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Towards 2025:
Separate collection and treatment of textiles in six EU countries

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1. Resume

Background and objectives

The revised EU Waste Directive in May 2018, requires EU Member States to establish systems for separate collection of textile (waste) by 1 January 2025. The Danish EPA commissioned a review of policy and practices in used textile collection in neighbouring countries with the following objectives:

- To ensure a strong knowledge base for planning Denmark's and other EU countries' implementation of the Waste Framework Directive's requirement for separate collection of textiles from 1 January 2025.
- To gather information on other countries' experiences and initiatives in the area of textiles and the circular economy to inspire future initiatives in Denmark and elsewhere

Method

With basis in a range of criteria 5 countries were selected for study: *France, Finland, Germany, the Netherlands and Sweden*. The neighbour-check covered the following general topics which have been elucidated through literature studies and more than 30 interviews with relevant actors:

- The definitions of the term 'textiles' and in which context these are used
- Definition and practice for when used textiles should be considered as waste / not waste
- Organisation of textile collection
- Systems and practices for collecting and reporting data on quantities of separately collected textiles and textile waste
- Technological options for sorting and recycling and other relevant technology
- Good initiatives within the area of circular textiles

The Current Situation

Strategies and Goals

Of the six countries, only France has legislation specifically dealing with the collection and processing of used textiles. French legislation forms the basis for extended producer responsibility for textiles (and shoes) from households. The EPR law includes targets for the collection, reuse and recycling of these products that are regularly reviewed and updated. The current target is for 50% of the marketed textiles in 2019 to avoid landfill. The law also stipulates how many collection containers there should be per 1000 residents.

The national waste plan in the Netherlands includes a "Sector plan for textiles" which defines, inter alia, minimum standards for the treatment of separately collected textiles to be complied with, but not qualitative targets for collection, recycling or recycling. The Swedish Environmental Protection Agency has targets for the collection, recycling and recycling of textiles, but the targets have not been adopted by law. Denmark and Finland have strategies for circular economics, but none of them include specific goals for textiles.

Definition of the term ‘textiles’

As France is the only country that has legislation for mandatory collection of used textiles, it is also the only country that has clear definitions of the products and flows that are covered by these regulation. However, in the other countries, certain norms have emerged for what is meant by “used textiles” based on various strategies, mapping reports, guidelines for collectors, etc.

All countries focus on the final product, while there is generally little or no focus on production waste and semi-finished products. In addition, most countries include clothing and home textiles, while mattresses, duvets, pillows, rugs, leather and furniture textiles are not included. France and Germany also include shoes, regardless of the materials they are made of.

Organisation of the collection of used textiles

For all countries, municipalities are responsible for collecting household waste unless the waste is covered by a producer responsibility system (see Table 1.1). Only France has a producer responsibility system for household textiles. The municipalities in the other countries can choose to collect used textiles from households themselves, or can choose to outsource the collection. In all five countries, most municipalities have chosen to outsource the collection of textiles to other actors. Producers in France have also outsourced collection.

Table 1.1: Overview of objectives, responsibilities and execution of textile collection

	Denmark	Finland	France	Germany	Netherlands	Sweden
Is there a national circular economy strategy (or similar) with a goal for textiles?	No	No	Yes	No	A textile sector plan without goals	Yes, but not yet adopted
Are there EPR regulations for textiles?	No	No	Yes	No	No, but under discussion	Planned by government
Who is *responsible* for collection of textiles from households?	Municipalities	Municipalities	Producers	Municipalities (but they don't have monopoly)	Municipalities	Municipalities
Who *carries out* the collection of used textiles?	**Charitable/commercial collectors** and to a lesser extent **municipalities and/ waste companies**	**Charitable collectors** and to a lesser extent **municipalities and/ waste companies**	**Charitable/commercial collectors**	**Charitable/commercial collectors** and **municipalities and/ waste companies**	**Charitable/commercial collectors** and to a lesser extent **municipalities and/or municipal waste companies**	**Charitable collectors** and to a lesser extent **municipalities and/or municipal waste companies**
What are the primary collection methods?	Bring-banks on public and private ground and collection over the counter in 2nd hand shops. Kerbside collection exists (except in Finland) but on a small scale					

In all six countries, the majority of the collection is handled by charitable and commercial collectors. In Denmark, Finland and Sweden, the collection is dominated by charities. In France, Germany and the Netherlands, commercial collectors have a significant share of the market. Collection via bring banks is the primary form of collection in all countries. Kerbside collection is significantly less prevalent, partly because of the high operating costs, but also because of the risk of theft.

