PUTTING CIRCULAR TEXTILES TO WORK

The employment potential of circular clothing in the Netherlands

CIRCLE ECONOMY

GOLDSCHMEDING FOUNDATION
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ABOUT THE CIRCULAR JOBS INITIATIVE

Circle Economy is an impact organisation that connects and empowers a global community to create the conditions for transformation towards the circular economy. Our mission is to accelerate the transition through practical and scalable insights and solutions that address humanity's greatest challenges.

The Circular Jobs Initiative is a knowledge centre that aims to ensure the transition to the circular economy is positive for work and workers. We are committed to promoting this mission by working with employers, workers, governments, multilateral organisations, education institutions and research organisations to shape this future. With the support of the Goldschmeding Foundation, the Circular Jobs Initiative develops and shares knowledge and best practices on the future of jobs for the circular economy and translates this knowledge into practical and scalable solutions.

ABOUT THE TEXTILES PROGRAMME

The Circle Textiles Programme was launched in 2014 as the first sector programme within Circle Economy. With a vision towards a zero waste textiles sector, since 2014, we have completed a diversity of projects with focus areas of textile-to-textile recycling, circular business models, design for cyclability, technology assessments and circular infrastructure developments. Our community of supporters, members and strategic partners continues to grow as we strive to connect a circular supply chain of producers and solution providers in order to reduce the existing textiles waste mountain, by enabling the data, technology and infrastructure needed to valorise textile waste at end-of-life; as well as prevent the mountain from building further, by increasing apparel brands' capacity to assess and adopt circular strategies.

With this report, Circle Economy and HIVA, in collaboration with the Goldschmeding Foundation, aim to support national actors in shifting the Dutch clothing value chain from linear to circular, while promoting employment opportunities and raising awareness for the social implications of this transition.

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EXECUTIVE SUMMARY

The road to full circularity in the Netherlands

The Netherlands has set the ambitious goal of full circularity by 2050 and halved resource consumption by 2030, necessitating change that spans sectors and industries. A systemic shift in the Dutch clothing industry can deliver substantial impact and edge us closer to meeting the government's overall circular and social goals, aiming for the creation and protection of new jobs, and the valorisation and upscaling of existing jobs. This paper presents a detailed roadmap for how the T&C industry in the Netherlands can become more circular leading up to 2050, with a deep dive into a circular scenario focused on 'reuse' that could maximise opportunities for employment and skills development.

State of play: a snapshot of the Netherland's clothing value chain today

Through its three traditional hubs—Leiden, Twente and Brabant—as well as many other cities and regions, the Netherlands employs more than 127 thousand workers in the clothing value chain. The bulk of these jobs (94%) are in retail and distribution. Only 1% of jobs can be classed as core circular jobs: these crop up in the value chain in the repair, waste and resource management sectors, and include jobs such as textile collection and sorting. A circular clothing industry is also supported by enabling jobs—which accelerate and upscale core activities—from rental and leasing to developing digital technology, and indirect jobs, such as transport logistics, education and governance.

Three scenarios for a circular clothing industry by 2050

By looking at the current landscape of the industry, we have identified opportunities to transform the clothing value chain in the Netherlands. This report presents pathways for achieving this goal through the lens of employment, creating three distinct scenarios: 1) reduce; 2) reuse; 3) recycle. To create these scenarios, the current skills needed in the clothing labour market were assessed based on interviews with stakeholders along the value chain in government and education. Finally, a set of key assumptions were tested through a local case study, providing valuable insights and recommendations for how to secure and develop the skills and jobs needed in the labour market to scale a circular T&C sector in the Netherlands.

Although all future scenarios explored present positive gains in terms of potential job creation, focusing on repair, reuse and resale was found to have the largest job-creating potential: leading to an increase of 25%. To realise this scenario and its potential, the current workforce must be retrained to overcome relevant skills gaps.

Scenario one | Reduce: changing consumption patterns and fostering circularity

The first scenario would see a drastic reduction in the amount of new clothing purchased in the Netherlands in 2050. Instead of discarding older items, consumers would instead prioritise extending the functional lifetimes of their clothing through rental, resale and repair. This scenario would reduce the amount of imported clothing and boost jobs in the Dutch clothing value chain by 20%. This would create strong potential for the rise of enabling and indirect jobs ranging from washing and cleaning to software development and logistics.

Scenario two | Reuse: prioritising clothing reuse locally

In this scenario, reuse has been designated as the key strategy for diverting clothing waste from landfills and international exports. This would see a strong increase in local collection and sorting of waste. Reuse is also bolstered due to a growing second-hand market, resulting from a shift from first-hand retail stores to second-hand stores, and an increased use of repair and maintenance services. This scenario boasts the highest potential for job creation, with a 25% increase in the Dutch clothing value chain.

Scenario three | Recycling: scaling recycling and local fibre processing

The final scenario places a strong focus on textile-to-textile recycling, with significant increases in collection and sorting—similar to Scenario two. For this to become a reality, processing technologies that enable such cycling and are financially feasible have been developed and scaled. This scenario would increase jobs by 14%. While it has the lowest job-creating-potential, it is also recognisably the most stable for value chain operations. It would not strongly impact jobs in the first-hand retail and distribution sector, as in scenarios one and two.

Which skills do we have now, and which do we need?

Currently, skills in repair and maintenance, logistics and procurement, manufacturing, management, sales and retail, waste management and industrial cleaning emerge across circular jobs in the clothing value chain. As we shift away from linear modes of operation, the need for such skills will only become more prevalent—as will the need for more specialised jobs. In a fully-circular textiles scenario, new jobs in the repair sector will emerge: from (re)manufacturing designers to employees that can assess the quality of second-hand garments. Resale collection managers and technical, associate and professional-level workers in technology and e-commerce will come to the fore in resale, while increased collection and sorting will see a boost in the number of textile sorters and manual textile collectors.

The way forward

A full circular clothing value chain will be possible if and only if the relevant actors—the Dutch government, private and social sectors, academia and education institutions—coordinate and collaborate. The roadmap has been set, and the first steps taken, yet still there is a long way to go. This report makes recommendations for key stakeholders, and overall puts forward strong research upon which robust policies and business models for the future can be based. To ensure no one is left behind, the welfare of the workforce is considered: these issues must be at the centre of policy development.

INTRODUCTION

The circular economy is a means to preserve our natural resources, mitigate climate breakdown and work toward a more equitable society. It calls for waste to be designed out, for products and materials to be kept in use for as long as possible and for natural systems to be regenerated.[1] Countries around the world are beginning to incorporate the circular economy into their agendas. It has firmly moved from the fringes of discussion to the mainstream in recent years.[2] Consumer goods, and especially textiles and clothing (T&C), is considered a core sector to accelerate the transition from linear to circular business models.

T&C production and consumption is highly globalised, with production being largely concentrated in Asian countries such as China, India and Bangladesh,[3] value chains spanning borders, and billions of consumers around the world. Globally, the industry employs more than 300 million workers,[4] involving many stakeholders: making change in the T&C industry a collaborative challenge. This includes, for example, considering the implications of industry change on the people employed. The industry is also a top polluter in terms of the waste and greenhouse gas (GHG) emissions it produces. Overhauling the largely linear T&C industry has the potential to deliver a massive impact on national and global levels both for the people it employs and the people and ecosystems impacted by its pollution.

The T&C value chain: time for a redesign

Globally, clothing production is on a major upward trend and has doubled in the last 15 years. If this trend continues, production is expected to triple by 2050.[5] According to the World Economic Forum's latest Net-Zero Challenge: The supply chain opportunity report, the T&C value chain contributes around 5% of total global GHG emissions.[6] This ranks it as one of the most polluting supply chains, after food and construction. Aside from emissions, the mountain of textile waste continues to grow: every second, the equivalent of a truck load of clothes is burnt or landfilled. The impact of T&C, however, is complex and extends beyond manufacturing and production. This complexity is clear in the labour market: of the 1.5 million people employed in Europe in the T&C value chain, a variety of other sectors are involved: from logistics and manufacturing (related to the machinery needed for the production of fabrics and final garments), to the distribution, retail and end-of-life stages.[7]

In the Netherlands, approximately 800 to 900 million pieces of clothing are purchased each year.*[8] Women's clothing leads the way, accounting for just over half of the average household expenditure on clothing, followed by men's and finally children's apparel. In the past few decades, clothing prices in the Netherlands have also dropped: allowing citizens to purchase more for less.[9] This trend hides structural issues within clothing production and its associated working conditions, as the fast fashion industry relies on low wages in developing countries.[10]

A clear goal for a national circular economy

Since 2016, the Netherlands has been mapping ways to achieve a fully circular economy by 2050. The Dutch government convened private stakeholders, civil society and academic institutions to create a roadmap to move the Netherlands toward a fully circular economy, while also delivering a 50% reduction in the use of primary raw materials by 2030.

Five transition agendas were identified, and specific actions were appointed to key industry sectors and value chains. The Transition Agenda for Consumer Goods, published in 2018, is especially relevant for T&C, as it explicitly depicts the main steps for moving towards a circular T&C value chain. Together with Furniture and Electrical Appliances, change in the T&C sector is expected to contribute substantially to the government's overall circular goal. In 2020, the Dutch Circularity Gap Report found that the Netherlands was already 24.5% circular—higher than many of its European counterparts.[11] However, the report also underlined the importance of transforming major sectors of its economy if it is going to reach its 2050 goal.

Three scenarios for a circular clothing industry by 2050

This report contributes knowledge on how the Netherlands can achieve a fully circular clothing industry by 2050, whilst also maximising opportunities for employment and skills development. Specifically, it aims to answer the following research questions:
What is the current state of the national clothing value chain? What are the employment effects of circular scenarios on the clothing value chain in 2050?
What skills are currently present in the Dutch clothing value chain and what actions are needed to secure the skills needed for the future of the value chain?

To provide answers to these questions, we utilised national level data for the industrial sectors that comprise the clothing value chain in close collaboration with industry stakeholders. We modelled three scenarios for the future of the clothing** value chain:

1. Reduce: changing consumption patterns and fostering circularity;
2. Reuse: prioritising clothing reuse locally; and
3. Recycling: scaling recycling and local fibre processing.

**Based on the average clothing consumed per inhabitant in the Netherlands within: HvA (CREATE-IT applied research), MODINT, Saxion, Circle Economy, Sympany & MVO Nederland (2017). Measuring the Dutch Clothing Mountain: data for sustainability-oriented studies and action in the apparel sector, SIAs KIEM VANG funded. Data referenced in this study was sourced from Euromonitor (2017). Retrieved from: hva.nl*

***Only the clothing value chain was analysed; shoes, carpets, and any other textile products are outside of the scope. Indeed, most of the Dutch policies related to the circular economy target the consumption of clothing while the textile industry also encompasses other products. All segments of the value chain are represented, from imports to exports, including intermediary units such as repair and cleaning.*

1. A HIGHLY GLOBALISED TEXTILES AND CLOTHING VALUE CHAIN

Citizens in Europe consume, on average, 26 kilograms of clothing per year, mostly imported from clothing production hubs, such as Asia.[12] Nonetheless, the European T&C value chain employs 1.5 million people[13] across 160,000 companies, 99% of which are considered small- and medium-size enterprises. In 2019, the estimated turnover of the European T&C value chain amounted to 162 billion euros.[14] Conversely, the Netherlands offers employment to more than 127 thousand workers, and due to the highly globalised nature of the value chain, to more than 60 thousand workers abroad directly linked to Dutch companies.[15]

There are three traditional regional hubs of T&C production in the Netherlands—Leiden, Twente and Brabant.[16] Yet, national production of T&C represents only around 8% of the international trade (imports) for the period 2010 to 2019. This demonstrates how heavily the Dutch clothing market relies on the imports of pre-finished and finished products. In the case of the European region, production averages 72% as a share of imports for the same decade (See Figure One). For the Netherlands, a decreasing trend in terms of national production versus imports is clear: at the beginning of the past decade, national production represented 11.5% of imports, a decrease of 6.3 percentage points for the period 2010 to 2019.

