

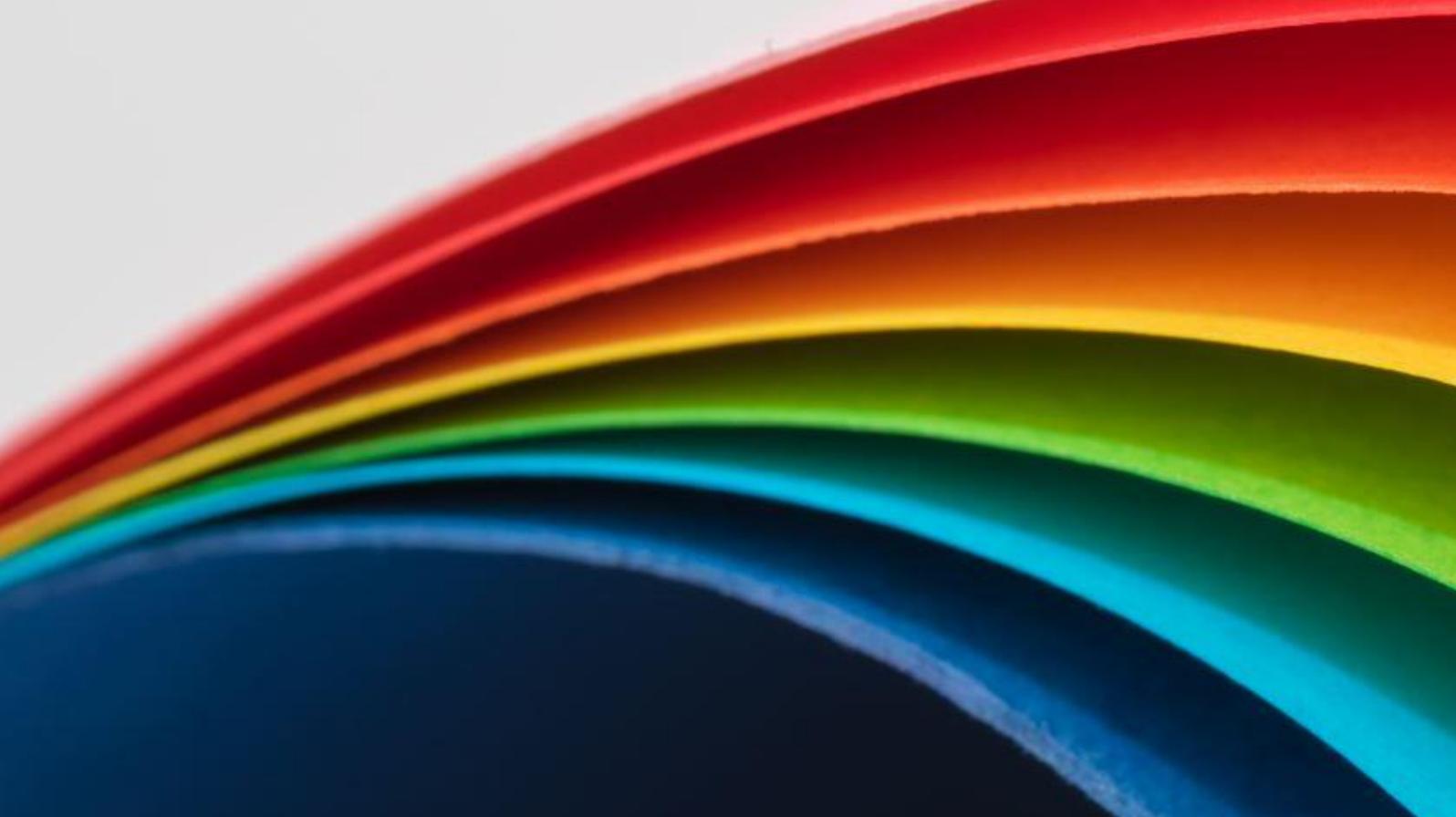


Ministry of Foreign Affairs

# DEFINING CIRCULARITY OF TEXTILE INDUSTRY IN TURKEY

*Commissioned by the Netherlands Enterprise Agency*

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International.*



DEFINING  
CIRCULARITY OF  
TEXTILE  
INDUSTRY  
IN TURKEY

COLLABORATION OPPORTUNITIES BETWEEN TURKISH AND  
DUTCH MARKETS

About:

This report has been commissioned by the Embassy of the Kingdom of the Netherlands in Ankara and Netherlands Enterprise Agency, RVO.

April 2021

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# 1 PREFACE

**T**extile consumption covers a wide variety of end products ranging from hi-tech synthetic yarns to wool fabrics, cotton bed linen to industrial filters, or medical masks to high fashion. This diversity of end products corresponds to a complex number of industrial processes, structures, and markets in the supply chain. The retail brands and B2B sector is essential for all textile and clothing products sold to the consumers.

The Netherlands has set the goal to have a circular economy by 2050. The government has launched a policy programme which aims to use at least 30% recycled material in new clothing by 2030 and have halved the environmental footprint of the textile sector by 2035.

The Turkey - Netherlands Joint Economic and Trade Commission (hereinafter referred to as JETCO), which was established with “the Declaration Establishment of JETCO” signed in Ankara on June 3, 2014, held its third meeting in a virtual environment on September 28, 2020. The agreement on ‘Collaboration in the transition to a circular economy would bring strategic economic advantages and contribute to a more efficient use of limited natural resources and their commitments to the global sustainability (in reference to UN SDGs commitments) was reinforced and both Sides took note with satisfaction the progress made in the bilateral cooperation supporting the transition towards a circular economy’. More in particular they took note of the successful textile and food circularity collaborations between the respective Turkish and Netherlands businesses, knowledge institutes, NGOs, and government bodies.

As the fifth largest consumer goods market for Turkish goods, initiatives in the area of circular textiles will not only make consumption and production more ‘responsible’ for both parties (SDG12) but also help to strengthen Turkish textiles in EU while creating opportunities for the Dutch and Turkish trade relations.

To serve the purpose, our research commissioned by the Embassy of the Kingdom of the Netherlands in Ankara and Netherlands Enterprise Agency, RVO, ***intends to understand the level of progress towards circularity on textiles in Turkey and hence define the collaborative opportunity areas between the Dutch and the Turkish parties.*** In order to progress the efforts, further verification and strategic planning are necessary as this study serves to give a high-level indication and awareness on the related circular textile topics.

We would like to thank the textile and circular economy experts, brand leaders, producers, business platforms and entrepreneurs we have spoken to, who devoted quality time to reflect on their experiences. We hope the findings are opening the way towards circular textile efforts while creating tangible benefits to all parties participating. We will be happy to serve further and be part of this exciting transformation.

Gulin Yucel  
*Partner*  
Brika Sustainability

## 2 EXECUTIVE SUMMARY

**D**espite all evidence of transgressing the planetary boundaries, no crises could demonstrate better than COVID-19 that our economic models are not resilient. Nothing is more evident than the fact that transition to the circular economy is urgent, requiring systemic change and asking for collaboration.

The textile value chain is one of the most critical intervention points in this fundamental transformation due to its size and economic benefits it offers; despite ripping off environmental and social integrity.

On the other hand, problems of the existing system are opportunities for the future for those who can look into the problems from a systems-thinking perspective, understanding gaps and bringing forward innovative approaches in fast and structured ways.

This report intends to define gaps in the Turkish Textile Market and define collaborative opportunity areas for Dutch and Turkish companies for the circular textile transition. For pragmatic purposes, only the highlights of findings and opportunity definitions are presented in this Report (while the extended Report might be available upon request).

### 2.1 From Linear Inefficiencies to Circular Opportunities

In a market with no definition and boundaries, inefficiencies or inexistence of structures are the potential opportunities. Current inefficiencies cost so much for both the Dutch (or European) Consumer and the Turkish Production markets that it is worthwhile to dig further in order to convert problems into financially feasible (as well as environmentally and socially responsible) business cases. Some of these inefficiencies, as might be found in detail in the report, might be summarised as below:

**Despite material costs are high, recycling is so low for both EU, the Netherlands and Turkey:**

- The cost of raw materials (fibre or yarn) is about 66% of the total cost in garment making; however, only 10% of the raw materials in Europe can be recycled and 9 % can be reused. [4]
- For Turkey's production in textile and clothes, material costs are 33% and 47%, respectively while Turkey is a net Importer for Textile Fibres. [5]

**Inefficiencies are not only in internal (within EU) use. The externalities also matter:**

- Clothing purchased by EU-28 households in 2017 used an estimated 1.3 tonnes of primary raw materials and 104 m<sup>3</sup> of water per person.
- Some 85 % of these primary materials and 92 % of the water were used in other regions of the world, which is highest of all consumption domains. [6]

**These inefficiencies have burdens on the Dutch, EU and Turkish economies:**

- The textile waste in the Netherlands is 2.3% of the Gross Domestic Product (GDP) with over 5.9 kg/person waste each year [7]

- It is estimated that every additional kilo tonne of recycled textiles might create an additional six to seven jobs, making textiles the most job-intensive recycling sector in the Netherlands [8].
- The EU textile sector, predominantly composed of SMEs, produces 60% of value elsewhere (EU Green Deal document) with impact for forgone profit as well as in environmental footprint. The EU imported clothes worth €154 billion in 2019, just over half of which came from non-EU Member States (52%, or €80 billion) [9]
- Production capacity of Turkish Textile and Clothing is lagging behind manufacturing sector average; textile and clothing having a share of 4.8% within Turkey's GDP (Gross Domestic Product) with indirect impact from sectors providing raw materials and induced impact from consumption of sectoral employment [3]. Therefore, any technological capacity regarding improvement in production efficiency and decreasing dependency on raw materials is valuable for Turkish Textile & Clothing.

These indicate that existing consumption and production patterns in need of generating value, where circular textile can be a remedy.

## 2.2 About Textile & Clothing Sector in Turkey

Major strengths of Turkish Textile & Clothing Sector, which are critical for circular textile transformation, can be summarised as below:

- **Industrial Experience and Geographical Advantage:**
  - Turkey is the seventh biggest exporter in the world with USD 9.8bn and 3% share and in clothing, one of the top manufacturers along with China, Bangladesh, Vietnam, India, UK, and Indonesia. Both textile and clothing have positive contributions to foreign trade balance. In 2019, Turkey's textile and clothing exports to the Netherlands are 25%; 4th biggest market for Turkish textiles & clothing (after Germany, Spain and the UK).
  - Turkey's location is within 3000 kilometres for major locations in the Netherlands. Also, there has been positive re-shoring taking place during the Covid-19 pandemic; demonstrating Turkish Textile and Clothing Sector's nearshoring potential exists for Europe.
- **Diverse and Flexible Manufacturing:**
  - Turkey has a robust manufacturing capability with strong infrastructure with continuous energy, technologically advanced machinery, skilled labour force as well as established complementary industries.
  - There is vertical integration on a country base and production from fibre to fabrics and garments on regional / country basis can take place within three production clusters, which is important for circular textile set-up.
  - There is EU fashion understanding based on strong relations with major European brands and producers.
  - Existing R&D and Production Capacity (despite currently used for fast-fashion) is flexible enough to produce on demand.
  - Recycling expertise exists with established recycling production sites for fibre.

- **Socio-economic Contribution and Fair Labour Practices**

- Regarding social aspects, Turkish Textile and Clothing is contributing positively with highest employment capacities within the manufacturing sector (approximately one million people, constituting 7% of registered employees in the social security system and 65% of the registered employment) where 41% are female registered workers (vs 31% of Turkey’s female worker ratio). In theory, attempts to increase trade with textile and clothing in Turkey is helping to improve social indicators, which is important for responsible consumption.
- Existence of social welfare indicators and strict compliance to them is a relative strength area for Turkish Textile and Clothing; which is stated during interviews with the Dutch parties as critical for the Dutch consumers

- **Entrepreneurial Leadership**

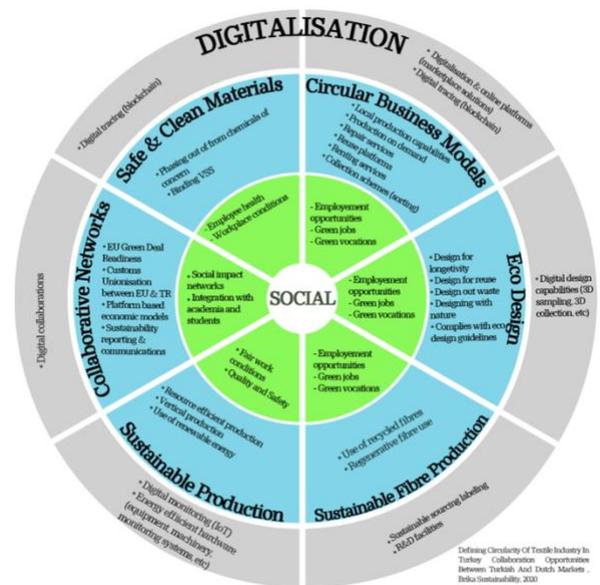
- Turkish Textile and Clothing Sector is a highly entrepreneurial set up, which is critical for such an investment-intensive industry. For circular textile transitioning, this leadership and commitment can be very influential; bringing in the speed and flexibility needed for the success.
- These leaders also have strong ties within Europe and with Turkish Government, which is important when setting up new structures and market definitions around circular textile.

**How far are the players from ‘ideal state textile’?**

In order to assess where the consumption and production patterns for textile & clothing are, a circular framework was used during the interviews with the Dutch and Turkish parties.

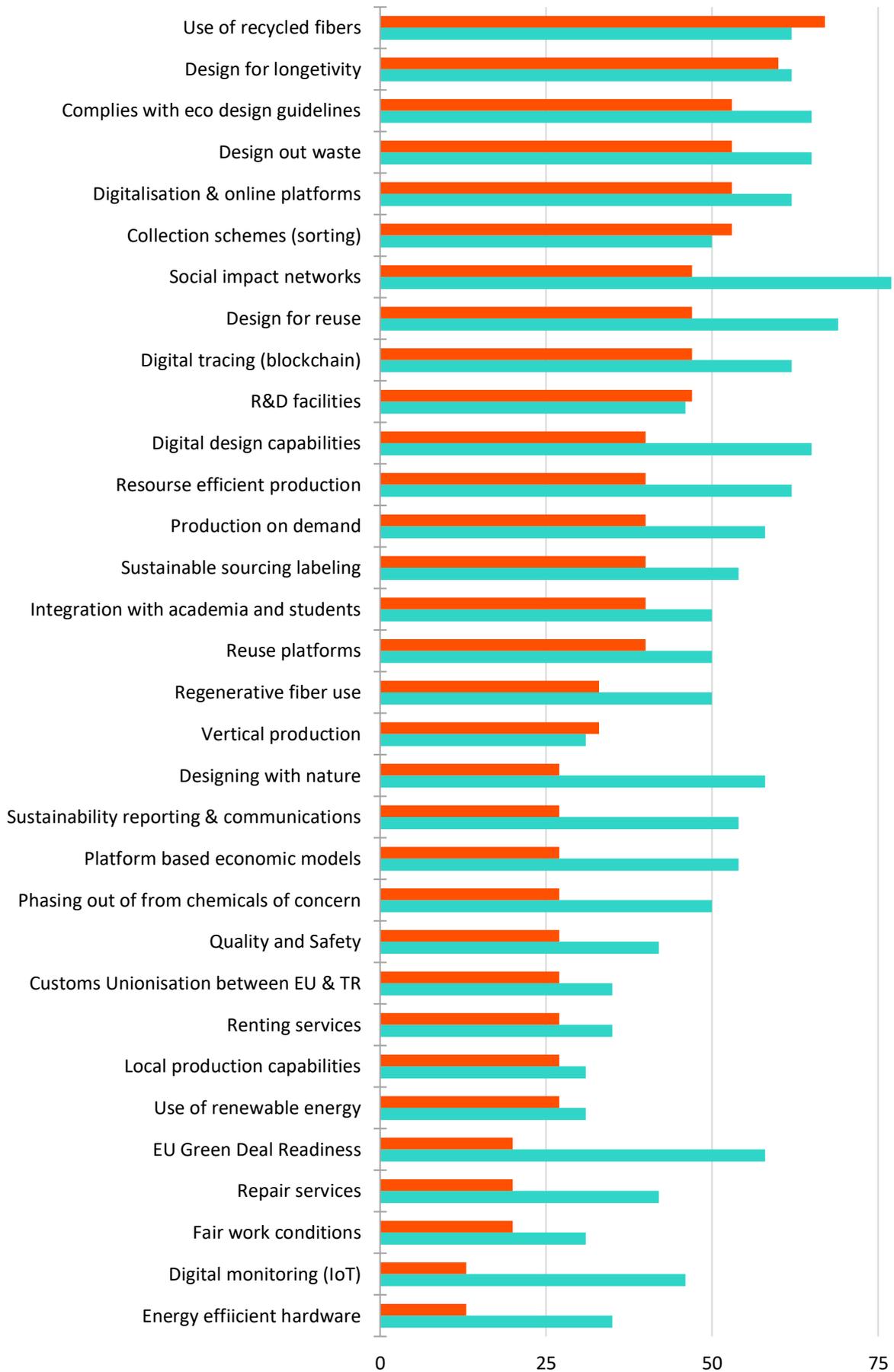
This Circular Textile Framework includes six different pillars; embracing circular economy principles to provide a clear picture of the ‘ideal state textile’. Aim is to make all players to realise that circularity indicators work together.

Findings show a clear linear ‘take, make, waste’ model and there is little sign for a circular pattern in processes and flows as discussed in detail in Chapter 6.1.



**High interest for collaboration exists around the circular textile initiatives**

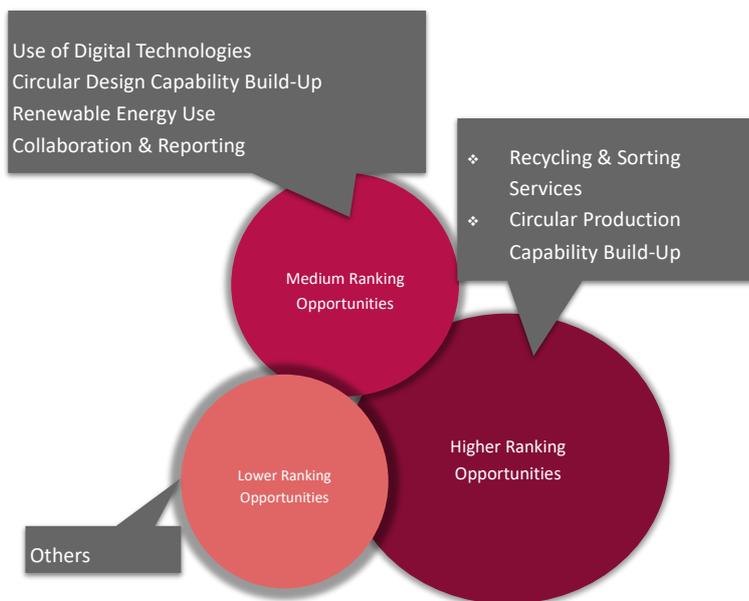
Despite the existing state is a linear textile pattern, both the Turkish and the Dutch parties stated a high level of interest for circular textile initiatives they would like to collaborate. Responses are discussed in detail in Chapter 4.7 and summarised are as below:



In general, there is a high level of interest for collaboration from all parties involved. Circular textile necessities are accepted, despite challenges from transitioning from 'fast fashion'; and opportunities are clearly foreseen for the short and medium term.