The quantity of separately collected used textiles, as a share of new textiles placed on the market each year, varies across the six countries from 23% in Finland to 75% in Germany (see Table 1.2). The data years are spread between 2012 in Finland to 2018 in France, and the mapping studies are not uniform in terms of scope. Therefore, the results cannot be directly compared.

The regularly updated targets in France, and implementation of these via a well-designed system of incentives and sub-targets for producers, municipalities, collectors and sorting facilities, have led to rapid increases in collection rates, albeit from a relatively low level. The volumes collected have almost quadrupled between 2006 and 2018. This significantly exceeds the growth rates of the three other countries that have data for more than one year.

Table 1.2: separate collection of used textiles as a share of new textiles placed on the market in the same year

Country (data year)		Denmark (2016)	Finland (2012)	Germany (2013)	France (2018)	Nether-lands (2018)	Sweden (2013)
Consumption of new textiles	Ktonnes	85	72	1347[i]	624[i]	305	121
	Kg/person	15.0	13,2	16.7[i]	9.5[i]	17.7	12.6
Separate colleciton of used textiles	Ktonnes	37	16	1011[i]	239[i]	136	23
	Kg/person	6.4	3.0	12.5[i]	3.6[i]	7.9	2.4
Indsamling som andel af nye tekstiler	%	43%	23%	75%	38%	45%	19%

[i] *Includes footwear*
Source: see individual country chapters

No economic interest in non-reusable textiles
Unless there is a requirement from a municipality (or in France from the Producer Responsibility Organisation) that collectors also collect the non-reusable textiles, most charity and commercial collectors focused on reusable textiles. The non-reusable textiles currently have no value and sharply undermine the economic viability of collection. The majority of collectors do not wish to receive these textiles.

Definition and practice for when textiles are waste / not waste
However, even though most charities and commercial collectors do not wish to receive non-reusable textiles, they receive them anyway through their collection activities. With the exception of delivery over the counter in second-hand shops, citizens, either deliberately or accidentally, supply some non-reusable textiles along with the reusable in bring banks and kerbside collections. This is even when the bring banks are marked by clear information that only reusable textiles are welcome.

In Germany and the Netherlands, the delivery of non-reusable textiles by citizens, even where they are not asked for by collectors, has meant that all collection via bring banks and kerbside collection is defined as waste collection. In Denmark, Finland and Sweden, this is not defined as waste collection, in circumstances where collectors make it clear that they do not wish to receive the non-reusable textiles (see Table 1.3).

The definition of when textiles are waste can have a number of consequences for the collectors and the subsequent actors in the value chain. Where collection is defined as waste, the collector must obtain permission to collect waste and may also need to register as a waste collector. When textile waste is exported, it must be exported as green waste with similar documentation requirements. In some countries there are also special rules for domestic transport (see Table 1.4).

In countries where the collection of used textiles is mostly not defined as waste collection (Denmark, Finland and Sweden), collectors are generally sceptical of these consequences and consider them as an additional burden that they avoid by not asking for the non-reusable textiles. In countries where the collection of used textiles is generally defined as waste collection (France, Germany and the Netherlands), it does not appear to have had a significant negative impact on the textile collection of charities or commercial actors. Some collectors in these

countries, moreover, consider that definition as waste collection has excluded "grey actors" and has professionalised and standardised the value chain for used textiles.

Table 1.3: overview of when textile collection is defined as waste collection or not

	Denmark	Finland	Sweden	France	Netherlands	Germany
Collection over the counter in second-hand shops where textiles are checked through on delivery.	Not waste					
Kerbside collection and bring-banks where the collector clearly communicates that it ONLY receives clean, undamaged and reusable textiles.	Not waste			Waste		
Kerbside collection and bring-banks where the collector communicates that all types of textiles may be delivered.	Waste					
Indoor collection in a retailer where the collector clearly communicates that it ONLY receives clean, undamaged and reusable textiles.	Not waste				Unclear	Waste
Indoor collection in a retailer where the collector communicates that all types of textiles may be delivered.	Waste					

Table 1.4: Consequences of used textile collection being defined as waste collection

	Denmark	Finland	France	Netherlands	Germany
Must one be registered as a waste collector if one collects textiles defined as waste?	Yes	Only if waste collection is the organisation's chief activity	Yes		
Are there special rules for transport of waste within country borders?	Yes	No	Yes, for transport over 10 tonnes	No	Yes
Are there specific end-of-waste criteria for textiles?	No		Yes	Partially	No

Registration of collection and treatment data

It is in the interests of national and local authorities to encourage or require (detailed) data registration to allow monitoring circularity in used textiles and textiles waste. The separate collection of textiles can then begin to contribute to the revised Waste Framework Directive's ambitious targets for recycling and preparation for reuse of municipal waste.

