced as a by-product in the meat industry, unprocessed may lead to global problems. The European leather industry has made serious efforts to protect the environment in recent years, as evidenced by its latest sustainability report.[53] Thus, if campaigns aimed to curb leather products prefer alternative materials such as "textile leather", "pineapple leather" and similar artificial leather substitutes, it is highly questionable whether these are indeed alternatives serving sustainability.

Also, the "organic" label on a cotton T-shirt cannot be considered authentic unless there is a certificate confirming that the cotton has been produced under controlled conditions without the use of insecticides and fertilizers, e.g. they have been grown GMO-free in compliance with the requirements of the GOTS standard. Environmental impacts and the achievement of sustainability goals are examined from different perspectives by different standards and assessment systems. The Higg-Index scores are criticized by a number of professional organizations, so it is worth treating the SAC organization's ranking with reservations regarding the sustainability of raw materials that are important in our industry. The OEKO-TEX® series of standards described in this publication, which reflects a holistic approach to sustainability, is the best-known effective tool for manufacturers, traders and brands in the TCLF sector to communicate their sustainability commitments in an easily understandable and credible way.

53 https://www.euroleather.com/doc/SER/Europai%20Boripar%20-%20Tarsadalmi%20es%20kornyezetvedelmi%20Jelentes%20az%20Europai%20Boriparrol%202020%20-%20HU%20web.pdf

4. The circular approach in the education of textiles and clothing professionals in Hungary

Introduction

Education, vocational training and lifelong learning are crucial for ensuring a sustainable future; they make the relevant necessary knowledge and skills accessible to all. *"Education and training are key aspects of human development at all stages of life, and are key drivers for growth, job creation and social cohesion."* [54]

Education at the service of sustainable development must be seen as a process which teaches us to make decisions that take into account the economy, ecology and social well-being of all communities, that is, their long-term future; it enables us to take responsibility and teaches us to live in a sustainable way.[55] It is based on experience obtained by addressing real-life problems and on a holistic approach.

In their report to the Club of Rome "No Limits to Learning", Botkin et al. articulated the importance of innovative learning to develop skills and abilities as early as 1979. Education and training are considered crucial for the development of the ability to anticipate, foresee, think for the future and assess consequences; the ability to participate, join together and trust, participate in joint action, and generate the need to have a fair share of the common good of humanity. *"Mastering a novel-type learning can also be interpreted as a new global challenge: Is humanity able to review its traditional thinking and values, and make the necessary changes? The awareness of all members of society needs to be developed much more purposefully."*[56]

Today, when we talk about the sustainability of education or about the education of sustainability, in particular the need to develop a circular approach, we need to focus on developing competences through a wider use of pedagogical methods.

4.1 Competencies needed to develop a circular approach

The MacArthur Foundation, one of the key ambassadors and supporters of the circular economy and of circular thinking, identified basically, three key pillars of the operation of the circular model:[57]

54 Reflection Paper towards a Sustainable Europe by 2030, Annexes, European Commission COM (2019) 22., 30 January 2019 https://ec.europa.eu/commission/sites/beta-political/files/rp_sustainable_europe_hu_v2_web.pdf, p.34.
55 Mária Kováts-Németh: Erdőpedagógiától a Környezetpedagógiáig (From forest pedagogy to environmental pedagogy), Apáczai Kiadó, 2010)
56 Botkin, J.W. – Elmandrija, M. – Malitza, M.: No Limits to Learning, Pergamon Press, Oxford, 1979, p. 157
57 Information on the circular economy, Moveco Interreg Danube Transnational Program, http://www.interreg-danube.eu/approved-projects/moveco/section/circular-toolbox

1. *"Preserve"*: Appreciate and preserve the value of materials and products, favoring renewable energy and raw materials, and preserve natural capital by using waste as a resource.
2. *"Innovate"*: Make optimal use of resources by keeping materials and products in the circular process. Through smart product design and innovation, develop business models (e.g. collaborative economy, an economic and social system that provides collective access to goods, services, data and knowledge; renovation, redistribution, further utilization to provide a kind of added value; return logistics, digitalization) which encourage operators responsible for production or marketing to give the product concerned as long a useful life as possible.
3. *"Close the loop"*: Improve the efficiency of the system by recycling, repairing and re-using materials and products that turned into waste, to create new value after the end of their life cycle. System efficiency can be increased by identifying negative externalities and by minimizing them through life-cycle planning.

The research conducted in 2017-2019 under the ERASMUS + CYCLE project financed by the European Commission links three broad categories of competencies to these three pillars of the circular economy, and defines expected competencies within each (Figure 22):[58]

- Narrowing the loop ("Preserve") – competencies contributing to minimizing resources use:
  - environmental commitment;
  - responsibility for the environment;
  - initiative;
  - creative thinking.

- Decelerating the loop ("Optimize") – competencies contributing to keeping materials and products at their highest level of usability, prolonging their life span, thus slowing down the flow of resources:
  - ability to mobilize resources;
  - working with others;
  - problem-solving skills;
  - environmental motivation.

- Closing the loop ("Close the loop") – the competencies promoting product recycling and releasing materials into new cycles:
  - risk-taking and decision-making capability;
  - ability to innovate;
  - environmental management approach;
  - ability of experiential learning.

58 Circular Economy Competences, Making the case for Lifelong learning, Pedagogical Model to Include Circular Economy Competences in Adult Education Cycle Project - Ref. number 2017-2-ES01-KA204-038470, www. cycle-project.eu#CYCLEproject#CycleLearning

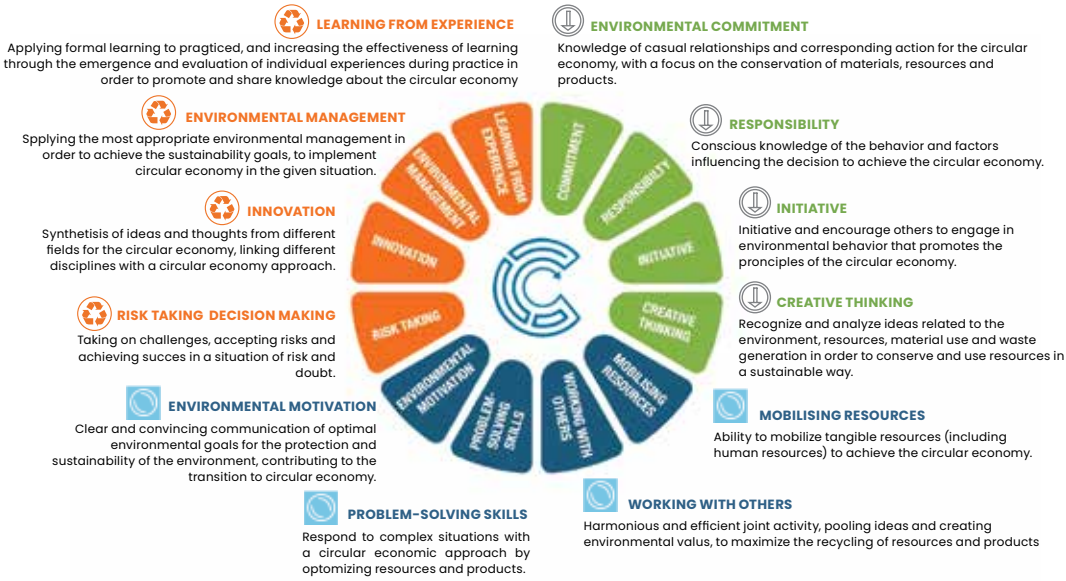


Figure 22. Competencies in circular economies (source: CYCLE project)

4.2 Education methodology to promote the development of circular thinking: Project-based education

Project-based education governed by self-regulation is the most efficient pedagogical method of competencies development. The path leading to the achievement of personal goals, to creating the product, can be subdivided into distinct activity areas.[59]

1. Students choose a topic from real life themselves (industrial contacts in education are important), or driven by the instructor's guidance, and recognize and understand the problems associated with the project topic, their causal relationships and the main objective leading to solving them. Groups are formed, and further specific problems and sub-targets necessary to achieve the main objective are specified within the groups and individually. Students choose the sub-topic they feel capable of resolving.
2. During the planning process, the tasks necessary to achieve the milestones are identified, and a plan is drawn up to implement them. This is followed by data collection, task distribution and the selection of appropriate work form and the time spans. Responsible persons are appointed.
3. During the implementation phase, the facts are analyzed, the data are systemized and processed, and the problem is solved.
4. The finished product is presented.

59 Rita Bodáné Kendrovics: Use of the project method for teaching the subject "Water quality protection", in: Dr. Mária Kováts-Németh - Dr. Rita Bodáné Kendrovics (eds): A környezetpedagógia elmélete és gyakorlata (Theory and practice of environmental pedagogy), Palatia Kiadó, 2015

Figure 23 shows a general project schedule to help design and implement any project aimed at designing and developing a circular economic approach.

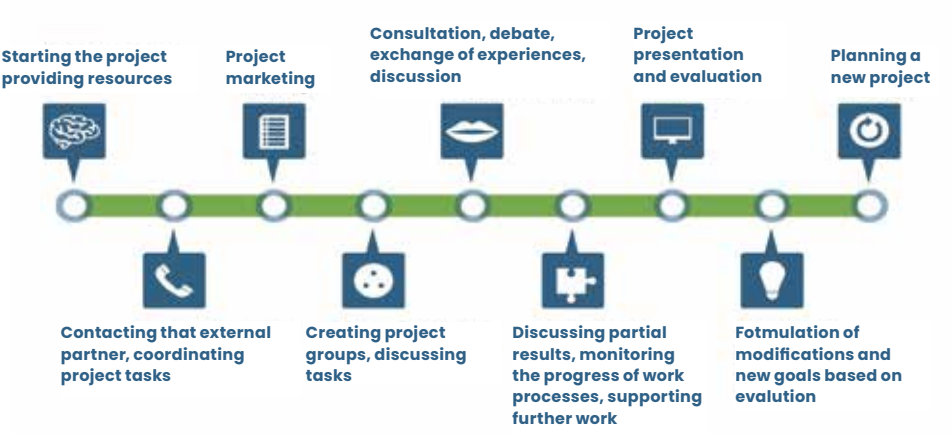


Figure 23. Project schedule

The priority objectives of circular economy projects are the following:

- to acquire and understand the basic concepts of the circular economy;
- to understand the limited availability of resources;
- to develop the ability to use the business model of the circular economy;
- to recognize the needs of companies in relation to the circular economy;
- to develop the systems approach and problem-solving ability;
- to get to know the management tools related to the circular economy;
- to recognize technological, economic opportunities and barriers and find the best solution;
- to develop the ability to cooperate and contact-making skills that are indispensable for it.

Project-based education makes it possible to develop the competencies assigned to the three major groups – narrow, decelerate and close the loop – in projects implemented with external partners to address real problems. This also responds to the labor market's need to ensure a link between training institutions and employers, and to implement joint practical education.

Details of project organization, implementation and a more detailed description of competencies can be found at the following link: **https://tex2green.hu/files/fajl/bodnri1.pdf.**

5. Situation and sustainability challenges of the Hungarian light industry

5.1 Introduction, research methodology

The Hungarian textiles, clothing, leather and footwear industry, which entered the 21st century with more than 11 thousand active companies and almost 130 000 employees (considering only businesses with at least 5 staff members), was considered a *major industry*. Its companies and employees represented 16-17 percent of manufacturing industry as a whole, while its sales indicators, strongly influenced by subcontracting, were between 4 and 5 % in 2000. Our exploratory study undertakes to analyse *this light industry*, focusing primarily on the processes of the last *two decades*. The delimitation of the period under consideration is not arbitrary: the new millennium began with events that have significantly affected the spatial organization of international light industrial networks and brought major changes (abolition of the quota system governing the trade in textile products, China's WTO membership, Central and Eastern Europe's accession to the EU), then it was marked by the global economic crisis of 2008, and ended with the COVID-19 pandemic, whose long-term effects are unknown yet in 2020.

Although the project focuses basically on the clothing industry, due to strong *vertical and horizontal interlinkages* along the value chains, it takes into consideration also the textiles, leather and footwear industries, since economic, social and environmental sustainability issues cannot be dealt with effectively if clothing is taken out of its industrial environment. In the course of our work, *we modify the division of the TCFL sector into three subsectors slightly*: in addition to the textiles and clothing industry, we also separate the leather and footwear industries considered a single subsector in statistics. It is not only the *logic of the verticals* including more technology- and labour-intensive elements that makes this necessary, but also the specific behaviour of the manufacturing of leather products after the turn of the millennium. Thus, we are actually analysing four areas of the TCLF sector.