Below is the summary of the 'opportunity definitions', which are stated interest areas consolidated under two higher ranking and four medium ranking topics:

## 2.3 Highlights of prioritised opportunities



### 2.3.1 Recycling and Sorting Services:

This is one of the top opportunity areas discussed under this Report. In order to increase recycling rate of textile waste and to reduce the final disposal waste volumes, a recycling process might not be enough as it implies a linear process in itself.

A recycling strategy is needed to include type of fibres, design principles for technical recyclability and a systemic solution on how to bring consumption patterns and sorting into the picture.

Sorting services need to be in place in order to trace goods in their life cycle journey and make use of their value at all stages. Where raw materials are very precious and major cost input (besides energy), there should be utilisation at every possible destination. Further sorting services offer a distinct market definition, non-existent but very promising, for all parties involved.

Some initiatives that can be cited and further discussed in this research are;

- **Establishment of regional hubs for sorting and recycling** (like ReHub Initiative by Eurotex [10] in order to leverage Turkey's geographical advantage for post-consumer sorting and recycling)
- **Reciprocal trade deals with ownership redefined** (like medical clothing and masks)
- **Extension of mechanical sorting capability to Turkey** (like Fibersort or similar technology to be installed in Turkey)
- **Development of chemical recycling** (by involvement of innovative circles and academia), which is an untapped potential (with 1.6 Mt CO2 reduction is projected for 2030).
-

### 2.3.2 Circular Design Capability Build-up:

In order for recycling & sorting to be effective, circular design principles and standards need to be established and accepted among parties (brands, suppliers / producers, other complementary partners). The ecosystem for circular design and consultancy exists strongly among the Dutch parties, as listed in Appendix A and beyond.

Some initiatives discussed in this research are;

- **Design for re-use; Nature-driven design**
- **Farm-to-closet mind set in R&D**
- **Use of cross-industry frameworks, such as gaming and VR**
- **Recyclable zippers & accessories**

### 2.3.3 Circular Production Capability Build-up:

Production capability minimising and finally eliminating input (materials and water) waste, using renewable energy, and terminating use of chemicals of concern (beyond addressed in standards like REACH and ZDHC) are the primary goals underlying the opportunities of this section.

- **Technologies for termination of chemicals of concern in denim and other fabric production (like no-dye fibres or harmless dye)**
- **Technologies for denim washing (that is free of sodium hypochlorite, potassium permanganate and pumice stone and reducing water discharge)**
- **Natural chemicals from farming and forestry ecosystems**
- **Monitoring capability (IoT) for minimising input and energy use**

are among the highly demanded capabilities from the producers.

### 2.3.4 Sustainable Sourcing & Labelling:

In order for circular flows to be established, **tracing and labelling** of materials must be a prerequisite. **Digitalisation** offers immense opportunities for the systems-functioning for all the criteria mentioned in this study.

### 2.3.5 Renewable Energy Capacity Mechanisms:

This is significant as possible impact of an EU carbon-border adjustment mechanism might produce a total tax burden of €120 – 196 million, corresponding to 1.4% of textile exports to the EU. ‘Inclusive finance mechanism and mobilisation of both EU and international funds for supporting the Green Deal globally’, as stated under JETCO, will be critical during this transition. Any financial and technical involvement at this stage is a strong initiative for the Dutch Parties.

### 2.3.6 Platforms for Collaboration and Reporting:

Becoming part of social impact networks and further integration for sustainability communication (including reporting) are also among high-interest collaboration areas from the parties. Regarding Dutch business, the opportunities might be cited as;

- **'Accelerator Role' by established consultancy services**
- **Development of impact measurement methods and standards**
- **Services for measuring the total environmental and social impact of an operation (business model or industry)**

## 2.4 What is the Role for Parties to Achieve Circular Textile Value?

There is a role for both the Dutch and the Turkish Parties as transitioning to circular textile is a complex task, requiring multiple stakeholders working together.

In this journey, there are significant advantages for both the Dutch and the Turkish Parties.

**The Dutch Parties can bring cutting technology, design, innovation capabilities based on experience and established institutions. The Dutch business culture and industry platforms for collaboration might be extended for circular textile. Amsterdam might continue to serve as a global denim centre – for design, products and services that serve circular textile only.**

**Turkish Textile & Clothing is a strong ally for Dutch Parties with its established textile capabilities, dedicated investments and strong infrastructure. Due to strong relationships with European businesses and consumer understanding, combined with the nearshoring advantage critical for close-loop material flows, Turkey is a sound partner for circular business in Europe. High engagement of the textile leaders, as also reinforced with this Research, is a key driver to start immediately.**

Last but not least, circular textile is a challenging but doable. Engagement of all Parties, guided by necessary approaches for transition, will be critical here. The journey must start now.

## 2.5 Guiding Remarks

In order to define existing status in relation to opportunities for circular textile, the approach in this report is as follows:

- **'Circularity Analysis of the Value Chain' (Chapter 4) looks to see where the Dutch and Turkish parties are with regard to 'Circular Textile' by use of the circularity framework covering 6 topic discussions and 33 indicators.**
- **'Macro-Economic Analysis of Turkish Textile' (Chapter 5) introduces stylised facts, challenges, and policy recommendations.**
- **'Collaborative Value Definition for Circular Textile' (Chapter 6) explains and materialises all defined opportunities as well as brings recommendations and insight to the discussion.**

### 3 METHODOLOGY

This research attempts to give a high-level picture on existing challenges and macro level economic indicators on Turkish textile, develop awareness on circular textile agenda, and define opportunity areas where further work is required. The efforts do not directly intend to prescribe solutions for circular textile supply chain as further verification and strategic planning are necessary to achieve that.

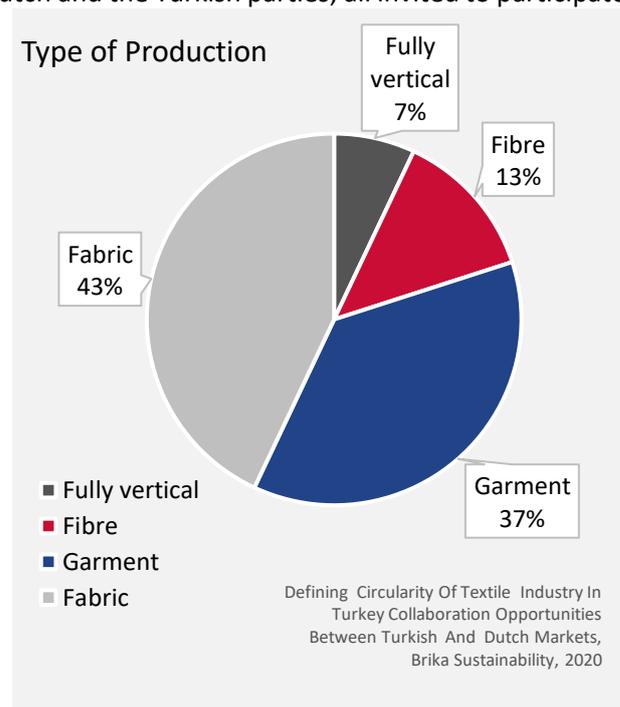
The study consists of two parts:

1. Field research: This includes consultations with selected parties from the Netherlands and Turkey (as detailed below); all in regard to their involvement and experiences with circular textile. The consultations took place as online interviews, conducted between October 7- December 17, 2020 and took over 110+ hours.
2. Desk research in two different ways:
  - a. Macro-economic analysis of the Turkish Textile and clothing sectors; high level analysis of the textile players and technology & innovation players in Turkey and abroad; all in regard to circular textile indicators
  - b. High level technical environmental analysis indicating externalities and systemic weaknesses of textile production; perspectives on EU Green Deal

Detailed analysis and comments for both types of research are included for respective parts while a significant portion of the research is presented in the 'longer version' of the Report, which is to be reviewed upon request to the Commissioners.

For field research, the target audience included both the Dutch and the Turkish parties; all invited to participate through e-mail invitations. Acceptance rate was at 95%; high coverage based on previous relationships with the parties as well as the appeal of the research content, which indicated the aim of 'collaboration around opportunities on circular textile'. This level of interest indicated that the timing of the research was also ripe.

The consultations aimed for high level of representation in specific business content and reliable expert opinion from critical stakeholders. Hence, the consulted parties were among the board members or majority shareholders, C-level executives, and top management /



head of respective line of business of textile companies and brands, civil society members, subject matter experts, and government representatives and academicians.

Turkish Textile producers were invited based on their size and extent of their production capability – with no intention to be exclusive – to reflect a high-level picture on circular textile value chain. **The total exports of these producers represented approximately 11% of total Turkish exports. These producers have either direct relationships with major Dutch brands and/or other major European brands.** The type of production they represent are 13% fibre, 43% fabric (including denim), 37% garment, and 7% fully integrated.

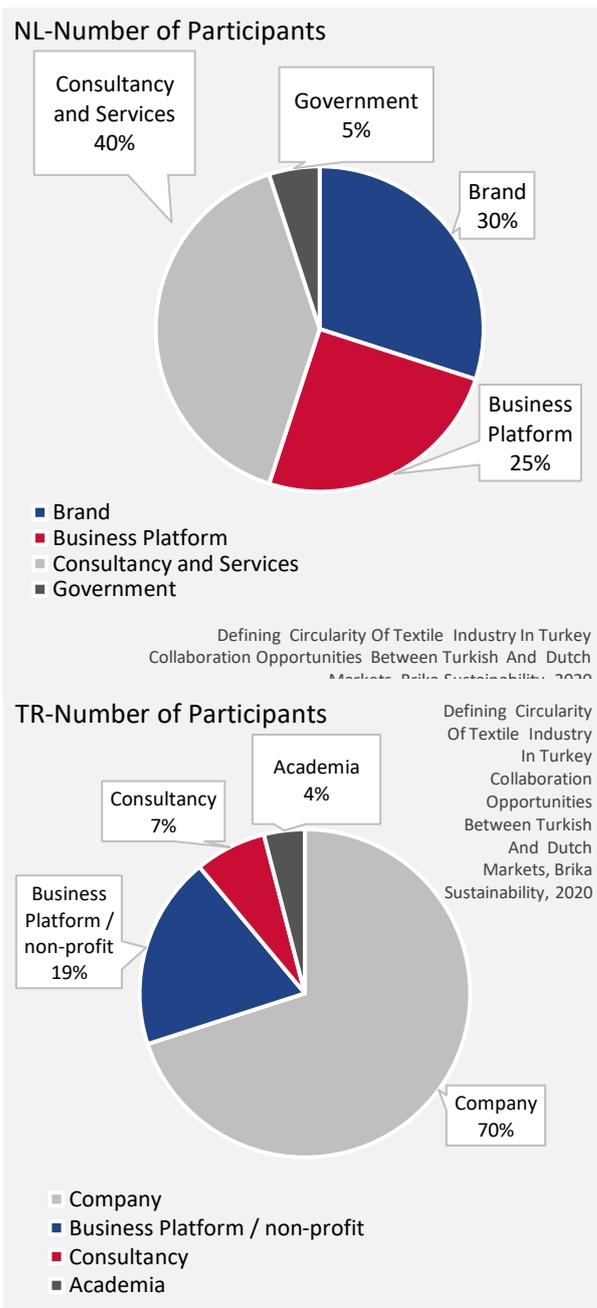
The Dutch participants represented major brands (30%), consultancy & services companies (40%), business platforms (25%) and government bodies (5%) (The Netherlands Consulate in Istanbul).

The Turkish participants represented companies / producers (70%), consultancy services (7%), business platforms (19%) and academia (4%).

All respondents, whether from the Dutch side or the Turkish side, were consulted through the same set of questions, which were on maturity levels of consumption and production patterns as well as circularity indicators. Maturity level ratings were based in five type of answers; ranked between 1-5. Circularity ratings were consisted of six topics and 33 indicators for discussion. Relative scoring was measured on all indicators in form of ‘none; little; to some extent; to a great extent; no opinion’ in order to eliminate prior preparation and collect response based on sectoral experience and understanding of the respondents.

There is a large inventory of facts and findings based on this research. It should be noted that although the attempt was to define a large scope, for alignment of feedback received from the consultations, verification and further studies are necessary.

Feedback received at the end of the consultations was very positive; consulted parties indicated high levels of satisfaction for pursuing a strategic level of discussion and developing awareness on versatile circular textile topics.



# 4 CIRCULARITY ANALYSIS OF THE VALUE CHAIN

This section intends to analyse the baseline of the value chain and challenges regarding circular textile indicators, developed for the purposes of this study. There is a resemblance to the framework developed by European Environmental Agency and European Topic Centre on Waste and Materials in Green Economy [11] with the intention to pursue on established efforts and further extend them for good purposes. The framework of this study attempted to pull on social and digital capabilities while putting all the chosen indicators dedicatedly to textile production context.

**A**s described in detail in the 'Methodology' section, circularity is questioned by the use of 6 pillars and 33 indicators, all submitted for review below. Also, challenges are addressed in detail for each pillar and indicator used.

The circular business model capabilities of Turkish Textile are questioned in three ways:

1. To the Dutch parties, regarding current experiences with Turkish Textile producers.
2. To the consulted Turkish Producers, on their view of Turkish Textile in general (TR1) as shown in averages.
3. To the consulted Turkish Producers, on their assessment of their own capability (TR2) as shown in averages.

The variations in results between TR1 and TR2 might be explained as below:

- ❖ The consulted parties represent the segment with high value production capability and capacity and hence perform better on the selected indicators.
- ❖ There is some over-estimation in self-assessment.

For the purposes of the research, both result sets are presented.

## 4.1 Results

As a pretext to the circularity indicator discussion, both the Dutch and the Turkish parties were asked to respond regarding the maturity levels in buying and production patterns. The topics were asked regarding materials, recycling, re-use/long-term use, eco design and ecological footprint perspectives in below questioning patterns:

- ❖ Please rate to what extent the buying decisions are based on type of materials / recycled content use / designed for re-use & long-term use / ecological footprint (CO<sub>2</sub>, water, chemicals)
- ❖ Please rate to what extent the production patterns consider type of materials / recycled content use / designed for re-use & long-term use / ecological footprint (CO<sub>2</sub>, water, chemicals)

This discussion is relevant as for the aim of circular textile, both consumption and production patterns matter. No supply chain is going to produce for more circular unless demand exists.

The results indicate that there is alignment in maturity levels for consumption and production, despite minor variances:

- ❖ Both parties believe that eco-design is a weak buying-criteria in the Dutch consumption market.
- ❖ Re-use & long-term use is commonly associated with quality and not quite grasping the circular use.

The Turkish parties are slightly overrating the maturity in materials and recycle. This might be due to that fact that they are assessing the procurer, who might be more mature when compared to the end users that the Dutch parties were assessing.

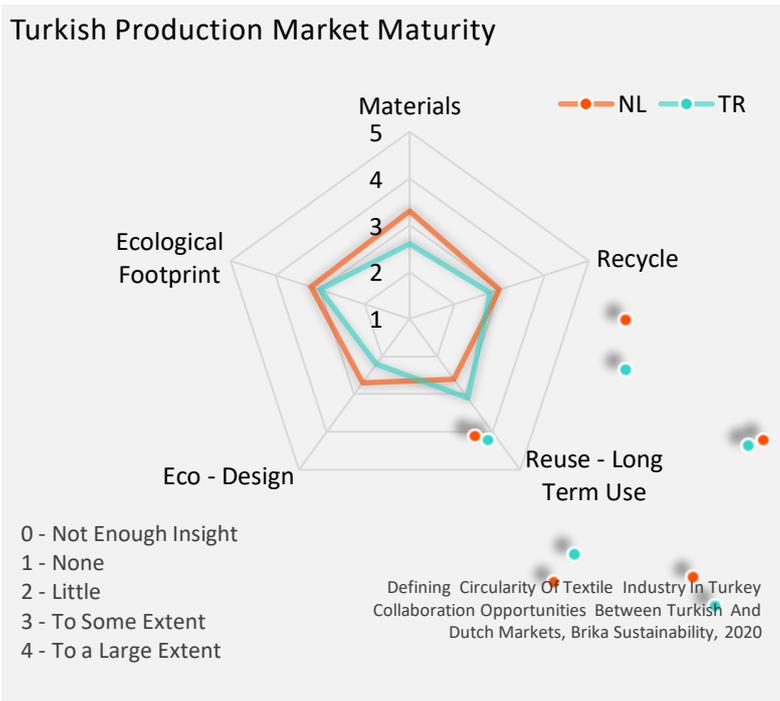
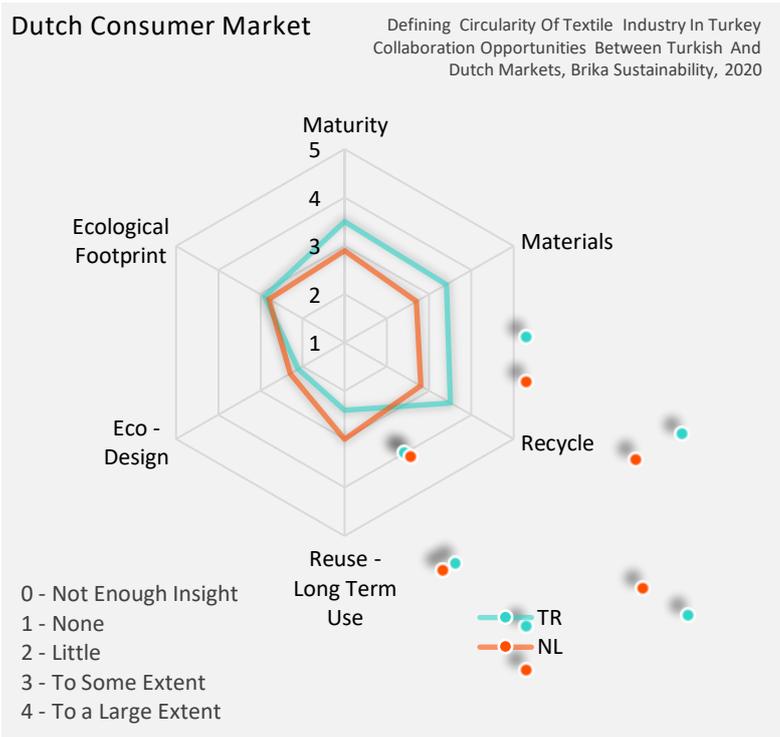
In the Netherlands, an average consumer buys 46 new clothing items per year. This results in approximately 173 items in a person’s closet, on average 30 percent is never worn and 40 items per year are thrown away. Further, 3 garments per person are discarded in the supply chain. [12]