Of the six countries, only France currently has a robust data collection and reporting system for used textiles. France is also the only country with specific goals for the collection of used textiles, recycling and recycling. A Danish requirement for full transparency in the fate of the collected textiles can potentially encourage a broader application of codes of conduct for textile collectors, such as the Nordic Textile Commitment developed by the Nordic Council of Ministers[1], which increases knowledge about the fate of textiles downstream and ensures that the actors handling the textiles downstream, adhere to environmental and social standards.

[1] See for example Fråne et al (2017)

Implementing the 2025 requirement for separate collection of textiles

Plans for implementing the 2025 requirement for separate collection of textiles
France seems to be the closest to implementation with respect to having in place 1) specific regulations on separate collection of textiles, 2) a formal definition of the scope of textiles that should be covered by collection systems, 3) a collection system where re-usable (re-wearable) and non-reusable textiles are actively sought after and accepted, and 4) support mechanisms to ensure the economic viability of collection and processing of non-reusable textiles for individual actors.

Producer or municipal responsibility
The six countries differ on how they will allocate overall responsibility for the collection of textiles (waste) and what systems will be set up. The European Commission's New Circular Economy Strategy envisages the development of an EU textile strategy that will refer to extended producer responsibility (EPR) as one opportunity for Member States to strengthen textile sorting, recycling and recycling, France and Sweden already, or plan to, delegate overall responsibility to producers via EPR regulations.

Germany has developed a draft revision of the German waste legislation that places the responsibility for the collection of textile waste from households on municipalities, provided that the treatment of these waste quantities is technically and economically feasible. It seems that Finland will also place the responsibility on municipalities. The Danish government and supporting parties agreed in June 2020[2] to require Danish municipalities to carry out the separate collection of textile waste from 2022. The Netherlands has yet to decide who will have overall responsibility.

Ensuring the collection of non-reusable textiles
Regardless of who has ultimate responsibility, the actual collection is likely be carried out via a range of underlying systems and actors. These actors could be the same in a country with an EPR system and a country where municipalities have overall responsibility. The responsible organisations primarily need to ensure that the correct incentives and framework conditions are in place to ensure that these systems and actors operate effectively.

Supporting the collection of non-reusable textiles
The biggest challenge with respect to the 2025-requirement will be that collection of non-reusable textiles along with the reusable will deeply challenge the economic viability of collection and could lead to the disappearance of charitable and commercial collectors from the sector. Potential solutions include:

- Direct or indirect economic support of textile collection in return for meeting certain minimum requirements such as transparency on the fate of collected textiles
- Establishing new economically viable recycling markets through investments in new sorting and processing technologies

Both types of support are included in the French EPR system. In France it is sorting companies rather than collectors that receive direct financial support from the Producer Responsibility Organisation, EcoTLC, per tonne of textiles that they receive from registered collectors. This indirectly supports EcoTLC-registered collectors through ensuring higher payments per tonne for their textiles. Emerging recycling technologies, meanwhile, are supported through an R&D fund that is financed by textile producers.

Development of sorting and recycling technology

[2] Klimaplan for en grøn affaldssektor og cirkulærøkonomi 16.juni2020 https://kefm.dk/media/13158/aftaletekst.pdf

An additional 1.4 million tonnes of non-reusable textiles are expected to be collected annually across Europe by 2025. There is a need for industrial scale high-quality fibre-to-fibre recycling along with automated or semi-automated sorting of post-consumer textile waste that can provide consistent supplies of necessary fibre types for recycling. A number of promising technologies are on the verge of being upscaled to industrial scale, in northern Europe.

One example is the SIPTex automated sorting facility that is to be established in Malmö in Sweden, just a few tens of kms from Copenhagen, during 2020. Although, the maximum capacity of this facility would lie close to the future annual supply of Danish non-recyclable textiles, Denmark would be competing for capacity with other neighbouring countries. In any case, the close geographical proximity of SIPTex to Denmark would only be relevant where the textile waste is separated from reusable textiles within Denmark. This currently happens to a very limited extent (1000 tonnes per year). Most Danish textiles are exported elsewhere for manual sorting due to the high cost of labour in Denmark.