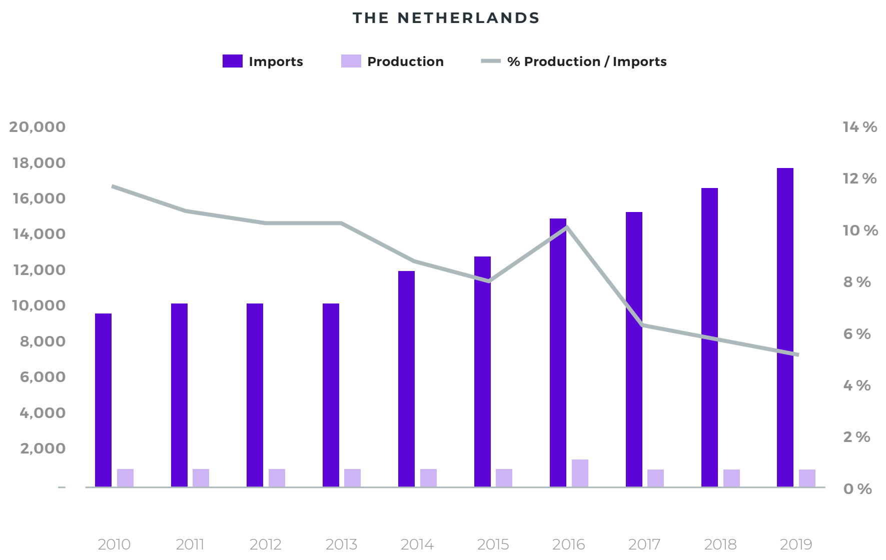
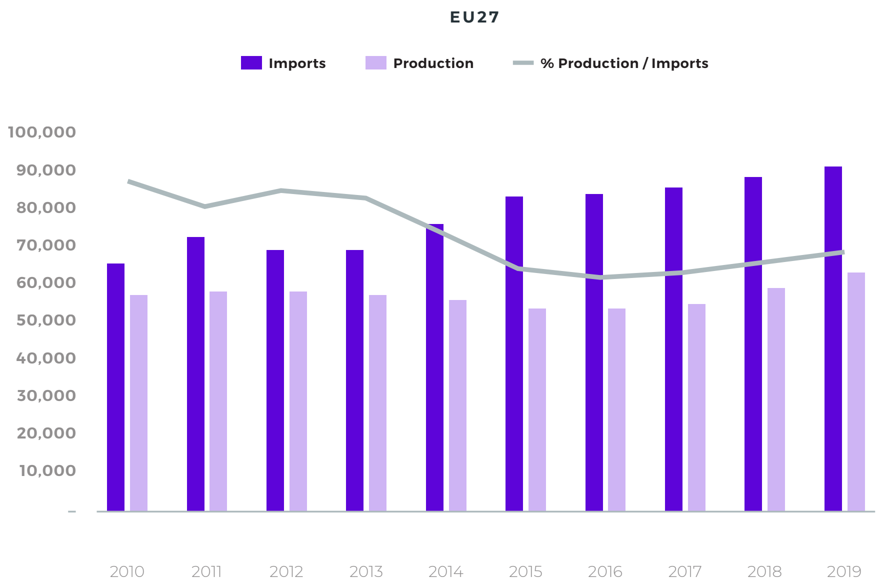


*Figure One. International trade (imports) versus production of clothing in the Netherlands and EU27.**

Left axis: *Monetary value (millions of €) of imports and production.*
Right axis: *Production as a share of imports in %.*



**Production and International Trade consider the relevant industry codes within Manufacture of Textiles (Section 13) and Manufacture of wearing apparel (Section 14) of the Statistical classification of economic activities in the European Community. Retrieved from: Eurostat*

1.1 THE CLOTHING VALUE CHAIN IN THE NETHERLANDS TODAY

A small fibre, textile and clothing manufacturing industry is present in the Netherlands today, mostly focused on technical fibres. Still, approximately six kilotonnes (kT) of clothing are produced locally, accounting for 1,346 full-time equivalents (FTEs) including fibre and clothing manufacturers. The local clothing sector is characterised by the strong presence of the retail and distribution sector, which largely sells imported clothing. In 2019, the sector's total employment equaled around 127,024 FTEs; retail and distribution represented 94% of the total. This activity takes into account roles within brands, wholesale and retail departments, as well as service and sales roles linked to the retail sector. After the clothes are used and disposed of by consumers, textile collection and sorting activities take place. These account for less than 1% of total employment. Additionally, the international trade (imports plus exports) of clothing employs 447 FTEs, mainly performing logistics activities for semi-finished and finished goods.

VALUE CHAIN STAGE	FTE	OUTPUTS (KT)	TURNOVER (€1000)
Imports + Exports	447	477.15	78,319
Production of fibre	346	53	51,577
Manufacturing	1,000	53.26	60,797
Distribution & Retail	119,424	290.76	10,024,154
Repair & Maintenance	930	4.58	60,944
Resale	1,074	12.70	58,848
Rental	1,431	4.74	211,616
USE	n.a.	350.53	18,214,370
Textile collection	222	125.50	33,037
Incineration	1,307	192.79	262,062
Sorting	804	49.05	244,979
Recycling	38	15,44	21,850
TOTAL	127,024	1,629.50	29,322,554

Table One: Clothing value chain in the Netherlands (2019)
Source: CBS and LISA

THE CLOTHING VALUE CHAIN OF THE NETHERLANDS

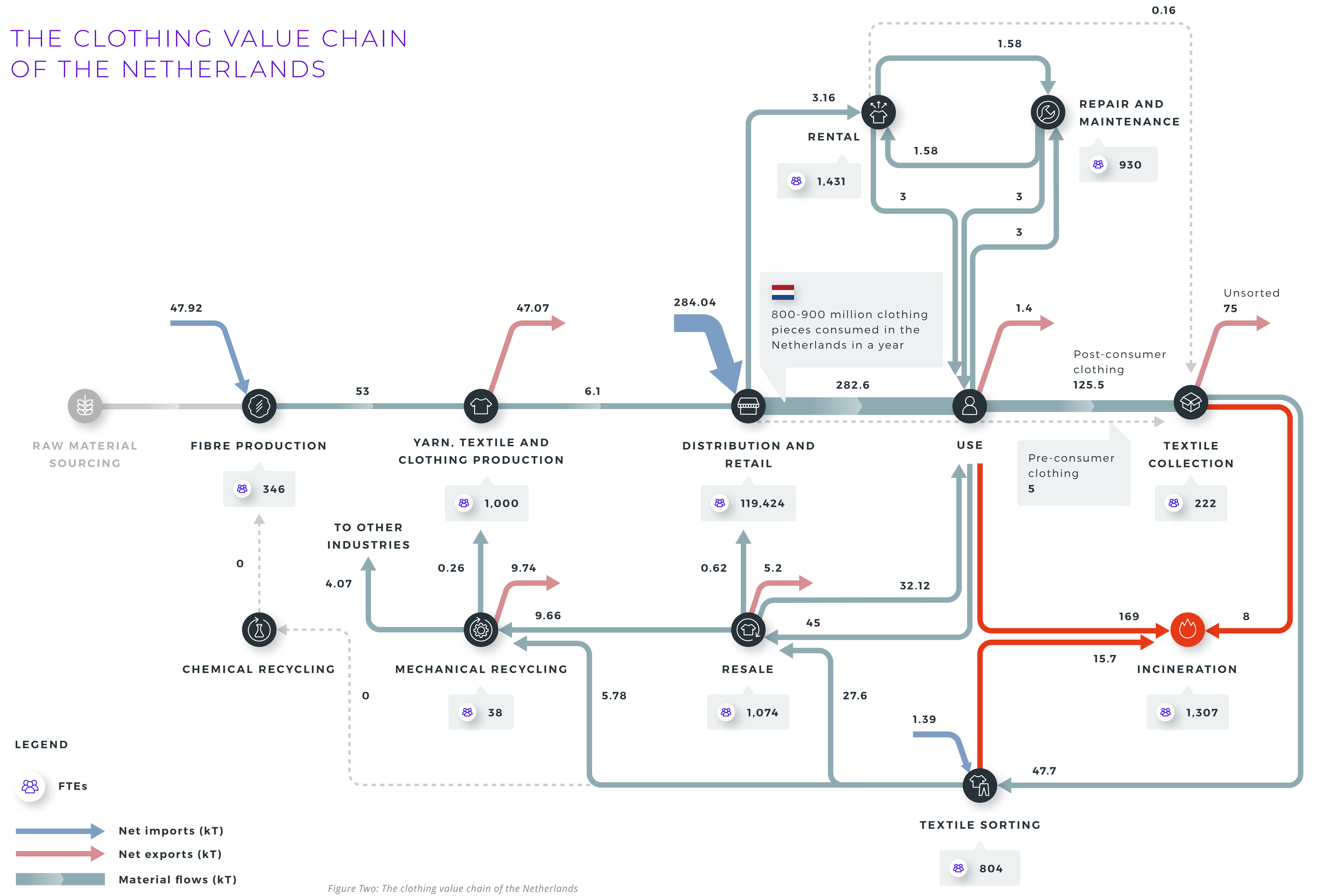


Figure Two: The clothing value chain of the Netherlands

JOBS IN THE CIRCULAR ECONOMY (FRAMEWORK)

- **Core circular jobs in the Dutch clothing sector.** Core circular jobs ensure that raw material cycles are closed. They include jobs in the repair, waste and resource management sectors. For the clothing value chain, there are currently 222 FTEs of core circular jobs accounted for in textile collection and 804 FTEs in textile sorting. While the management of textiles at their end-of-use is a well-established activity within the Netherlands, with 44.6% of all discarded textiles being collected separately, the textile waste generated in the country continues to grow. It rose by nearly 20% between 2012 and 2018—thus accelerating the need for more prominent textile collection and sorting activities. Furthermore, a large portion of textiles that are separately collected—60% (75 kT)—are exported and sorted abroad.[17]

  The clothing repair sector accounts for 930 FTEs across the Netherlands, in line with the minimum 1% of annual Dutch household expenditure that goes towards the maintenance, repair and cleaning of clothes and shoes. Yet, 77% of EU citizens have reported that they prefer to repair their products rather than buy new ones, demonstrating sizable growth potential for the repair sector if the right incentives are put in place.[18]
  The resale sector for second-hand products accounts for 5,968 FTEs, of which 1,074 FTEs can be attributed to the resale of second-hand clothing. Around 12.7 kT of clothing is sold annually in second-hand stores, along with other consumer goods, from furniture to books. Second-hand clothing is also resold through online platforms, an emerging activity, as well as reused through more informal setups such as clothing swaps, donations or exchanges. These alternative activities are not considered within the employment and material volumes, as data gaps exist in these sectors. However, they represent increasing consumption trends for the European region and worldwide, potentially spurred by the covid-19 pandemic.[19,20]
- **Enabling circular jobs in the Dutch clothing sector.** Enabling jobs form the supporting shell of the circular economy, and include jobs in the T&C value chain that contribute to circularity in rental, leasing and digital technology development. In 2019, clothing rental and leasing activities in the Netherlands employed 1,431 FTEs. These could have included—amongst other jobs—managing rental stores and organising warehousing. Other enabling jobs in the sector include circular design within brands, manufacturers and independent designers, although there is no comprehensive quantitative indication of how many FTEs they represent.

- **Indirect circular jobs in the Dutch clothing sector.** These are jobs that indirectly uphold the circular economy. While they do not play a direct role in furthering the transition to the circular economy, they can still support the adoption of circular strategies. They include jobs that provide services to core circular strategies. Within the clothing sector this includes, for instance, logistics and cleaning services. For example, in 2019, the washing and cleaning of textiles employed 6,958 FTEs. Although Circle Economy Job's framework considers indirect jobs, the current model estimation does not include sectors and workers outside the core and enabling jobs in the clothing value chain.