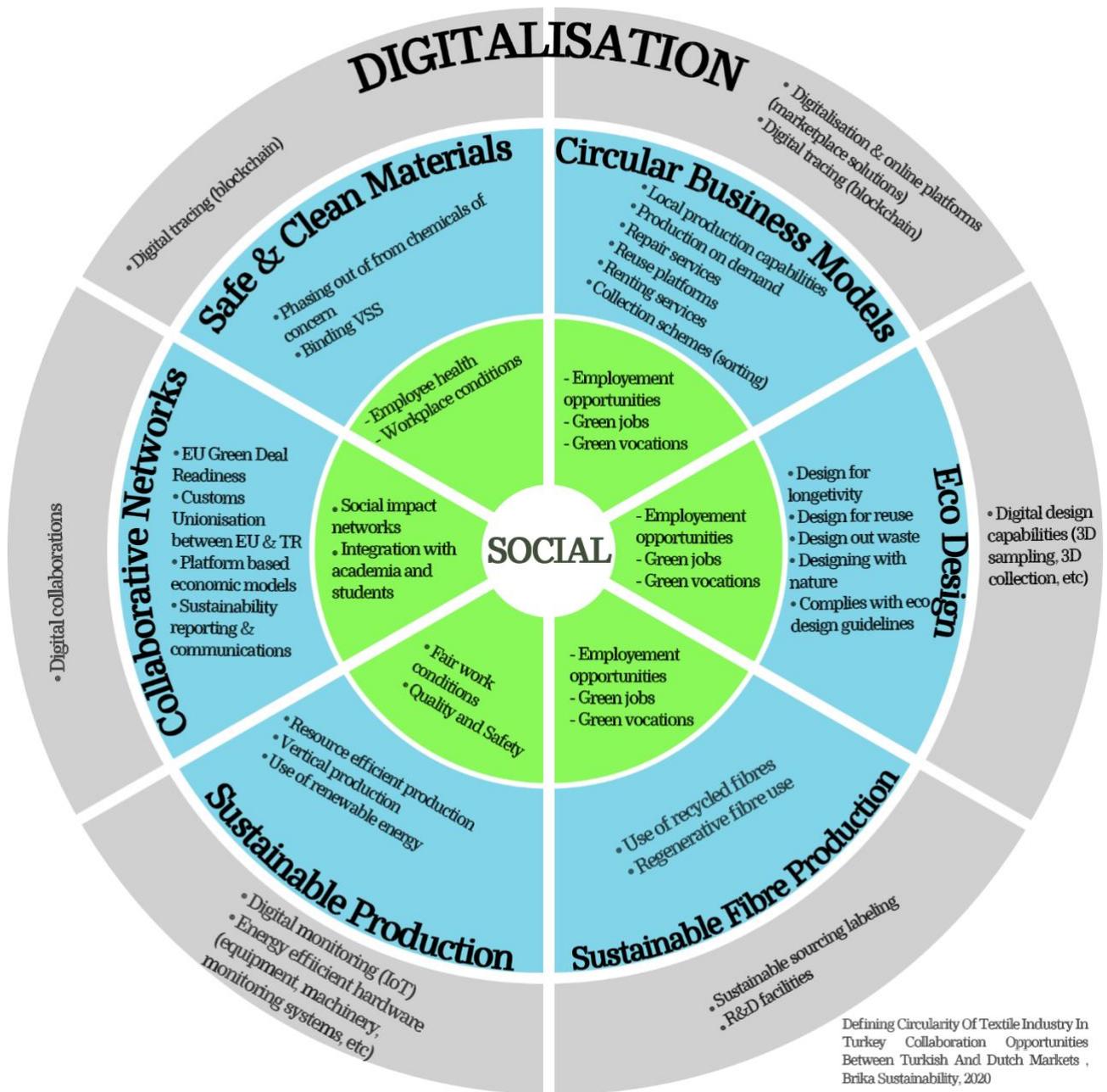
This level of impact obliges consumption preferences and patterns become more responsible, considering environmental and social aspects in buying.

- ❖ Both parties agree on the ecological footprint, recycling are to some extent in production patterns.
- ❖ There is slight overestimation from the Dutch parties on materials and eco-design compared to the producers, whereas the opposite holds true for re-use & long-term use.

The analysis deepens into assessment of circularity by use of 6 topic discussions and 33 indicators. It should be noted that within the ultimate aim of circular textile, these indicators work together. For example, it is not possible to produce in clusters unless there is collaboration among the players. Likewise, there can be limited room for efficiency in production unless materials are designed with longevity.

Below are the circularity indicators used for the assessment:





## 4.2 Circular Business Models

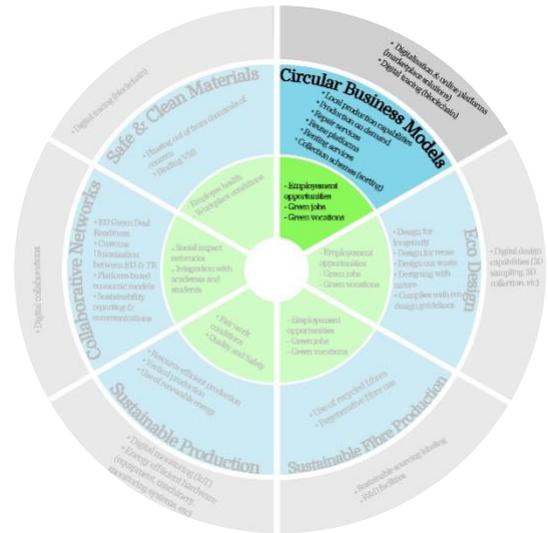
The Turkish textile and clothing industry covers the entire textile value chain and therefore a wide range of activities from the processing of natural or synthetic fibres into yarns, the production of woven, knitted, or non-woven fabrics, the treatment of textile materials (finishing, dyeing, coating) up to the production of a great variety of end-products such as high-performance technical textiles for a lot of industrial applications as well as home textiles and clothing.

The diverse production capability is delivered in an extensive supply chain, most of which works with the major producers consulted for this research and beyond.

Transforming for circular textile necessitates collaboration

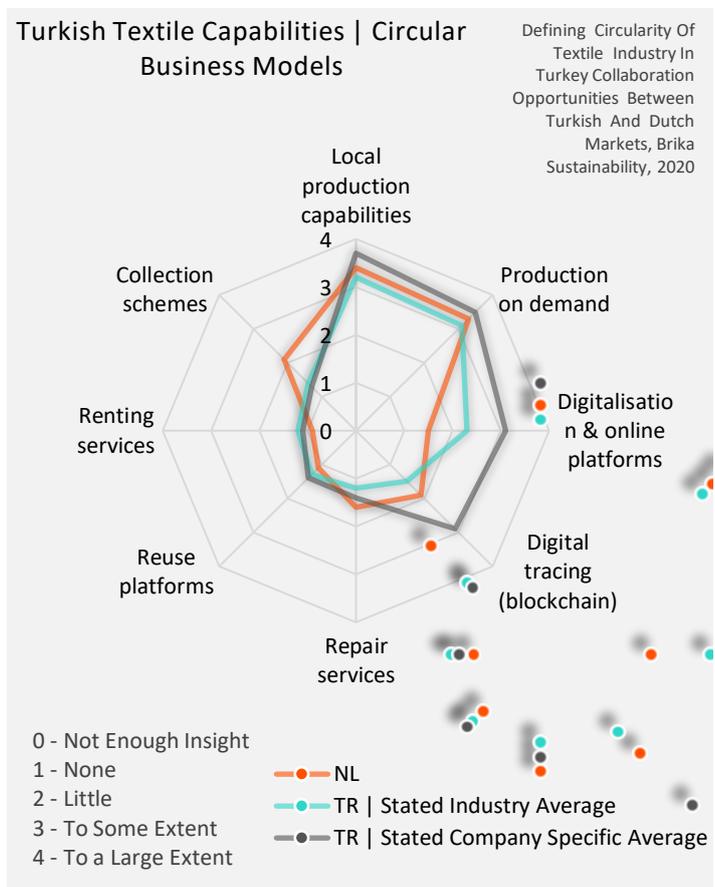
among the supply chain beyond traditional. Mehmet Kaya from TYH puts it as *'we need a partner chain, not a supply chain'*.

Business models are significant in order to reach for a true circular textile. In order to grasp the current situation and look for opportunities to improve, business model discussion is run under six topics and findings are detailed below.



### 4.2.1 Survey Results

- ❖ There is a general consensus from the Dutch and Turkish parties that local production and production on demand capabilities exist strongly for Turkish Textile.
- ❖ The level of digitalisation perceived by the Dutch parties is less than what Turkish parties state they have. This might indicate two things:
  - There is an expectation gap, and the Dutch customers might be willing for further digitalisation in their business transactions.
  - The level of digitalisation might not be visible to the Dutch parties while leaving room for further communications or alignment.
- ❖ Collecting schemes, renting services, re-use platforms, repair services are very limited capability areas. These indicators, being very critical for circularity, might be considered as 'out of scope' discussions from the production perspective.
- ❖ Detailed discussions on circular business models are submitted and analysed as below:



#### 4.2.2 Local production capabilities

Circular economy demands working in clusters in order to realise efficiencies and design out waste. The cluster definition used is based on a geographical unit defined in a peripheral unit of approximately 320 kilometres (200 miles). The interactions needed to produce within the cluster are essential and hence looked for.



Turkey's textile production chain extends into three defined clusters based on the employment numbers [13]. This does not mean that there is no textile production in other geographical locations; for the purposes of defining the clusters, the ones with smaller employment are neglected.

Despite Turkey's textile production is clustered in three geographical locations, the extent that these clusters function as 'close-loops' has its potential to be re-organised as different functionality might be and is served with some of the producers consulted from the other clusters. As an example, fibre production is dominated by the eastern cluster and carried into, especially the northern cluster. Likewise, supplementary production is dispersed. Denim as a form of fabric and home textile production is better clustered compared to fabric production.

#### 4.2.3 Production on demand

This is regarded as highly met since almost all the producers were producing for built-to-order. However, this assessment is primarily for buyer-to-producer framework and does not take into consideration the end user consumption side, as addressed under Industry 4.0 concept. The negative outcome of this lack of understanding is that about one thirds of the textile products becoming waste before placed on the retail shelves [14]. Hence, there is room for integration of the consumer into the production cycles.

There is also a mention that production on demand, with current production methods, is a tendency to increase waste. This might be another area that needs further verification.

#### 4.2.4 Digitalisation & online platforms (marketplace solutions)

Despite digitalisation of the marketplace is a growing concept of Industry 4.0, there is a tendency to pursue with traditional bi-lateral relationships, which seem to be very strong among the consulted parties. When transitioning to a circular economy while maintaining the proactive business development capability, traditional might not be adequate and more digital marketplace approaches will be needed. The pandemic has escalated the need for marketplace solutions, as addressed by the consulted parties.

A collaborative project coordinated by the Turkish Ministry of Industry & Technology and led by IHKIB is regarding digital transformation of the garment industry. The project, aiming to develop capacity around digitalisation, will be kicked-off by January 2021 [15].

#### 4.2.5 Digital tracing (blockchain)

Digital tracing is an important development opportunity. From tracing of the inputs until post-consumer to recycling, digital tracing can be used to bring all environmental under close loop. Inputs can be from various sources; organic cotton claim, BCI content claim, rPET claim, etc. Hence, the trace and the transparency are important to differentiate the source in inputs. Also, this tracing can be used for transparency in labour practices and social impact.

Blockchain based solutions, which enable a strong capability in tracing the whole production chain via cradle-to-cradle, very limited among use the producers *and* the consumption chain. The opportunities seem to be untapped here, leaving space to digital tracing to integration via ERPs (enterprise resource planning systems) and other web- enabled bilateral-working applications.

Few projects are in the R&D phase with some producers.

A more mature example comes from Cross Jeans with their digital loading project, which is run with their collaborative partners DHL, Schneider Electric.

This type of technology, not only limited with blockchain, has the potential to bring in intelligence to almost all circularity indicators mentioned in this study.

#### 4.2.6 Repair services / Reuse platforms / Renting services / Collection schemes (sorting)

Textile consumption covers a wide variety of end products ranging from hi-tech synthetic yarns to wool fabrics, cotton bed linen to industrial filters, or nappies to high fashion. This diversity of end products corresponds to a multitude of industrial processes, enterprises, and market structures in the supply chain. The retail & B2B sector is also an important part of the textile and clothing value chain and is essential for all textile and clothing products sold to the consumers.

**Ownership** abiding with the brand / procurer and later passing on the consumer is the biggest hurdle why there is no claim on the materials for reuse or recovery. Turkish producers see repair, re-use, renting services as 'out of their responsibility' and can envision little from the opportunities coming from these circular business models.

Sorting for recycling is very low. Whether sorting responsibility abides with Turkish producers or by the Dutch brands, retailers, or other intermediaries is another contradictory discussion.

#### 4.2.7 Repair Services

Repair services are not seen as a responsibility of the producers; it needs to be done in the domestic markets that goods are shipped to and hence cannot be remotely done from Turkey.

Traditionally, there is little capacity around fabrics only, as mentioned by some of the producers. For knitted fabric, expertise from Italy is consulted.

#### 4.2.8 Collection schemes (sorting)

So far in the EU there is rather limited experience with separate collection of textiles as only 15 – 20 % are separately collected while the vast majority ends being landfilled or incinerated. Furthermore, there are large differences among Europe in terms of how they manage this waste stream and the performances they have [16]. This indicates a significant lack of sorting services.

**Recycling of post-consumer textiles** from EU is mentioned to be a major new business area for Turkey, especially with established recycling production sites of GAMA Iplik, Else Bornewa, Kale Iplik, Dünya Iplik, Kipas, ISKO, Bossa, etc.

The total textile waste from the Netherlands and Turkey is a significant potential for recycling, dependent upon sorting services are in place.

**UNIT Tonne**

**WASTE Textile wastes [17]**

GEO/TIME	2004	2006	2008	2010	2012	2014	2016	2018
<b>Netherlands</b>	115,935	125,344	128,783	107,245	114,260	95,156	102,261	126,208
<b>Turkey</b>	260,549	0	389,834	85,496	160,658	214,324	206,442	231,836

The problem resides with the current local stock levels of post-consumer textile necessary as input for these sites and others to come. The local collection capacity is low despite increasing attempts from the local governments and Kızılay (Turkish Red Cross).

This discussion of post-consumer recycling comes very strongly from the Dutch consulted parties, pinpointing Turkey's potential competitiveness, given regulatory framework is in place.

Moreover, current regulatory framework is inhibiting import of post-consumer goods to Turkey, which is a primary concern for circularity seeking Dutch parties and some Turkish producers.

To meet the expectation, there are provisions to the existing law for deformed textile imports, which opens the way for others to come, as quoted from ITKIB (Istanbul Textile and Garment Exporters Association):

#### Importation of Used Textiles

*Importation of goods that are old, used, replenished, faulty and worn-out is subject to the permission of the Ministry of Trade. In this context, the importation of used clothing and finished goods or rags from textile manufacturing process and fibres, wastes, lints shredded was considered, within the 7th clause of the Import Regime Decision by the Ministry of Trade, and the importation of that types was not allowed in order to protect domestic production.*

*ITKIB raised demand for amendment of the 7th clause of the Import Regime Decision to allow the importation of the used goods which were collected from customers by global clothing brands to be used in the production of goods to be exported, was considered by the Ministry of Trade. The importation of the fibered or clipped goods which are collected from consumers and are not in the final product form (yarn, fabric, garment etc.) is allowed on the condition that all of the final products that are produced from these imported materials will be exported back under the Inward Processing Regime in order to protect our existing domestic production and not to damage the relevant clause.*

*On the other hand, it was conveyed by ITKIB to the Ministry of Trade that Turkish leading brands in the garment industry take "making their products environmentally sensitive" as one of their primary goals with the assumption that sustainability and recycling projects have gained*

importance in world trade. The intent from these leading brands to increase production from recycled materials and in time production from only recycled materials was put forward.

In this context, considering the fact that the new products which are produced by the inputs obtained from recycling of used products are not to be considered as used items and the importation of these used products will be beneficial/will have a positive impact for the employment, production and export capacity of Turkey was confirmed. ITKIB was also informed by Ministry of Trade that some polyester fibre and synthetic yarn product groups from recycled (regenerated) were to be allowed for importation.

### 4.3 Eco Design

Eco-design capability is important for circular textile transition. It is a mutual responsibility of the brands to demand for it as well as the producers to bring forward the capabilities.

From the producer perspective, flexibility in design resides with the Turkish producers. However, the demand from the brands is working for dynamics of fast fashion – quick design, short term use. Circular design principles on the other hand are not necessarily in the agenda, except for the few niche collections or from specialised brands.

To reflect circularity in design principles, this pillar looks into six topics:

- ❖ Design for longevity
- ❖ Design for reuse
- ❖ Design out waste
- ❖ Designing with nature (Biomimicry)
- ❖ Complies with eco design guidelines
- ❖ Digital design capabilities (3D sampling, 3D collection, etc)



### 4.3.1 Survey Results:

- ❖ Despite the consulted producers see their ability to design for circular slightly higher, the average ratings from the Dutch and Turkish parties show that the capability is medium to low on all topics.

### 4.3.2 Design for longevity

In a recent survey by Sourcing Journal Andrea Price, Manager of fabric R&D for knits at Gap says “In theory, if the circular economy is functioning in the way that it should, [the materials] should be basically high quality. That does not necessarily mean expensive. It means the best material for the job for the lifespan of that product. In order for something to be recycled, refurbished, remanufactured, reused, redistributed,

maintained and prolonged [or] regenerated, you have to have good materials and good design—simple design and quality materials.” [18]

On the other side, the consultations in general – both the producers and buyers – do not show enough evidence that the industry is there yet. Contrarily, the operating principles reward short-term gains.

As Ismail Kolunsag from Cross Jeans says: “The current business model does not allow for the cost of circularity in terms of design, production and business processes in general. The number of days accommodated for design is about four days, whereas design for circularity can be achieved in 40 days, having a direct effect on lead times and cost structure. Whether the customer is ready to pay for circularity or not is the question here.”

Another perspective is reflected by a sector consultant, Alper Cataloglu, as “For more circular design of products, buyers /brands must commit a baseline in volume.”