Most textiles are not suited to fibre-to-fibre recycling

Regardless of where automated sorting of non-reusable textile waste took place, these facilities would be designed primarily to supply fibre-to-fibre recycling facilities such as those being developed by re:newcell, Södra Cell and Worn Again. It is estimated that only about a quarter of non-reusable textiles are suitable for current and emerging fibre-to-fibre recycling technologies due to the need for mono-fibres or relatively simple fibre blends.

The remainder (over 1 million tonnes of non-rewearable textile waste per year across Europe) would need alternative recycling solutions. There are some examples of potential technologies including the RETEX process for production of construction panels and the Lendager/Convert process for production of insulation and acoustic panels. Such products are unlikely to offer a per tonne price for textiles waste that could compensate for increased collection costs and, moreover, may only lead to limited reductions in the overall impacts of the lifecycle of textiles.

Failing markets for second-hand textiles

Strategies for collection and subsequent reuse and recycling developed by Denmark also need to take account of the changing global markets for reuse. These are already signs that markets for lower quality re-wearable garments are drying up due to increasing supply, but constant or dwindling demand. As we approach 2025 these markets will come under further pressure.

A new approach to used Danish textiles may need to be considered to take account of these developments. A strategy that is planned as part of the far reaching Teleketju programme in Finland is that collectors would separate the best quality rewearable garments suitable for sale in Finland and other parts of Europe and send the remainder for automatic or semi-automatic sorting and subsequent recycling. Under normal circumstances, such a strategy would significantly reduce the share of used textiles that are reused and thus reduce the environmental (and economic benefits) of the used textile value chain. However, this argument will reduce in weight as global reuse markets for lower quality textiles become saturated.

A need for a broader policy focus

All these challenges suggest a need to widen the scope of policy focus further up the textiles value chain than the 2025-requirement for separate collection would immediately suggest, to both reduce the overall consumption (by volume) of textiles and to ensure that those textiles that do eventually become waste are readily recyclable. There is a need for policies and initiatives that a) encourage eco-design of textiles for durability and recyclability, b) mainstream business models aimed at recirculating textiles until their technical life is over, and c) influence consumption behaviour towards choosing quality rather than quantity

2. Background

Denmark has a relatively high separate collection rate for used textiles compared to other European countries with available data (see Table 2 in Watson et al, 2018a and Figure 5.1 later). Nevertheless, it is estimated that more than half of the textiles that are purchased by Danish households are discarded in mixed waste streams intended for incineration. It's estimated that 42 000 tonnes of textiles from households are incinerated in Denmark each year (Watson et al., 2018b).

The revised EU Waste Directive in May 2018[3], requires EU Member States to establish systems for separate collection of textile (waste) by 1 January 2025. A further addition requires that by 31 December 2024, the European Commission must consider whether to set goals for preparation for reuse and recycling of separately collected textiles[4].

It is up to the individual Member States on how they implement the requirement for separate textile collection. The directive does not specify the type of collection to be introduced or the types of textiles to be covered and from which sources.

As part of the process of implementation of the 2025 requirement, the Danish Environmental Protection Agency wishes to gather more knowledge on how to ensure effective systems and frameworks. There have previously been no specific requirements in relation to the handling of textile waste in Danish or European legislation. Therefore, clarification of legal definitions as well as general knowledge of collection of used textiles and textile waste is lacking, including experience from existing / completed initiatives in other countries. With respect to the latter, DEPA is interested in initiatives that focus on optimal handling of textile waste, but also on initiatives that consider other elements of the value chain, potentially including design, production and use.

Based on the above, DEPA has commissioned Plan-Miljø, About Waste and IVL Svenska Miljöinstitutet to carry out a so-called neighbour check (see box 1) in the area of used textiles. The project was carried out between October 2019 and February 2020.

Box 1: Definition of Neighbour Check
The term "neighbour check" can be defined as a check of neighbouring countries or other comparable countries' regulations or practice in selected areas in order to identify the need for any adjustment of a national law, regulation, guidance or practice, e.g. in connection with implementation of an existing or future EU Directive. It represents a comparative analysis of different countries' legislation and / or practice, organisation, etc. within a given theme and is a regularly used tool of the Danish government for advising on policy.

2.1 Goals and deliverables

The overall aim of the project is to ensure that knowledge and insights from selected European countries can assist Denmark and other EU Member States to establish systems and regulation that ensures the separate collection of textiles by 1 January 2025.