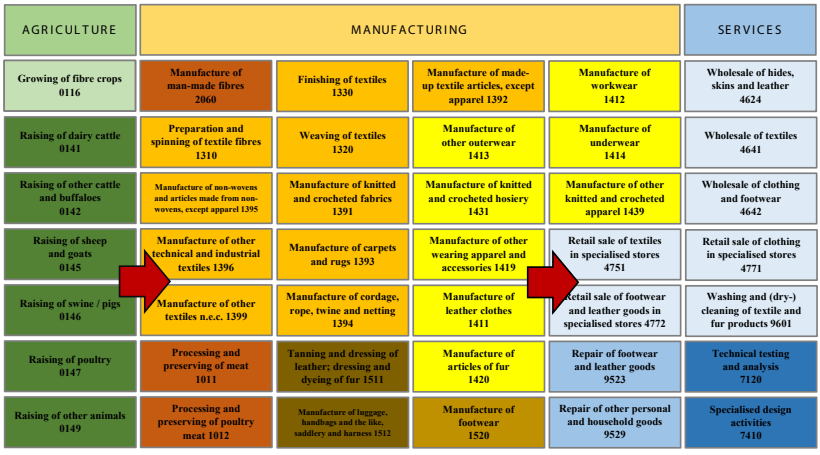


Figure 24. Structure and internal and external links of the TCLF sector, based on the TEÁOR-NACE categories

- Our analysis relies heavily on professional documents and the *scientific literature* about research in this sector published in Hungary, as well as the relevant past expertise in the CEE region. For the textile and clothing industry, the materials underpinning the R&D&I strategy drawn up in 2009-2010 are an important starting point; the baseline analysis of the leather and footwear industry, on the other hand, relies on the summary (under publication) of experience obtained during a longer-time sectoral research. Some of the results of this research can also be found in the papers referred to in the sources of the study.[60] [61]
- Part of our empirical study reviews the developments of the last two decades based on the *sectoral, sub-sectoral and industry-specific* data of the Hungarian Central Statistical Office (KSH) and of EUROSTAT. For Hungary, this is supplemented with county- and settlement-level data to identify territorial processes. External trade data adhering to a product-group-based, instead of a sectoral, logic are derived from the database of the International Trade Centre (NKK).
- Due to the sectoral limitations of *the data structure*, we focus on the industry "Manufacture of textiles, wearing apparel, leather and related products". Although a number of actors in the value chains of relevance for the industry under study (man-made fibre manufacturers, dealers, stylists and designers, technical investigators/ analysts, textiles and fur cleaners, etc.) are involved (Figure 24), the current data structure is not suitable to capture the respective TCLF-related performances of many among them.
- The Association of Hungarian Light Industry (MKSZ) has also conducted a *questionnaire survey* to map, in addition to the general situation and the effects of the COVID-19 epidemic, the economic, social and environmental sustainability issues corresponding to the project objectives as well as industrial cooperation in the sector. Questionnaires sent to more than 1500 actors (not only those operating in the narrowly defined TCLF industry) were completed by 73 respondents.
- The responses mainly reflect the views of firms based in Budapest (36%), Western Transdanubia (18%) and in the South (16%) and North Great Plain Region (14%). Most respondents are *small* (44 %) *and medium-sized enterprises* (32 %), 80 % of them are Hungarian-owned, and they cover a relatively diversified range of core activities: manufacturers of outerwear (19 %) and made-up textile articles (except apparel) (11 %) carry the largest weight in the sample.
- Although the range of respondents could be broader and cover more industries (manufacture of man-made fibre, textile cleaning), the results are considered usable. In *geographical and sectoral* terms, the *diversity* of the sample is favourable, while in terms of size and ownership, the distribution of respondents is fortunate because a strategic approach focusing on the development of an industry will mostly deal with *domestic-owned SMEs*.

On the sectoral side, the core activity classification of respondents adequately covers their actual earning and employment activities: only 10% of businesses indicated that most of their output was not related to their main activity. Half of these respondents

60 Molnár E. (2017): A félperiféria szerepe az élőmunka-igényes ágazatok globális értéktermelési hálózataiban (The role of the semi-periphery in the global production networks of labor-intensive industries). *Területi Statisztika* (Regional Statistics) (57) 4: 436 to 464

61 Molnár E. (2018): A zsugorodás térbeli anatómiája: élőmunka-igényes iparágak földrajza az ezredforduló utáni Magyarországon (Spatial anatomy of shrinkage: Geography of labor-intensive industries in Hungary after the millennium). *Tér és Társadalom* (Space and Society) (32) 2: 41 to 60

were registered in the special branch of design activities (7410), whereas in fact they were involved in the manufacturing of textiles, clothing or leather products. The above clearly shows that this is one of the "grey zones" of the economy where light industrial manufacturing activities transgress the boundaries of industrial statistics and suggest that light industry actually carries a substantially larger, yet unknown weight (in early 2019, there were 3600 or more active companies in the priority branch, but the extent of their linkage to the design activities area and that of their own manufacturing activities is unknown). The *geographical distribution* of the industry also differs from the one suggested by the statistical data. Budapest-based companies in particular typically carry out at least manufacture itself at sites in the countryside. Nearly 40% of Budapest respondents operated in this way, realizing a substantial part of their activity at sites located mainly in Southern and Central Transdanubia and the Southern Great Plain area. Three of the 10 companies referred to here are 3 medium-sized ones (50-249 staff), and 7 are small ones (5 with 20 to 49 staff and 2 with 10-19). This highlights the importance of a critical approach to data based on registered seat, especially for the capital city.

5.2. Dynamics and general structural characteristics of the Hungarian TCLF sector

In the Hungarian light industry, stabilization in previous years gave way to decline again after the turn of the millennium. The underlying *causes are cyclical* (post-2000 economic crisis) and *structural*, but the longer-term course of the events suggests that the latter predominate. The international market positions of the Hungarian light industry were fundamentally determined by the *liberalization of trade in textile products* and the significant increase of *domestic production costs*. At a global level, the former included the removal of quota-based restrictions, China's membership of the WTO and the free trade of industry in the EU and associated countries at regional level, and the accession of some of the associated countries, including Hungary, to the EU. One of the key (over-ambitious according to some) elements of the latter was a *radical minimum wage increase* in 2001-2002 that had a particularly intense impact on the costs of this labour-intensive industry where subcontracting played such a significant role. In the case of the most affected clothing and footwear industries, labour costs carried a great weight in the costs structure of production, thus the above modification had a strong impact on the subsectors that typically employed people close to the minimum wage. The situation of the subsectors producing mainly for export deteriorated further due to the appreciation of the forint (HUF) against the euro (EUR) and the dollar (USD).

As a result of these changes, Hungarian producers *were ousted from the production networks,* typically managed from abroad, of which they had been part of before mainly as subcontractors. Labour contract orders to domestic producers went to the cheaper East European and Middle and Far Eastern manufacturers, and a large part of foreign subsidiaries in Hungary were liquidated and significant divestiture began in the sector. Consequently, the light industry can be considered as one of the *biggest losers of industrial restructuring in the last 20 years*. The number of employees showed particularly steep decline in the sector: by 2019, it fell to less than 40 000 among companies with more than 4 staff. This degradation has weakened the *TCLF sector's position in the manufacturing industry*: By 2019, it contributed less than 10 % of businesses, around 5% of employment and 1-2 % of total and export sales.

The shrinking of the sector *is uneven in terms of time and subsectors*. It had suffered most of its losses before the 2008 crisis, and could actually recover in sales indicators to some extent after the nadir of recession, except for the clothing industry. The leather subsector, however, *stood out of the line*: its sales indicators multiplied and, consequently, its relative position strengthened within the TCLF sector and also in manufacturing as a whole. This increase was coupled with an increase in the number of employees: it was the only TCLF subsector that had more employees in the second half of 2010 than at the turn of the millennium (Table 1).

Table 1. TCLF subsectors: Dynamics by volume index of sales revenues and number of employees (% of 2000 values); source of data: KSH (Hungarian Central Statistical Office)

	Turnover										
	2000	**2002**	**2004**	**2006**	**2008**	**2010**	**2012**	**2014**	**2016**	**2018**	**2019**
Textiles	100	82	74	62	48	43	58	60	58	70	65
Clothing	100	110	97	83	57	41	39	41	38	32	33
Leather	100	92	92	249	439	293	328	500	648	660	565
Footwear	100	96	56	45	58	39	67	64	51	50	45
TCLF sector	**100**	**97**	**83**	**76**	**68**	**51**	**61**	**68**	**70**	**72**	**66**
	Employees										
	2000	**2002**	**2004**	**2006**	**2008**	**2010**	**2012**	**2014**	**2016**	**2018**	**2019**
Textiles	100	85	86	70	50	35	41	39	36	36	22
Clothing	100	88	67	44	37	31	28	26	28	25	29
Leather	100	93	83	99	120	77	67	87	121	124	113
Footwear	100	93	50	43	37	33	35	34	33	32	28
TCLF sector	**100**	**88**	**70**	**53**	**43**	**34**	**34**	**33**	**34**	**32**	**30**

The dynamics of the leather industry represents a *reversal of trends* compared to the developments of the 1990s. At that time, partly due *(inter alia)* to the higher adaptation costs of the leather industry, it became the victim of restructuring: the processing of hides and skins practically disappeared from the domestic leather industry, and its activities were reduced to the leather-craft industry (manufacture of luggage and bags in the first place) and to the activities of automotive suppliers.

In both areas, especially in the latter, significant *new investments* took place after the turn of the millennium, and production has been relocated from Western Europe to Hungary. As a consequence, the indicators of the subsector are determined today by the performance of a few major car leather manufacturers and of a suitcase and bags company: their weight is discernible in the post-2008 W-shaped sales revenue and employment indicators of the subsector, indicative also of influence of the heavily affected car industry.

The growing *leather industry became a major player in the shrinking TCLF sector.* Its previous weight of 3-4% in 2010 increased to 30-35% in turnover, 35-40% in exports and 12-13% in employment. Whereas at the turn of the millennium the clothing industry was the most important subsector in the TCLF sector according to all indicators, by the second half of the 2010s, it was relegated to third position in terms of sales indicators after the textiles and leather industries (the first one moved to the head of the list in terms of total sales revenue and the second based on exports).

The share of businesses with more than 4 staff and their average employee headcounts also show that, in addition to shrinking, the TCLF sector was characterized by *fragmentation*: in 2000, these two indicators did not differ substantially from the corresponding manufacturing averages, but by 2019 they showed an unprecedented backlog, with decreasing values compared to the millennium. Footwear production was the most concentrated among the subsectors based on the proportion of enterprises with over 4 employees, but it lost its previous leading role in relation to the leather industry in terms of the average headcount figures. The duality of the latter subsector (lowest share among businesses with more than 4 staff, but highest average headcount figures in this group) highlights its polarization: the relatively high number of micros coexisted with a few large enterprises of outstanding size, and the subsector as a whole was determined by the course of the latter (Table 2).

This relative organizational concentration of the leather and footwear industries is in line with the finding that the industry was one of the subsectors with the largest relative weight of *foreign-owned enterprises according* to the 2014 data: foreign enterprises contributed above 86 % of its sales revenues, and it ranked second within manufacturing, right after machinery (KSH 2016).

With some simplification, the differences in the dynamics of the leather industry and the other three subsectors can be interpreted as an expression of the differences between a sector dominated by foreign large companies and subsectors defined more definitely by domestic small and medium-sized enterprises.

Table 2. Change in TCLF enterprise size; source of data: KSH (Hungarian Central Statistical Office)

	Share of enterprises with more than 4 staff (%)										
	2000	**2002**	**2004**	**2006**	**2008**	**2010**	**2012**	**2014**	**2016**	**2018**	**2019**
Textiles	21	20	23	22	22	22	21	20	20	19	18
Clothing	20	20	19	18	17	16	16	18	18	16	16
Leather	19	18	20	18	17	16	16	17	15	12	13
Footwear	42	32	40	39	37	35	40	41	45	41	41
TCLF sector	**22**	**21**	**22**	**20**	**19**	**19**	**19**	**20**	**20**	**18**	**18**
Manufacturing	**22**	**22**	**23**	**24**	**24**	**24**	**24**	**25**	**26**	**25**	**25**
	Average employee numbers in enterprises with more than 4 staff (persons)										
	2000	**2002**	**2004**	**2006**	**2008**	**2010**	**2012**	**2014**	**2016**	**2018**	**2019**
Textiles	51	48	55	58	48	47	59	62	54	54	32
Clothing	52	47	46	40	40	37	37	37	39	39	43
Leather	40	47	47	73	111	78	71	96	142	158	128
Footwear	67	65	52	56	57	61	62	65	64	67	57
TCLF sector	**53**	**50**	**49**	**48**	**47**	**44**	**47**	**49**	**50**	**52**	**46**
Manufacturing	**51**	**48**	**46**	**46**	**49**	**48**	**50**	**54**	**54**	**59**	**56**

The shrinking of the Hungarian TCLF sector is not unique and not even prominent in Europe: in the context of the relocation of labour-intensive mass production outside the continent, *decline, and in particular downsizing, became typical all over Europe,* with significant differences by subsector and country. T*he Hungarian TCLF sector is of medium size in European comparison*, both overall and considering its subsectors: it has a stronger position in terms of employment than in output value, and this is indicative

of its role in the international division of labour, and the weight of more labour-intensive production, and how it is connected to the various networks (significant subcontracting).

The value of exports at current prices has increased in Hungary since the turn of the millennium, as in most European countries, but at a relatively modest rate. Whereas in 2001 Hungary was the 14th largest TCLF exporter in the EU, by 2019 it slipped back to the 16th position, preceded also by Slovakia besides Poland, the Czech Republic and Romania in the region (Figure 25).