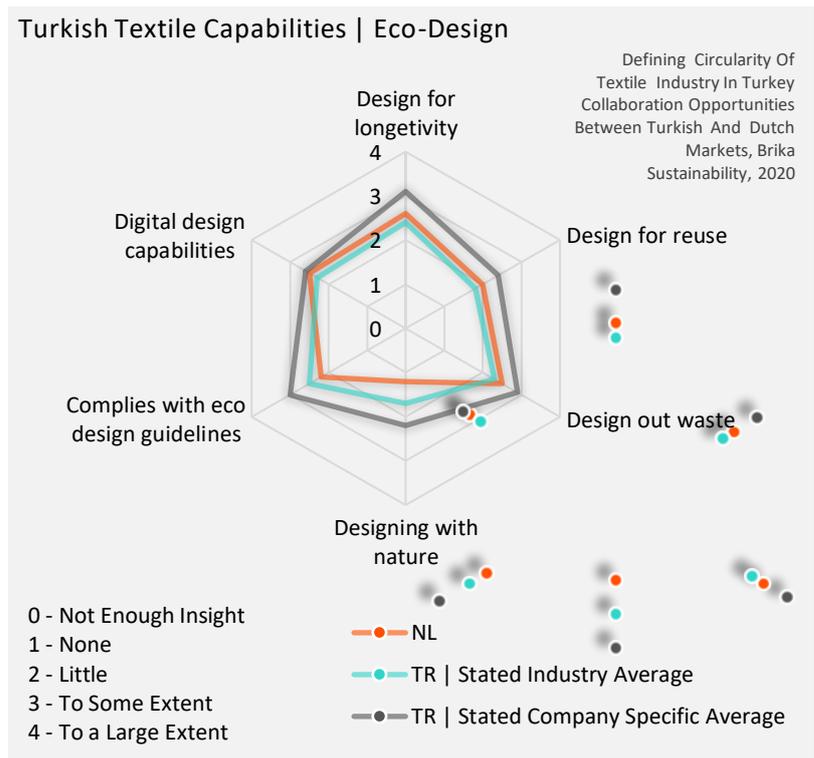
In summary, design for longevity requires dedication, committed demand, and comes at an additional cost during transition.

### 4.3.3 Designing with nature (Biomimicry)

This is a very immature area and there seems to be limited demand and supply related to designing with nature principles.

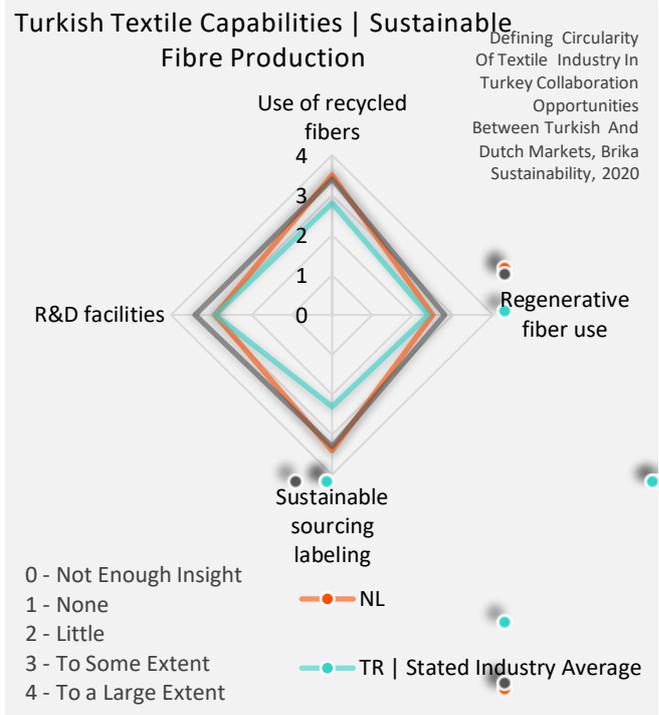
There is ambiguity in understanding the relative merits of bio-design, an emerging design movement which incorporates the use of living materials, or ‘moist media,’ such as fungi, algae, yeast, bacteria, and cultured tissue. The idea is to create a product whose properties are enhanced as a result of the use of these living materials. [19]

Under common design principles, there is little mention to designing with nature, which shows the lack of demand and output as a result. The few examples are on mushroom- based leather, hairy fabric, etc. Research indicates that there is also Turkey-based leather and suede producer Flokser, who developed a synthetic leather





Better Cotton Initiative Turkey (IPUD), whose aim is to make cotton production better for the people who produce it and the environment it grows in by reducing the environmental impact and improving livelihood in cotton producing areas, estimates the total better cotton production as about 190 thousand tons for 2020 with approximately 2000 farmers involved. The regions of production resemble the production clusters defined earlier, a fact reinforcing local production capabilities. [21]



Season: 2020-21 Projected Better Cotton Production in Turkey	Total Farmers	Area Under Cotton Production (Ha)	Seed Cotton Production (MT)	Lint Cotton Production (MT)
<b>Licensing Data (12.10.2020)</b>	1,986	34,153	187,842	73,258

Turkish textile also offers a strong base for synthetic fibres. To reflect circularity in fibre production, this pillar looks into four topics:

- ❖ Use of recycled fibres
- ❖ Regenerative fibre use (biodegradable or compostable)
- ❖ Sustainable sourcing labelling
- ❖ R&D facilities

#### 4.4.1 Survey Results:

- ❖ The capabilities for recycled fibres and sustainable sourcing labelling are to a large extent.
- ❖ R&D capability exists, not necessarily indicating that this capability is serving circularity.
- ❖ Regenerative fibre use is relatively a small capability area.
- ❖ In general, there is a strong base and balanced (square) strength for sustainable fibre production.

#### 4.4.2 Recycled fibre use

Recycling of natural and synthetic fibres capability of Turkey especially with established recycling production sites of like GAMA Iplik, Else Bornewa, Kale Iplik, Dunya Iplik, ISKO, Kipas and Bossa is quite significant.

This mechanical process is based on manual and/or machine-aided shredding where up to 90% of the textile, as stated by the major recyclers, can be regenerated. There is still 10% going to incineration despite best efforts and technology. Incineration is yet another environmental catastrophe especially for synthetic materials like the popular material polyester or nylon causing carcinogenic fumes.

This is primarily a design weakness as fast fashion demands a huge variety of materials and techniques to be used, considering little for the need for recycling as the last resort. 'The bulkier the design with varying zippers, buttons and fibre, the harder it gets to increase recycling percent' states Zafer Kaplan from Gama Iplik.

Another mentioned challenge of recycled fibre use is coming from government subsidies on industrial fibres. In order for recycled fibre to be competitive, these subsidies need to be eliminated.

As Siem Haffmans from Partners for Innovation states in his co-written book "Products that Flow" [22], technically everything can be recycled. Milling down something, or melting, or dissolving and separating elements to use them for producing something new, however, is not just a matter of conquering technical challenges. It also involves the identification, selection and subdivision of ingredients and combining them again, procedures that precede what happens in shredders and may continue after that.

This brings the challenge back to design and sorting services, where the ultimate aim is keeping the material in the 'cradle', giving no harm to the environment by not toxicating and using as little energy as possible. Assuming that recycling is an ultimate solution to eliminate sins from irresponsible consumption and production might be fatal.

#### 4.4.3 Regenerative fibre use (biodegradable or compostable)

Regenerative fibre is a developing concept; considerably new when compared to recovered/recycled. There is consensus that the further development and use should be promoted.

Likewise, in designing with nature, there is little mention to regenerative fibre use, which shows the lack of demand and output as a result.

#### 4.4.4 Sustainable sourcing labelling

Labels on textiles is one of the biggest waste streams as they are the first to be cut or removed by the consumers. According to Zafer Kaplan from GAMA Iplik, 450.000 tons of label material per annum is discarded; as ending up in the landfill through housing waste. Digitalisation of labelling is an immediate quick win to eliminate this waste.

For sustainable sourcing labelling, brands designate nominated trim suppliers to producers.

#### 4.4.5 R&D Facilities

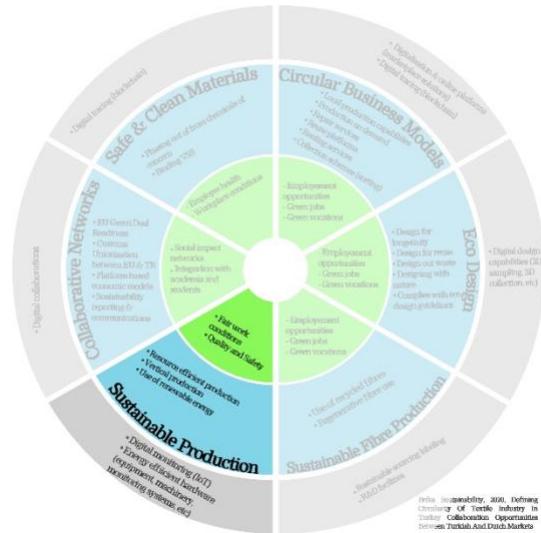
R&D facilities of the producers consulted exist to a large extent. This provides the capability to deliver requested design and materials content flexibly. The downside is that this variety production does not necessarily consider circular design principles and hence gives way to further fast fashion.

## 4.5 Sustainable Production

Sustainability of production is another broad pillar of circularity, which looks into how efficiently and sustainably energy and materials are used in production as well as how workplace security and labour conditions are managed.

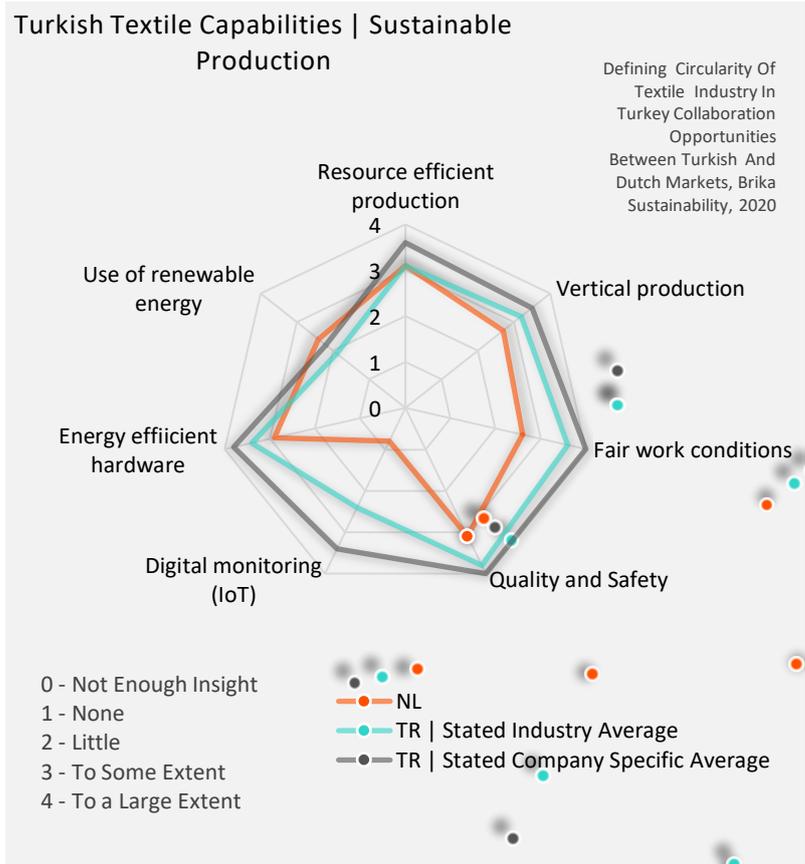
This pillar is examined under seven different topics:

- ❖ Resource efficient production
- ❖ Vertical production
- ❖ Fair work conditions
- ❖ Quality and Safety
- ❖ Digital monitoring (IoT)
- ❖ Energy efficient hardware (equipment, machinery, monitoring systems, etc)
- ❖ Use of renewable energy



### 4.5.1 Survey Results:

- ❖ There is alignment on medium-to-large extent efficient resource use. However, it should be noted that the resonance of this topic among the consulted is on efficiency for financial gains.
- ❖ Vertical production, meaning integrated production capability is believed to be there for Turkish producers but less so for the Dutch parties.
- ❖ Fair work conditions, quality, and safety, which are mentioned to be critical to the Dutch consumers, is to a large extent strong for Turkish producers while not as obvious for the Dutch parties.
- ❖ Energy efficiency in the used equipment is prevalent.



- ❖ Use of renewable energy in production is a sourcing area where there is limited capacity among the producers.
- ❖ Digital monitoring of production is the topic with biggest gap in claimed versus assumed. Like the other digital capability topics, this might be due to lack of communication on the capability or inability to meet the expectation from the buyer side.

In general, denim production differentiates itself as more efficient. Yet, denim is not 'innocent' for its production. Considering Levi Strauss & Co's life cycle assessment study in 2007, one pair of jeans consumes almost 4000 litres of water and emits 33 kg of CO<sub>2</sub>. [23]

On the other hand, there is little economies of scale when producing 'green'. Incentives by the brands as well as financial subsidies by governments should be in place.

Next-generation green factories or sites exist among the consulted producers. The infrastructure and energy-efficient machinery are other advantages with the consulted producers.

#### 4.5.2 Resource efficient production

Cotton cultivation, known for its intense use of water, pesticides, and fertilisers, is widely practiced in the water-stressed Mediterranean countries. Turkey is among the top ten cotton-producing countries but is also in the category of "countries facing water shortage problems" with 1,519 m<sup>3</sup> of water per capita [24].

ITKIB/IHKIB representatives state that capacity usage of Turkish textile exporters is around 80%, +4 points above the global averages. Even the small producers have this capability and accept it as criteria for competitiveness when exporting. On the other hand, there is waste and over-stock levels in the industry; the later primarily coming from fluctuations in exchange currency rates pressurising the producers.

#### 4.5.3 Fair work conditions

This is a relative strength area for Turkish Textile due to strict regulations implemented locally and audits executed locally and externally. However, the levels of confidence in this capability are not prevalent for the Dutch parties and further re-confirmation is needed.

On the other hand, some producers claim that the external audit efforts are not aligned and standardised and hence is taking too much of operational burden for the producers. This misalignment might be the reason for the discrepancy in the results.

#### 4.5.4 Digital Monitoring (IoT)

Most producers claim their digital infrastructure is capable for digital monitoring. Some use artificial intelligence.



Ereks Garment - Blue Matters Green Production Facility in Turkey, 2020.

This capacity among the consulted companies is stated to be high compared to previous research on digitalisation stating that only 36% of garment producers in the Aegean Region can utilise digital monitoring capability. [25]

This might be due to overall maturity level of the consulted group and/or the lapse time since the previous report. Also, this maturity level is not perceived by the Dutch parties.

Given the scope and capability that digital technology might bring, it is worthwhile to verify the current use and consider updates.

#### 4.5.5 Use of Renewable Energy

Renewable energy capacity is limited to a few of the consulted companies, at varying degrees. Few plants can produce 100% of the energy needed from renewables while most others are in planning phase.

This constitutes a risk for both buyers and producers when EU Green Deal requirements are in the way. Investment plans should be visited immediately. Policy requirements and options need to be discussed further.



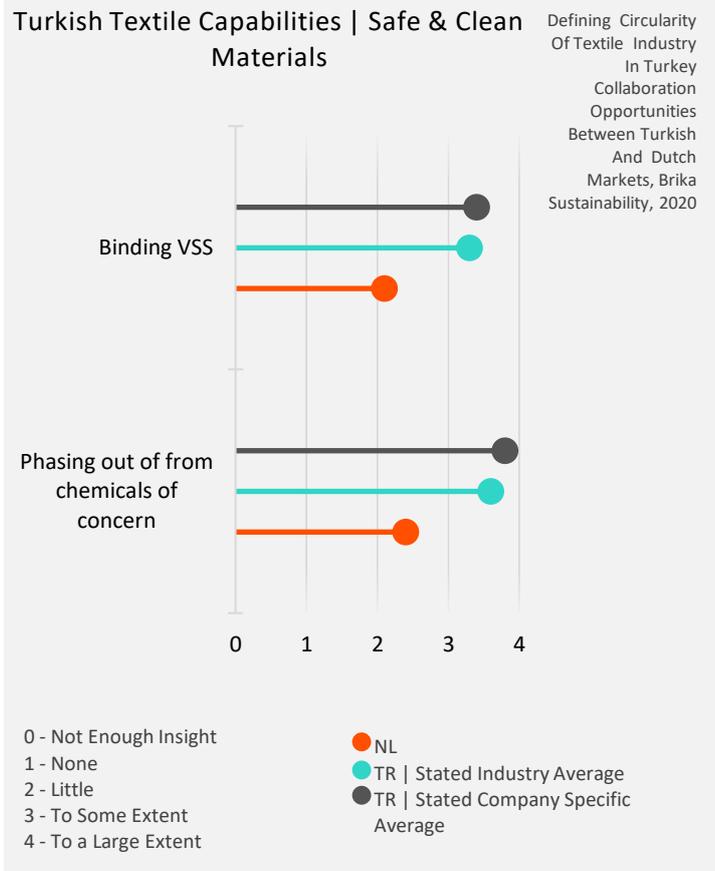
TYH Textile Akhisar –100% RE Site

## 4.6 Safe & Clean Materials

### 4.6.1 Phasing out of from chemicals of concern

Generally, despite there is demonstrated compliance in REACH, ZDHC and other major voluntary sustainability standards, there are chemicals of concern being used that are not necessarily addressed by the criteria. (See Appendix C Glossary of Abbreviations)

For example, sodium hypochlorite, potassium permanganate and pumice stone are commonly used for denim production.



The difficulty with eliminating chemicals of concern or toxicating chemicals is the fact that there are none or few ecological alternatives. This is a huge opportunity area for collaboration.

Hence, there is way to go in defining of all chemicals of concern with potential negative impacts in environmental integrity and social welfare. Retail brand from Sweden, H&M, is leading a project for elimination of chemicals of concern, which some Turkish producers are part of. Knowledge transfer might be helpful at this point.

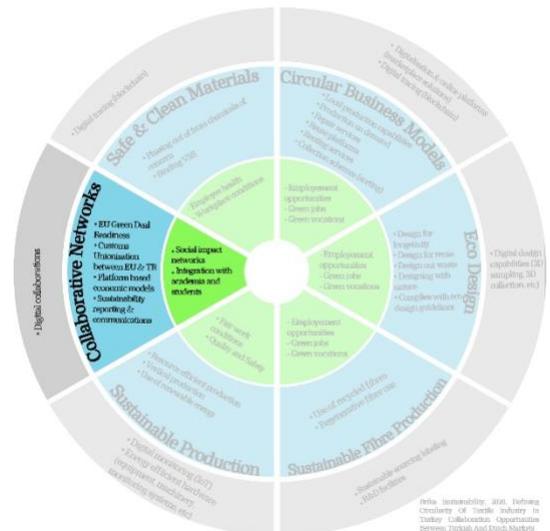
## 4.7 Collaborative networks

Reaching the state of circularity, a challenging transition from the current state, requires strong collaboration among various stakeholders, presence in atypical networks and engagement in unique opportunities.