1.2 WORKERS' RIGHTS IN THE NETHERLANDS ARE INCREASINGLY AFFORDED ATTENTION

Working conditions

As well as considering the current numbers of jobs in the clothing value chain and how employment in circular activities could be increased, the working conditions within the T&C value chain is another issue of concern. Despite the common view that Europe boasts better working conditions than production hubs located in Asia and other developing regions, there is an increasing awareness of the need to address risks for workers in the Netherlands.[21]

In 2017, the Netherlands signed the Dutch Textiles Agreement on Sustainable Garments and Textiles (AGT), which aims to prevent poor working conditions and abuse of workers within the industry. As part of the agreement, companies have submitted annual action plans that address the lack of proper working conditions, to be revised every year. According to the initial annual reports, there is still a long way to go regarding awareness and producer responsibility in improving working conditions. This applies to the Netherlands, as well as to the many countries in Asia where Dutch companies subcontract manufacturing and material processing. For instance, the annual report issued in December 2017 noted that only

Photo by Thyla Jane

17% of businesses had sufficiently investigated risks in parts of their supply chains in other countries.[22]

The government has also put greater emphasis on the importance of improving salaries for the garment sector.[23] This effort comprises the necessary amendments to pay fair salaries within the Netherlands and to avoid taking advantage of flexible regulatory schemes in developing countries, which is the case for certain manufacturing and production hubs.[24] In the Netherlands, larger private sector companies are also working towards this goal and taking actions to address this issue. However, the 2019 Living wage in the garment sector report suggests the industry still needs to work on improving transparency, ring fencing labour costs, and shifting from pilots to mainstream practices.[25]

Wages

Worker remunerations depend highly on the type of economic activity and qualifications required. Usually, workers within the agriculture and retail sectors get paid lower salaries in comparison to employees in manufacturing or wholesale trade activities. For 2019, the average wage per hour worked was equal to €18.6 in the agriculture sector, €17.2 in retail trade, and €25.1 in manufacturing.[26]

ECONOMIC SECTOR	2019
01 Agriculture	18.6
13-15 Manufacturing of textiles and leather products	25.1
37-39 Sewage and waste treatment	25.5
46 Wholesale trade (no motor vehicles)	17.2
73-75 Advertising, design and other	27
77 Renting and leasing of tangible goods	26.6
95 Repair of computers and consumer goods	20.5
96 Other personal services	18.1

Figure Three: Average hourly wages per economic sector, in euros. Source: CBS

Some activities within the clothing value chain are considered low-paid jobs, such as positions related to sorting, collection and recycling. This is not exclusively the case for the Netherlands. Millions of people worldwide make a living from these activities under the same conditions.[27] Waste pickers commonly have low levels of education and/or belong to disadvantaged groups, distant from the labour market. This makes it even more important to pave the way for their inclusion in the clothing value chain of the future, where sorting, collection and recycling play a key role in achieving circular goals.*

1.3 MORE WOMEN IN THE DUTCH CLOTHING VALUE CHAIN WORK ON A PART-TIME BASIS THAN MEN

In 2019, the production of fibres, manufacturing, distribution and retail, and end-of-life stages, equaled 15% of the total Dutch manufacturing sector, compared to 5% of total employment in manufacturing in Europe. The clothing industry's workforce is almost equally divided in terms of gender, with 49.9% of the value chain being made up of women in 2019 for the Netherlands. However, when analysing working conditions through part-time and full-time employment, it emerges that, on average, 17.5% of women are working part-time, compared to 8.6% of men. This trend could be considered representative of the gender gap present in the rest of the Dutch labour market. According to the OECD, 60% of employed women in the Netherlands work less than 30 hours per week.[28]

PART-TIME WORKERS IN THE TEXTILE CLOTHING VALUE CHAIN BY GENDER

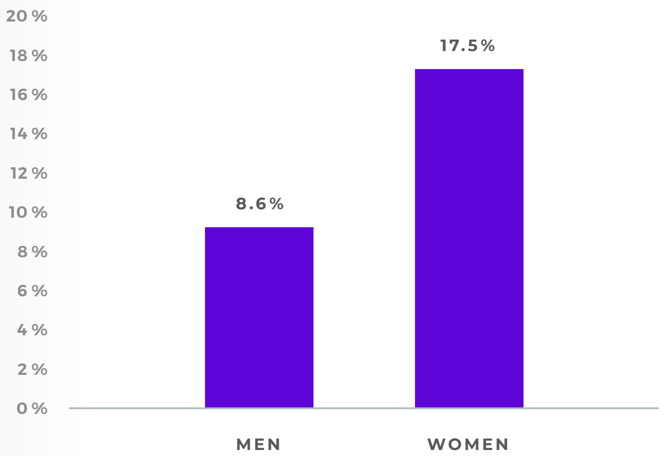


Figure Four: Part-time workers in the textile clothing value chain by gender. Source: LISA.

**In the Netherlands, WSP Parkstad is currently collaborating with the clothing industry, providing working opportunities for people distant from the labour market in Sorting and Collection activities. Their scheme helps people to get better prepared for the labour market through training and certifications, which contributes to building up transferable skills for these vulnerable groups.*

2. A HIGHLY GLOBALISED TEXTILES AND CLOTHING VALUE CHAIN

2.1 METHODOLOGY FOR MODELLING THE TRANSITION

Circular economy policies aim to reduce intensive resource use along a varied set of economic activities, reducing CO_2 emissions and ideally having a positive impact on labour markets. These circular strategies span from changes in production modes, to incentivising shifts in patterns of demand, aggregate income and macroeconomic conditions, or even modifying terms of trade and international competitiveness of the industries in question.[29]

The labour market of the Dutch clothing industry could see four types of impacts as outcomes of a shift towards a circular economy. First, **job creation** in the value chain elements where the proposed strategies increase the final output: for instance, an increased number of jobs in the recycling sector. Second, **job substitution** where a shift takes place from a certain business model. This could result from a transferral of jobs from first-hand sales to second-hand sales. Third, **job elimination** in cases where there is no replacement for jobs in highly polluting activities. And finally, job adaptation in the occupations that will be transformed and the respective labour force reskilled,[30] such as resellers who will have to adapt to selling second-hand clothing. For this project, we have explored three scenarios for how the Dutch clothing industry could shift towards a circular economy model. The scenarios rely on changes in consumer behaviour and specific business models within the clothing industry in the Netherlands. To model these impacts, an integrated material flow model for the clothing value chain was developed: an efficient method for modelling simplified relationships between industries and sectors. For the future circular clothing industry in 2050, employment, financial transactions and material volumes circulating within the Dutch clothing industry were modelled.

The model is considered a first approximation for a future scenario using parameters and assumptions, in other words, proposing certain parameters for specific elements of the value chain, taking into consideration economic and population growth, and the current stage of the clothing value chain.** Departing from the current baseline of existing jobs stemming from the clothing industry in the Netherlands,*** three scenarios were developed. Scenario one relies on a change in consumption patterns, mainly through changes in rental and leasing, second-hand sales and repair of garments. Scenario two emphasises the reuse of garments, and extending their lifetimes through repair and second-hand sales. Finally, the third scenario considers an industry focus on scaling textile-to-textile recycling activities. These outline various circular value chains which could support the Netherlands in achieving full circularity in the textiles sector by 2050. The modeling approach only considers direct effects within the industry value chain, meaning it does not take possible collateral effects that must occur in other industry sectors into account, such as logistics and transportation, or manufacturing companies that must supply machinery suitable for the future scenarios. In the same way, it does not include induced (spillover) effects through other value chains and sectors as a consequence of having a higher number of jobs within the clothing value chain. The clothing industry is not considered to experiment with intrinsic structural changes. This means that the results presented must be considered a conservative approximation for the employment effects in 2050.

Furthermore, consumption patterns for 2050 were considered equal to the current patterns, despite trends depicting that more circular clothing will be purchased in the coming years. The productivity levels for the different chains of the Dutch clothing industry were conservatively established. Nevertheless, the unexpected and long-lasting changes in the sector, stemming from disrupting events such as the covid-19 crisis, are extremely hard to predict. The assumptions**** allow a basic model to be established for 2050. From this baseline model, the three scenarios were evaluated by modifying different parameters of the clothing supply chains.

***See Annex Two for an in-depth explanation of assumptions and parameters.*

****In order to compare the three scenarios with the baseline, the 2019 baseline has been forecasted towards 2050 to consider population and industry growth expected by then. A detailed explanation of these assumptions can be found in Annex Two.*

***** See Annex Two for an in-depth explanation of assumptions and parameters.*

SCENARIO 1
REDUCE: CHANGING CONSUMPTION PATTERNS AND FOTSERING CIRCULARITY

SCENARIO ASSUMPTION

- 15% Clothing consumption comes from resale (second-hand sales)
- 10% Clothing consumption comes from lease and rental
- 12% Clothing consumption comes from repair and maintenance

EFFECT

Employment impact: 20% higher than business as usual in 2050

The year is 2050; the Netherlands sees a reduction in the amount of new clothing consumed. Dutch residents prioritise extending the service life of their clothing through product-as-a-service (PaaS) models such as rental, resale, swapping, repairing and leasing. In this scenario, rental and leasing represent 10% of the clothing consumed each year, formal resale of second-hand clothing 15%, informal resale of second-hand clothing another 15% and repair 12%. This also means that lower volumes of clothing are discarded each year. When garments are finally discarded, they are clearly worn out, rendering them no longer suitable for resale, but rather for recycling.

According to our analysis, this scenario has the potential to increase total jobs in the Dutch clothing sector by 20%. This number is not as high as for Scenario two, yet it must be reiterated that the results are very conservative. Indeed, the increase includes a significant reduction (28%) of FTEs in the distribution and retail of first-hand sales, although this could be tackled by transitioning workers into other service-based models such as the resale of second-hand clothing and rental. The end-of-use value chain also sees a reduction in job opportunities in this scenario, all the way from textile collection to recycling operations.

Scenario one shows a strong shift towards service-based consumption models, which creates significant potential for an increase in enabling and indirect jobs such as washing, cleaning, software development and logistics. For example, consider the current textile washing and cleaning activities: in 2019, this sector employed 6,958 FTEs throughout its operations, hence, an increased need for the further development of these services opens up an opportunity for local employment, in close proximity to the location of consumption. Similarly, with an increase in local resale, repair and clothing adjustments may also increase in tandem, creating new opportunities for local seamstresses and independent repair shops.

VALUE CHAIN STAGE	FTE		OUTPUT (KT)
	SCENARIO 1	SCENARIO 1 VS BAU 2050	
Imports and exports	471	-29%	537.3
Fibre production	512	0%	84.2
Manufacturing	1,446	0%	84.4
Distribution and retail	82,108	-28%	331.8
Repair and maintenance	17,927	1222%	96.2
Resale	28,912	314%	40.4
Rental	21,730	1068%	88.0
USE		n.a.	557.1
Textile collection	621	102%	403
Incineration	1,447	-14%	263.7
Sorting	946	-14%	66.8
Recycling	16	-68%	7.9
Total	**156,164**	**20%**	**2560.9**

Table Two: Reduce: Changing consumption patterns and fostering circularity. Source: CBS and LISA

SCENARIO 2
REUSE: PRIORITISING CLOTHING REUSE LOCALLY

SCENARIO ASSUMPTION

- 80% Collected clothing gets sorted locally
- 10% Sorted clothing is exported directly
- 35% Sorted clothing goes to repair
- 50% Sorted clothing goes to resale

EFFECT

Employment impact: 25% higher than business as usual in 2050

The year is 2050; businesses and the Dutch government have prioritised reuse as a key strategy in diverting and cycling textiles away from landfills and back into active use. Garments change ownership from one consumer to another but are mostly reused for their original purpose, including alterations linked to the repair and maintenance of post-consumer clothing needed for reselling. In contrast to the first scenario, a key element of success here relies on increased collection and sorting activities, and a better connection between collection and sorting activities and repair services/second-hand stores.