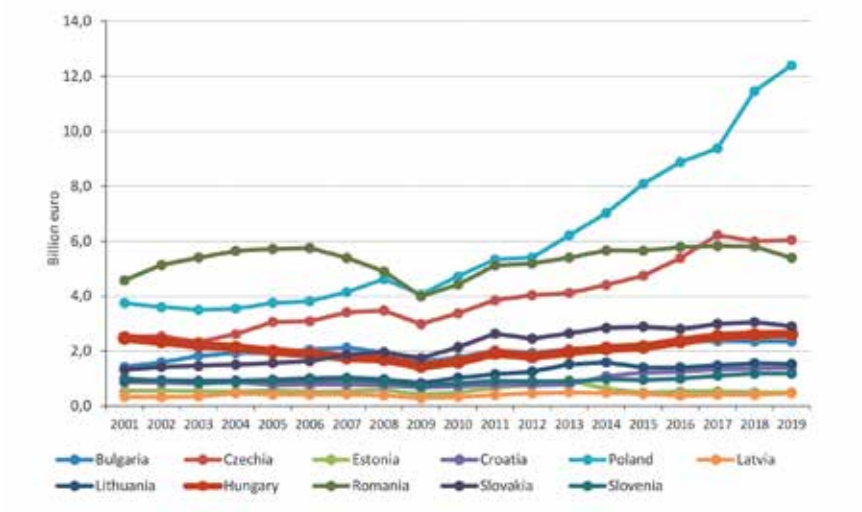


Figure 25. Hungary's position among CEE EU Member States, based on TCLF export value (EUR billion); source of data: International Trade Centre (ITC)

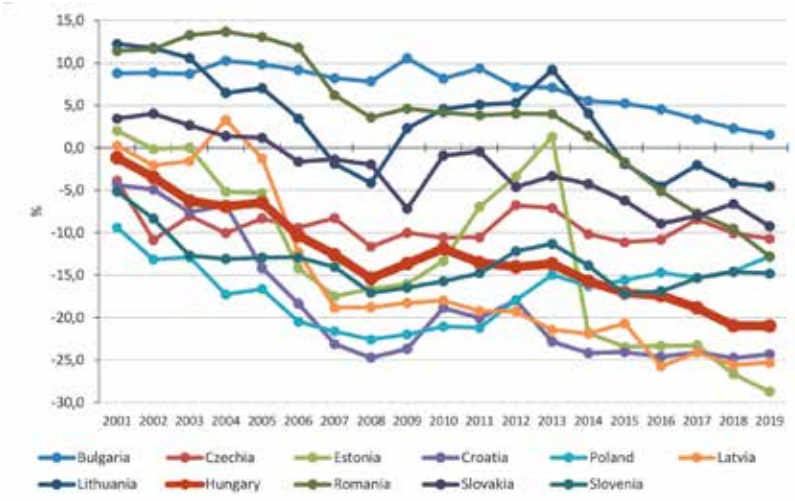


Figure 26. Hungary's position among CEE EU Member States, based on TCLF external trade balance (% of export/import goods turnover); source of data: International Trade Centre (ITC)

After the millennium, the number of EU Member States with positive external trade balances for TCLF products diminished, and the previously moderate deficit of others, including Hungary, started to increase. More than 70% of the external trade balance of TCLF products has deteriorated: Hungary is in the midfield, *one of the economies with a higher deficit in the CEE region*. Only four countries in the EU (Belgium, Italy, Portugal and in our region Bulgaria) have a positive external trade balance (Figure 26). This circumstance indicates that exiting the role of low-cost manufacturer and the consequent challenges are common in almost all the CEE countries.

5.3. Product and activity structure of the Hungarian TCLF sector

The changing external and internal conditions require the *repositioning* of the Hungarian light industry which can be achieved by changing the *product and activity structure*. Of course, this perception is not new: the idea of structural change has been on the agenda since the end of the 1990s when the necessity for the subcontracting of domestic players for Western countries – resulting in the dominance of production functions through foreign subsidiaries – ended and doubts were expressed about the long-term sustainability of integration into international production networks.[62] [63] [64] [65]

On the one hand, *products with a higher value added* (even subcontracting in more demanding market segments), and on the other hand, *own products* positioned in demanding, less price-competitive market segments represent the direction of further progress: in the case of the latter, the strategic functions of the value chain (product development, design, production organization, marketing, related services) would also be developed, which would not only provide better earning opportunities, but also cure the problem of dependence on external orders.

A common feature of these potential restructuring directions is that by steering the representatives of the domestic light industry into market segments characterized by higher entry barriers, it devalues the role of *production costs* in the competitiveness of economic actors: innovation, quality, functionality and flexibility aspects can become dominant.

The *class structure* of the industry discloses relevant information about the *product structure* of the TCLF sector. It is noteworthy that although there have been significant shifts in both production and employment data since the turn of the millennium (and they tend to point in the same direction), the structural change is particularly spectacular in the former data (Table 3).

62 Cseh J. (1997): *A textil- és textilruházati ipar helyzete, a versenyképességét meghatározó tényezők.* [*The situation of the textile and apparel industry, the factors determining its competitiveness.*] Workshop study. Budapest University of Economics, Department of Business Economics.

63 Cseh J. – Farkas J.-né – Geiger T. – Várszegi Á. (2002): *Könnyűipari ágazatok az Európai Unióban és Magyarországon: textil-, ruházati, bőr- és cipőipar.* [*Light industry sectors in the European Union and Hungary: textile, clothing, leather and footwear.*] Hungarian Chamber of Commerce and Industry, Budapest.

64 Laki M. (2005): A magyar cipőpiac átalakulása 1989 után, avagy a gyenge pozitív visszacsatolás esete. [The transformation of the Hungarian shoe market after 1989, or the case of weak positive feedback.] *Bőr- és cipőtechnika, -piac* (55) 6-7: pp. 191–205.

65 TMTE (2009): *A magyar textil- és ruhaipar kutatás-fejlesztési és innovációs stratégiája.* [*Research and development and innovation strategy of the Hungarian textile and clothing industry.*] http://tmte.hu/_userfiles_/tmte/071_texplat_jovokep_091210.pdf (Download: 30 November 2020)

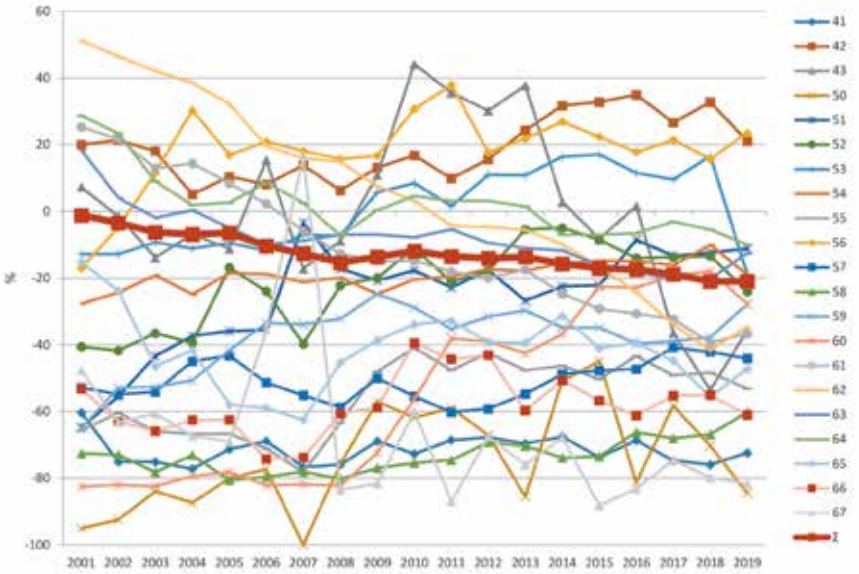
Table 3. Distribution of the production value and employees of the TCLF sector by classes in Hungary (%); data source: KSH (Hungarian Central Statistical Office)

	Production value						Employment					
	2000	2004	2008	2012	2016	2019	2000	2004	2008	2012	2016	2019
13	**37**	**32**	**24**	**34**	**28**	**34**	**23**	**27**	**24**	**31**	**28**	**19**
1310	7	7	6	7	4	4	3	4	3	4	3	2
1320	8	7	5	5	4	5	4	3	2	2	2	2
1330	0	2	1	0	1	2	1	1	1	0	1	1
1391	1	1	0	1	0	0	1	1	0	1	0	0
1392	12	6	6	9	12	11	10	12	14	19	18	9
1393	1	1	0	0	0	0	1	1	0	1	0	0
1394	0	0	0	1	1	6	0	0	1	0	0	1
1395	2	1	2	4	4	4	0	0	1	1	1	1
1396	0	0	0	7	1	2	0	0	0	2	1	1
1399	5	7	2	1	1	1	3	5	2	1	2	1
14	**47**	**54**	**39**	**28**	**24**	**24**	**58**	**57**	**53**	**46**	**45**	**53**
1411	0	0	0	0	0	0	1	1	0	0	0	0
1412	3	3	3	3	3	4	5	4	4	4	5	14
1413	29	37	20	11	10	10	35	32	24	18	23	22
1414	10	9	9	8	5	4	11	12	14	13	9	8
1419	2	3	3	4	4	3	3	5	4	5	4	4
1420	0	0	0	0	0	0	0	0	0	0	0	0
1431	0	1	1	0	0	0	1	1	1	1	0	0
1439	2	2	3	2	2	2	2	4	5	5	5	4
15	**16**	**14**	**37**	**38**	**48**	**43**	**19**	**15**	**23**	**23**	**27**	**27**
1511	0	0	1	0	0	0	1	0	0	0	0	0
1512	2	4	22	20	35	31	3	4	9	7	12	13
1520	13	9	14	18	13	12	16	11	13	16	15	15
CB	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

CB: Manufacture of textiles, wearing apparel, leather and related products.

At a class level, the strengths of the TCLF sector in the textile industry include the manufacture of non-woven ready-made textiles (1392), in the clothing industry the manufacture of outerwear (1413) and underwear (1414), while in the leather and footwear industry the *manufacture of bags, belts* (1512) and footwear (1520). The biggest production value producer since the second half of the 2000s has been the manufacture of bags and belts (which, contrary to its name, also includes automotive leather products), while the biggest employer has traditionally been the *manufacture of outerwear* (Table 3). At the same time, it is important to see that a major player can influence the weight of even major classes: the large-scale staff reduction in the manufacture of non-clothing ready-made textiles by 2019 has been accompanied by a similarly unrealistic increase in workwear production. In this case, *change of main activity* of a statistical nature by a significant – probably rehabilitation – employer is suspected rather than real changes in performance. In particular, the clothing industry has a stronger position in terms of employment than in terms of turnover, while the opposite is true of the leather industry. Even so, within the *labour-intensive* TCLF sector it is the *clothing industry* that seems to bring together the activities that require more labour. The relatively low share of the subsector in the production value can also be explained by the overrepresentation

of the still significant subcontracting, which does not include raw material costs and thus typically "under-measures" the production value. The changes identified indicate, on the one hand, a reversal of the restructuring of the clothing and footwear industry, typical of the 1990s and, on the other hand, a tendency toward the strengthening of the *technological-functional side* in the TCLF sector, in line with European trends.[66]



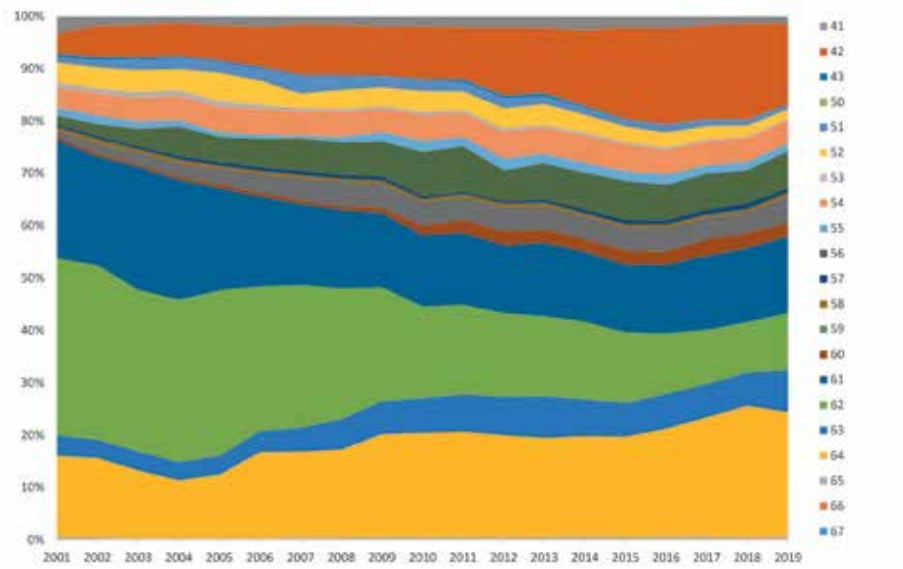
41 Raw hides and skins (other than furskins) and leather; 42 Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silkworm gut); 43 Furskins and artificial fur; manufactures thereof; 50 Silk; 51 Wool, fine or coarse animal hair; horsehair yarn and woven fabric; 52 Cotton; 53 Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn; 54 Man-made filaments; strip and the like of man-made textile materials; 55 Man-made staple fibres; 56 Wadding, felt and nonwovens; special yarns; twine, cordage, ropes and cables and articles thereof; 57 Carpets and other textile floor coverings; 58 Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings; embroidery; 59 Impregnated, coated, covered or laminated textile fabrics; textile articles of a kind suitable for industrial use; 60 Knitted or crocheted fabrics; 61 Articles of apparel and clothing accessories, knitted or crocheted; 62 Articles of apparel and clothing accessories, not knitted or crocheted; 63 Other made-up textile articles; sets; worn clothing and worn textile articles; rags; 64 Footwear, gaiters and the like; parts of such articles; 65 Headgear and parts thereof; 66 Umbrellas, sun umbrellas, walking sticks, seat-sticks, whips, riding-crops and parts thereof; 67 Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles of human hair; Σ Total TCLF chapters.