This brings with it a challenge for traditional textile relationships, which are based on strong bilateral ties and little engagement in extended networks.

This pillar examines the level of collaborative networks under six topics:

- ❖ Social impact networks
- ❖ Integration with academia and students
- ❖ EU Green Deal Readiness
- ❖ Customs Union between EU & TR
- ❖ Platform based economic models facilitated by trade organisations
- ❖ Sustainability reporting & communications



### 4.7.1 Survey Results:

- ❖ The level of engagement of Turkish Textile in social impact networks and in integration with academia & students are perceived lower and little for the Dutch parties as opposed to a medium-high level of engagement assessment by the Turkish producers.
- ❖ Likewise, engagement in platform-based economic models is perceived lower and little for the Dutch parties as opposed to a medium-high level of engagement assessment by the Turkish producers.
- ❖ EU Green Deal Readiness is an emerging capability for both the Dutch and Turkish Parties. To serve this, a special chapter is presented as part of this report.
- ❖ Sustainability reporting and communications is meeting the expectations while leaving room for improvement.
- ❖ Customs Unionisation is an indifferent issue for the Dutch parties while the Turkish side set expectations.

#### 4.7.2 Social Impact Networks & Platform-based Economic Models

This is a strong initiative area for circular textile progression. Traditional textile relationships, which are based on strong bilateral ties, needs to be extended into impactful platforms and networks. Companies face financial & technological barriers which they cannot address alone and therefore need collaboration across value chains.

Despite efforts from organisations like ITKIB/IHKIB, TGSD (See Appendix C), level of communication and cooperation among producers is stated to be low. This is a hurdle when transitioning to circular economy. Various parties from the whole of the value chain needs to be collaborating further.

#### 4.7.3 EU Green Deal – Harmonisation Beyond Carbon Tax

Harmonisation of all production systems with EU is significant short-term concern as half of Turkey's exports go to the European Union. Further, alignment with the EU Green Deal is possible based on this harmonisation of all production areas and sectors.

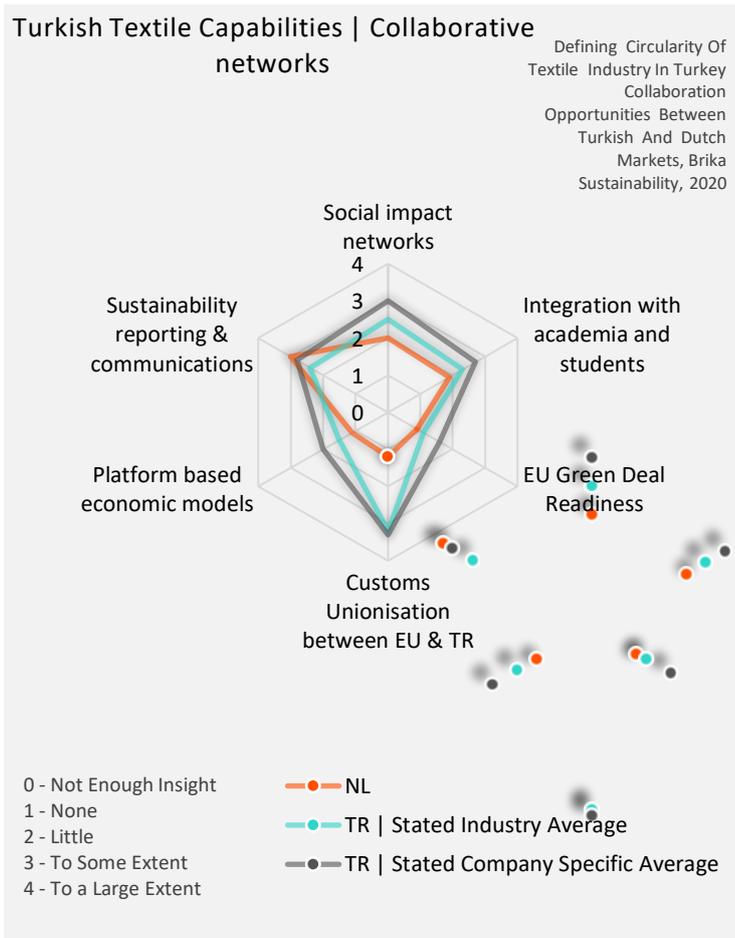
Critically, the primary issue is treated only in terms of a **border carbon tax**. The producers with the related production (or financial) capability will prevail and other who fail will be serving the developing countries with their lower quality (with highly dense emissions) products.

#### 4.7.4 Customs Union between EU & TR

This version of the Report addresses to the business specific issues and opportunities. Although Customs Union is an aspect questioned in the survey, the output regarding this topic is not sited here for pragmatic purposes and can be referenced in the longer version of the Report.

This section intends to deliver the findings from consultations with the Dutch and Turkish parties as well as highlights from the research around circular textile during the course of the study.

Chapter 6 will look deeper into opportunity definitions.



# 5 MACRO-ECONOMIC ANALYSIS OF TURKISH TEXTILE: STYLISTED FACTS & CHALLENGES & POLICY RECOMMENDATIONS

This part of the research highlights key challenges of textile and clothing sectors in Turkey while summarising from international trade and other development indicators, sector objectives and strategic roadmaps. Statistical & stylised facts on Turkish Economy and Textile & Clothing Sector are discussed in detail in the longer version of the report, available upon request.

## Summary of Turkish Textile & Clothing Sectors within a Global Perspective:

### 5.1 Turkey Is a Significant Player of Internationalised Sectors

Global trade volume for textile and clothing sectors is USD 730bn and they are highly integrated in global value chains. Despite this high degree of internationalisation, the foreign direct investment (FDI) stock is relatively low compared to the other manufacturing sectors and the number of multinationals or big companies operating within the sector are limited.

As of 2019, global textile sector alone exports stood at USD 331bn with China exporting 36% of the global volume. Contrary to the general belief that as countries develop countries move-on from labour-intensive sectors to high-technology sectors, developed countries like USA, Germany, Italy, Japan, the **Netherlands**, France, and Spain continue to be in the top 20 exporters of the textile goods<sup>1</sup>. Turkey is the **seventh biggest**

#### Box 1: Turkey-the Netherlands Textile and Clothing Foreign Trade<sup>†</sup>

Turkey's textile and clothing sector exports to Netherlands have been growing during the last 25 years; but their relative weight has been decreasing as the total trade volume increased by almost four times to \$8.5B.

Trade from Turkey to the Netherlands, 2019, \$ Mn		
	Exports	Imports
Textile	497	31
Clothing	853	6
Total	5444	3071

As of 2019, Turkey's textile and clothing sector exports are 25% of the total \$5.4B exports, while imports are only 1.2% of the total imports from Netherlands. Clothing imports from the Netherlands are at insignificant levels; but textile imports from Netherlands lost share within Turkey's textile imports to the Asian countries, like China, India, Bangladesh, and Indonesia.

<sup>†</sup>For detailed foreign trade numbers between Netherlands and Turkey, please refer to longer version of the Report.

<sup>1</sup> For detailed list of the top 20 exporters and their share, please refer to longer version of the Report.

**exporter in the world with USD 9.8bn** and 3% share. In the clothing sector, Turkey is the one of the top manufacturers, along with China, Bangladesh, Vietnam, India, UK, and Indonesia<sup>2</sup>.

Therefore, textile trade is significant for both Turkey and the Netherlands; especially when considered from a collaborative perspective.

Yet production capacity is lagging behind the manufacturing sector average; hinting some portion of domestic production was replaced by imports.

This is an area drawing attention to more efficient production systems and digitalisation for circular textile.

## 5.2 Negative Contributions to Foreign Trade Balance for Textile Fibres

In general, there is positive trade contribution from textile sector imports to Turkish economy, reaching as high USD 6.9bn in 2011 while falling back to USD 4.5 bn at the end of 2019. The only product group, which has a negative trade balance within the ISIC codes, is **textile fibres**.

This negative trade balance for textile fibres indicates an improvement potential for improving positive trade balance position of Turkey around circular textile with sorting services and recycling.

## 5.3 High Employment Capacity Within the Manufacturing Sector

Registered employment constituted only 65% of the employment in these two sectors. Since the beginning of 2018, employment capacity is again on the rise.

Female workers constitute 41% of the total registered workers in textile (27%) and clothing sectors (51%), well above the total registered female average of 31% and the second highest female worker ratio in Turkey (after the education sector).

This raises the impact of social welfare indicators in existing state as well as when transitioning for sustainable textile. The solutions or collaborative opportunities need to take into account this diversity potency of the sector.

## 5.4 Regional Development

Textile and clothing sector contribute to the regional development as the companies are diversified in different regions of Turkey. While textile sector is more concentrated in bigger cities, clothing sector has a weight in middle-income cities in Turkey and it is more regionally distributed. Majority of clothing sector companies are concentrated in Istanbul, while textile sector companies are located both in Western and Eastern (Gaziantep, Kahramanmaras, Malatya etc) parts of the country.

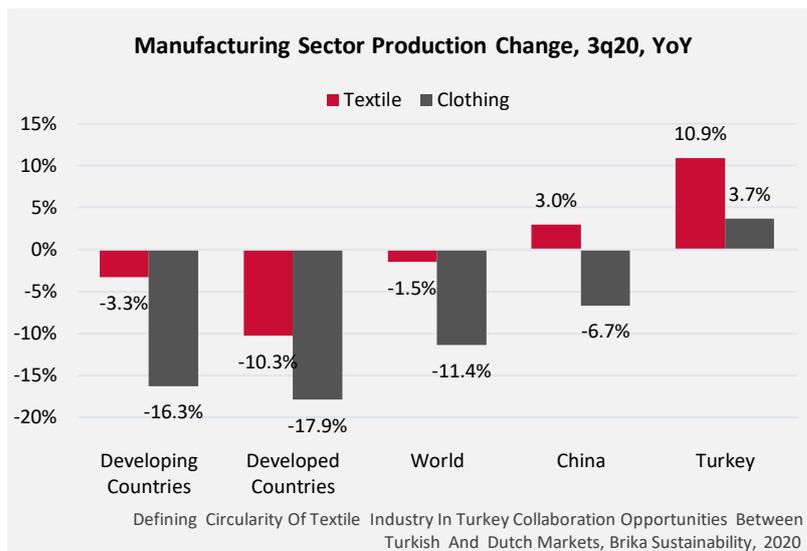
Based on the clustering indicator for circular textile, this geographical representation (as discussed in Chapter 4), is an advantage while leaving space for better (self-sufficient and integrated) re-organisation; which might indicate an opportunity for collaboration.

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<sup>2</sup> Top 20 exporters of clothing sector, see [35]

## 5.5 Recent Figures Indicate that Some Re-shoring Might Be Taking Place

Even though textile and clothing sectors plummeted during the second quarter of the year as one of the side effects of the Covid-19 pandemic, both sectors rebounded faster than the rest of Turkey's exports. Latest export figures as of end of 3q20 reveal that both textile and clothing sector exports increased much faster than the total exports, signalling first near-shoring attempts after the start of the pandemic. Field findings of this research signals that Turkey is using its geographical, logistical, and flexible production advantages as international companies are trying to diversify their markets.



This nearshoring potential is significant for competitiveness of the textile and clothing sectors of the Netherlands and indicates that there is room for collaboration.

## 5.6 Textile and Clothing Sector Objectives and Strategic Roadmaps

As one of the most important exporters of Turkish economy, both textile and clothing sectors are emphasised within public sector's development plans, sectoral plans. Additionally, business organisations specific to these two sectors also draw roadmaps for the future of the sector.

Details of the 11th Development Plan of 2019-2023 developed by the Presidency of Strategy and Budget [6] and the 'Special Expertise Commission for Textile, Clothing and Leather Sectors' are summarised and cited in Appendix D 11<sup>th</sup> Development Plan of 2019-2023

JETCO is another strategic initiative between the Netherlands and Turkey, commitments submitted at high levels.

These are strong opportunity indications that should give way to private sector initiatives between the Netherlands and Turkey.

## 5.7 Challenges

Besides the above stated fragilities of a circular business model, there are macro level issues that the Turkish Textile Industry is facing, like any other leading textile manufacturer country or region. Some are cited below to indicate the urgency for transitioning to circular textile.

- ❖ Growing stress in natural resources has consequences in pre-production, primarily with production of cotton as it necessitates judicious use of water, chemical fertilisers, and pesticides for sustainable production.
- ❖ Sustainable inputs for production and from post-production are becoming critically important as competitive parameters.

- ❖ Trade asymmetries created in foreign trade agreements (FTAs) that EU signs with the third countries are challenging for Turkish textile and clothing industries; and they undermine the overall connectedness benefits that the Customs Union is designed to create.
- ❖ Legislation harmonisation with the EU has resulted in Turkish textile and clothing sector companies' fast adaptation with the EU standards (REACH, ZDHC, etc), which is also evident with the field research. Despite this, full adaptation to EU standards in production and waste management varies regionally due to lack of financial capabilities for investments in waste management and overall for more sustainable production.
- ❖ The requirements to measure, report, and factor in the costs of a product's carbon footprint within the EU is expected to escalate and become a requisite for companies exporting to Europe. According a recent study [26] **on the possible impact of an EU carbon-border adjustment mechanism, Turkish textile sector can be exposed to a total tax of Euro 120mn with a carbon price of 30 Euro/tCO<sub>2</sub>; while the tax on all Turkish exports amounting to Euro 1,085mn. If the carbon tax is raised to 50 Euro/tCO<sub>2</sub>, the levy on the textile sector would increase up to Euro 195mn, corresponding to 1.4% of textile exports to the EU region; while total export tax to the EU region amounting to Euro 1,809mn.** This is a significant budget not only for Turkish producers, but also for the buyers of these goods.
- ❖ Despite no indication of low levels of total factor productivity for Turkish Textile and Clothing within manufacturing per se, there is little scope for innovation in their current production and organizational structures [27]. At the international level, unless both sectors develop their R&D intensity and increase cross sectoral technology diffusion, there are risks of deteriorating contribution to Turkey's longer-term ladder of development for these sectors as well as risk of disruption.

## 5.8 Policy Recommendations

Policy recommendations regarding macro-economic findings, which indicate opportunities for collaboration between the Netherlands and Turkey, can briefly be summarised as below:

- ❖ Upgrade in raw material production process to a more sustainable cultivation via the use of digital tracking technologies in agriculture (as expressed in the 'Science and Innovation Section 'of JETCO meeting notes in September 2020),
- ❖ Standardisation and accreditation of non-GMO cotton production
- ❖ Promoting regenerative farming as textile inputs while abolishing subsidies on industrial agricultural inputs,
- ❖ Legislative arrangements for the recycling of and import of used clothing sector products within the scope of Customs Union (as aligned with JETCO meeting notes in September 2020) including special investment support mechanisms for established facilities,
- ❖ Further legislative harmonisation with the EU for circular textile standards and accreditations,
- ❖ Inclusive financing mechanism should be developed for SMEs with a regional perspective in adaptation to circular economy practices,
- ❖ Developing a roadmap to reduce the emissions through investments, R&D, technological innovation while promoting and incentivising via financing at lower credit rates (e.g., Euro 1bn for research and innovation projects, EBRD voucher framework co-financed by the Netherlands EBRD Trust fund to support Turkish SMEs for circular business models),
- ❖ Policies for improving R&T intensity and digitalisation (beyond e-trade).

## 5.9 Summary of Macro-economic Analysis

This macro-economic research is complementary to the field textile analysis executed, giving it depth and macro level of context into how and where the opportunities fall under.

## 6 COLLABORATIVE VALUE DEFINITION FOR CIRCULAR TEXTILE

As stated well in Holland Circular Hotspot's Report "From Linear to Circular in the Textile and Apparel Industries" [28], 'a circular textile value chain is a blueprint to the future, because circular business models contribute to the various challenges within the industry. But the transition to the circular economy requires systemic change and asks for collaboration, above all in the textile value chain that is so spread out over the world. Governments can set the ambition, boundary conditions and nurture experimentation or give the example by circular procurement. Researchers and knowledge institutes can develop new insights and tools, validate ideas and boost awareness. Global brands and retailers, especially after COVID-19, should realise that this is about resilience and about their future markets.'

In general terms and from the perspective of the circular textile economy, two major changes need to occur:

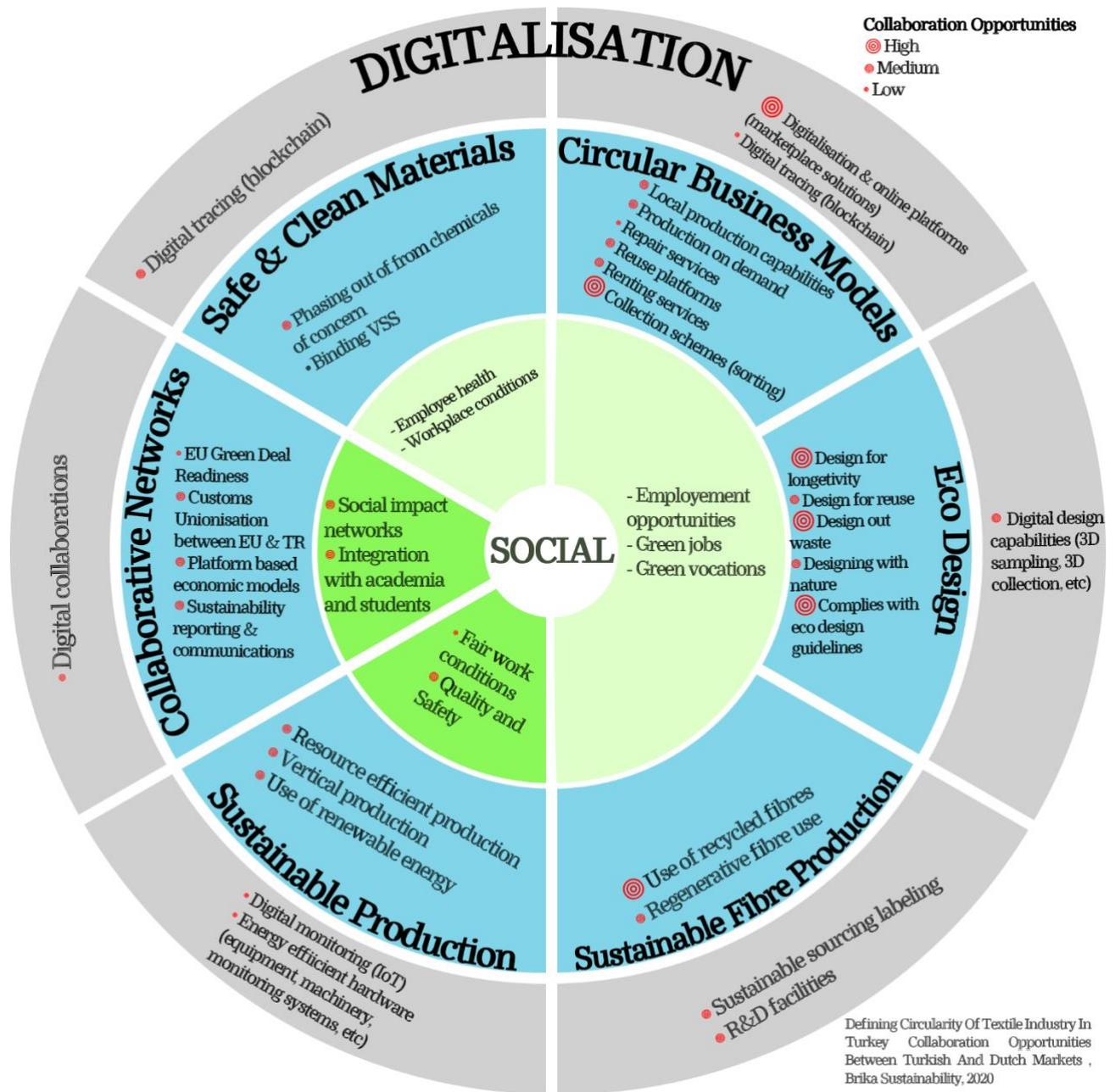
1. Firstly, the production systems must be restructured to allow this transformation.
2. Circular economy has a structure that transgresses the borders of a single country. All companies and governments that are part of this system need to acknowledge that they will need partners with varying needs and skills at every point in the product cycle.