This scenario would see a strong increase in local textile collection (approximately 80% of what is sold annually) and local sorting (80% of collected textiles are sorted), as well as in local reuse, due to a growing second-hand market in the Netherlands and the success of other repair, maintenance and cleaning services. This increase in the reuse of clothing also comes from significant changes in the design and production phases in connection to the quality and composition of the materials used. This spike in clothing reuse is also linked to the integration of the fashion and technology sectors, enabling changes across business models and revenue streams.[31]

This scenario shows the most potential for an increase in total jobs in the sector: 25%. This includes the creation of 24,286 potential new FTEs in the repair and maintenance stages, shifting approximately 17,319 FTEs from new sales to second-hand sales, and creating an additional 4,611 FTEs in second-hand sales. Once again, the results are conservative and account for a drop of 15% in employment in the distribution and retail sector, which could be redirected to distribution and retail in the second-hand market.

VALUE CHAIN STAGE	FTE		OUTPUT (KT)
	SCENARIO 2	SCENARIO 2 VS BAU 2050	
Imports and exports	733	10%	836.5
Fibre production	512	0%	84.2
Manufacturing	1,442	0%	84.3
Distribution and retail	97,037	-15%	392.1
Repair and maintenance	25,643	1790%	137.6
Resale	28,912	314%	319.0
Rental	1,892	2%	7.7
USE		n.a.	557.1
Textile collection	717	133%	465.0
Incineration	443	-74%	79.1
Sorting	5,364	386%	379.0
Recycling	10	-80%	5.0
Total	**162,705**	**25%**	**3346.6**

Table Three: Reuse: Prioritising clothing reuse locally Source: CBS and LISA

SCENARIO 3
RECYCLE: SCALING RECYCLING AND LOCAL FIBRE PROCESSING

SCENARIO ASSUMPTION

- 70% Collected clothing gets sorted locally
- 70% Sorted clothing is exported directly
- 40% Sorted clothing goes to repair
- 60% Sorted clothing goes to resale

EFFECT

Employment impact: 14% higher than business as usual in 2050

The year is 2050; the circular clothing industry in the Netherlands has placed a strong focus on textile-to-textile recycling. End-of-pipe solutions have been developed and implemented at scale. There has been a strong increase in local textile sorting (70% of collected textiles) and a strong increase of recycling after sorting (70% of sorted clothing). Within recycling, 40% is considered closed-loop mechanical recycling while the remaining 60% goes through a closed-loop chemical recycling process.

Processing technologies that enable textile-to-textile recycling as well as other textile innovations, such as 3D fabric and product printing, have been developed and scaled, and are financially feasible for industry stakeholders to implement. The large amounts of recycled fibres readily available are incorporated into new yarns and textiles, made possible by changing the design of their operations, products and sourcing strategies.

This scenario predicts a potential increase in the industry's total circular jobs of 14% from our quantitative analysis, creating 433 potential new jobs in the recycling sector, as well as further developing existing fibre processing, spinning, weaving and knitting activities locally. This would increase fibre and textile manufacturing by 5,000 FTEs. This scenario also holds the most potential for technological development and regional coordination with other manufacturing or recycling hubs to spread and develop capacity across Europe. Although this scenario shows the lowest potential increase in total jobs, it also conveys the most stable scenario for all value chain operations, with no significant employment loss occurring for any activity.

VALUE CHAIN STAGE	FTE		OUTPUT (KT)
	SCENARIO 3	SCENARIO 3 VS BAU 2050	
Imports and exports	729	10%	832.2
Fibre production	1,392	172%	229.0
Manufacturing	5,568	285%	352.6
Distribution and retail	11,064	-3%	448.8
Repair and maintenance	1,380	2%	7.4
Resale	19,275	176%	68.8
Rental	1,892	2%	7.7
USE		n.a.	557.1
Textile collection	759	147%	492.5
Incineration	759	-54%	141.9
Sorting	4,992	-352%	352.7
Recycling	482	883%	241.3
Total	**148,329**	**14%**	**3,704.9**

Table Four: Recycle: Scaling recycling and local fibre processing
Source: CBS and LISA

3. THE SKILLS GAP IN THE CLOTHING LABOUR MARKET

The shift towards circularity in the clothing sector will have a vast impact on the workforce, as the transition entails shifting roles across the value chain. The type of job gains, losses and shifts will be largely dependent on the specific local context of the industry. Such shifts may also lead to a mismatch between the skills workers have now and the skills they will need to thrive in a circular T&C industry fit for the future. This section will consider the skills that need to be invested in to ensure the skills gap does not widen.

Taking a closer look at the European T&C sector, we observe that only 28% of the labour needed to produce and distribute clothing consumed in the EU is regionally based—showing that the EU sector is largely dependent on workers and skills from other parts of the globe.[32] Nevertheless, certain skills and jobs are still present within the EU. Most of these jobs are concentrated within SMEs, which account for 99% of the companies present in the clothing sector.[33] The workforce for the textile and clothing industry in the EU is ageing: in 2018, 34% of employees were over the age of 50—an increase of 12% over the last decade. Reversing this trend may become a struggle as the sector is not considered especially attractive for young talent in terms of profit margins, innovation and salaries.[34]

Our analysis shows that the retail and distribution stage occupies the largest portion of the clothing sector across Europe. In the Netherlands, 94% of clothing sector jobs, from a total of 127,024 FTEs in 2019, are found within this stage of the value chain, from roles within brand departments, wholesalers and retailers, to roles linked to the service and retail sectors. In addition, the Netherlands does employ workers within textile production, mostly linked to technical textiles and workwear. The following sections explore which skills and education levels are demanded by the Dutch clothing sector today, and investigate which skills and new roles the sector will potentially need in the future in order to transition towards circularity.

DIVING INTO SCENARIO TWO | PRIORITISING CLOTHING REUSE

Skills may be practical or cognitive and are to be understood as 'the ability to apply knowledge and use know-how to complete tasks and solve problems'. According to the European Skills/competences, qualifications and occupations (ESCO) framework, the skills pillar includes four sub-classifications: 1) skills and competences, 2) knowledge, 3) attitudes and values, and 4) language skills and knowledge.[35] The following skills analysis for the present and future needs of the clothing sector in the Netherlands understands skills as this broad categorisation. The analysis is based on the most promising scenario in terms of potential employment creation. Therefore, the focus is placed on clothing repair, reuse, collection and sorting activities, as outlined in Scenario two.

The current skills demanded by these value chain activities have been assessed through a descriptive analysis of current job listings. Data from relevant sectors for 2019 was compiled and cleaned for relevance to the textiles sector. This resulted in 2,289 job advertisements. Repair yielded the highest volume of jobs (1,405 vacancies), followed by collection and sorting (608 vacancies) and lastly in the resale stage (276 vacancies).[36]

The future skills and roles prioritised in the sector have been gauged by rolling out a qualitative content analysis of twenty interviewees: stakeholders across the clothing sector, education and government. Following both analyses, a number of insights on the new roles and skills that our circular clothing scenario will require have been compiled.*

**The full list of interviewees can be found in the Acknowledgements section at the end of the report.*

3.1 SKILLS REQUIRED TODAY

The following heatmap shows an overview of the results of the analysis of job listings for the sectors assessed based on an allocation of skills to a certain group. Most job listings evidentiate the importance for the three sectors of logistics and procurement, manufacturing and maintenance as well as managerial skills. However, there are specific skills needed within these groups that are particular to either repair, resale or collection and sorting activities. Further detail on this analysis can be found below.

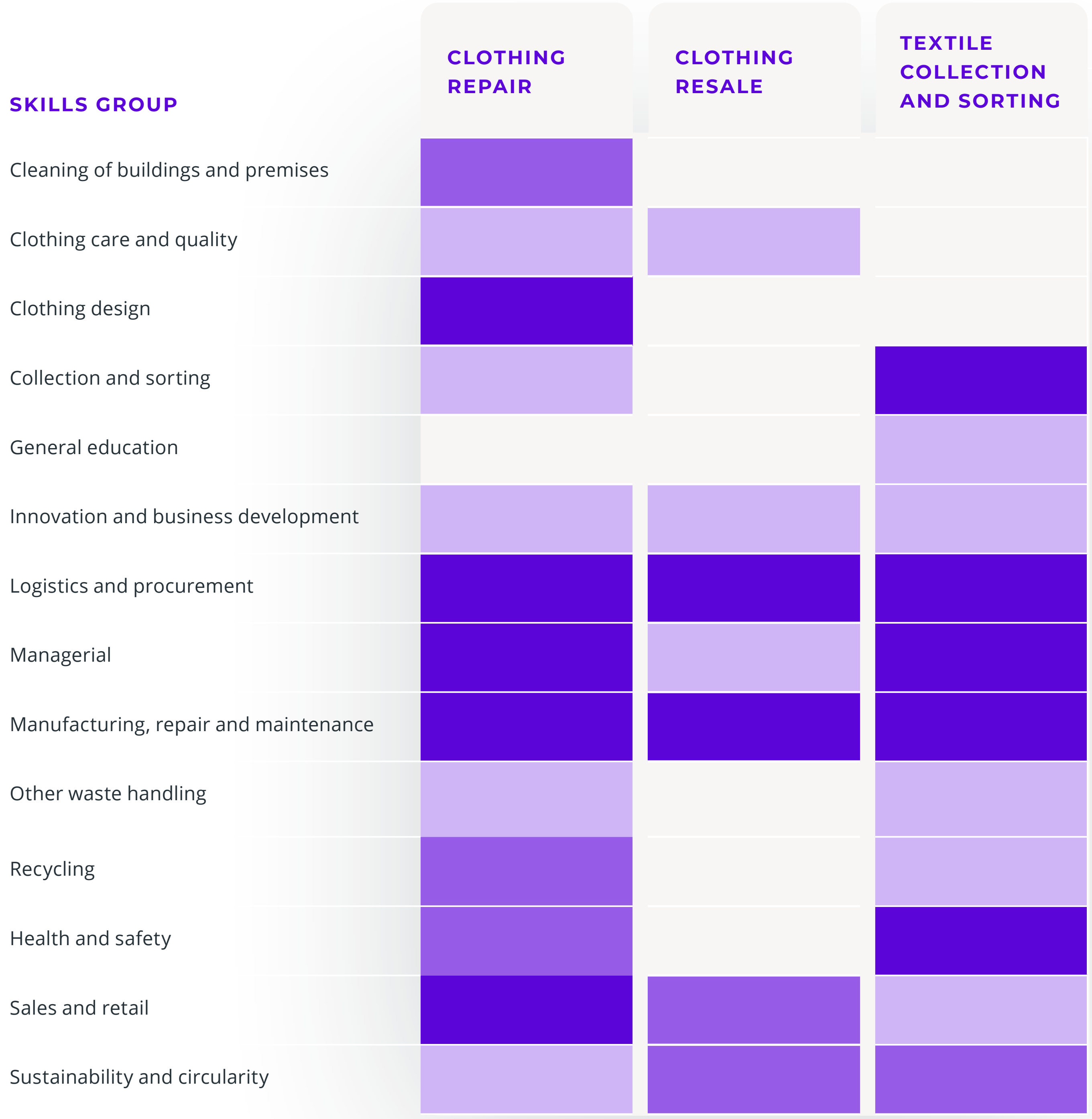


Figure Six: Skills demanded for Repair, Resale and Textile Collection and Sorting

MOST MENTIONS +10% | SOME MENTIONS UP TO 9.99% | FEW OR NO MENTIONS UP TO 4.99% | NO MENTIONS 0%

CLOTHING REPAIR SKILLS TODAY

The repair and maintenance of clothing is a sector characterised by micro and small family-run businesses. There are also additional social workplaces that host repair services across different municipalities in the Netherlands. As the craft of repairing, mending and extending the lifetime of clothing itself is an intensive manual activity, it makes up most of the time invested by the workforce in this sector. Therefore, the most commonly demanded skills are related to clothing assembly and manual or mechanical repair activities, as well as the use of sewing, ironing and other machinery. In order to keep businesses up and running, transportation and delivery skills, in addition to stock control and procurement management make up the largest portion of the logistics and procurement skills required. Lastly, managerial skills such as business administration, finance and scheduling are extremely relevant to keeping businesses running, although they are not required often due to the limited number of managerial positions currently offered within this value chain element.