Figure 27. The balance of foreign trade of each TCLF chapter as a percentage of the total export-import turnover of each chapter; data source: International Trade Centre (ITC)

Foreign trade data tell a lot about the product structure of the Hungarian TCLF sector and its connection to global production networks. It is noteworthy that while at the turn of the millennium, the exports and imports of TCLF products were almost in balance, they later shifted towards imports and the *balance became increasingly negative.* At the beginning of the said period, the foreign trade turnover of the products in more labour-intensive classes involved in subcontracting, exporting to Western countries (clothing products – 61-62, ready-made products for non-clothing purposes – 63, footwear – 64, leather goods dominated by leather clothing and bags – 42) typically showed a massive *surplus*. This has largely disappeared by now, so there is now a more

66 EURATEX (2020): Facts & key figures of the European textile and clothing industry.

significant surplus in only two chapters: leather goods that have undergone major internal restructuring (42), where automotive leather products have become dominant, and wadding, felt and nonwovens; special yarns; twine, cordage, ropes and cables and articles thereof (56) (Figure 27). The sector's *structure of export goods* has also changed significantly: the relative weight of the two previously leading clothing product groups (61–62) has decreased, with footwear (64) and leather goods (42) now taking the lead. On the "springboard", the appreciation of finished textile goods (63) and some other textile chapters (56, 59), and the continuing importance of man-made filaments (54) are remarkable (Figure 28).



41 Raw hides and skins (other than furskins) and leather; 42 Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silkworm gut); 43 Furskins and artificial fur; manufactures thereof; 50 Silk; 51 Wool, fine or coarse animal hair; horsehair yarn and woven fabric; 52 Cotton; 53 Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn; 54 Man-made filaments; strip and the like of man-made textile materials; 55 Man-made staple fibres; 56 Wadding, felt and nonwovens; special yarns; twine, cordage, ropes and cables and articles thereof; 57 Carpets and other textile floor coverings; 58 Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings; embroidery; 59 Impregnated, coated, covered or laminated textile fabrics; textile articles of a kind suitable for industrial use; 60 Knitted or crocheted fabrics; 61 Articles of apparel and clothing accessories, knitted or crocheted; 62 Articles of apparel and clothing accessories, not knitted or crocheted; 63 Other made-up textile articles; sets; worn clothing and worn textile articles; rags; 64 Footwear, gaiters and the like; parts of such articles; 65 Headgear and parts thereof; 66 Umbrellas, sun umbrellas, walking sticks, seat-sticks, whips, riding-crops and parts thereof; 67 Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles of human hair; ∑ Total TCLF chapters.

Figure 28. Exports of each TCLF chapter as a percentage of total TCLF exports; data source: International Trade Centre (ITC)

The concentration of man-made fibres also exceeds the performance of the leather processing industry as defined by some large companies: its two most significant representatives are in Nyergesújfalu (Zoltek) and Tiszaújváros (Tisza Textil), but this area of manufacturing is outside the statistical boundaries of the light industry.

Labour productivity data provide useful information reflecting the internal structure

and international position of the Hungarian TCLF sector, summarizing the efficiency of production, the product structure and the functions in the value chains. Performance in process, product and function, complemented by the possibility of chain/intersectoral upgrading is referred to as dimensions of economic upgrading in the international literature.[67] [68]

Shift toward a higher value added – by continuously improving cost capability ratios relevant for connection to production networks – helps to ensure that, despite the rising costs of production, exclusion does not occur.

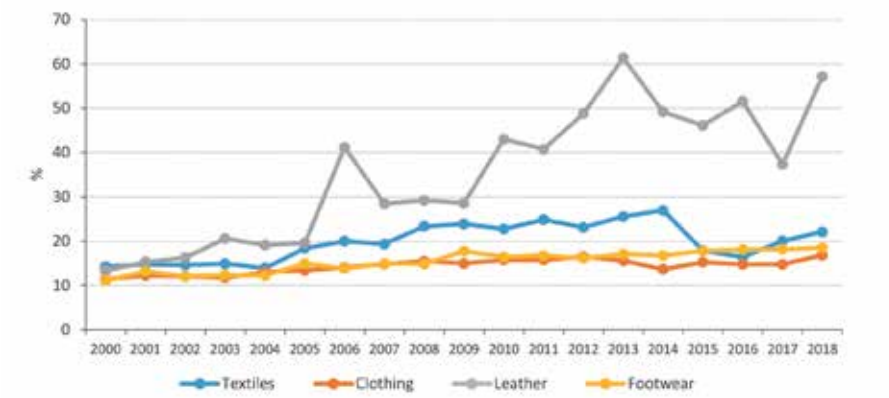


Figure 29. Apparent labour productivity (gross value added per person employed) in the subsectors of the Hungarian TCLF sector as a percentage of the corresponding data in Germany; data source: EUROSTAT

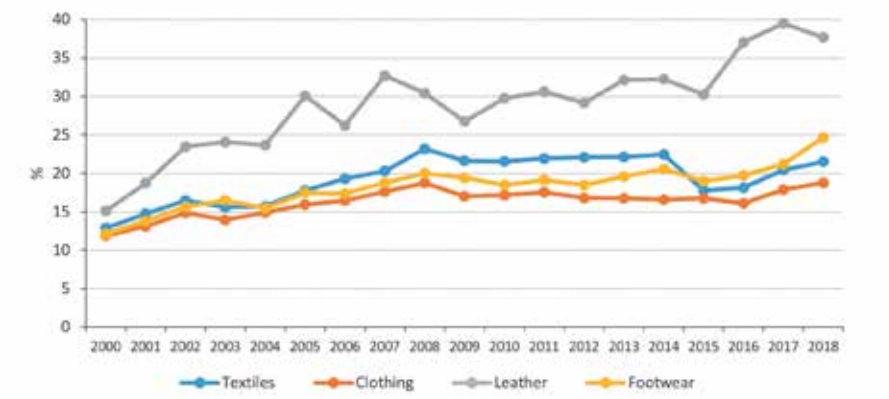


Figure 30. Average personnel costs (personnel costs per employee) in the subsectors of the Hungarian TCLF sector, as a percentage of the corresponding data in Germany; data source: EUROSTAT

When comparing the performance of the Hungarian TCLF sector to the equivalent *indicators of German industry* that has always been an important point of reference, it

67 Barrientos, S. – Gereffi, G. – Rossi, A. (2011): Economic and social upgrading in global production networks: A new paradigm for a changing world. *International Labour Review* (150) 3-4: pp. 319–340.

68 Fernandez-Stark, K. – Frederick, S. – Gereffi, G. (2011): *The Apparel Global Value Chain. Economic Upgrading and Workforce Development*. Duke Center on Globalization, Governance & Competitiveness.

can be clearly seen that on the one hand, the Hungarian productivity and labour cost indicators are largely lagging behind, on the other hand, they are catching up moderately, and on the third hand, the leather industry has a more favourable position in both respects compared to other subsectors. At the beginning of the 2000s, the Hungarian TCLF sector typically reached 10-15% of the corresponding indicators of German industry, which increased to 15-25% by the end of the 2010s. Only the *manufacture of leather products* was able to achieve 50-60% of the labour productivity and 35-40% of the labour costs of the German leather industry (Figure 29-30). The switching of the Hungarian leather industry between the previously presented industries (turning toward automotive supplier networks) plays an important role in catching up, an essential element of which is that this industry is interested in segments where the traditional subcontracting does not dominate. The significant difference between labour productivity and labour costs is also noteworthy, which shows that the expansion of large foreign companies dominating in the sector, operating regional production networks, in Hungary is largely due to *favourable cost capability ratio*.[69]

It can be stated in connection with all four subsectors that in the early 2000s, within the European Union Hungary was in the group of countries (Czech Republic, Slovakia, Baltic States, Romania, Bulgaria) with the *lowest labour productivity* and *wage cost indicators,* but ranked relatively high in that group. In comparison, by the end of 2010, the country's relative positions had deteriorated in three subsectors in a highly polarized European field. Only Bulgaria is clearly behind it in the textile industry, and only Bulgaria and Romania in the clothing and footwear industries. The leather industry shows a different picture here as well. In terms of labour productivity, it outpaced not only all post-socialist EU member states, but also Cyprus, Greece and Portugal (even though this leap in wage costs is not perceptible). It can therefore be stated that in Hungary, despite the shrinkage, *restructuring in several subsectors* is behind the transformation of the light industry in Central and Eastern European countries facing similar challenges. This was despite the fact that Hungary had previously been one of the leaders in the region in this industry, and the need for restructuring was expressed at least two decades earlier.

Table 4. Manufacturers involved in subcontracting and sales revenue from subcontracting (%); data source: KSH (Hungarian Statistical Office)

	Manufacturers (%)						Sales revenue (%)					
	2008	2010	2012	2014	2016	2018	2008	2010	2012	2014	2016	2018
13	22	23	19	12	17	21	7	5	4	2	9	4
14	43	48	45	40	44	43	34	39	38	34	34	34
151	30	37	39	32	40	41	1	1	2	1	1	1
152	34	34	31	32	36	39	25	23	21	22	24	26
CB	**35**	**38**	**36**	**31**	**36**	**36**	**16**	**16**	**14**	**11**	**12**	**12**

CB: Manufacture of textiles, wearing apparel, leather and related products.

One of the most important measures of the change in the structure of products and activities after the turn of the millennium has been the change in the proportion of *subcontracting* which became a key player in the 1990s. While in the manufacturing

69 Coe, N. M. – Yeung, H. W. (2019): Global production networks: mapping recent conceptual developments. *Journal of Economic Geography* (19) 4: pp. 775–801.

industry, subcontracting was performed by 15-20% of manufacturers a decade ago, this figure is now not much over 10%, this figure in the TCLF sector has remained stable at around 35% over the last decade. While 1-2% of the sales revenue of the manufacturing industry is realized through subcontracting, in the TCLF sector this value has been declining over the last decade, but is still above 10%. Especially in the light of sales indicators, it is striking that subcontracting is more widespread in the more *labour-intensive clothing industry* and the *footwear industry*, while its role is marginal in the textile and leather industry (Table 4). The share of subcontracting in exports was similar: of the two most strongly affected subsectors, the proportions are around 40-45% in the clothing industry, around 25% in the footwear industry, with stable or slightly increasing rates in recent years. It should be emphasized, however, that as restructuring progresses, these proportions are now well below the mid-1990s levels when subcontracting accounted for around 90-95% for clothing and 95% for footwear.[70]

This can be explained on the one hand by the price-based exclusion of domestic light industry players from previous subcontracting-based international production networks and the appreciation of their exports containing their own products, and on the other hand by the structural change observed in foreign subsidiaries (switch from subcontracting).

Subcontracting means the production of someone else's products: in the framework of this, the company typically sells its production competencies and manpower in an industry where the depressed wages of the employees represent an important means for achieving favourable cost-capability ratios. At the same time, there are significant differences in the market positioning of products produced in subcontracting and in the value creation steps performed in the framework of subcontracting: products with a higher value added and requiring a higher level of knowledge, and by performing certain activities beyond manufacturing (raw material purchasing, production development), higher income and more stable positions in international production network can be achieved even as a subcontractor. The role of subcontracting in expanding the market, channelling new knowledge and helping to produce higher quality products more efficiently can also be observed. At the same time, subcontractors are first and foremost faced with *functional limitations*: they can only expand their activities towards the (non-strategic) functions that production network managers allow them. The international literature sees the functional upgrade-limiting nature of this type of division of labour that can be prevented through multiple roles and connections to multiple production networks.[71]

It is no coincidence that among those respondents of the MKSZ (Association of Hungarian Light Industry) questionnaire belonging to manufacturing companies (59 companies), in addition to the actors who only do subcontracting and those who only produce their own products, the largest group is actually represented by *enterprises combining subcontracting* and *own product manufacturing*. The exclusive or partial appearance of subcontracting can be observed in the largest proportion in the clothing industry and the footwear industry, in line with the results of our survey. Our previous experience from domestic shoe manufacturers showed that numerous players engaged in *subcontracting*

70 Cseh J. (1997): *A textil- és textilruházati ipar helyzete, a versenyképességét meghatározó tényezők.* [*The situation of the textile and apparel industry, the factors determining its competitiveness.*] Workshop study. Budapest University of Economics, Department of Business Economics.

71 Tokatli, N. (2013): Toward a better understanding of the apparel industry: a critique of the upgrading literature. *Journal of Economic Geography* (13): pp. 993–1011.

got *into an intermediate position* in the international production networks: these players, while doing subcontracting for their western customers, typically outsourced the production of shoe uppers, which is the most labour-intensive step in production, to domestic and foreign subcontractors for cost-effectiveness reasons and in the spirit of flexible capacity utilization.[72] A significant part of our responding manufacturers, especially in the textile industry, only produce intermediate products, while others, especially among fashion design companies registered outside the industry, only produce end-use products, but actually, it is possible in all subsectors of the TCLF industry to create a combination of two types of product, with *different roles in different production networks.*

Regardless of whether being companies doing subcontracting or manufacturing their own products, or producers of intermediate or end-use products, most respondents say that high quality, reliability supported by various certificates, the existence of certain special (functional) properties or the ability to transport flexibly is more important than low price. The former aspects were rated with the highest scores by the majority of respondents (Figure 31). All this indicates that in the light industry, the direction of domestic *product restructuring* is from price-sensitive mass products to *more special products* which, combined with the ability of *flexible service*, can also give importance to producers in the Central and Eastern European region even in the long term.