As a practical example, reuse of products, which is an important chain in this link, may not take within the same country or the same region. Therefore, production, use, and reuse can be profitably carried out in different countries or regions. A healthy process stream for reuse may only be possible with repair and refurbishment of the products. For this reason, systems that accept the circular economy goal have to invest in the necessary spare parts or materials, in case of textile. Further, it should be noted that products, even when no longer used by the end-user, still have value. In order to maintain this value, the end product must be collected from the final user in a proper way. The conversion of the product to be recycled in the most similar way to its main structure requires the least effort and energy. In order to achieve this, the original system must be set up correctly. Otherwise, after recycling the outcome will be an insulation material, not a valuable raw material that may be obtained at the end of proper recycling.

This research intends to see the 'gaps' or 'challenges' when transitioning to circular textile, which indicate the opportunities and collaboration initiatives for all parties, the Dutch and Turkish.

The identified opportunity areas of interest from the consulted parties as well as from the desk research executed falls under the categorised initiatives, discussed in detail below.

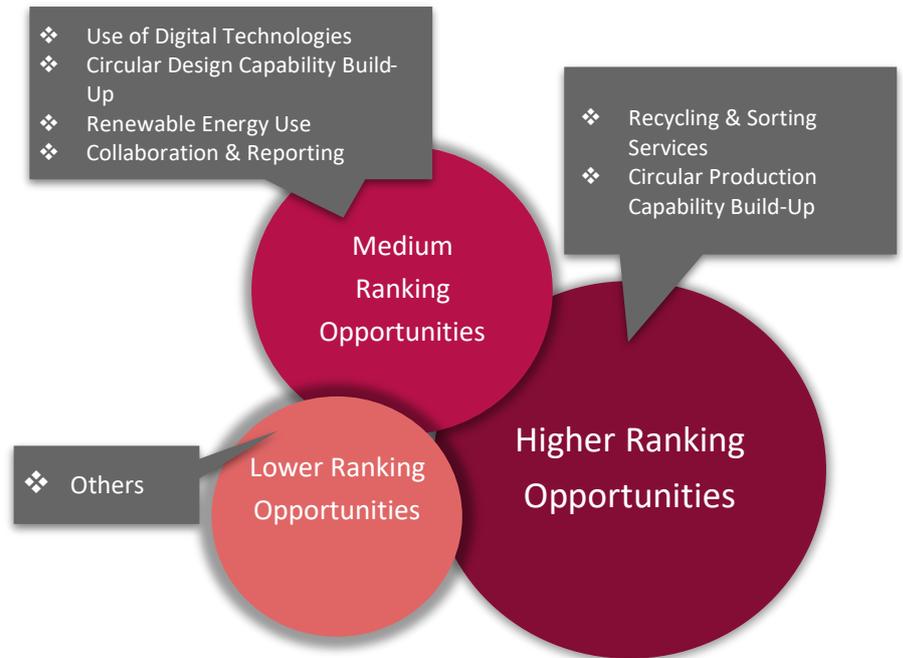
Summarising the opportunity areas based on the consultation framework may be shown as below (as bigger spots as higher areas of mutual interest to parties) (See Appendix B Collaboration Opportunities):



Below are the groupings of the indicators where participants from both sides expressed their interest to collaborate. The indicators in this way represent opportunity areas, which are grouped according to the voting they received from the participants.

**Potential to Grow:** These are the areas where there is high level of collaboration demanded from the Turkish producers but as high from the Dutch parties. This might be due to specific expertise areas of the Dutch parties consulted. The recommendation is that these to be considered closer by the appropriate Dutch parties.

- ❖ Digital Monitoring (IoT)
- ❖ EU Green Deal Readiness
- ❖ Energy efficient hardware



## 6.1 Opportunity Definitions & Recommendation

### 6.1.1 Recycling & Sorting Services

- ❖ Use of recycled fibres
- ❖ Regenerative fibre use (\*)
- ❖ Design for longevity
- ❖ Collection schemes (sorting services)
- ❖ Renting services
- ❖ Design out waste
- ❖ Compliance with eco-design guidelines
- ❖ Digitalisation & online platforms
- ❖ Sustainable sourcing labelling

**The research attempts to define the textile & clothing flows as they exist. Despite these flows are very high level and needs to be verified further, the picture is presented to demonstrate the existing patterns.**



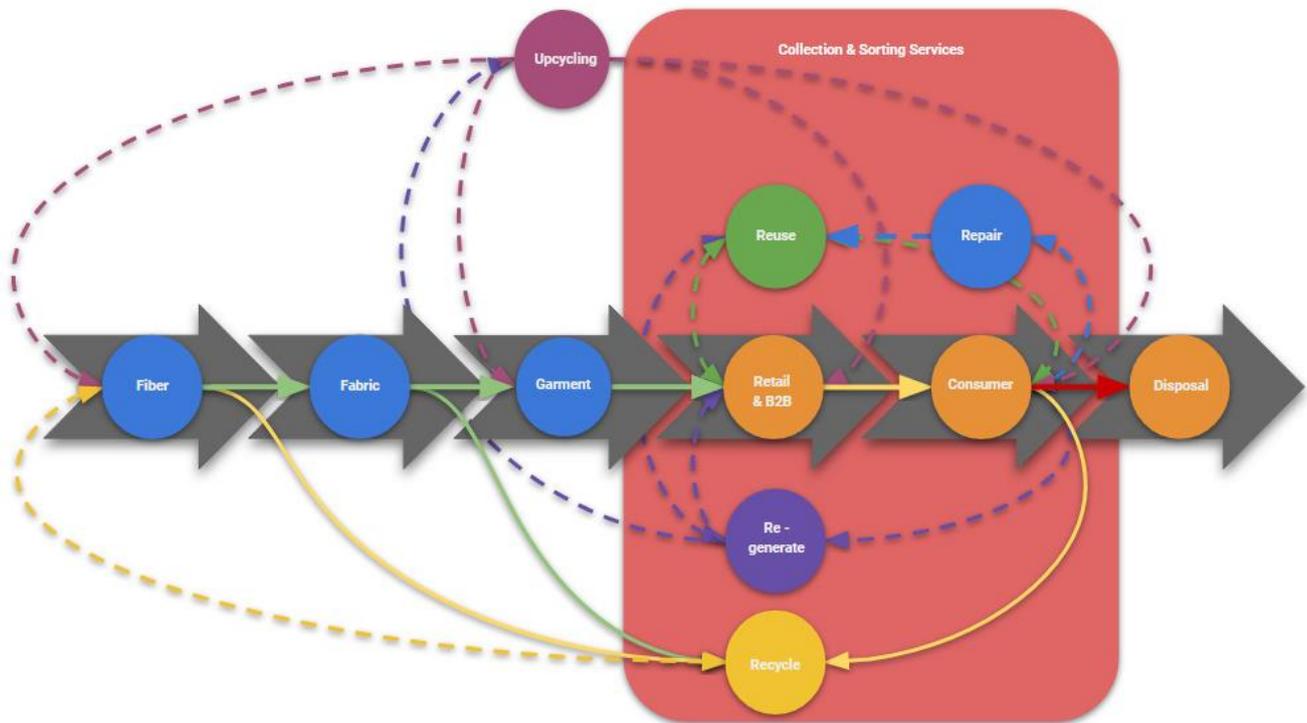
What is already established is demonstrating a clear linear 'take, make, waste' model. How to transform to a circular pattern involves establishment of distinct processes and flows.

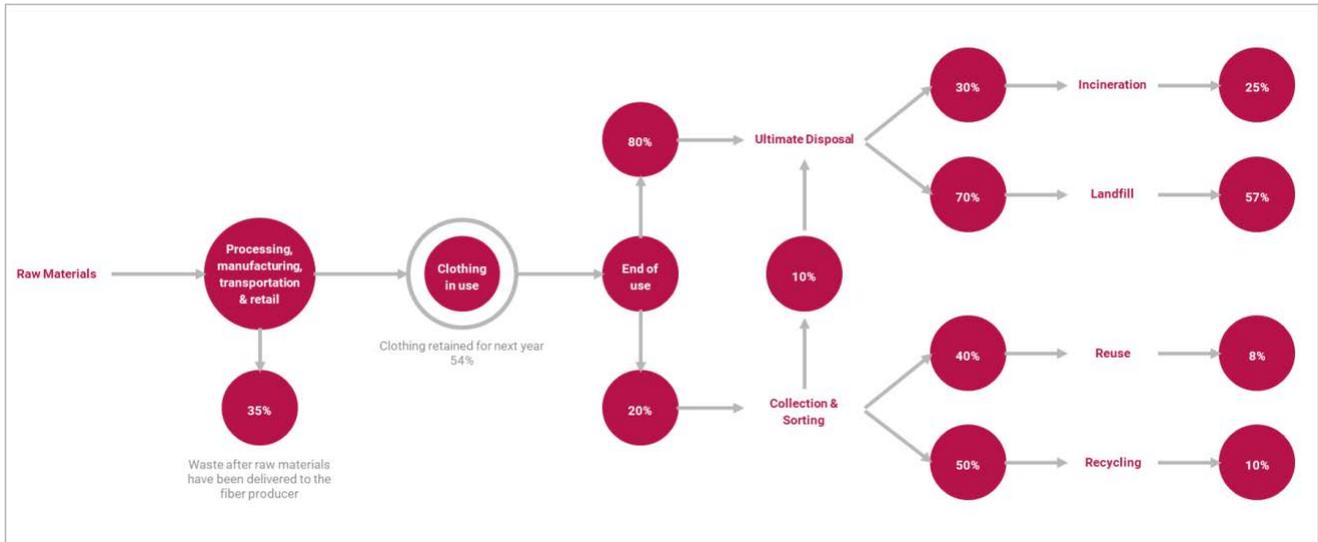
A good starting point for collaboration towards circular textile & clothing is to develop a circular framework, verify baselines and identify flows, and then establish a strategic transformation plan that involves various stakeholders working together, including consumer education. As denim and sustainability expert, Adriana Galijasevic states it:

'Improvements can be made through customer education, inspiring them to be more conscious regarding their purchasing decisions, as well as by setting up convenient infrastructures that will allow them to depart from their products responsibly once they no longer need them'

The real opportunities can only be defined afterwards. For example, there is no material value that can be designated to 'repair services' when there is lack of a market structure to address the need. The same holds true for re-use and re-generate services. Even for recycling, the only known is how much is produced and disposed. Assuming the complexity of the textile & clothing production when considered within the industrial production, the potential is not yet known for recycling.

**When transitioning to a true circular economy, production systems should be established so as to ensure that products are obtained as fabrics to be used for the same purpose when they are recycled. Recycling without considering these regenerative systems will be costly and will not give the desired result in environmental impact assessments.**





Fate of Textile Raw Materials in EU [12]

Considering the amount of waste in textile and the EU regulations expected textile sorting for recycling is a significant potential. Given the nearshoring and existing recycling capacity of Turkey, a collaborative business model design around sorting-services-for-recycling is a strong opportunity.

*‘While apparel is only one of several textiles’ applications, the global apparel production and consumption appear to have doubled over the past 15 years, generating higher waste. Even if the amount of textile waste separately collected in Europe has increased over the last five years from an estimated 2 million tons in 2014 to 2.8 million tons in 2019, this volume is expected to increase substantially once the EU waste legislation will be put into practice by the end of 2024. In less than four years textile waste shall be collected separately and could total an amount between 4.2 to 5.5 million tons which should be dealt with ideally within the EU.’ [7]*

**ReHubs Initiative** was raised by EURATEX, the European Apparel and Textile Confederation, who proposes the development and set up of European Textile Recycling Hubs (ReHubs). On November 16, 2020, a joint initiative to upcycle textile waste and circular materials all over Europe was announced in Brussels. The aim is to create 5 hubs to process textile waste and become European coordination centres and collect an amount between 4.2 to 5.5 million tons to be dealt with ideally within the EU, as stated in the announcement.

**Opportunity:** It is critical and necessary that at least one of these ReHubs are located in Turkey. Turkey’s existing textile and recycling capability, nearshoring potential, and willingness for collaboration, as detailed in the previous chapters, is the basis of a strong opportunity definition.

Country	Yearly Total Textile waste (Tonnes)	Yearly textile waste per person (Kg)	Yearly recycled textile waste per person (Kg)	Yearly reusable textile waste per person (Kg)	Yearly incinerated textile waste per person (Kg)	Yearly landfilled textile waste per person (Kg)	Spending Per person, pound per capita (2018)	Percentage of gross domestic product (GDP)	Yearly export of worn clothing per person (Kg)	Final Score (100-0, 100 being the worst)
Italy	465,925	7.7	0.8	0.6	1.9	4.4	£920	3.7%	2.6	100.0
Portugal	1,715	8.0	0.8	0.6	2.0	4.6	£680	4.1%	2.1	96.9
Austria	62,446	7.0	0.7	0.6	1.7	4.0	£1,080	2.9%	4.6	84.9
UK	206,456	3.1	0.3	0.2	0.8	1.7	£980	3.2%	5.9	59.1
Belgium	169,949	14.8	1.5	1.2	3.7	8.4	£810	2.3%	16.7	51.7
Czech Rep.	108,273	10.2	1.0	0.8	2.5	5.8	£300	1.8%	3.4	49.7
Denmark	18,134	3.1	0.3	0.3	0.8	1.8	£840	1.9%	2.6	47.0
Spain	98,881	2.1	0.2	0.2	0.5	1.2	£580	2.7%	1.3	45.7
Finland	14,934	2.7	0.3	0.2	0.7	1.5	£750	2.1%	2.3	44.4
Germany	391,752	4.7	0.5	0.4	1.2	2.7	£780	2.3%	6.0	43.5
Netherlands	102,261	5.9	0.6	0.5	1.5	3.4	£870	2.3%	9.0	41.6
France	210,001	3.1	0.3	0.3	0.8	1.8	£570	1.9%	1.2	39.0
Ireland	22,944	4.7	0.5	0.4	1.2	2.7	£650	1.1%	2.4	34.1
Poland	103,683	2.7	0.3	0.2	0.7	1.6	£340	3.1%	4.8	28.3
Hungary	23,190	2.4	0.2	0.2	0.6	1.4	£210	1.8%	5.0	0.0

[29]

To look more into how these circular flows can be established, similar practices in Prato, Italy can be examined.

**Opportunity & Policy recommendation:** A quick win area for recycling is coming out from ITKIB/IHKIB export numbers. Turkey has exported medical clothing and masks valuing over \$ 100 Million in the first nine months of 2020, an increase of 800% since 2019. Assuming there is a fast and one-time use of these clothing and an expected further increase due to the pandemic, these export numbers nor the fast consumption of these materials are not expected to decline in the short term.

There might be a bilateral close-loop agreement to take back the fast-consumed medical equipment to be used for regeneration or recycling.

Group 1: 62101092 - Single-use gowns, of a kind used by patients or surgeons during surgical procedures	\$ 28,547,735.40
Group 2: 621132100012, 621133100012 - Protective overalls	\$ 1,373,653.09
Group 3: 630790920000 - Perforated drapes - flat drapes - dental sheaths (drapes used in surgical operations)	\$ 6,923,658.63
Group 4: 621010980000 - Non-woven garments (Protectives included)	\$ 63,271,093.55
Group 5: 621132100011, 621133100011, 621142100000, 621143100000, 621149000019 - Aprons (All types included)	\$ 786,690.07
<b>TOTAL</b>	<b>\$100,902,830.74</b>

There are different reasons for low recycling rate of waste textiles, that are related with the different composition of textile goods being composed of various materials such as cotton, wool, rayon, polyester, nylon, etc., making it difficult to separate the waste textiles.

How this waste can be recycled and by whom is another problematic issue. The biggest challenge to large-scale commercialisation is the ability to recycle blended materials, regardless of whether the source is post-consumer or post-industrial. Mechanical recycling has its limitations, and chemical recycling is still comparatively nascent.

Elastane is also cited as a restriction by more recyclers globally than any other fibre, posing a challenge because of its ubiquity. Nylon and metals, too, are often restricted. [30]

**In order to increase recycling rate of waste textiles and to reduce the final disposal waste volumes, a recycling strategy should be established that includes not only what different types of fibre should be used in production, which is a design principle including technical recyclability, but also a systemic solution on how to bring consumption patterns and hence sorting into the picture.**

### Sorting - Mechanical Recycling

A strong technology to sort large volumes of mixed post-consumer textiles by fibre type comes from **Fibersort**, launched by Valvan Baling Systems and Wieland Textiles in March 2018. [31]

With the promise of preventing 170,000 tons of discarded garments from incineration and hence upcycling them as raw materials, Fibersort uses 3D scan and analysis by means of spectrography, software aided high-speed analysis based on the composition, colour, and structure of used fibres.



<https://www.wieland.nl/en/innovation-fibersort/>

**Opportunity:** Due to the amount of mechanical sorting necessary, both in Europe and in Turkey, Fibersort technology can be installed in Turkey, preferably in one of the production clusters mentioned in the previous chapter.