CLOTHING RESALE SKILLS TODAY

In line with repair requirements, clothing resale job listings also show a high presence of work linked to transportation—such as forklift truck driving—as well as to stock control. However, for this value chain stage, an additional area—packaging and processing duties—takes a larger role. The relevance of packaging activities is clear when considering that the clothing that is resold through either physical or online second-hand platforms needs to be presented in such a way that it assures cleanliness and quality. Hence, skills associated with the manual or mechanical upkeep of the clothing resold, including cleaning activities, are also of utter importance. Finally, sales skills focusing on retailing and wholesaling, including sales till operations, as well as service-focused skills such as telephone skills or greeting customers usually appear within job listings. Within clothing resale, we find that sustainability awareness and knowledge already appears in this value chain stage as a requirement, while this skill set is not currently required for repair, collection and sorting stages.

TEXTILE COLLECTION AND SORTING SKILLS TODAY

The collection and sorting of disposed textiles is a detailed and time-consuming process, which is largely conducted through manual labour. Waste management, industrial cleaning, handling and load carrying skills unsurprisingly take centre-stage in this sector. All of the post-consumer textiles that go through a sorting facility need to be assessed according to quality and/or fibre type, cleaned and baled, before being shipped domestically or internationally for reuse or recycling. Each sorting facility has its own sorting process, and its own complex market networks to sell to. Therefore, for sorting jobs, the ability to prioritise based on certain requirements is a key skill. Meanwhile, the relevant managerial skills pivot around facility and task management, as well as human resource management. Logistics and procurement operational skills including freight forwarding and stock control appear in third place, followed by machinery use and maintenance skills.

EDUCATION LEVEL REQUIREMENTS

The repair sector is currently demanding mostly tertiary or higher education across job listings (83.2%), while for collection and sorting this requirement drops significantly to just over 40%. Therefore, most educational requirements for the collection and sorting stage are either a secondary school degree or are not specified at all within the job listing.

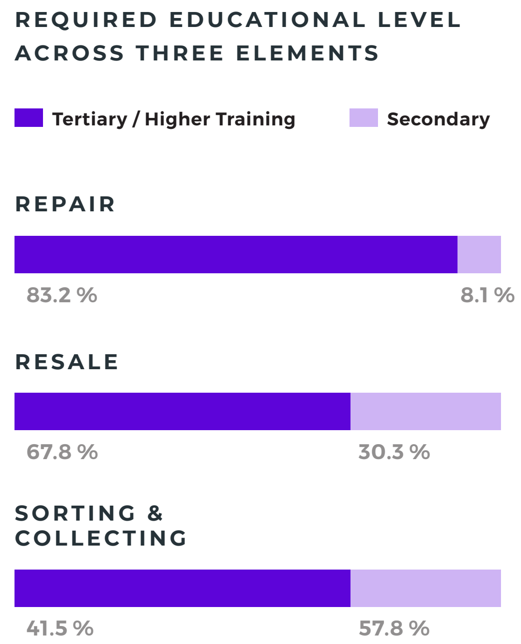


Figure Seven: Required educational level

Educational requirements go hand in hand with the requirements that those activities present for practical and theoretical skill sets, repair being the sector that requires more use of blended, theoretical and practical skills (47% blended versus 48.5% practical), whilst collection and sorting almost fully require practical skill sets—which in many cases can be learnt on the job (91.6% practical). All three stages seem to require—most prominently—more practical than theoretical skill sets, which may present a relevant opportunity for the scaling of vocational education and training (VET) as well as on-the-job training programmes. VET, therefore, could be a key mechanism for ensuring a skilled workforce for driving the circular transition, as well as a crucial step in driving the uptake of circular strategies, promoting equity and closing the skills gap.[37]

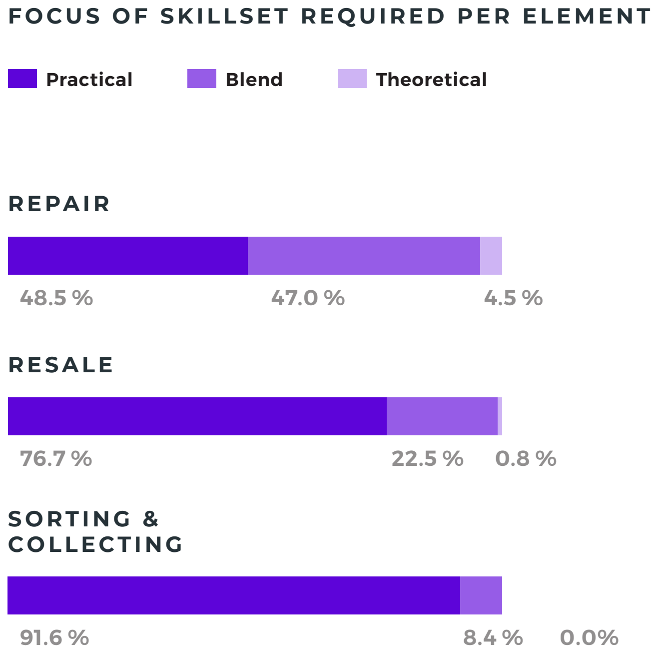


Figure Eight: Skill sets required per element

3.2 FUTURE SKILLS REQUIREMENTS

For the Dutch clothing sector to become circular by 2050, it is expected that some already-existing jobs will need to be scaled; many more people in those areas will need to be trained for these jobs. This is particularly relevant in the case of textile sorters. And while some jobs may already exist in other stages of the value chain, they will likely need to be transferred or created for new stages—notably for technology and innovation roles. In the Netherlands, a shift in job types is more likely to happen than substantial employment loss.[38] Finally, it is also expected that new jobs will be created, from (re)manufacturing designers to clothing quality assessment workers.

The technician, associated professional and operator occupations are anticipated to grow, which means that future job listings will mainly require high- or medium-level qualifications rather than low-level ones in industrial employment. This is in line with EU expectations that by 2025, five times more jobs will be available for highly-qualified employees rather than low-qualified ones.[39] That being said, it also means an opportunity for low-qualified workers to upgrade their skills through 'learning-by-doing' and on-site training. It is therefore expected that there will be a need for multi-skilled technicians and associate professionals in logistics, sales and administration, while increasing the demand for design and marketing professionals within fields such as repair and remanufacturing.

The field of innovation generally—and the role of Innovation Manager more specifically—is also promising for the clothing industry in the Netherlands, due to its positioning as one of three Member States hosting the most students within textile and clothing technology studies.[40] Partnerships and innovation management are recurrently mentioned throughout interviews for all three value chain stages. These positions that act as linking pins or bridges between diverse roles inherently target the need for interdisciplinary skills that enables collaboration across disciplines, departments and organisations.

In line with the Netherlands' R&D focus, the occupations expected to change the most across Europe are Digital Marketing Professionals, Sustainability Experts and 3D CAD Designers. For all of them, a new consumer type drives significant change in these occupations. Additionally, for Digital Marketing Professionals and 3D CAD Designers, drivers for change are related to globalisation, technological changes and new economic and value models. On an operational level, machinery operators will need to have better oversight of the production line, as automation increases. Abstract thinking skills for these roles will therefore become necessary in order to troubleshoot. For Sustainability Experts the main drivers for change may be related to environmental change, as well as the introduction of new regulations and novel governance structures.[41]

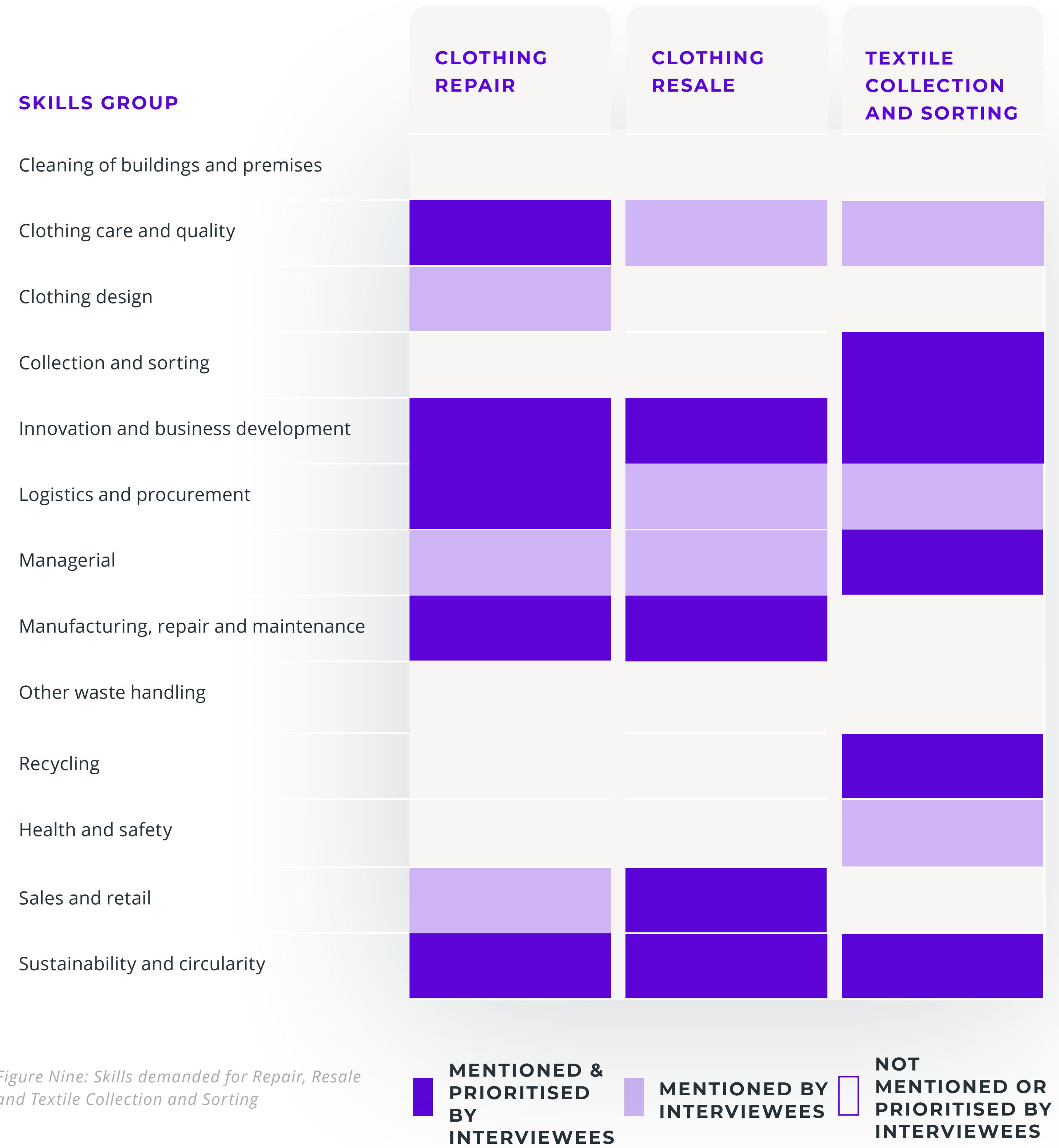


Figure Nine: Skills demanded for Repair, Resale and Textile Collection and Sorting

CLOTHING REPAIR: FUTURE ROLES AND SKILLS

Remanufacturing Designers will be essential in this scenario to create value out of a new, increasing and ever-changing material stream available for repair and remanufacturing. Key activities in this role include assessing the 'reusability' of in coming clothing (assisted by quality assessment workers): understanding which parts of clothing could easily be disassembled and used in the remaking and refurbishment of other parts of clothing. Skills needed include creativity, planning, knowledge of fabric properties and functionality, and the ability to handle uncertainty. Additionally, strategic planning and production management, as well as a much larger scale of skilled trade workers for (dis) assembly, repair and maintenance activities will likely be needed. Although manufacturing, tailoring, assembly and sewing skill sets are already being taught and are present in the Dutch labour market, the scale of their presence today is quite limited and will require growth. Additional skills and attitudes, from communication and handling of uncertainty and complexity, to a focus on re-made instead of new manufacturing are perceived to be key for achieving this circular scenario.