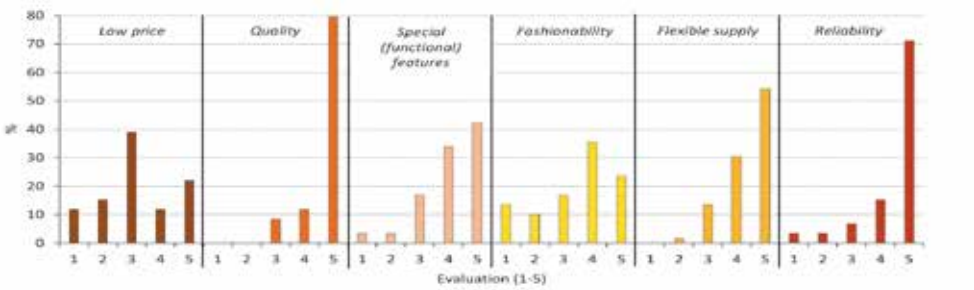


Figure 31. Key features of the products of the manufacturing companies that completed the questionnaire (1 = not important at all, 5 = most important);
source: MKSZ (Association of Hungarian Light Industry)

Although the reduced non-manufacturing activities and the related human resources background make transition difficult, especially for subcontractors, the post-millennium experience and the risk of exclusion from production networks has channelled industry players towards *diversification strategies.* As part of this, more and more of them began to engage in the development of *own products* and the building of brands. Not only textile, clothing, leather and footwear companies are involved in this restructuring, but – in line with the consumer-driven nature of the industry [73] [74] – traders, or – through the so-called designer brands – also fashion design companies.[75] Attempts to identify Hungarian brands and examine their general characteristics were made by Kalmár (2018) in the

72 Molnár E. (2017): A félperiféria szerepe az élőmunka-igényes ágazatok globális értéktermelési hálózataiban. (The role of the semi-periphery in the global production networks of labor-intensive industries.) *Territorial Statistics* (57) 4: pp. 436–464.

73 Bertram, H. (2008): Local customers – global buyers: Der deutsche Schuhfachhandel zwischen den Fronten. Geographische Rundschau (60) 9: pp. 20–27.

74 Fernandez-Stark, K. – Frederick, S. – Gereffi, G. (2011): The Apparel Global Value Chain. Economic Upgrading and Workforce Development. Duke Center on Globalization, Governance & Competitiveness.

75 Eifert K. N. (2020): A cipőipar helyzete Magyarországon. Magyar cipőpiac és a magyar designer cipők. (The situation of the footwear industry in Hungary. Hungarian shoe market and Hungarian designer shoes.) Thesis, Moholy-Nagy University of Arts.

footwear industry,[76] and Máté (2019)[77] in the clothing industry. The former collected 63 footwear brands and the latter 348 clothing brands. Analyses showed a spectacular increase in the number of branding attempts in the late 2000s and early 2010s, especially for clothing products. The identified trends make it clear that structural transformation in the TCLF sector cannot be captured by industry data alone, as a significant part of performance linked to functional upgrade is reflected in the statistics of other segments of the value chain. On the other hand, first and foremost in the *fashion industry*, it is important to highlight the importance of perceptible efforts aimed to strengthen the relationship between product and brand development and the domestic production base. From this point of view, there are significant potentials in the cooperation between the Hungarian Fashion and Design Agency, built from the side of fashion designers, and the Hungarian Association of Light Industry, which represents the manufacturers' side.

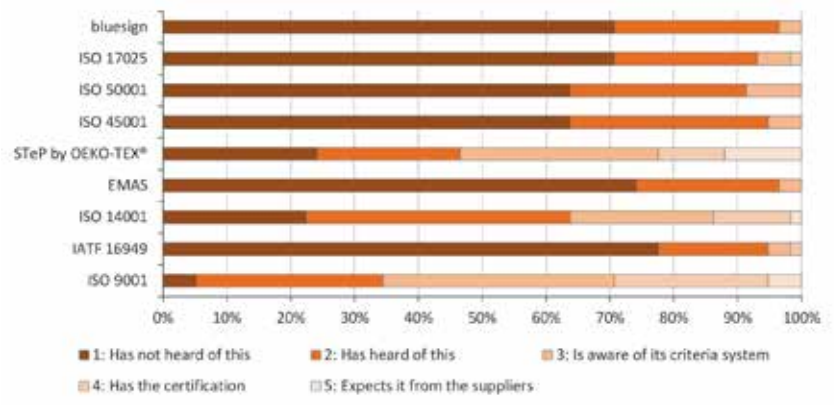


Figure 32. Awareness and prevalence of management system certificates among respondents; source: MKSZ (Association of Hungarian Light Industry)

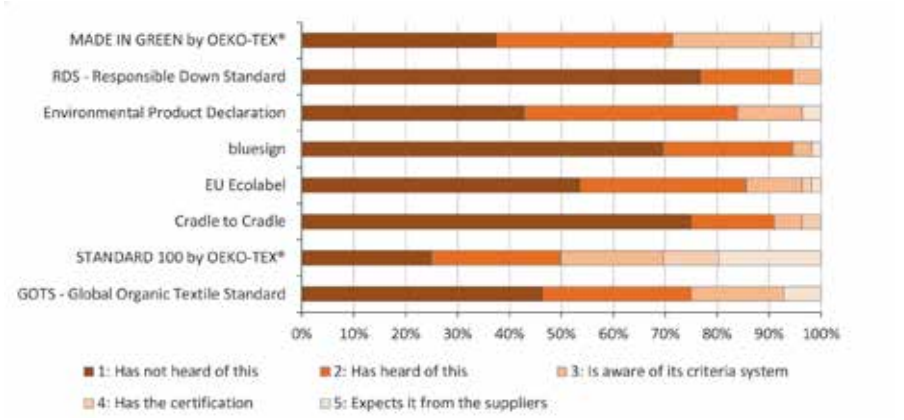


Figure 33. Awareness and prevalence of product certifications and ratings among respondents; source: MKSZ (Association of Hungarian Light Industry)

76 Kalmár E. M. (2018): *A kreatív gazdaság elemeinek megjelenése a magyar iparban, a cipőgyártás példáján.* (*The appearance of the elements of the creative economy in the Hungarian industry, on the example of shoe production.*) Thesis, University of Debrecen.

77 Máté M. (2019): *A textil és ruházati ipar szerkezetváltozásai Magyarországon: a "kreatív fordulat" esélyei.* (*Structural changes in the textile and clothing industry in Hungary: the chances of a "creative turn".*) Diploma thesis, University of Debrecen.

As was mentioned above, attempts by light industry players excluded from former labour division systems to open up to market segments with *higher entry barriers* can help improve longer-term competitiveness and, at the same time, their position in international production networks. Management systems relevant from the point of view of production organization and certificates that qualify manufactured products can contribute to this. In both areas, environmental certifications, which are about sustainable production processes (eco-efficiency) and products (eco-branding) as dimensions of the so-called *environmental upgrading* are also becoming more and more part of the related literature.[78]

The MKSZ questionnaire aimed to measure the awareness and prevalence of management systems and product certificates. The *corporate governance* systems known by the highest percent of respondents (N = 58) include the ISO 9001, STeP by OEKO-TEX® and ISO 14001. The proportion of certified companies is almost 30% in the case of ISO 9001, more than 20% in the case of STeP by OEKO-TEX®, and about 15% in the case of ISO 14001 (Figure 32). From the listed *product certificates*, STANDARD 100 by OEKO-TEX® was the best known, where 30% of the respondents (N = 56) had such certificate (Figure 33). At the same time, the sample has distorted reality in a positive direction: the system of relations of INNOVATEXT Zrt., acting as an OEKO-TEX® certification body, played a role in the survey with questionnaires; this may have resulted in the overrepresentation of those with various certificates and those with OEKO-TEX® certification.

The prevalence of the other systems listed was low, and there are several corporate governance and product certification systems of which 70% of respondents never heard. It is important to stress that shifting toward *environmental sustainability* is partly an ethical issue and partly an economic – competitiveness issue, a means that helps reduce price competition and conquer market segments with higher entry barriers. With all this in mind, it is of strategic importance to increase the knowledge available to industry players in this area.

5.4. Social background of the Hungarian TCLF sector

Product and activity restructuring supposes serious (quality) human resource needs. The manufacturing character of the Hungarian TCLF sector is reflected in the proportion of *intellectual employees*: values showing moderate growth, lower than the average of the manufacturing industry, are characteristic throughout the period under review, with significant differences between classes. The share of intellectual employees is particularly low in the subcontracting classes, where, on the one hand, there is a limited presence of non-manufacturing, mainly intellectual functions and, on the other hand, low earning potential: according to subcontracting shoe manufacturers, this activity can "take" approximately 10 percent of intellectual workers.

A significant part of the textile industry presents a higher proportion of intellectual employees: in the non-woven textile and product manufacturing class (1395), the proportion of intellectual employees even exceeds the average of the manufacturing industry (Table 5).

78 De Marchi, V. – Di Maria, E. – Micelli, S. (2013): Environmental strategies, upgrading and competitive advantage in global value chains. *Business Strategy and the Environment* (22) 1: pp. 62–72.

The decline in *full-time employment* is stronger in the textile and clothing industry, but there is a significant difference within these subsectors. This is clear from the rehabilitation employers' industry registers: where these actors are more present, the rate of full-time employment is lower. This effect is clearly illustrated by the values of the manufacture of made-up textile articles (except apparel) (1392) and manufacture of workwear (1412) classes, accompanied by a significant change in the number of employees. This is thought to be caused by switching by a *rehabilitation employer* between industries (Table 5).

In addition, the *re-employment of pensioners* due to acute labour shortages could also lead to a decline in full-time employment rates.

Table 5. Occupational structure in the Hungarian TCLF sector, by class, data source: KSH (Hungarian Statistical Office)

	Intellectual employees (%)						Full-time employees (%)					
	2000	2004	2008	2012	2016	2019	2000	2004	2008	2012	2016	2019
13	**15**	**13**	**15**	**15**	**14**	**20**	**89**	**79**	**69**	**64**	**58**	**89**
1310	13	13	15	16	18	19	93	89	97	97	96	96
1320	18	15	20	22	14	14	91	92	97	94	96	98
1330	23	19	21	24	16	26	95	90	90	78	88	79
1391	22	16	31	17	16	20	0	87	83	79	82	91
1392	11	9	13	13	12	20	91	74	52	48	42	86
1393	15	21	17	16	13	23	96	41	90	64	81	59
1394	15	16	20	23	11	17	98	91	90	91	91	96
1395	25	23	25	29	30	31	98	98	94	91	93	94
1396			46	24	16	16			88	93	89	96
1399	19	19	20	19	15	25	97	82	84	71	76	79
14	**10**	**10**	**10**	**10**	**12**	**13**	**91**	**85**	**83**	**83**	**72**	**61**
1411	8	11	13	11	14	17	95	90	81	78	78	81
1412	9	9	10	11	9	13	86	67	77	72	62	34
1413	10	11	11	10	13	13	91	85	84	84	69	65
1414	9	8	9	10	12	12	96	94	91	89	86	87
1419	11	11	11	12	14	17	83	82	72	83	79	79
1420	19	9	13	13	14	16	93	87	83	65	79	69
1431	10	9	11	10	16	23	95	92	88	75	74	85
1439	10	9	8	8	10	10	84	68	71	73	63	57
15	**10**	**11**	**13**	**10**	**11**	**14**	**94**	**88**	**89**	**87**	**92**	**92**
1511	14	13	13	13	16	24	95	93	95	94	80	71
1512	10	13	17	14	13	18	88	83	93	93	98	94
1520	9	10	9	9	9	11	95	89	86	85	87	91
CB	**11**	**11**	**12**	**12**	**12**	**15**	**91**	**84**	**81**	**78**	**73**	**75**
C	**21**	**21**	**22**	**25**	**26**	**29**	**96**	**94**	**93**	**91**	**92**	**93**

CB: Manufacture of textiles, wearing apparel, leather and related products; C: Manufacturing.

The textile, clothing, leather and footwear industries typically *employ women*: this is also supported by a questionnaire survey conducted by the Association of Hungarian Light Industry (MKSZ), where more than 90% of the respondents (N = 68) stated the dominance of women and 65% the very high proportion of the female workforce, about 75-100%. The

proportion of women in the clothing and footwear industry is also higher than the TCLF industry average. This highlights the importance of the specific challenges for women's employment ("mothers' employers") in this industry, while at the same time, provides an opportunity for industry players to increase their competitiveness in the increasingly intensified struggle for human resources *by satisfying the need for flexible employment needs of women with families.*

Regarding the age structure of those employed in this industry, relatively few respondents provided precise answers: based on data from 39 respondents, the dominant role of the 30-45 age group and the 45-60 age group can be assumed in the industry. However, about one-third of the respondents reported that more than 50% of workers were aged 45 to 60 years, which predicts *difficulties arising from generational renewal.* Based on this experience, significant energy needs to be devoted to the industry even in the medium term to ensure the replacement of the aging workforce.

Based on data from 41 respondents, it can also be stated that the largest proportion of the actors involved typically employ *skilled workers and workers with primary school qualification*. It is noteworthy that of the 71 companies responding to the questionnaire item about *training,* 41% did not give any in-house training, 45% did not give any external training during the last three years, and 20 of these companies (28% of the respondents) had no need for any in-house or external training. The other end of the scale is represented by a few (4 – 6%) "hyperactive" actors where more than 50% of the employees participated in both in-house and external training in the last three years. Interestingly, the latter are typically domestically owned, smaller companies: one of them was in the medium-sized category. *Training on environmental protection, circular economy* was given by 20-25% of the companies (N = 70) in the last three years, and more than 40% stated that they planned to do so in the future. The overlap between the two groups of respondents is significant: 16% of the respondents (N = 70) were already involved in environmental training and planned to continue such training. The opposite pole is represented by more than 50% of those respondents who neither implemented nor planned any environmental training. The ratio of the latter seems to be very high in the light of the objectives of our project…

Labor shortage has now become common in the industry: 70% of the respondents (N = 73) named at least one qualification or job where they experienced shortage in recent years, while several respondents listed 4-5 such areas. Shortage phenomena appeared in companies of all sizes, ownership and subsectors, and in all regions. Weighted on the basis of the mentioned frequencies, we present by a word cloud the named areas, of which seamstress and sewer, followed by shoe upper maker, warehouse worker, tailor, weaver, textile machine operator, and in general, skilled worker and technician were mentioned most commonly (Figure 34). This also reflects the *industry composition of the respondents,* the greater frequency of textile and clothing players. Taking into account the proportion of the professions stated by respondents in each subsector to be in short supply, for example, shoe upper makers would be present at least at the seamstress level, as three-quarters of the footwear respondents mentioned this. Labor shortage in this industry is not limited to Hungary in Central and Eastern Europe: in addition to the labour-absorbing effect of more dynamic industries and services as well as the grey economy, light industry actors were also adversely affected by the

intensification of finding employment in Western Europe.[79] [80] It should be added that in the case of Hungary, these effects are compounded by the disadvantages of the unfavourable demographic situation: the number of young people entering the labour market to replace the "Ratkó children" retiring in recent years promises far less workers.