### Chemical recycling

Chemical recycling, on the other hand, is yet another immature area. Despite there are various attempts from the niche as well as known producers locally and on a global scale, there is little data showing to what extent and efficiency this process is achievable.

Chemical recycling is seen as a key means of making petrochemicals based content more sustainable and is considered to be an interesting complement to today's mechanical recycling.

An interesting example from Sweden is worth mentioning: **Renewcell's** patented Circulose<sup>®</sup> technology dissolves used cotton and other natural fibres into a new, biodegradable raw material, Circulose<sup>®</sup> pulp, which is used by fibre producers to make biodegradable virgin quality viscose or lyocell textile fibres.

**Opportunity:** Successful development of chemical recycling will depend on availability of waste streams – reinstating importance of sorting services and the opportunity for the Netherlands (not exclusively for textile) might be an annual CO<sub>2</sub> reduction of 1.6 Mt is projected for 2030 [32].

Chemical recycling capabilities is suggested to be established using collaborative strength of Dutch innovative platforms, academia, entrepreneur ecosystems, textile players, governments, etc.

### Circular Brand Design

Circular textile can be possible with the right design perspective of the business model and of the products. Brands are at the steering wheel of this change required for changing consumption and production patterns.

Brand designs embedding repair and reuse are getting more popular especially from the younger generations. **Mud Jeans** is a good example from the Netherlands on this ‘next-gen’ circular brand design.

Another example is from Sweden’s **Nudie Jeans**, who brings together the circular use into its brand proposition: ‘Recycling post-consumer garments can be trickier than it might sound. One needs to have a functional system for collecting garments and equally as important, have control over the fibre content to ensure a high-quality end product. Fortunately for us, the Repair and Reuse initiatives have since long built a foundation for collecting unwanted jeans, and since they are ours, we know the fibre content very well. Basically, the idea of repairing and reusing our own products paved the way for recycling them as well.’ [33]

It is important that these ‘next-gen’ circular brands scale up as well as established brands adopt these patterns in their business model.

Last but not the least, the clothing industry must abandon operating principles that only reward short-term gains. **There is no way for fast fashion to be on the runway of textile & clothing economies.**

**Opportunity & Policy recommendations:** From the environmental perspective, as stated earlier recycling and second-hand sales has the potential to reduce greenhouse gas emissions by 13%, water use by 18%, land use by 8%, and eutrophication by 12%. In addition, in case of a more circular model where 57% of its products are sold as second-hand greenhouse gas emissions has the potential to decrease by 43%, water use by 61%, land use by 25% and eutrophication by 48%. This is why environmental footprint considerations for products should be imposed by regulations, in pricing considerations and in labelling.

In order for the circular flows to be established, below are some recommendations:

- ❖ Minimum recyclable content criteria in textile & clothing
- ❖ Subsidies for recycled fibre and elimination of subsidies on industrial agricultural fibres
- ❖ Subsidies for re-use, repair and regeneration type of businesses

### 6.1.2 Circular Production Capability Build-up

- ❖ Vertical integration
- ❖ Quality & safety
- ❖ Local production capabilities
- ❖ Integration with academia & students
- ❖ Use of renewable energy
- ❖ Binding VSS
- ❖ Digital Monitoring (IoT)

### Trace and Elimination of Chemicals of Concern

Toxic chemicals cause serious violations of planetary boundaries. To reduce the existing problems in textile production, good examples exist among the Turkish producers. Some are cited below:

• Use of Digital Technologies

- Circular Design Capability Build-Up
- Renewable Energy Use
- Collaboration & Reporting

**Use of Digital Technologies**

- Digital Tracing
- Production on Demand
- Resource Efficient Production
- Sustainable Sourcing & Labelling

**Circular Design Capability Build-Up**

- Design for Reuse
- Designing with Nature
- Regenerative Fibre Use
- R&D Facilities
- Re-Use Platforms

**Renewable Energy Use**

- Use of Renewable Energy

**Collaboration & Reporting**

- Social Impact Networks
- Sustainability Reporting & Communication
- Design Out Waste

Medium Ranking Opportunities

ELYAF Textile’s Heritage™ Dying is a “ready to use natural dyestuff” bringing in an innovative natural way of dying cellulosic fibres such as cotton, viscose, linen, bamboo, Tencel, Modal etc. Local forestry products picked up plants from the nature are transformed into powder with grinders to be brewed directly for dyeing. Patent owning drying innovation helps to lower chemicals, water, and energy use significantly. The social aspect is important as well: The domestic plants picked up by local villagers from the nearby forests, gaining economic welfare from this innovative technology.



Likewise, Soktas Textile’s Naturally Coloured Cotton from their family-owned farmland a few kilometres away from their production site is an environmentally friendly no-dye product, creating a pure and breathable fabric with a soft and delicate feel. Elimination of dyeing process contributes favourably in fibre and fabric footprint calculations.

**Opportunity:** Use of no-dye fibres and harmless dye can be promoted and further commercialised. Besides textile, farming and forestry ecosystem can be tapped; the benefits can be extended to other sector definitions.



Another solution comes from a joint Dutch and Turkish venture, WiserGlobe /WiserWash. By their patented Certified by Union Control Process washing process, they can reduce the water used in decolorisation to only 200 ml per denim and the whole process saves up to 92% of the clean water and 40% of energy consumed in traditional washing. The process is also free of sodium hypochlorite, potassium permanganate and pumice stone, which are chemicals of concern for denim production. ([www.wiserwash.com](http://www.wiserwash.com))

**Traditional vs Wiser Wash**



Every denim piece produced using traditional methods requires 70-80 litres of fresh water and a chemically-intensive washing process. This leads to extreme levels of water wastage and chemical.



If all of the jeans produced worldwide were Wiser Washed®, we would save 1400 billion liters of clean water,

### 6.1.3 Use of Digital Technologies

- ❖ Digital tracing (blockchain)
- ❖ Resource efficient production
- ❖ Production on demand
- ❖ Sustainable sourcing labelling

#### Digital Monitoring

Digital Monitoring capability (IoT) is critical to be able to understand shortages in material and energy usages. The well-functioning of this capability is to be verified and monitored regularly to see the upcoming opportunities here.

#### Digital Tracing:

This type of technology, not only limited with blockchain, has the potential to bring in intelligence to almost all circularity indicators mentioned in this study.

The digital loading project from Cross Jeans, as discussed in the earlier chapter, is a good example there.

Another example that might be relevant to reflect on the circular thinking is from Circularise and Porsche collaboration with Borealis, Covestro and Domo Chemicals to enable the traceability of plastics in the automotive sector.

‘Stuttgart/The Hague/Vienna/Leverkusen/Ghent, November 3, 2020 - Circularise, the blockchain supply chain transparency provider, as part of the Startup Autobahn innovation program, recently launched a project with Porsche and its pioneering material suppliers – Borealis, Covestro and Domo Chemicals – to enable the traceability of plastics on blockchain and to ensure that the use of sustainable materials in Porsche cars can be proven. By digitizing materials Circularise was able to create a digital thread through the whole supply chain, enabling material traceability, tracking the CO2 footprint and other sustainability metrics like water savings<sup>3</sup>.

*Opportunity:* Likewise, in textile & clothing, similar projects on digital tracing can be developed with involvement from technology players.

#### Sustainable Sourcing & Labelling

Digitalisation of labelling is an immediate quick win to eliminate this waste. The potential impact is addressed in the previous chapter.

*Policy recommendation:* In order to reduce and finally eliminate labelling based on material use, regulatory improvements are necessary.

Recyclable garment targets may be set, and minimum recyclable content criteria imposed by legislation

#### *Opportunities:*

- ❖ Labelling is a huge segment of textile & clothing once digitalised.
- ❖ Recyclable zippers and buttons (imports mostly from Japan at this point)

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<sup>3</sup> <https://www.circularise.com/press>, <https://tcbl.eu/projects>

#### 6.1.4 Circular Design Capability Build-up

- ❖ Design for re-use
- ❖ Designing with nature
- ❖ Regenerative fibre use
- ❖ Design out waste (\*)
- ❖ R&D facilities

The “bridge” between brands and manufacturers to build structured transformation. The Dutch platforms can be the bridge.

##### *Opportunities:*

Design principles in regard to circularity needs to be re-visited considering below:

- ❖ Sustainable materials, clean production (currently limited to PCW and PIW)
- ❖ Design of raw materials, regenerative raw materials, nature-based design
- ❖ Design with raw materials, processes that can enable reuse, refurbishment, creative redesign, recycling – apply 10R instead of 3R
- ❖ Design for disassembly, re-assembly
- ❖ Nature driven design through R&D

Further, ideas for collaboration might be given regarding above:

- ❖ The Dutch designers, who are already working to design waste out as well as developing nature-based solutions can be linked with the Turkish manufacturing industry. The ‘realist project’ given below is a good example for this.
- ❖ Fashion for Good led workshops might be organised for knowledge transfer

#### Regenerative materials and R&D:

##### *Opportunities:*

In order to develop regenerative materials, below cycles or areas need to be familiarised:

- ❖ Vegetable farming and harvesting
- ❖ Animal farming and harvesting
- ❖ Synthetic fibres production from petroleum hydrocarbons-based polymer batch
- ❖ Regenerative fibre production – hemp
- ❖ Farm to Closet mind-set in R&D
- ❖ Use of cross industry frameworks, such as integration into gaming and VR, into acceleration of circularity

##### *Policy recommendation for R&D:*

How to scale up R&D efforts for circular materials and processes is a significant issue.

Turkish Government subsidies exist for R&D capacity development, which supports cross-border collaboration. On the other hand, regarding R&D from abroad, the subsidies are not offered for P&D (product development) capacity. Assuming circularity necessitates cross border collaboration, research and development subsidies might be revisited.

The governments should discuss further, as mentioned in JETCO agreement in September 2020 on how to scale up innovations.

#### 6.1.5 Renewable Energy Use

- ❖ Use of renewable energy

Lack of renewable energy use and amount of carbon used during production constitutes a risk for both buyers and producers when EU Green Deal requirements are in the way.

As stated in the JETCO 2020 agreement, both sides also highlighted the importance to the provision of an inclusive finance mechanism and the mobilisation of both EU and international funds fairly for supporting the Green Deal globally.

Investment plans should be visited immediately and collaboratively.

### 6.1.6 Collaboration & Reporting

- ❖ Social impact networks
- ❖ Sustainability reporting & communication
- ❖ Sustainable sourcing labelling

As discussed in detail, collaboration, monitoring, and communication are the ultimate ways of successful transformation.

**Opportunity:** From a cultural as well as business perspective, the Dutch Parties can play an accelerator role here, which may bring win-win benefits for both parties in the search for circularity. The established circular consultancy services are a good leverage to work on these collaborative platforms and methods.

There are some good examples of these type of collaborative models between the Dutch and Turkish parties that are worth mentioning (without any intention to be exclusive):

#### Denim Deal

House of Denim, a foundation promoting best practices and network-wide collaboration for cleaner and smarter denim practices, led for a new post-consumer recycling of textiles called the 'Denim Deal', which was signed in October 2020 by 30 parties representing the Dutch central and local government bodies, the Dutch brands, the Turkish producers, technology, and consultancy partners [34]. All signatories to the Denim Deal have committed themselves to meet certain sustainable standards as part of their operations. This includes agreeing to work as quickly as possible towards a standard of using at least 5% recycled textile in all denim garments.

One improvement potential for the Denim Deal, as stated by some producers, is that it scales up the planned impact by having further representation from bigger brands *and* some other bigger producers.

#### New Cotton Project (New Cotton Project, 2020)

Another project that went live during the course of this research (24th November 2020) is the New Cotton Project with twelve parties; consortium of brands, manufacturers, suppliers, innovators and research institutes, funded by European Union. Being a close-loop design from start, this project intends to achieve over a three-year period, textile waste's collection and sorting, and regeneration into a new, man-made cellulosic fibre that looks and feels like cotton – a "new cotton" – using Infinited Fibre Company's textile fibre regeneration technology. The fibres will be used to create different types of fabrics for clothing that will be designed,

Lower Ranking Opportunities

\* Others

- Energy Efficient Hardware
- Fair Work Conditions
- Repair Services
- Digital Monitoring
- EU Green Deal Readiness



manufactured, and sold by global brand Adidas and companies in the H&M Group. One of the recycled fibre producers Kipas, who is part of this research, is one of the parties of this circular business model and will use the regenerated fibres to denim.

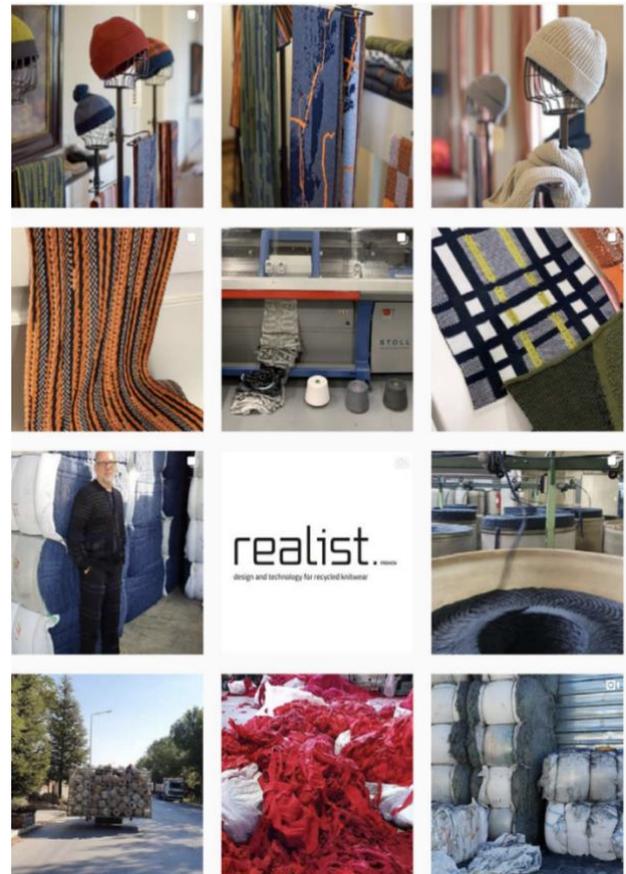
### Realist Project

Knitwear Lab from the NL and Bersa Triko from TR's REALIST\_ Project aims to produce knitted with Turkish post-industrial textile waste.

In a multi-collaborative environment with partners from the Creative Industries Fund NL, the Dutch Consulate in Istanbul, Maison the Faux and the Marmara University, the project demonstrates a good example on cooperation between the innovative power of technological Dutch Design and the Turkish textile knowhow, bringing a commercial and recycled collection for the mainstream fashion markets in Europe and Turkey. The project is also significant from a stakeholder engagement perspective and brings in communities and women, academia, and research centres, governments when developing the business concept.

Some other collaborative projects worth mentioning here are as below:

1. Renewcell & Levis partnership
2. Evrnu
3. Econyl
4. Natural Fibre Welding
5. HKRITA
6. GALY – cotton grown in a lab
7. Texloop
8. H&M Green Machine
9. H&M Planet First Program
10. Unspun
11. EON-ID
12. Ioncell



### Reporting & Communication

Reporting and communication are among the key parts of circularity transformation, as defined by the consulted parties.

#### *Opportunities:*

Besides monitoring sustainability progression, impact measurement methods and standards should also be adopted by the players. This means measuring of the total environmental and social impact that one operation, business model or the industry in general is creating.

The whole textile and clothing industry must call for consumer awareness on circularity transformation. The language needs to be simple and relevant.

Education on circularity of citizens and the industry must accompany all efforts.

## 6.2 Conclusion

This research is conducted in order to give direction to the Dutch businesses, government, academia, and others a high-level indication on the type of opportunities that arise around circular textile engagement with Turkish textile producers and other involved ecosystem partners.

Analysing the overview of the textile & clothing market with a perspective from production to consumption, the transition to circular textile is inevitable. The material and resource waste, production footprint (carbon, water, chemicals), energy and process inefficiencies have negative economic, environmental and social impacts – in other words, current production and consumption systems are not sustainable.

Turkey is a major textile & clothing player as well as a significant supplier for the Dutch market. Due to its nearshoring potential, which is critical for establishing circular textile loops, Turkey has important advantages.

Immaturity of production conditions for circular textile in the Turkish market brings significant opportunities for Dutch businesses, as discussed in detail previously. The aim should be to translate problems into opportunities, which enable a fair welfare distribution to parties involved.

There is a role for all parties. The below sections summarise the recommendations for the Dutch businesses and the Dutch Government.

### **Recommendations for Dutch Businesses are as below:**

- It should be remembered that the most opportunities refer to non-existent market definitions or business models. Above opportunity areas, as also highlighted by the participants of the research, needs to be detailed with stakeholders.
- For higher ranking opportunities (recycling & sorting services; circular production capacity build-up) and medium ranking opportunities (use of digital technologies; circular design; renewable energy; collaboration & reporting), task forces need to be established to define scope and magnitude. As an example [23], the possible impact of an EU carbon-border adjustment mechanism on Turkish textile sector (with a carbon price of 50 Euro/tCO<sub>2</sub>) can be a levy of Euro 195mn, corresponding to 1.4% of textile exports to the EU region; while total export tax to the EU region amounting to Euro 1,809mn. This is a significant budget not only for Turkish producers, but also for the buyers of these goods. The planning by these task forces should include an investment case for the specific transition areas.
- The brands will need to support consumers in their choices by offering and their supply chain supplying for only sustainable products. No production partner will produce with circular textile principles unless there is demand from buyers. Seizing the opportunity in the long-term dynamics of the textile market, brands need to take the initiative to transform the market both from consumption and production patterns.
- The waste and recycling sector need to organise itself, encouraging the customers and producers on delivering high-quality use of recyclables rather than primary raw materials. Recyclable raw materials shall no longer be incinerated. Consumers will regard the careful use of products and materials as a standard matter, in order to make a concrete contribution to the preservation of natural capital and the countering of climate change.

**These activities are suggested to be pursued involving the Dutch businesses and platforms, Turkish producers as well as the Dutch Government:**

- 1. Business Framework Development:** A good starting point for collaboration towards circular textile & clothing is to develop a circular framework, verify baselines and identify flows, and then establish a strategic transformation plan that involves various stakeholders working together.
- 2. Raising Awareness:** The research provided an initial and articulate picture to the participants on what circular textile is about and what kind of transition it requires. The positive feedback received from the participants is confirming that the discussions should pursue and be extended to other players.
- 3. Developing Circular Innovation Agenda:** A significant portion of the solutions needed for circular textile are not commercially available, e.g., nature-based production chemicals, chemical recycling, biomimicry-based design, ... The communities (entrepreneurial organisations, academia, business platforms, etc) should be brought together around developing solutions.
- 4. Coordination and Communication:** Transition to circular textile should be coordinated and communicated for the stakeholders involved.