CLOTHING RESALE: FUTURE ROLES AND SKILLS

Clothing resale is expected to require new jobs within brands, such as Resale Collection Managers, as well as technical, associate and professional roles in the fields of technology and e-commerce. The rise of online resale platforms will be essential in giving brands and businesses visibility and a platform from which to operate their reuse models, while providing consumers with a functional marketplace from which to browse and buy used items. This may lead to an increased demand for skills related to merchandising and buying data analysis, and 3D design, as well as knowledge of automation and technology integration in logistics processes.[42] Other skills prioritised by interviewees for this stage of the value chain include valuing inclusivity, and having good listening skills. This is due to the potential for a diverse workforce in the resale labour market, as well as the sector's emphasis on customer service and prioritising client needs. At the same time, having an understanding and knowledge of sustainability and circularity will become more important—as most times this lies at the core of resale models. Nonetheless, financial and business development skills will need to be further scaled, as they currently represent a gap for this sector.

TEXTILE COLLECTION AND SORTING: FUTURE ROLES AND SKILLS

The textile collection and sorting sector expects an increased demand for local and/or regional systems. This may lead to an increase in the number of Textile Sorters needed, as well as the presence of more Manual Textile Collectors. Sorters will be essential in developing more nuance in the sector, in terms of new parameters and categories, from differentiating materials and stocks from specific brands, to sorting according to the repairability of garments. Those seeking this job must have knowledge of different material compositions, brands and their subsidiaries, and the ability to judge the re-wearability of clothing and its potential for repair. Additionally, as textile collection systems change, it may be expected that less technical and transportation knowledge will be required, while physical strength and fluent communication skills could become more relevant in a more localised system. When looking at managerial roles, there is a large opportunity to attract people with distance to the labour market, calling for an increase in Social Work Managers, with excellent people management skills, a good variety of social skills and an understanding of the needs of different vulnerable worker groups.

3.3 CHALLENGES & BARRIERS AHEAD

However promising this outlook for skills development in the clothing sector, there is still a long way to go to ensure its successful implementation. According to a 2017 Deloitte survey,[43] business executives around the world perceive 'learning and reinventing careers' as the second most urgent business issue to tackle, after going digital. Nevertheless, much remains to be done, as 32% of Alvanon's 2020 State of Skills survey respondents claim there is an insufficient or lack of focus on training within businesses.[44] An example is the increasing requirement for workers to be equipped with the necessary skills to develop sustainable production and operate environmentally friendly technologies.[45] However, while 89% of Alvanon's respondents highlighted sustainability as a key issue, only 38% see the topic as an important area for training.

Potential new and transitional job opportunities in the Netherlands for this circular scenario may therefore encounter the following challenges:

1. The amount of guidance and on-the-job training needed for these role transitions is often misjudged. Skills development does not only refer to acquiring new knowledge and building new competencies—crucially, profound work needs to be carried out in co-creating and shaping values, attitudes and mindsets that are in line with the premises of circularity. This can be done for example by establishing stronger collaborations between businesses and experienced vocational education institutes or educational service providers.
2. Skills shortages in the Netherlands are expected mostly in skilled trade jobs that are expected to significantly grow in scale for this particular circular scenario. This is the case for repair and maintenance technicians and manufacturing workers, for example. The role of VET is therefore essential in driving the uptake of circular strategies, by closing the skills gap, promoting equity, and bridging manual, technical and digital skills that will be needed in the future to take on these jobs.[46]
3. Opportunities for people distant to the labour market are currently not intentionally set up for their skills requirements to be suitable for different vulnerable worker group characteristics. Carving these job profiles to match diverse skill pathways for different worker groups may be an option to reduce the distance to the labour market. Furthermore, the amount of guidance and training needed can be often misjudged, as well as the availability of trained managers, specifically in social work management at workplaces
4. The responsibility of upskilling and reskilling the workforce does not fall upon one actor. All stakeholders involved in the sector have a role to play in skills development. Government incentives, civil society support, business action, worker motivation and educational guidance are key to ensure the roll out of skills development pathways that are in line with a sustainable and circular future.

Consequently, a collaborative approach between business, education, government and civil society remains an essential building block for setting up the skills pathways needed to enable a circular transition for the clothing sector that is not only effective, but also just and inclusive.

3.4 OPPORTUNITIES FOR SKILLS PATHWAYS DEVELOPMENT: A CASE STUDY

Following the analysis of the skills gaps and challenges identified in the Netherlands to transition towards a circular clothing sector, we partnered with an Amsterdam-based organisation, Makers Unite, to explore the specific skills and occupations gaps for their current and future business models.

The following case presents the key insights of the discussions held with the organisation both internally as well as externally with representatives from academic and social work institutions. The case study elaborates on the opportunities for organisations on-the-ground to undertake skills development pathways that are relevant to a circular clothing industry in the future.

CASE STUDY: SKILLS FOR A REPAIR FACILITY OF THE FUTURE

EU-level collaboration to address skills shortages for industrial symbiosis Established in 2016 in the Netherlands, Makers Unite is a creative platform and social enterprise that works with skilled newcomers arriving in the Netherlands who have a refugee background. They create sustainable products by upcycling secondary materials, such as life-vests discarded on Greek shores. Through these products, they aim to provide a powerful positive message and facilitate dialogue about how migration can be an asset to society. In doing so, Makers Unite also strives to encourage circular design and business models, and for the circular transition to be more inclusive.[47]

Makers Unite employs thirteen people today in the Netherlands, of which seven are part of their office team, including a CEO and founder, an impact strategist, and roles in accounting, business development, communication strategy, social media and partnerships management. Production is led by their in-house team of six, including a product development manager together with a product developer and a designer, an atelier manager, a tailor and a supply chain planner; who collaborate with international brands, like Ben and Jerry's and Filling Pieces among others, on the co-creation of product collections. In parallel to their in-house production, the social enterprise runs a Creative Lab: a six-week programme offered for free to skilled newcomers in textile crafts, to support the development of skills to ease their transition into further employment or training opportunities in the Netherlands. To date, 153 people have participated in the Creative Lab with a 66% match rate going onto their next professional or educational steps.

When looking into the future of the circular clothing sector in the Netherlands by 2050, Makers Unite aims to transition its current model into a concept design and repair model, based in the Netherlands but with an international perspective—ensuring the model is replicable in other geographies. This concept is built on three main pillars:

1. **Fostering social inclusion**
2. **Innovating in education**
3. **Improving technological capacity**

Nevertheless, implementing such a concept, creates certain challenges that require new skills and additional roles to be developed within their operations. Some of these challenges are:

- Becoming a self-sustaining organisation by moving away from a sole dependence on grant funding and developing formalised commercial income.
- Establishing long-lasting partnerships and relationships with government and academic institutions to support up- and re-skilling of the workforce to meet future skills needs.
- Improving operational and logistics activities by preparing the organisations to be fit for a future where skilled trades are deeply interconnected to new technologies and software development.
- Incentivising repair business models by moving away from today's throwaway culture and consumption behaviour.

ADDITIONAL ROLES AND SKILLS

Data scientists and analysts will play a key role across every stage of the business model, being able to monitor and utilise data collected from users or repair activities to understand and improve decision making for design and processes. Through research, several ICT roles have been identified as key missing occupations throughout apparel and footwear businesses. These could be, for example, related to data monitoring of use and repair activities, data analysis of business/ operational information, virtual design, programming operations and the automation of assembly and manufacturing tasks.[48]

Sustainability and innovation managers, although present today, are both roles that will require relevant changes in terms of the skills needs. Firstly, it is expected that these roles will become much more data-driven—therefore, analytical skills become key. Additionally, the recognition that technological, environmental and social innovation are intrinsically related, calls for skills in communication and collaboration, as well as attitudes that encourage openness to feedback and an ability to guide and give colleagues and partners ownership of the innovation processes.

Logistics and customer communications expect shifts in their operations in future business models. Decentralised and on-demand digitised logistics and further customisation, along with new online service offers in customer relationships will require the development of collaboration and listening skills, as well as flexible attitudes that can handle uncertainty.

The transition of **design, product development** and **tailoring** roles away from new manufacturing towards repair and remanufacturing activities may require the development of an understanding of aesthetic trends in this field. This may also entail the additional role of **fashion stylist** within repair facilities. Digital skills in 3D garment construction, digital design, pattern cutting and prototyping will also be required across these activities.

FUTURE BUSINESS MODEL

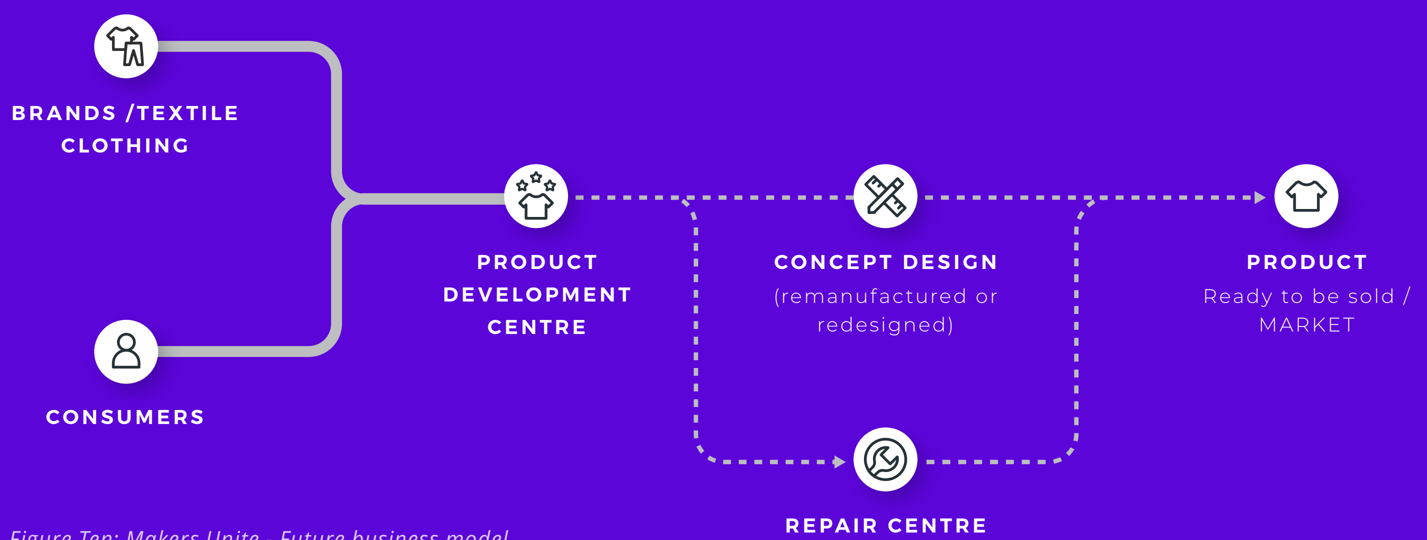
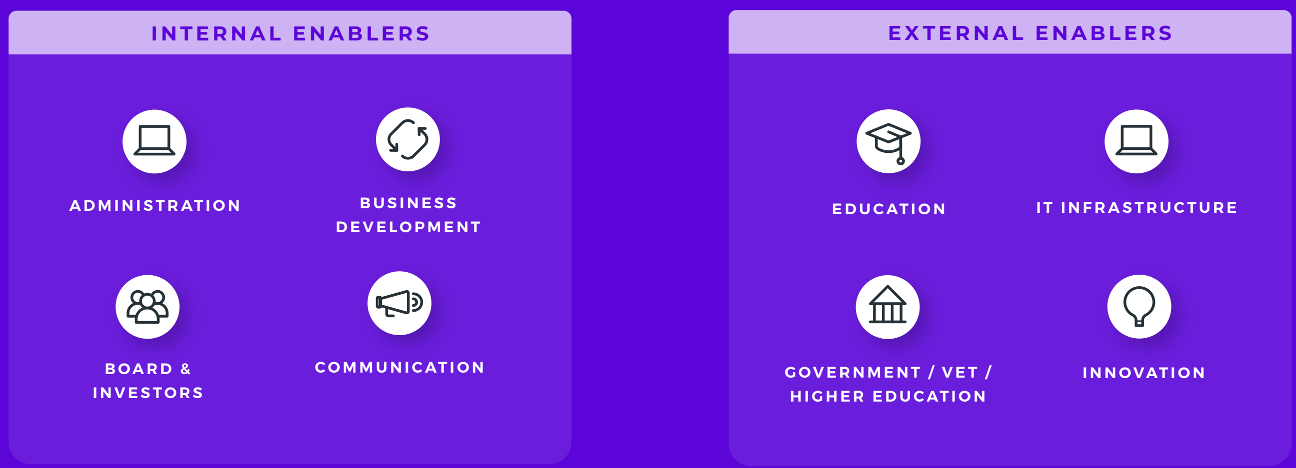