Figure 34. Jobs in which respondents have experienced labour shortages in the past 3 years; source: MKSZ (Association of Hungarian Light Industry)

A survey of the prevalence of *new digital jobs* showed that these innovations had already appeared in the Hungarian industry: the most common new jobs included product manager and trend analyst, which were present in almost 30% of the respondents (N = 73) (Figure 35).

The position of digital marketing expert was most often mentioned (20-25%) in connection with the planned jobs, which can hardly be independent of the restrictive effects of the coronavirus epidemic on traditional sales channels.

From an environmental sustainability perspective, there is an important message about whether companies have an employee responsible for *the environment / sustainability / circular economy*. Experience shows that about a quarter of our respondents (N = 71) employ such a staff member. Larger companies, foreign-owned industry players, textile companies and players in Central Hungary and Transdanubia perform above the group average.

It should be noted that in order to prolong life cycle, it will be necessary to ensure the supply of specialists in the repair of textile and clothing products (artificial weaving, zipper repair, lining change, etc.), by means of organized – mainly practical – training.

79 Kalantaridis, C. – Vassilev, I. – Fallon, G. (2008): The Impact of Internationalization on the Clothing Industry. In: *The Moving Frontier*: *The Changing Geography of Production in Labour Intensive Industries* (ed. Labrianidis, L.). Ashgate, Aldershot England. 149–175.

80 Smith, A. – Pickles, J. – Buček, M. – Pástor, R. – Begg, B. (2014): The political economy of global production networks: regional industrial change and differential upgrading in the East European clothing industry. *Journal of Economic Geography* (14) 6: 1023–1051.

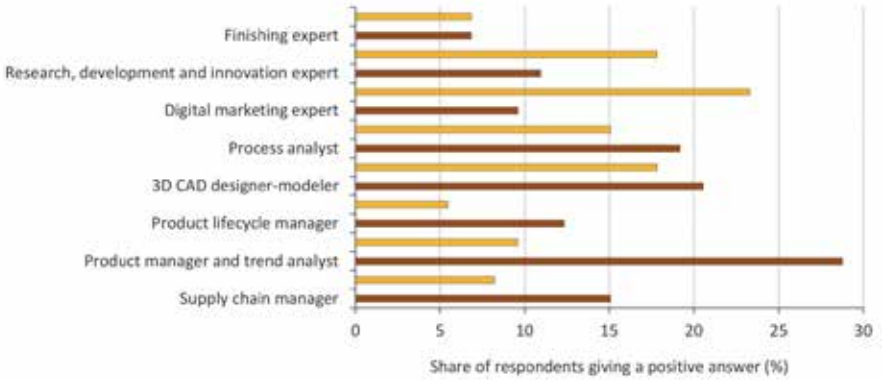


Figure 35. New digital jobs in responding companies (brown: yes; yellow: planning); source: MKSZ (Association of Hungarian Light Industry)

Table 6. Average gross earnings of full-time employees in the Hungarian TCLF sector by subsector and class, as a percentage of the national economy average; data source: KSH (Hungarian Statistical Office)

	Average gross earnings of intellectual workers (as a percentage of the national economy average)						Average gross earnings of manual workers (as a percentage of the national economy average)					
	2000	2004	2008	2012	2016	2019	2000	2004	2008	2012	2016	2019
13	**101**	**83**	**77**	**80**	**80**	**90**	**83**	**81**	**83**	**88**	**89**	**94**
1310	114	98	94	102	102	105	96	89	87	90	91	94
1320	85	83	85	100	108	110	88	97	97	114	121	125
1330	110	67	58	62	58	70	86	82	83	91	79	84
1391	85	54	52	64	60	62	83	70	74	83	85	94
1392	101	82	73	70	71	84	74	68	78	81	83	86
1393	83	78	60	75	84	73	83	85	76	96	97	74
1394	84	49	51	63	78	98	78	70	70	91	93	112
1395	130	118	128	121	108	106	108	109	105	112	100	102
1396			74	79	66	111			82	90	86	94
1399	117	81	67	58	57	64	93	96	76	79	82	75
14	**76**	**63**	**63**	**71**	**66**	**67**	**72**	**67**	**68**	**72**	**74**	**72**
1411	55	54	51	39	50	47	61	55	64	64	70	64
1412	64	60	61	70	53	61	59	64	63	68	69	71
1413	71	61	59	57	61	63	70	65	66	69	71	68
1414	106	71	72	89	80	79	90	73	73	77	80	79
1419	72	58	65	71	71	71	63	63	65	71	75	74
1420	67	39	53	101	38	60	58	56	66	70	67	74
1431	74	59	59	48	52	49	75	75	66	72	70	65
1439	64	66	71	78	75	79	61	68	68	77	78	78
15	**81**	**73**	**73**	**88**	**97**	**93**	**79**	**74**	**74**	**81**	**88**	**83**
1511	82	51	54	65	28		99	77	68	67	61	
1512	102	88	79	115	116	106	84	79	80	90	103	95
1520	77	68	66	69	74	74	77	72	70	77	76	74
CB	**84**	**71**	**70**	**78**	**79**	**81**	**76**	**72**	**72**	**78**	**82**	**81**
C	**130**	**122**	**119**	**131**	**128**	**122**	**112**	**110**	**108**	**113**	**118**	**117**

CB: Manufacture of textiles, wearing apparel, leather and related products; C: Manufacturing.

Earning opportunities result from the product and activity structure of light industry actors. At the same time, they have a significant impact on the future of the industry, as they fundamentally determine the chances of the light industry in the competition for a motivated, skilled and young workforce. In light of this, it is noteworthy that the light industry can still be considered the industry of *"light wages"*: even at a class level, it has hardly any area where gross average earnings are above the national average. The textile and leather sectors have a better position in this respect, while wages in the more labour-intensive clothing and footwear sectors are lower. At the same time, there are differences in the wages of intellectual and manual workers, and there are significant fluctuations year by year. For the whole period under review, it can be stated that the spinning of textile fibres (1310), textile weaving (1320) and the manufacture of non-wovens and articles made from non-wovens (1395), as well as the production of bags and saddlery (1512) stand out from the field. At the same time, it is noteworthy that, apart from one or two seemingly exceptional years, even the average earnings of the best-performing sector did not reach the manufacturing average (Table 6).

Although in the 2010s the employment of temporary agency staff has become more and more widespread in Hungary, this form of employment has not really become typical in the light industry. According to the data of the National Employment Service, in 2018 a total of less than 1,000 temporary workers were employed in the TCLF sector by the 42 contracted employers: this was one of the lowest values in the manufacturing sector compared to the number of employees in the industry. This situation is well reflected in the reaction of our respondents: more than 93% of those who completed this questionnaire item (N = 72) did not employ temporary staff, and the share of such staff was below 10% even in the case of the vast majority of those who stated otherwise.

The employment of *homeworkers* is also less typical: 77% of our respondents (N = 71) did not have such employees. There are no general tendencies in the employment of homeworkers: the overrepresentation of companies based in Central Hungary may be worth mentioning. 85% of the responding light industry companies work *in a single shift*: this may be strongly related to the high employment of the female workforce, who, in addition to running a family, have limited room to work in other work schedules. At the same time, as evidenced by our field experience with leather and shoe manufacturing companies operating in more dynamic areas (Kiskunfélegyháza, Szolnok), a single shift schedule that often offers more room for manoeuvre for household organization or backyard agricultural production can often provide a competitive advantage compared to large multinational companies offering better earning opportunities but working in several shifts. It is noteworthy that among the 15% of respondents working in a schedule other than a single shift, foreign-owned companies, large and medium-sized companies and textile companies are overrepresented. The latter is in line with the observation that within the TCLF sector, the textile industry had the lowest dominance of female employment. In addition, optimizing the utilization of high-value machines specific to the subsector may justify a multi-shift work schedule.

The above-mentioned gross average earnings are typically (in about 60%) based on *working time*. Performance-based pay or a combination of the two approaches seem to be more common for foreign companies, large and medium-sized companies, and rural actors. From *welfare policies / fringe benefits* applied in addition to wages, flexible

working hours and support for travel to work (in addition to legal obligations) are most common: about 65% of the respondents (N = 60) named these two areas from among the options to be selected (Figure 36). Other fringe benefits, this time listed without weighting, include: discounted product purchase, joint trips and other events, Christmas gifts, baby packages for children, summer camp for children, Santa Claus gifts, funeral support for deceased relatives, as well as legal and social assistance, Széchenyi ("SZÉP") card, bonus salary supplement / production commission, as well as training and supply of vitamins.

The *improvement of working conditions* also appears to be an important aspect in the light of responses. From the examples listed in the relevant item of the questionnaire, most respondents mentioned air conditioning equipment and mineral water / soda water options: among the respondents (N = 63), the frequency of these two measures to improve working conditions was close to 70%. In addition to the other ideas listed in the question as examples (LED lighting, ergonomically designed work equipment / workplace), a number of measures were highlighted. Examples include an equipped kitchen, a buffet, a renovated social block, quality changing room, coffee, tea and milk supply, listening to the radio and music, WIFI use, as well as a dust extractor, sound-absorbing covers, quality workwear or LED monitors, and providing protective glasses for those using monitors. Some employers provide one meal daily, or ice cream or fruit to the employees, while others provide a bicycle storage facility for the employees.

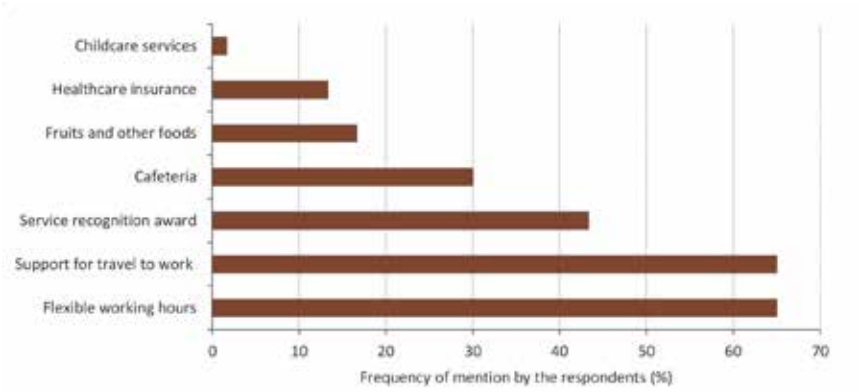


Figure 36. Different forms of welfare policy / fringe bene fits applied at the responding companies; source: MKSZ (Association of Hungarian Light Industry)

It should also be mentioned that despite the various welfare measures and measures to improve working conditions, 83% of the respondents (N = 71) never had a *trade union* and only 13 percent currently have employee representation. Among the latter, large companies and foreign-owned companies are overrepresented. This can be related on the one hand to the size of the companies and on the other hand – in some cases – to their history before the change of the regime: in several cases, an established trade union structure was inherited by foreign owners. The incidence of *collective agreements* lags behind even that of the trade union organization: 94 per cent of the respondents (N = 65) do not have or have never a collective agreement, while only 3 per cent (a domestically owned medium-sized and a foreign-owned large company) has such document currently in force. The *weakness of organization on the employee side* can be a significant barrier to industry efforts based on employer-employee collaboration.

The questionnaire survey covered the awareness and prevalence of *social responsibility / ethical production certificates.* Among our respondents (N = 60), STeP by OEKO-TEX – Sustainable Textile and Leather Production certificate was the most well-known. 75% of the respondents had at least heard of this, 45% were aware of its criteria system, more than 20% had the certification, and 10% stated that they also expected it from their suppliers.

Similar to environmental issues, social sustainability also appears to be an ethical and competitive issue at the same time: the industry needs a young, skilled and motivated workforce to be able to successfully adapt to the challenges and to change its product and activity structure, which is a condition for its long-term survival. With the increase of labour shortages and the further intensification of competition for labour, and the increase of the "positional power" of the labour force[81], only an industry with attractive prospects has a chance of survival. Of the "low" and "high" pathways of competitiveness based on low-cost production and higher value added, respectively, only the latter has a longer-term future in Hungary: *the economic and social side of upgrading*[82] cannot be separated.

5.5. Territorial dynamics and cooperation systems of the Hungarian TCLF sector

The shrinkage of the industry after the turn of the millennium also had a significant impact on its geographical conditions. The decline of employment in the industry *varies by region*: while in 2019 the number of employees in the TCLF sector was 30% of the 2000 value at national level, in Szabolcs-Szatmár-Bereg and Jász-Nagykun-Szolnok county, which stand out from the field with a below-average decline, this figure was 80% and 62%, respectively. Regionally, the employment in the industry decreased the least in Central Hungary, while in Eastern Hungary and, especially in Transdanubia, the industry suffered higher losses. This anomaly can be explained by companies *registered in Budapest* that have a significant part of their activities performed in rural sites, which contribute to the overvaluation of the capital and the undervaluation of rural areas. This shrinkage *increased the concentration of the industry*: while in the early 2000s, the five largest employing counties had 47-48% of those employed in the TCLF sector, this value increased to 56% by 2019, mostly due to continuous growth. In 2010, there was a sharp increase in the divergence of the spatial pattern of the TCLF sector from the manufacturing sector as a whole: the growing weight of the eastern and southern counties suggests that the industry was more capable of clinging at the periphery, while it is disappearing from more dynamic regions.