**Recommendations for EU are as below:**

- There should be ambitious recycling and landfill-reduction targets for 2030/2035, mandatory waste prevention measures and reinforced rules on separate collection of waste.
- Further legislative harmonisation with the EU for circular textile standards and accreditations is needed.
- There needs to be legislative arrangements for the recycling of and import of used clothing sector products within the scope of Customs Union (as also aligned with JETCO meeting notes in September 2020) including special investment support mechanisms for established facilities,
- Followingly, Dutch government level recommendations in this research can be summarised as below:
- Raw material production process might be upgraded to a more sustainable cultivation via the use of digital tracking technologies in agriculture (as expressed in the 'Science and Innovation Section ' of JETCO meeting notes in September 2020).
- There should be legislative arrangements for the recycling of and import of used clothing sector products within the scope of Customs Union (as aligned with JETCO meeting notes in September 2020) including special investment support mechanisms for established facilities,
- There needs to be standardisation and accreditation of non-GMO cotton production.
- Regenerative farming as textile inputs should be promoted while subsidies on industrial agricultural inputs should be abolished.
- Inclusive financing mechanism should be developed for SMEs with a regional perspective in adaptation to circular economy practices.
- Developing a roadmap to reduce the emissions through investments, R&D, technological innovation while promoting and incentivising via financing at lower credit rates (e.g., Euro 1bn for research and innovation projects, EBRD voucher framework co-financed by the Netherlands EBRD Trust fund to support Turkish SMEs for circular business models).
- Policies for improving R&T intensity and digitalisation (beyond e-trade) are recommended.
- Policies to eliminate labelling based on material use, regulatory improvements are necessary.

**Mutual recommendations for the Dutch and Turkish governments can also be mentioned as below:**

- The governments should discuss further, as mentioned in JETCO agreement in September 2020, on how to scale up innovations and provision of an inclusive finance mechanisms and the mobilisation of both EU and international funds fairly for supporting the Green Deal.

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## A List of Companies Consulted

TR	ORGANISATION	ORGANISATION TYPE	WEB SITE
1	BOSSA TICARET VE SANAYI ISLETMELERİ TICARET A.S.	Company	<a href="http://www.bossa.com.tr/">http://www.bossa.com.tr/</a>
2	ZORLU DIS TICARET A.S.	Company	<a href="http://www.zorludisticaret.com/">http://www.zorludisticaret.com/</a>
3	EREKS KONFEKSİYON SAN. VE TIC. A.S.	Company	<a href="https://www.ereksgarment.com/">https://www.ereksgarment.com/</a>
4	GAMA RECYCLE ELYAF ve IPLİK SAN. A.S. <sup>†</sup>	Company	<a href="http://www.gamaiplik.com/">http://www.gamaiplik.com/</a>
5	BURSALI DIS TICARET A.S.	Company	<a href="https://www.bursaligrubu.com/">https://www.bursaligrubu.com/</a>
6	ORTA ANADOLU TICARET VE SANAYI ISLETMESİ T.A.S.	Company	<a href="https://www.ortaanadolu.com/">https://www.ortaanadolu.com/</a>
7	ENKAY MODA KONFEKSİYON SAN. TIC. LTD. STI.	Company	<a href="http://www.enkaytextile.com.tr/tr/enkay-moda.html">http://www.enkaytextile.com.tr/tr/enkay-moda.html</a>
8	YESİM SATIŞ MAGAZALARI VE TEKSTİL FABRİKALARI A.S.	Company	<a href="https://www.yesim.com/">https://www.yesim.com/</a>
9	DENİMER KUMASCILIK SAN. VE TIC.LTD.STI.	Company	<a href="http://www.denimer.com.tr/">http://www.denimer.com.tr/</a>
10	CALIK DENİM TEKSTİL SANAYİ TICARET A.S.	Company	<a href="https://www.calikdenim.com/">https://www.calikdenim.com/</a>
11	ALPER CATALOGLU	Consultancy /expert	
12	EROĞLU GIYIM SAN.TIC.AS	Company	<a href="http://www.eroglugiyim.com/">http://www.eroglugiyim.com/</a>
13	FASHION POINT TEKSTİL ÜRETİM A.S.	Company	<a href="http://www.fashionpoint.com.tr/">http://www.fashionpoint.com.tr/</a>
14	WHOSUSTAIN	Consultancy	<a href="http://whosustain.com/">http://whosustain.com/</a>
15	KIPAS PAZARLAMA VE TICARET A.S.	Company	<a href="http://www.kipasmensucat.com/">http://www.kipasmensucat.com/</a>
16	ELYAF TEKSTİL SAN. VE TIC. A.S.	Company	<a href="https://www.elyaf.com/">https://www.elyaf.com/</a>
17	BETTER COTTON INITIATIVE - İPUD	Business platform / non profit	<a href="https://iyipamuk.org.tr/Default.aspx">https://iyipamuk.org.tr/Default.aspx</a>
18	OZAK TEKSTİL KONFEKSİYON SANAYİ VE TICARET A.S.	Company	<a href="http://www.ozaktekstil.com.tr/">http://www.ozaktekstil.com.tr/</a>
19	PAMEKS GIYIM SAN. A.S.	Company	<a href="http://www.pameks.com/tr/">http://www.pameks.com/tr/</a>
20	DYNAMO - DENİM KUMASCILIK SAN. VE TIC.LTD.STI.	Company	<a href="http://www.denimkumas.com.tr/">http://www.denimkumas.com.tr/</a>
21	TYH ULUSLARARASI TEKSTİL PAZARLAMA TIC. A.S.	Company	<a href="http://www.tyh.com.tr/">http://www.tyh.com.tr/</a>
22	WWF TURKEY	Non profit	<a href="https://www.wwf.org.tr/">https://www.wwf.org.tr/</a>
23	İTÜ (İSTANBUL TECHNICAL UNIVERSITY) - HALE KARAKAS	Academia	<a href="https://akademi.itu.edu.tr/karakas/hal/Hale-Karakas/">https://akademi.itu.edu.tr/karakas/hal/Hale-Karakas/</a>
24	SOKTAS DOKUMA SANAYİ VE TICARET A.S.	Company	<a href="http://www.soktas.com.tr/">http://www.soktas.com.tr/</a>
25	TAYPA TEKSTİL GIYIM SANAYİ VE TICARET A.S.	Company	<a href="https://www.taypa.com.tr/">https://www.taypa.com.tr/</a>
26	LC WAIKIKI MAGAZACILIK HİZMETLERİ TICARET A.S.	Company	<a href="https://www.lcwaikiki.com/tr-TR/TR">https://www.lcwaikiki.com/tr-TR/TR</a>
27	BUSINESS COUNCIL FOR SUSTAINABLE DEVELOPMENT TURKEY (BCSD TURKEY)	Business platform / non profit	<a href="http://www.skdturkiye.org/">http://www.skdturkiye.org/</a>
28	CROSS TEKSTİL SANAYİ VE TICARET A.S.	Company	<a href="https://crosstextiles.com/">https://crosstextiles.com/</a>
29	WISER GLOBE	Company	<a href="https://www.wiserglobe.com/home">https://www.wiserglobe.com/home</a>
30	PERSEUS TEKSTİL DIS TICARET LTD. STI.	Company	<a href="http://www.perseus.com.tr/">http://www.perseus.com.tr/</a>
31	İSTANBUL TEXTİLE AND APPAREL EXPORTERS' ASSOCIATION (İTKİB) / İSTANBUL APPAREL EXPORTERS' ASSOCIATION (İHKİB)	Business platform / non profit	<a href="https://www.itkib.org.tr/">https://www.itkib.org.tr/</a>
32	İSTANBUL MODA AKADEMİSİ	Academia	<a href="https://www.istanbulmodaakademisi.com/">https://www.istanbulmodaakademisi.com/</a>

TR	ORGANISATION	ORGANISATION TYPE	WEB SITE
33	ISKO DENIM <sup>†</sup>	Company	<a href="https://iskodenim.com/">https://iskodenim.com/</a>
34	WISER WASH KONFEKSIYON TEKSTIL SANAYI DIS TICARET A.S.	Company	<a href="https://wiserwash.com/wiser-wash">https://wiserwash.com/wiser-wash</a>
35	RECYCLING FIBER (no wish to be sited)	Company	
36	EBRU DEBBAG	Consultancy / expert	<a href="https://www.indigo-friends.com">https://www.indigo-friends.com</a>
37	TURKISH CLOTHING MANUFACTURERS' ASSOCIATION (TGSD)	Business platform / non profit	<a href="https://tgsd.org.tr/">https://tgsd.org.tr/</a>

<sup>†</sup> Stated opinion only

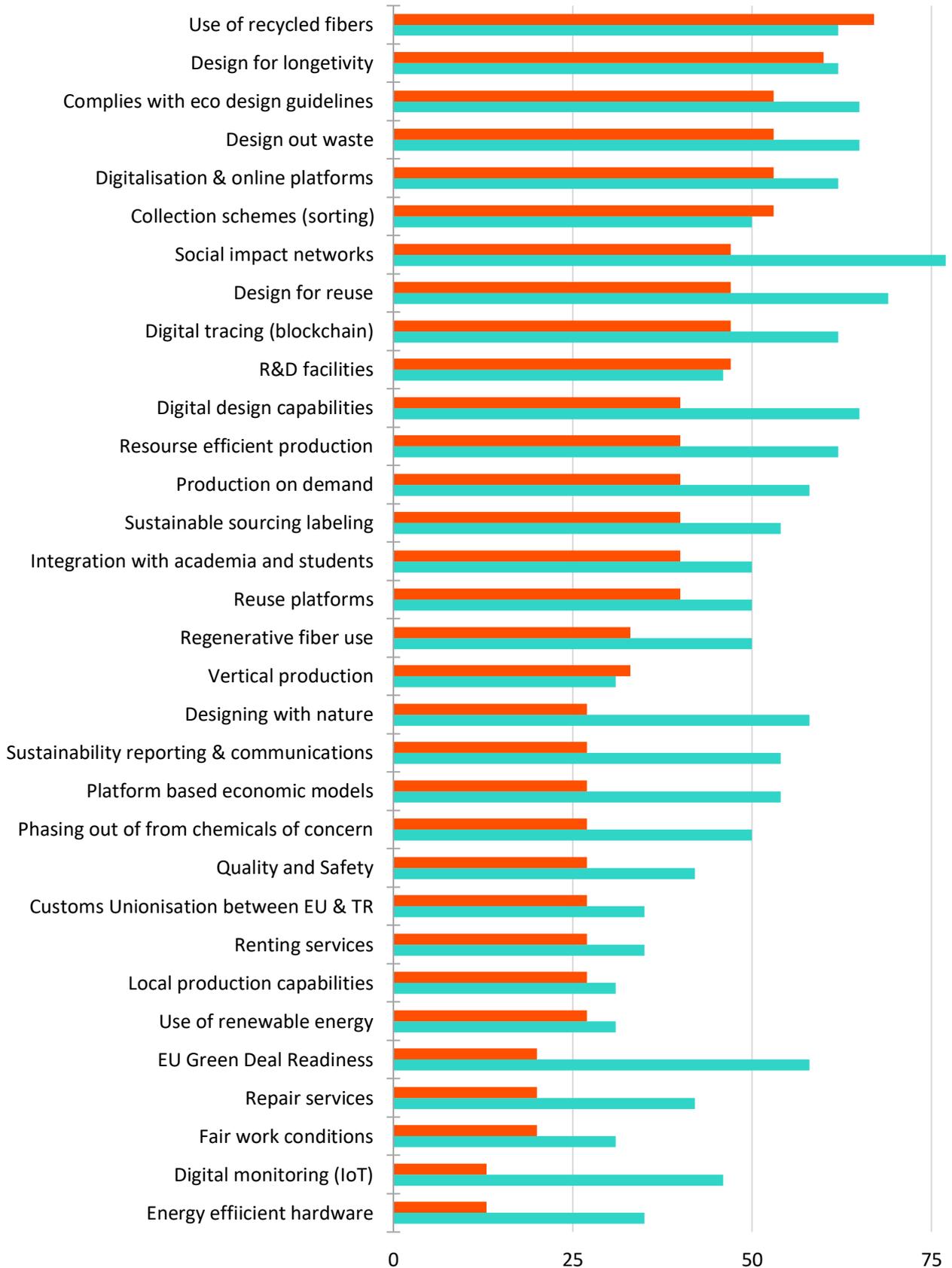
NL	ORGANISATION	ORGANISATION TYPE	WEB SITE
1	CIRCLE ECONOMY	Consultancy and services	<a href="https://www.circle-economy.com/">https://www.circle-economy.com/</a>
2	CIRCULAR COLAB	Business platform	<a href="https://www.circularcolab.org/">https://www.circularcolab.org/</a>
3	FASHION FOR GOOD	Business platform	<a href="https://fashionforgood.com/">https://fashionforgood.com/</a>
4	FRONTEER <sup>†</sup>	Consultancy and services	<a href="https://fronteer.com/">https://fronteer.com/</a>
5	HOUSE OF DENIM	Business platform	<a href="https://www.houseofdenim.org/">https://www.houseofdenim.org/</a>
6	JEAN SCHOOL	Consultancy and services	<a href="https://www.jeanschool.com/international-courses/?lang=en">https://www.jeanschool.com/international-courses/?lang=en</a>
7	MUD JEANS	Brand	<a href="https://mudjeans.eu/">https://mudjeans.eu/</a>
8	SCIRCULA	Consultancy and services	<a href="https://scircula.com/">https://scircula.com/</a>
9	SCOTCH AND SODA	Brand	<a href="https://www.scotch-soda.com/global/en/home">https://www.scotch-soda.com/global/en/home</a>
10	MVO NEDERLAND	Business platform	<a href="https://www.mvonderland.nl/en/textile-network/">https://www.mvonderland.nl/en/textile-network/</a>
11	MODINT	Business platform	<a href="https://modint.nl/">https://modint.nl/</a>
12	CIRCO	Consultancy and services	<a href="https://www.circonl.nl/english/">https://www.circonl.nl/english/</a>
13	OXIOUS	Brand	<a href="https://oxious.com/home.html">https://oxious.com/home.html</a>
14	DUTCH CONSULATE <sup>†</sup>	Government	<a href="https://www.netherlandsandyou.nl/your-country-and-the-netherlands/turkey/about-us/consulate-general-in-istanbul">https://www.netherlandsandyou.nl/your-country-and-the-netherlands/turkey/about-us/consulate-general-in-istanbul</a>
15	HOLLAND CIRCULAR HOTSPOT <sup>†</sup>	Consultancy and services	<a href="https://hollandcircularhotspot.nl/">https://hollandcircularhotspot.nl/</a>
16	PARTNERS FOR INNOVATION	Consultancy and services	<a href="https://partnersforinnovation.com/en/">https://partnersforinnovation.com/en/</a>
17	PVH	Brand	<a href="https://www.pvh.com/">https://www.pvh.com/</a>
18	KNITWEARLAB	Consultancy and services & brand	<a href="https://knitwearlab.nl/">https://knitwearlab.nl/</a>

<sup>†</sup> Stated opinion only

## B Collaboration Opportunities

■ NL ■ TR

Defining Circularity Of Textile Industry In Turkey Collaboration Opportunities Between Turkish And Dutch Markets , Brika Sustainability, 2020



## C Glossary of Abbreviations

REACH: Registration, Evaluation, Authorisation and Restriction of Chemicals

ZDHC: Zero Discharge of Hazardous Chemicals

IHKIB: Istanbul Apparel Exporters' Association

ITKIB: Istanbul Textile and Garment Exporters Association

TGSD: Turkish Clothing Manufacturers' Association

BCI: Better Cotton Initiative

rPET: Recycled Polyethylene Terephthalate

CO2: Carbon dioxide

IoT: Internet of Things

## D 11<sup>th</sup> Development Plan of 2019-2023

In the 11<sup>th</sup> Development Plan of 2019-2023 developed by the Presidency of Strategy and Budget [35], these main objectives have been listed:

- ❖ *The main objective is to be one of the leading countries that directs the value chain with a focus on fashion design and branding in the textile, leather, and clothing sector.*
- ❖ *Fast and flexible production, innovation, customer focus, integrated production structure, social responsibility, and environmental awareness, retailing and organisational skills will be developed in the sector.*
- ❖ *With regard to technical textiles, which is one of the key areas in the transformation of high value-added structure in the sector, companies will be supported to select optimum technology, comply with the environmental protection legislation, energy efficiency and waste re-use activities and cooperate with other stakeholders in the value chain (in particular machinery, fibre and technical end-use manufacturers).*

The report of the Special Expertise Commission for Textile, Clothing and Leather Sectors, further details the 2019-2023 objectives of these sectors:

- ❖ Changing from a sector procurer of world brands to a fashion-brand country with branding, design, and collection infrastructure.
- ❖ Strengthening the “organiser country role” by using the organisational power of the sector and the advantage of geographical location.
- ❖ Focusing on activities aimed at digitizing the supply chain, where buyers' demands are concentrated, using the leverage of technology.
- ❖ Ensuring that there are 5 Turkish brands among the 100 biggest brands of the world by investing in brands with global brand potential.
- ❖ To turn towards innovative and multi-functional products by using new technologies; to be among the leading countries in this field by increasing the production and export of technical textiles.

- ❖ Increasing productivity through modernisation and restructuring of production capacity.
- ❖ Increasing the added value in exports with the production of special fibres and high technology yarns.
- ❖ Increasing the production and investment capacity in man-made fibre and yarn, which are important for technical textiles.
- ❖ Transition from ordinary products to special products such as hip composites, biomaterials, turning towards environmentally friendly and new textile applications.

## **Senior Research Team**

Gulin Yucel

Pelin Yenigun Dilek

Ebru Debbag

Prof. Levent Kurnaz

## **Junior Research Team**

Ozge Tugralı

Mehmet Seber

Emren Borhan

Aytac Pacal

Naz Yucel

Sule Caglin



This is a publication of  
Netherlands Enterprise Agency  
Prinses Beatrixlaan 2  
PO Box 93144 | 2509 AC The Hague  
T +31 (0) 88 042 42 42  
E klantcontact@rvo.nl  
www.rvo.nl

This publication was commissioned by the ministry of Foreign Affairs.

© Netherlands Enterprise Agency | April 2021  
Publicationnummer: RVO-075-2021/RP-INT

NL Enterprise Agency is a department of the Dutch ministry of Economic Affairs and Climate Policy that implements government policy for Agricultural, sustainability, innovation, and international business and cooperation. NL Enterprise Agency is the contact point for businesses, educational institutions and government bodies for information and advice, financing, networking and regulatory matters.

Netherlands Enterprise Agency is part of the ministry of Economic Affairs and Climate Policy.