Figure Ten: Makers Unite - Future business model

ENABLERS BRIDGING THE SKILLS GAP



Building on the case of Makers Unite, as well as the broader skills gaps and challenges identified, the following skills pathways become relevant for the future of clothing repair, reuse, collection and sorting activities in the Netherlands:

1. **Foster sustainable and innovation-driven values and mindsets.** Shifting towards a different business and economic model requires embracing change and social innovation. The need to foster values and mindsets that enable this shift has been expressed across education, business and policy. In VET and higher education it is necessary to educate prospective designers and technicians on the impact associated with their material and construction choices when designing garments or accessories. Across businesses, it is necessary to shift Key Performance Indicators (KPIs) in order to positively incentivise innovation, and allow the uncertainty that comes along with it to be embraced. More broadly, there is a recognised need for education at all levels to help shape attitudes and mindsets that are in line with transversal skills such as systems thinking, willingness to collaborate, eagerness to learn, and flexibility to adapt to and deal with uncertainty.
2. **Understand the labour market and the potential of social innovation across the clothing sector.** Social innovation aims to cope with labour shortages, while maintaining business competitiveness and prosperity, as well as stimulating technological innovation.[49] This is the case in some of the resale and the collection and sorting activities throughout the clothing sector in the Netherlands, that currently provide job opportunities to workers with a distance to the labour market. This distance may be due to a temporary situation such as migration, or due to a permanent physical or mental disability. Understanding that not all workers across these programmes have the same interests and competencies is essential in order to structure and carve job profiles that align to workers changing needs and development opportunities. This task requires substantial time investment as well as the presence of managers in the workplace that are trained to manage and coordinate social work. Learnings from other industries, as shown in the Inspiration Magazine from Cedris,[50] could also be adopted by the clothing sector. This could result in the presence of a Development Coach in addition to an HR Manager in a repair facility.
3. **Embed analytical and IT skills in the clothing sector.** Current education and training pathways in the T&C industry currently do not adequately integrate life-cycle thinking and technological elements. Gaining a better understanding of a product's life beyond its manufacturing and sale is essential to accelerating the implementation of the circular economy. Furthermore, developing digital skills and literacy will enable better interaction with technological interfaces, as well as embed improved data collection, monitoring and analysis systems within the sector. This would be especially beneficial for sorting, resale and repair activities, as leveraging insights on data at a product level may further enhance the capacity for quality and material improvements and developments as well as forecasting needs for repair and maintenance interventions.
4. **Drive the local development of technical skills and knowledge.** If the future of the circular clothing sector is to materialise as proposed in the outlined scenarios, considering the current number of graduates and students in VET for the sector, there may be a shortage of technicians, operators and tailors with adequate experience in areas such as material assessment, textile sorting, inbound logistics operators, repair and remanufacturing. The role of VET and higher education is essential in driving the uptake of circular strategies, like remanufacturing and repair: on one hand by closing the skills gap, and bridging manual, technical and digital skills that will be needed in the future to take on these jobs,[51] and on the other hand, educational institutions may help graduates to see how their qualifications fit not only within traditional businesses but also within the circular economy. This can be further illustrated by collaborative projects with the industry, as well as internships or apprenticeships where job profiles can clearly depict the relationship between the skills taught and circular activities. The Circulair Ambachtscentrum programme (2019-2023) for the development of reuse, repair and value retention hubs across municipalities in the Netherlands, may be an excellent type of initiative to put these skills into practice.[52]

4. CONCLUSIONS

Putting Circular Textiles to Work has shown positive employment potential for all three scenarios analysed, given the established parameters. Although Scenario two, prioritising reuse and repair activities, has shown the highest employment potential and constituted the main focus of our skills analysis, the ideal scenario in terms of job creation for the Netherlands entails a combination of the three scenarios investigated. In a way, this implicitly occurred with some of the assumptions and parameters proposed in scenarios one and two. For instance, for increased reuse of second-hand clothing to occur, a change in consumption behaviour is needed. Moreover, its success depends on a shift in consumption patterns, extending the life cycle of clothing through repair and maintenance services. The current trend indicates that Dutch consumers are already conscious and are shifting from purchasing first-hand to second-hand clothing. This gives guidance on the direction that the clothing value chain could take.

Additionally, the role of recycling, in combination with the reuse of clothing, repair and maintenance should not be overlooked, in order to maximise the revalorisation of as many textiles as possible. Technology must play a key role allowing the efficient reutilisation of fibres and materials, either through mechanical or chemical recycling.

Further analysis of the skills that are currently demanded by the clothing industry, and the skills likely to be demanded in the future has been conducted. Emphasis has been placed on the value chain activities with the highest identified job creation potential: repair and maintenance, resale, collection and sorting. The workforce employed in these value chain elements must be trained to meet the needs of the future circular clothing industry. Managing partnerships across and beyond the sector will be a key role. It is expected that textile repair, resale and sorting roles will be scaled and that there will be an increased need for specialised skills and knowledge related to sustainability and circular business models in the fields of remanufacturing, quality and material assessment and development. The field of innovation and technology has also been recognised as key to skills development in the sector. New business models must strive for better integration of technology and digitisation within the traditional activities of core occupations, such as tailors, assemblers and fashion designers.

Considerations for other consumer goods
The Transition Agenda for Consumer Goods, published by the Dutch government in 2018, highlights two other key sectors in which to intervene in addition to T&C: electronics and furniture. Although it is not possible to directly apply the results of this report to other consumer goods, the main findings and the desirable scenario for the clothing sector could facilitate discussion and contribute to raising awareness for the actions other industry sectors could take in order to achieve a fully circular economy and employment potential by 2050.

In general, the trend towards increased reuse of second-hand products could be further explored in these two sectors. This may also contribute to the rise of business models based on repair and service for electrical appliances and furniture, focused on extending the life cycle of these products. Some value chain elements already highlighted in this report could become even more relevant for these sectors. For instance, electronic products currently reach their end-of-use stage with a much higher market value than clothing, providing a better perspective for business models to be developed in waste management: collection, sorting and disassembly.
Circle Economy has explored the current landscape for these two industry sectors in detail, elaborating on the strategies and circular scenarios that could be implemented in order to up and reskill the workforce. To access our briefing, Putting consumer goods to work: The employment potential of circular scenarios for Dutch consumer goods: lesson from the clothing value chain, *click here*.

RESEARCH LIMITATIONS

The scenarios described in this report are a conservative approximation of the possible employment impacts of transitioning to a circular clothing industry in the Netherlands by 2050. By estimating only the direct impacts within the clothing value chain, the model did not consider potential effects on logistics or manufacturing industries supplying inputs, such as machinery. In this sense, a positive impact on those industries could be expected—though would need further assessment.

Additionally, this research carries a scope limited to the Netherlands' labour market. While material and product flows imported and exported to and from the Netherlands were considered in the model, no assessment has been made on the potential employment loss or creation across other geographies of the T&C value chain that supplies clothing to the Netherlands. We consider it vital to address the challenges of potential employment loss in new clothing manufacturing globally, as well as looking into the potential for improving working conditions and job quality at these stages.[53]

We therefore encourage any current or future research considering this scope, such as the Keeping Workers in the Loop project led by Business for Social Responsibility (BSR)[54] or the ongoing research of the University of Utrecht aimed at assessing the social impacts of Circular Strategies in the apparel value chain through job quality, sustainable livelihood and gender equality.[55] Additionally, we aim to deliver skills and employment analyses across other geographies relevant to the clothing industry in the near future.

5. RECOMMENDATIONS

Considerations and insights extracted from this research for governments, businesses, academia and the social sector have been grouped under the following key recommendations.

ENSURING THE EMPLOYMENT POTENTIAL OF CIRCULAR CLOTHING IN THE NETHERLANDS

- The **Dutch government** plays a crucial role in making the circular transition for the clothing value chain a reality. It defines policies and lays out the route to follow for the private and social sectors, as well as for academia and VET institutions. Moreover, it can facilitate better matches in the labour market through employment services that reflect supply and demand needs. A good match implies that companies are able to fulfill their vacancies with properly skilled workers. The government, through the Uitvoeringsinstituut Werknemersverzekeringen (UWV), is working towards making this process more efficient[56] through the digitisation of employment services. However, this must not lose sight of the difficulties that accessing digital services could impose for low-skilled workers, or workers distant to the labour market in general. Traditional employment services must stay in place as an option for this population.

  Policy also plays an important role in changing values, attitudes and mindsets towards sustainability and innovation by incentivising the development of products that last longer, and on the level of consumers, keeping those products for longer. Furthermore, other mechanisms could be put in place to encourage this shift such as inclusive sizing regulations and a deposit system for clothing, which would incentivise the correct and separate disposal of clothing and textiles.

- A more sustainable clothing value chain presents several challenges for **businesses**, as current production processes must be adapted. Nonetheless, it also brings opportunities for designing new or improved business models, tailored to the needs of a circular society in which citizens are increasingly aware of their consumption patterns. The Makers Unite case study exemplifies how businesses can fit into a future where reuse, resale and repair are considered the better options for clothing. This opens up for example opportunities for up and re-skilling current employees to grow into job positions that were not considered directly in our I-O methodology but could become crucial for the success of the business models in question.

Additionally, for businesses, the higher integration of IT infrastructure in logistics and the decentralisation of repair services will impact digital services and transportation operations, both areas that would see an increase in jobs demanded due to the larger market share of online selling platforms, a trend in which second-hand stores also play a role. This trend could also touch upon repair services, making them accessible to more consumers who want to extend the lives of their garments. This will also require a higher integration of IT and technological **education** within specific textiles and clothing study degrees.

OPPORTUNITIES FOR DIVERSITY AND INCLUSION THROUGH ENSURING PROPER WORKING CONDITIONS

- So far, the **Dutch government**, in collaboration with agencies such as WSP Parkstad or Pantar, has done well providing job opportunities for vulnerable groups mostly allocated in collection, sorting, recycling and incineration. We encourage the government to continue this, but also to extend it to other activities of the clothing value chain. Second-hand stores, repair and maintenance activities can also provide meaningful opportunities for people distant to the labour market.
- Additionally, the Dutch government should pay close attention to the issue of working conditions. It is important to incentivise the private sector to be transparent and to continue improving in providing the workforce with better conditions, as done so far by the Social and Economic Council (SER) in coordinating the Dutch Agreement on Sustainable Garments and Textiles. This task also implies monitoring working conditions at the global level. Manufacturing hubs in Asia are the major challenge to address in terms of better salaries, working hours and safety measures.
- If we want a circular transition inclusive for the workforce and with good quality jobs, **businesses** must contribute to improving working conditions. The Dutch Agreement on Sustainable Garments and Textiles was a first step in the right direction. However, it is necessary for those Dutch private stakeholders that have not yet signed the Transparency Pledge,* to do so and start tracking progress. For those firms already on board, apart from stating the risks the workforce is facing currently, concrete action plans are needed to address such issues.
- Improving the transparency of working conditions within the clothing value chain would make it easier for **social sector** stakeholders to raise their voice and monitor the progress towards better quality jobs, salary improvements and the inclusion of vulnerable workers. Improved transparency would also benefit social sector organisations that look after specific groups, as it would facilitate tailoring advisory and social programmes more efficiently. The social sector must continue to play an active role in raising awareness for current working conditions.