The *weight of the TCLF sector in the local economy declined*: at the turn of the millennium, it was around 35-40% within the manufacturing industry, while employment rates representing 10-15% of the total economy also occurred at a county level; in 2019, the peak within the manufacturing industry was between 15-20%, and around 3-4% for the economy as a whole. In addition to Tolna county, which was at the forefront at both times, this ratio was higher in Vas county at the turn of the millennium, and in Szabolcs-Szatmár-Bereg county and Jász-Nagykun-Szolnok county at the end of 2010's (Figures

81 Smith, A. – Pickles, J. – Buček, M. – Pástor, R. – Begg, B. (2014): The political economy of global production networks: regional industrial change and differential upgrading in the East European clothing industry. *Journal of Economic Geography* (14) 6: 1023–1051.

82 Barrientos, S. – Gereffi, G. – Rossi, A. (2011): Economic and social upgrading in global production networks: A new paradigm for a changing world. *International Labour Review* (150) 3-4: 319–340.

37-38). This territorial restructuring can be clearly observed in the light of the *location quotient* values. The location quotient values show how much more or less weight a sector has in the economy of the given county compared to the national economy as a whole. While the values of the location quotient of Vas and Tolna counties stood out from the field already at the turn of the millennium, the data of Szabolcs-Szatmár-Bereg and Jász-Nagykun-Szolnok counties have increased over the last two decades. Today, in the light of the location quotient data of the four counties, the share of the industry in local employment in these areas is usually 3-3.5 times the national average. The exclusion of the TCLF sector from the more dynamically restructuring regions can be seen in the whole of Central and Eastern Europe: while the north-western regions are the engines of the region's re-industrialization, the *greater role of light industry in the manufacturing industry is characteristic* in the *eastern and south-eastern peripheries*.[83]

With the shrinking of the industry, the *number of light industry centres with large and medium companies has also decreased*. A total of 93 such settlements, including Budapest, remained by 2019. In the leading counties, including Szabolcs-Szatmár-Bereg, Tolna, Bács-Kiskun and Vas counties, their number was 9, 8, 7 and 7, respectively. After Budapest, most companies were seated in Nyíregyháza, Szolnok, Győr and Szombathely. However, apart from the capital city, which is home to 18 companies, there were no settlements in Hungary where the number of large and medium-sized companies in the TCLF sector exceeded 5. *Textile and clothing industry can be linked to larger settlements,* similar to leather and footwear manufacturing. According to our 2017 surveys, about 25% of those in the former industry and 40% of those in the latter industry were employed in settlements with a population of less than 15,000. *Settlement-level data on occupational structure* are only available from the data series of the 2011 census: these show that the TCLF sector can be considered a serious employer in several small towns, mostly in peripheral areas. The share of the textile and clothing industry was around 10-12% in the case of Szeghalom, Vésztő and Komádi, the share of leather and footwear production was almost 20% in Csenger, 15% in Martfű and 10% in Tiszaföldvár.[84]

83 Lux G. (2017): *Újraiparosodás Közép-Európában.* (Re-industrialization in Central Europe.) Dialóg Campus Kiadó, Budapest – Pécs.

84 Molnár E. (2018): A zsugorodás térbeli anatómiája: élőmunka-igényes iparágak földrajza az ezredforduló utáni Magyarországon. (The spatial anatomy of shrinkage: the geography of labor-intensive industries in Hungary after the turn of the millenium.) *Tér és Társadalom* (32) 2: 41–60.

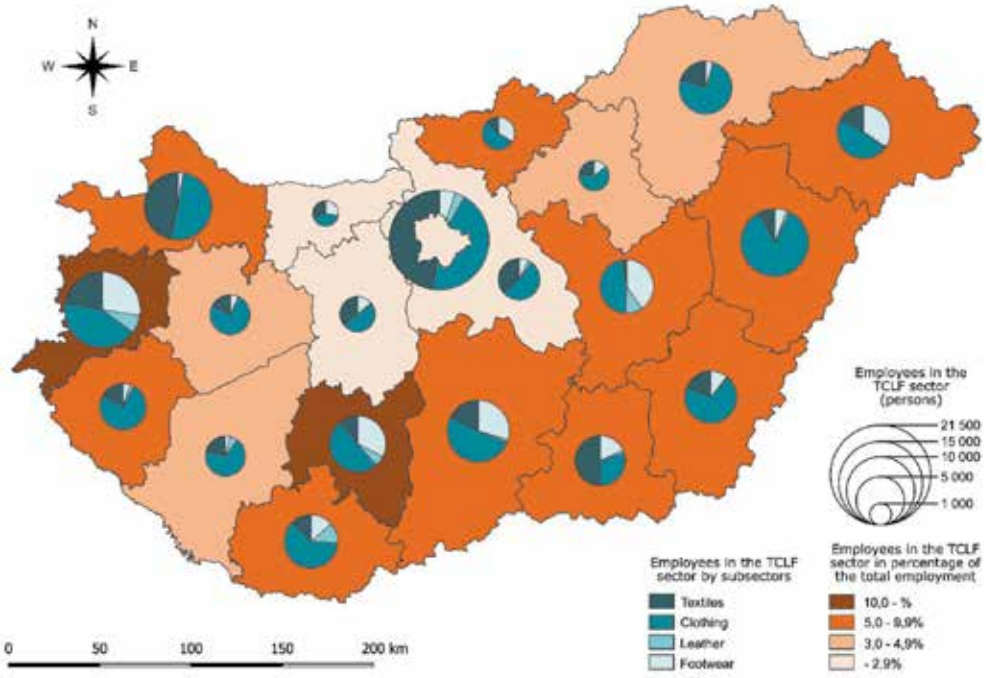


Figure 37. Spatial inequalities and internal structure of employment in the TCLF sector (2000); data source: KSH, the figure was edited by M. Mészáros

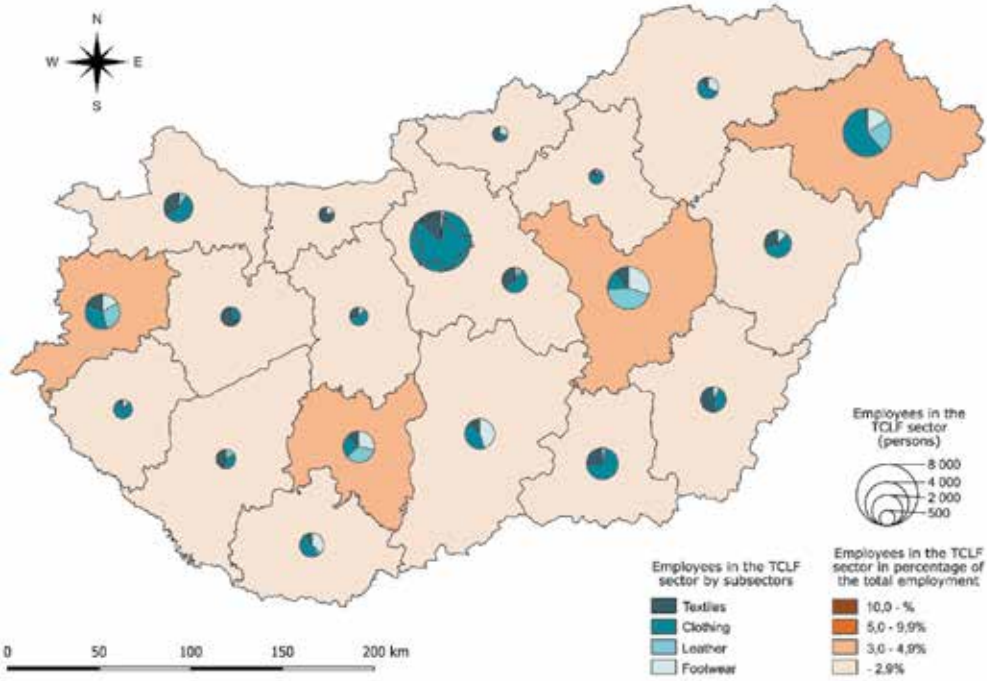


Figure 38: Spatial inequalities and internal structure of employment in the TCLF sector (2019); data source: KSH, the figure was edited by M. Mészáros

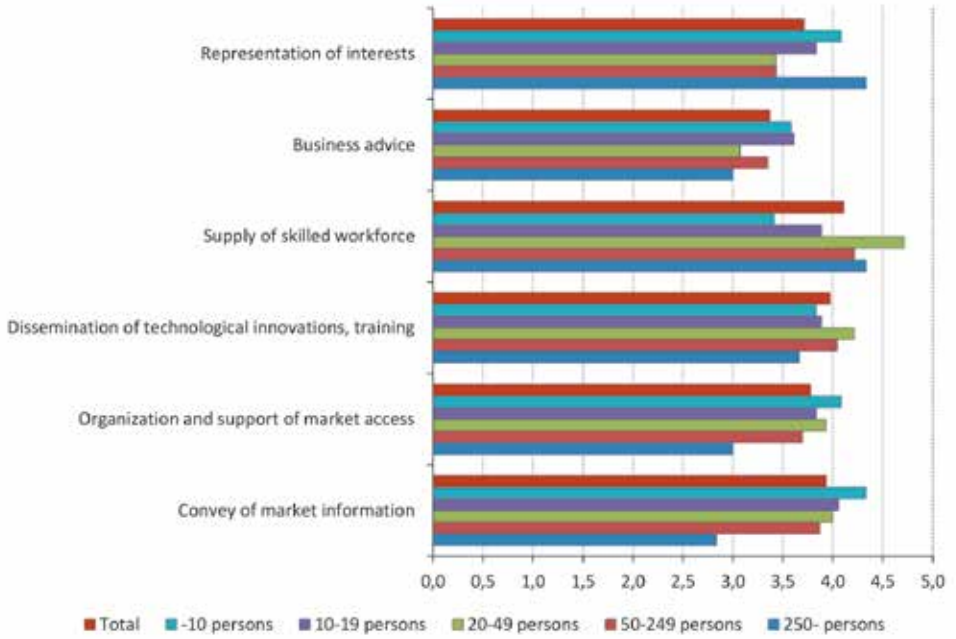


Figure 39. How and to what extent could an industry-wide professional organization effectively help your company? (average scores based on the size – employee number – of the respondents); source: MKSZ (Association of Hungarian Light Industry)

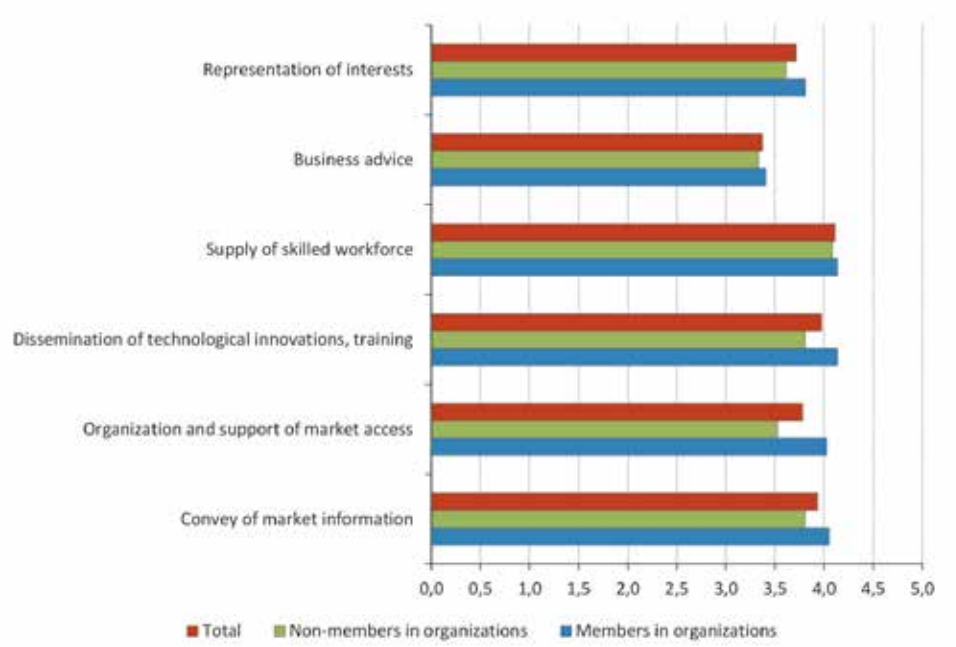


Figure 40. How and to what extent could an industry-wide professional organization effectively help your company? (average scores based on the respondents' organizational membership); source: MKSZ (Association of Hungarian Light Industry)

Shrinking critical masses are unfavourable from the point of view of *cluster-focused economic development efforts* relying on geographically based collaborations. Although our field experience among leather and shoe manufacturers has shown that *vertical relations* and *horizontal cooperation* along value chains occur almost everywhere, on the one hand they generally go beyond the narrower regional boundaries, and on the other hand they can rarely move to the level of institutionalized cooperation. There were some formalized cluster organizations in the textile and clothing industry (Southern Great Plain Textile Industry Cluster, Pannon Textile-Clothing Industry Cluster, Pécs Glove Cluster), but their operation did not last too long. There were only few responses to the questionnaire item about whether companies had any cooperation with other companies engaged in or outside the industry, going beyond market relations, in the last three years. A small fraction of the respondents (N = 30) answered yes to this question: the term 'cluster' was mentioned in only one place, and two or three respondents mentioned informal collaboration. Education and research collaborations were also on the not-too-long list, while one respondent mentioned joint development projects with suppliers. In comparison, more than half of the respondents (N = 73) stated positively that they were a voluntary member of the competent regional chamber of commerce and industry, and similarly, more than half were or are members of one of the major national industry organizations. The related list includes the Association of Leather and Shoe Industry (BCE), the Scientific Society of the Leather, Shoe and Allied Industries (BCBTE), the Hungarian Association of Light Industry (MKSZ), the Association of the Hungarian Fur Industry (MSZBSZ), and the Hungarian Society of Textile Technology and Science (TMTE), the Textile Cleaning Association (TTE) and the Textile and Clothing Industry Section of the National Association of Entrepreneurs and Employers (VOSZ). The most frequently named organizations in the answers to the supplementary question (N = 37) were TMTE (48%), MKSZ (18%) and VOSZ (18%), which reflects the overrepresentation of textile and clothing companies in the sample.