BRIDGING THE SKILLS GAPS TOWARDS 2050

- The **Dutch government** must facilitate the training or retraining of the employed workforce, unemployed population, or those in risk of being phased-out. The first option to achieve this is through the courses and programmes that public employment services currently offer. Those courses must consider the needs of companies but also the changes the clothing value chain will go through during the circular transition.
- Additionally, advocacy for and coordination of VET policy is key: governments have the mandate to provide targeted skills development opportunities to those without ready access to training, deliver funding, coordinate actors in education and industry and encourage data-driven decision making. They must also commit to recognising the role of VET in building back better—towards a more circular, resilient economy—from the covid-19 pandemic.
- **Businesses** have the option to train their workforce on-the-job or to coordinate re-skilling efforts with VET institutions. Coordination and partnerships with academia, education institutions and other industry sectors is crucial to make the most of a circular transition. They can also facilitate a culture of lifelong learning, where workers, managers and team leaders are upskilled and encouraged to continuously develop in line with new innovations or technologies.
- **Academia and VET providers** must incorporate the needs expressed by the clothing value chain into their curricula. Moreover, they must take a close look at technological progress and how it can be better integrated into the training. New training courses should pay attention to the values and attitudes of young generations in order to revalorise the T&C industry and make it more attractive to young talent looking for meaningful careers.
- Finally, for repair, resale, collection and sorting activities, the value chain activities with the highest employment potential in our desirable scenario, there is a higher need for practical rather than theoretical skills sets. This represents an opportunity for VET focused on main occupations within those elements and more on-the-job training programmes. Nonetheless, it is key to consider a multidisciplinary approach where transferable skills are reflected, such as the T-shaped skills methodology.[57]
- **Civil society** has a role to play in supporting the upgrading of VET courses and on-the-job programmes. That role includes ensuring that courses and training are properly designed and inclusive. Certifying that structural changes towards sustainability are reflected in such new training programmes will be needed, along with recognising and valorising the skills of vocational workers.

**The Transparency Pledge discloses information twice a year about human rights conditions. With this information, (local) stakeholders such as employees, trade unions and civil service organisations can, for example, raise awareness for abusive working conditions, so that they can take action. For more information.*

ANNEX ONE

METHODOLOGY FOR SCENARIO MODELLING

Introduction to the model

An integrated material flow model was developed to simulate the interactions between the different streams of the value chain of clothing in the Netherlands. The method provides a coherent representation of national production and consumption and is used to forecast the impact of changes in a particular sector of activity, and changes in consumption, and in end-of-life activities. The model only captures the production of one selected category of goods, here clothing. Therefore, one can examine the interdependence of the different segments of the value chain.

Description of the model: baseline 2019, business as usual 2050 and three circular scenarios for 2050

Only the clothing value chain was analysed; shoes, carpets, and any other textile products are outside of the scope. Indeed, most of the Dutch policies related to the circular economy target the consumption of clothing, while the textile industry also encompasses other products. All segments of the value chain are represented, from imports to exports, including intermediary units such as repair and cleaning. The model builds on the current situation in the Dutch clothing value chain. The model works with two scales. First, for each segment of the supply chain, the weight of clothing (in kilotonnes) traded with the other segments was evaluated. Each segment is thus connected to the other parts of the clothing supply chain through the current consumption patterns. We did not account for intrinsic changes in the clothing industry. All current patterns are kept identical for the construction of the baseline model.

Second, the model encompasses the labour (in full-time equivalents (FTEs)) associated with each segment. The volume and the labour needed are then linked through productivity in each segment. The baseline model manages to simulate a change in the employment capacity of each segment when a change in the traded volume of clothing is forecasted.

Based on the forecasted changes for consumption, productivity and demographics*, we extrapolated the current baseline of the clothing value chain to a future business as usual (BAU) scenario for 2050. The 2050 BAU scenario illustrates the economic changes, both in terms of volumes and employment, of the potential clothing industry if no additional changes are applied.
From the 2050 BAU baseline, three circular economy scenarios were developed to capture different evolutions of the clothing industry. The scenarios build on Dutch policy recommendations and are detailed in Chapter Three. For each scenario, up to five parameters were selected to be adjusted. From those expected transfers, the model simulates the changes occurring in the clothing value chain. The total and dedicated numbers of FTEs and of clothing volumes in each segment are estimated and compared to the 2050 BAU scenario.

Data

For the volume of clothing traded among and between segments of the value chain, data was obtained from CBS public statistics and through stakeholders consultation. The employment generated in each segment was captured as FTEs; each worker within the dataset registered as a part-time worker was considered 0.5 FTE. Data on employment was mostly extracted from LISA datasets** for the year 2019. For each segment of the value chain, an SBI code was attributed. When necessary, only a share of the overall SBI was considered to better reflect the reality. When data was not available or incomplete, for instance for the reuse sector, data from Flanders*** was extrapolated to match the Dutch sector. All assumptions and data were validated by Dutch clothing stakeholders during workshops organised in the context of the project by Circle Economy.

**The assumptions made are detailed in Annex Two*

***Employment is measured as FTEs. The raw data is reported as workers with a full-time or part-time contract. LISA is a database containing data on all establishments in the Netherlands where paid employment is carried out. The key data per branch have a spatial component (address data) and a socio-economic component (employment and economic activity). For more information consult.*

****Taking Flemish data as an estimate for the Netherlands is a conservative assumption. Flemish and Dutch consumers have arguably similar consumption patterns. Dutch consumers are showing stronger concern for environmental consumption and are more willing to spend a greater share of their budget on second-hand goods. Both regions' overall budgets for clothing are similar.*

ANNEX TWO

PARAMETERS & ASSUMPTIONS

The following table shows the activities considered within each value chain stage, as well as the share of each activity that is allocated to the clothing sector.

VALUE CHAIN STAGE	SBI ACTIVITIES	SHARE	REASONING
Fibre production	116 Growing of fibre crops 1451 Raising of sheep	10%	Most textiles and yarns manufactured in the Netherlands are from aramid fibres, other technical fibres, or for home textile uses such as carpets. Only 10% of fibre production is assigned to clothing.
Textile & clothing manufacturing	1310 Preparation and spinning of textile fibres 1320 Weaving of textiles 1330 Finishing of textiles 1391 Manufacture of knitted and crocheted fabrics 1431 Manufacture of knitted and crocheted hosiery	-	Manufacturing as a whole for the Netherlands was considered at 1000 FTEs, after a series of conversations with stakeholders. Manufacturing in SBI and LISA databases constitutes a much larger sector due to many retail and wholesale companies still being registered under the manufacturing codes, while no longer manufacturing within the Netherlands.[58]
	1411 Manufacture of leather clothes 1412 Manufacture of work wear 1413 Manufacture of other outerwear 1414 Manufacture of underwear 1419 Manufacture of babies' garments and sports clothing and clothing accessories 1439 Manufacture of knitted and crocheted apparel (no hosiery)	-	
	Manufacturing as a whole for the Netherlands was considered at 1000 FTEs, after a series of conversations with stakeholders. Manufacturing in SBI and LISA databases constitutes a much larger sector due to many retail and wholesale companies still being registered under the manufacturing codes, while no longer manufacturing within the Netherlands.[59]	50%	Fashion designers were considered to be 50% of the SBI code 7410 Industrial and fashion designers.
Distribution & retail	46411 Wholesale of clothing fabrics and haberdashery 46421 Wholesale of upper clothes 46422 Wholesale of work clothes 46423 Wholesale of underwear 46425 Wholesale of clothing accessories 47511 Shops selling clothing fabrics 47711 Shops selling menswear 47712 Shops selling ladies' wear 47713 Shops selling outerwear and clothing accessories (non-specialised) 47714 Shops selling baby and children's clothes 47715 Shops selling various baby articles 47716 Shops selling underwear, foundations etcetera 47717 Shops selling clothing accessories 4782 Retail sale of textiles, clothing and footwear via markets 47914 Retail sale via internet of clothes and clothing accessories	100%	-
	46761 Wholesale of textile raw materials and textile semi-finished products	10%	Most textiles and yarns manufactured in the Netherlands are from aramid fibres, other technical fibres, or for home textile uses such as carpets. Only 10% of textile manufacturing and retail is assigned to clothing.
Imports & exports	4611 Agents involved in the sale of agricultural raw materials, live animals, textile raw materials 4616 Agents involved in the sale of textiles, clothing, footwear and leather goods	100%	The kT of imports and exports were only considered as net imports or net exports, understanding that the flows of materials that link to local employment have mostly to do with net flows.

VALUE CHAIN STAGE	SBI ACTIVITIES	SHARE	REASONING
Repair & maintenance	9523 Repair of footwear and leather goods 9529 Repair of other consumer goods	74%	This share has been assigned based on average EU household consumption, where 74% of expenditure goes to clothing, 17% to footwear and 8% to household textiles.[60]
Textile collection	3811 Collection of non-hazardous waste	1.4%	7.9 kilograms per inhabitant of textile waste are collected separately from a total of 552 kilograms per inhabitant of waste per year[61 62]
Textile sorting	3811 Treatment of non-hazardous waste	-	There is no separate consideration of clothing and textiles within SBI codes for sortation. Therefore, this value chain stage was calculated based on stakeholder input. Sorting is a two-step process. The speed for pre-sorting is between 310 and 360 kilograms an hour per worker. Fine sorting output is 135–190 kilograms output per hour per worker.* This means that there are between 235 and 273 FTEs of pre-sorting (141 kT) and between 396 and 557 FTEs of fine sorting for whole flow (125.3 kT= 141 kT - 15.7 kT discarded in pre-sorting). Additional roles in the facilities (internal transport, baling, managers, etcetera) were calculated considering an extra 10% of employment to the sorting FTEs. Therefore, we can get an overview of the number of FTEs at the sorting stage in the Netherlands.
Resale	47792 Shops selling second-hand clothing	100%	-
Mechanical recycling	3832 Recovery of sorted materials	-	There is no separate consideration of clothing and textiles within SBI codes for recycling. Employment for recycling is considered at 6.6 FTE/kilotonne of material processed.[63] For 5.7 kT of materials processed per year, this points to 37.6 FTEs.
Chemical recycling	3832 Recovery of sorted materials	-	There is no separate consideration of clothing and textiles within SBI codes for recycling. Employment for recycling is considered at 6.6 FTE/kilotonne of material processed.[64] For the baseline, there is no employment considered, as this sector is currently too small to quantify. However, in future scenarios, this assumption for employment is taken into account.

The following are the assumptions and parameters set for the quantitative model of employment effects.

Industry growth: The yearly growth of the textile industry was about 3% (2.7% in 2019) over the past ten years, but in 2020 strong degrowth occured due to covid-19. We consider a growth in the overall sector for the total production (in kT) of 1.5% per year.

Population growth: The total population of the Netherlands in 2050 will grow by 0.2% in comparison to 2020. Age repartition is about the same from 2020 to 2050. Number of persons per household is constant (2.2 persons per household and 1.5 adult equivalents per household).

Employment FTE: All part-time employment was considered 0.5 FTE as an average.

Indirect employment: Indirect effects on employment were not included in the quantitative model (on other sectors that can be impacted, for example: research and development, education, logistics, transportation, cleaning etcetera) due to a lack of data and to stay on the conservative side.

Informal resale: This is considered the paid reuse of garments that are exchanged or passed onwards to others without any formal employment attached to it. These kT were calculated based on the ratios extracted from a recent study on Flanders (Delanoeije and Bachus, 2020).[65] Informal unpaid reuse was not considered in this model, as it does not affect neither budget nor employment.

Productivity: Productivity is calculated from product value, to be able to account for use, which is in product value. In the circular scenarios, productivity was taken as per the third quartile per stage—expecting the market will grow in the circular sector and thus companies will become more efficient. Also, new technology will arise resulting in less labour needed. For sectors with degrowth (for example, retail), we keep high productivity to be on the conservative side.

**The sorting speeds were validated by stakeholders active in this value chain activity.*

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