The picture outlined on the basis of the answers is most probably more favourable than the real one, as it was the companies that have been open in connection with filling in the questionnaire which confirmed their willingness to cooperate and organize. As was mentioned above, the weakness of the organization of the employee side impairs the effectiveness of the cooperation of the social partners; this is also true for the employer side. Still, there seems to be some leeway in *improving the level of organization of the industry*, as basically positive feedback was given to the question about the supporting role of a professional organization covering the industry as a whole (N = 73). Above-average ratings were obtained in all the areas listed: the most critical areas included the supply of *skilled workforce*, the dissemination of *technological innovations*, training, and the convey of *market information*. This is where most of the respondents see the possibility of effective external assistance to their company by a professional industry organization.

It is noteworthy that the preferences are somewhat different based on the *company size of the respondents*: the lack of a skilled workforce, for example, is primarily a problem for large companies, while the convey of market information is most important for micro-enterprises. There is little difference between the ratings of the companies when they are grouped according to which one is or is not a member in different professional organizations.

Based on the results, *outsiders can also see an opportunity* in external support for their activities: the difference between the two groups of members and outsiders is the smallest in terms of the supply of a skilled workforce, identified as the most serious problem overall (Figures 39-40).

5.6. Effects of the coronavirus pandemic

In 2020, the light industry could not avoid the economic recession caused by *coronavirus epidemic* either. It is clearly seen from the monthly *production volume indices* available up to September that the spring halt in the manufacturing industry, and within this the textile, clothing, leather and footwear industry led to a marked decline in the same two months (April and May) compared to the same period in 2019. The light industry was slightly more affected, while in the light of the summer and early autumn data, the recovery of the industry seems to be slower compared to the manufacturing industry as a whole. In both July and August, several sectors produced poor results, while the bags and belts class, the largest producer of production value (1512) was one of those experiencing the biggest decline and slowest recovery, as can be seen in leather and footwear production as a whole. Also, the decline in production entailed more serious *employment effects* in this subsector, but interestingly, of the two dominant employment classes, it is not the production of bags and belts with weaker production dynamics, but the production of footwear (1520) which is in a poorer situation. While footwear production is by far the largest employer among the classes with a significant decline in employment, it is noteworthy that its employment indicators declined compared to the previous year already before the halt, and the decline in the number of employees exceeded the decline in production during the crisis. The question to be answered is whether or not this is a process of long-term restructuring and employment decline embedded in the coronavirus situation. It is noteworthy that in the light of both production and employment data, there are certain classes that have not really been affected by the crisis.

The questionnaire survey conducted in September and October helps us better understand the *effects of the coronavirus pandemic.* Our respondents (N = 60) provided information about *what percentage of their pre-pandemic sales revenue their company was able to achieve.* The responses were strongly varied between the four possible categories. While one-fifth of companies had sales below half the pre-crisis level, slightly more than one fifth said their sales had reached or exceeded the pre-pandemic levels. Overall, more than half of the respondents reported rates between 50-100%. In the light of their assessment, the coronavirus pandemic appears to have had a more serious effect on micro and small enterprises, domestically owned enterprises, footwear companies and players registered outside the industry, as well as enterprises based in Central Hungary.

It is important to note that the responses of those who completed the questionnaire probably paint a more favourable picture than the real one here as well: companies struggling to survive may have shown a lower willingness to respond. However, remaining in this circle, it can be seen that many companies have already used one of the *rescue options offered by the government*. More than half of the respondents (N = 73) requested some form of government support. By far the most of them, 40% of the respondents, mentioned job protection support, but nearly 10% each mentioned the use of tax reliefs or preferential loans. At the time of completing the questionnaire, almost

half of the respondents planned to later apply for some of the support options offered. Here, investment support and tax reliefs were the most popular options (mentioned by more than 20% of the respondents each), but preferential loans, online training, and job protection wage subsidies were also frequently mentioned (Figure 41).

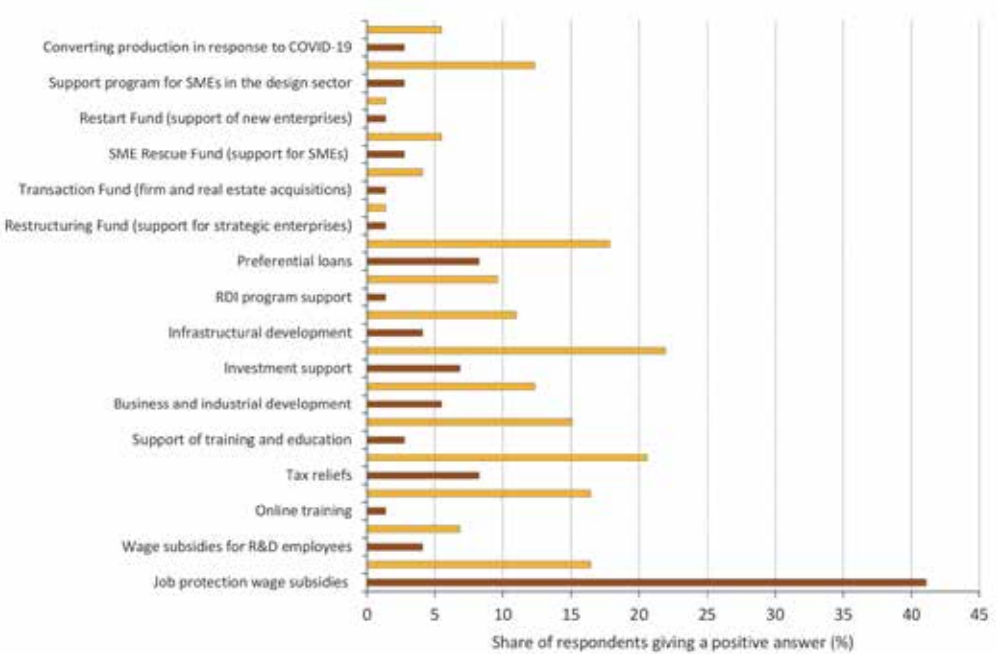


Figure 41. Opportunities already used or planned to be used by the respondents, offered by the government's economy protection action plan (brown: already used, yellow: plans to use); source: MKSZ (Association of Hungarian Light Industry)

It is difficult to judge the l*onger-term effects of the coronavirus pandemic* on the domestic development of the industry. In fact, structural changes in the global economy were already visible in the 2010s, which may have a serious impact on the development of the highly globalized production networks of the light industry in the future. One such factor is the *slowdown of globalization* (slowbalization), which can be linked to protectionist efforts and reindustrialization goals that have intensified in the wake of the 2008 economic crisis. The other challenge is the impact of *new technologies* (digitization, e-commerce) reshaping production networks.[85]

Both trends may be intensified by the pandemic. The more flexible operation *of global production networks* and the (re-appreciating) ability to produce domestically certain basic goods may lead to an increase in the role of European production (reshoring, nearshoring). The digitization of industry can also help this by reassessing the role of various deployment factors in the selection of the site, such as labour costs, which are particularly important for labour-intensive industries. On the other hand, during the coronavirus pandemic, there was an increase in presence in the virtual space, in the importance *of online sales channels,* which was also recognized by the respondents

85 Coe, N. M. – Yeung, H. W. (2019): Global production networks: mapping recent conceptual developments. *Journal of Economic Geography* (19) 4: 775–801.

to our questionnaire. In the future, the use of the tool can be expected to become more widespread among domestic industry players, which will not only present a solution for the restrictions imposed during the pandemic, which adversely affect the traditional forms of trade, but can also increase the *internationalization* chances of small and medium-sized enterprises with serious resource constraints, aimed to expand beyond the rather narrow domestic markets.

5.7 Summary

The Hungarian light industry faced serious challenges after the turn of the millennium, which was mainly due to the increasing globalization of the industry and the rising costs of local production. As a result of the changing circumstances, it has become increasingly excluded from the typically European production networks that it had joined in the socialist era, which played a major role in the survival of industry players after the political transition. The relocation of production to low-cost regions has led on the one hand to the liquidation of certain foreign subsidiaries, and on the other hand to a decline in the subcontract orders of domestic enterprises, a substantial decline in production and (especially) employment, and an increasing fragmentation of industry enterprises.

However, the negative trends have not affected the different subsectors and sectors to the same extent. While price-competitive mass production, often carried out in the form of subcontracting, has suffered great losses in segments exposed more strongly to globalization, a trend of appreciation can be observed in products produced in regional networks, better protected from low-cost site competition, technological and functional products less dependent on wage costs, and products that focus on different niche markets. The internal structure of the industry has undergone major changes, which is primarily reflected by the relative strengthening of the leather and textile industries, the automotive leather production with above-average in the leather industry gaining weight, and the intensification of own product development and branding efforts, mostly seen in the clothing and footwear industry that has suffered major losses. In this context, the environmental upgrade promoted by the project can also be interpreted as a means to enter less attacked market segments with higher entry barriers.

The situation of the Hungarian TCLF sector is typical for most economies in Central and Eastern Europe (and Southern Europe). At the same time, a characteristic feature of the Hungarian light industry is that all four subsectors (textile, clothing, leather and footwear) have retained their relative importance: as a result of structural changes, the balance of power between the subsectors has become more even. A less positive phenomenon is that the Hungarian light industry has lagged behind most neighbouring countries in terms of factor intensity: based on the labour productivity and labour costs of the textile, clothing and footwear subsectors, at most Romania and Bulgaria can be ranked lower in the European Union. Although in the leather industry there has been a shift between industries / value chains (by joining automotive production networks), a significant upgrading can be observed, but on the one hand it is a highly asymmetric process (more spectacular in terms of labour productivity than labour costs), which demonstrates the exploitation of the possibility of cheap production also at this higher level, and on the other hand it strongly depends on the performance of some large foreign companies that are slightly embedded in the domestic economy.

Light industry is characterized by the dominance of women's (physical) employment. Employers endeavour to compensate for low wages coupled with monotonous, stressful work by fringe benefits, welfare measures, and more flexible employment conditions. At the same time, the attractiveness of light industry professions among young people is low: with the retirement of older generations, despite the shrinkage of the industry, labour shortages have now become common. Low rates of full-time employment are associated with the frequent employment of mothers with small children, pensioners and people with disabilities. The age structure of those working in the industry shows strong aging, so the further exacerbation of labour supply problems can be expected in the medium term. Although it would be required for upgrading, a significant proportion of employers are not really active in training their employees. The future competitiveness, environmental and social sustainability of the light industry are interlinked: a change in the structure of products and activities (the improving image of the industry) is both the condition for and an expected consequence of the employment of a skilled and motivated young workforce.

The shrinkage of the light industry is accompanied by the industry's displacement to more peripheral regions and, at a national and regional level, by the narrowing chances of creating critical masses. While at the turn of the millennium there were still counties where 10-15% of those employed, and 35-40% of those employed in the manufacturing industry, were linked to the TCLF sector, today this industry does not play a prominent role in the counties where its most significant footholds have remained. Not only does this adversely affect the opportunities for advocacy, but the potential benefits that can be gained from the networking of the fragmented industry players are also fading away. All this is further strengthened by the fact that there are hardly any local-regional light industry organizations in Hungary that operate in an institutionalized form. With the shrinkage of the light industry as a whole and the weakening of its local concentrations, a need necessarily arises to bring together the various subsectors and organize them at a national level.

Despite the challenges listed, the *Hungarian TCLF sector also has numerous strengths,* on which the future of the industry can be built:

1. Serious industry traditions, significant professional culture.
2. Remarkable adaptability-learning ability.
3. Large-scale international embeddedness, outstanding export orientation.
4. The relatively balanced importance of the 4 subsectors of the TCLF sector.
5. Intensifying industry organization efforts at different points in the value chains.
6. Central East European (central) location enabling flexible production.

Closing remarks

We would like to express our thanks for the support awarded to us in the Széchenyi 2020 program funded by the European Social Fund (ESF), which has made it possible to prepare this publication in both Hungarian and English, as well as a number of sector-specific studies that fill a gap and have formed the basis of this publication.

Special thanks to the management of CALIDA Magyarország Kft. and UNICON Zrt., as well as to the companies participating in the questionnaire survey for their cooperation, answers and presentations that have contributed to the high-quality implementation of the project and the preparation of the studies.

The leading professional organizations of this sector continue to be committed to ensuring that the companies in the sector represented by them can find the right answers to any new challenges and continue to develop, by flexibly adapting to market changes.

For a sustainable and circular economy
in the textile, clothing, leather
and footwear (TCLF) sector.
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