The project also has two specific purposes:

[3] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L0851&from=EN
[4] ibid

1. To carry out a neighbour-check in the area of textiles in at least five selected European countries to ensure a strong knowledge base for planning Denmark's and other EU countries' implementation of the Waste Framework Directive's requirement for separate collection of textiles from 1 January 2025.

2. To gather information on other countries' experiences and initiatives in the area of textiles and the circular economy to inspire future initiatives in Denmark and elsewhere.

Many actors already carry out separate collection of textiles both in Denmark and abroad using a wide range of different methods and have experienced a broad spectrum of challenges. Conducting the separate collection in an efficient and sustainable manner is challenging and requires a deep knowledge of the topic that provides the basis for comparing and evaluating alternative approaches to the problem. This neighbour-check focuses not only on how textile collection (and the further processes) takes place in selected countries, but also what the challenges have been and how these have been addressed.

3. Method for information collection and analysis

3.1 Selection of countries for review

The neighbour-check was carried out in five European countries, selected in collaboration between the project team and the Environment Agency based on the following selection criteria:

1. Initiatives for separate collection and processing of textiles have been introduced
2. The selected countries cover different approaches to the collection and processing of textiles
3. The selected countries are potential partner countries with Denmark in relation to future textile handling (geographical proximity)
4. Data and information are reasonably accessible

Based on the above criteria, the following five countries were selected:

Land	Baggrund for valg af land
 Sweden	o Organization of waste management is similar to Denmark's o Several reports are available on organizing textile collection o There is a wide range of initiatives by government and private companies to increase the collection, reuse and recycling of textiles o The present government is committed to introducing extended producer responsibility (EPR) for textiles o Investments have been made in sorting and recycling technologies o IVL (project partner) knows all the important players and has excellent contacts in the country o There is some good cooperation among several actors
 Germany	o Has Europe's highest collection rates (as a share of textiles placed on the market) for used textiles o Organization of waste management is similar to Denmark's o Unlike Denmark, all textile collection is defined as waste and all collectors are registered waste collectors o Has a number of sorting and recycling companies o Some Danish used textiles are already sent for sorting in the country
 Finland	o Has a collection system similar to the Danish one o Has established a collaborative platform for actors in the collection, sorting and processing of used textiles and textile waste o Has specifically worked with easing out legislative ambiguities o Has prepared a code-of-conduct for end-of-life textiles o Has invested in textile-to-textile recycling facilities

 France	o Has an extended producer responsibility (EPR) system for textiles o Has achieved a rapid increase in the collection of textiles o Several available reports are available on how textile collection is organised o There is a strong collaboration between organizations o There are many initiatives by government and private companies to increase the collection of textiles o Producers have invested heavily in recycling technologies o The project team knows the important players and has good contacts in the country
 The Nether-lands	o Organization of waste management is similar to Denmark's o Several available reports on organizing textile collection o Many initiatives by government and private companies to increase the collection of textiles o Are considering extended producer responsibility (EPR) o Has a number of sorting and recycling companies and significant investments in sorting and recycling technologies o All textile collection is supposed to be registered o The project team has good contacts in the country o There is cooperation among several actors o Some Danish used textiles are already sent for sorting in the country

3.2 Study themes

The neighbour-check in the five selected countries covered the following general topics (A to F), which have been elucidated partly through literature studies and partly through interviews with relevant actors in the selected countries:

A. The definitions of the term 'textiles' in various contexts
B. Definition and practice for when used textiles should be considered as waste / not waste
C. Organisation of textile collection
D. Systems and practices for collecting and reporting data on quantities of separately collected textiles and textile waste
E. Technological options for sorting and recycling and other relevant technology
F. Good initiatives within the area of circular textiles

These overall topics are described in further detail below.

A. Identification of definitions of textiles and the context in which they are used

The requirement in the revised Waste Framework Directive (WFD) on the separate collection of textiles is relatively vague: *'Member states will set up, by 1 January 2025, separate collection of textiles [….] from households*.' It is not clear what categories of textile products are covered. Moreover, it is not clear whether the requirement only covers textiles from households and other organisations covered by municipal waste schemes, or whether it also covers textile waste from industry and business.

Under the theme, knowledge is gathered about what product types and flows of used textiles / textile waste are covered by the selected countries' current legislation, guidelines and/or norms regarding the collection of textiles for reuse and recycling.

B. Definition and practice for when used textiles should be considered as waste / not waste

When used textiles should be regarded as waste is an important consideration with regards to the WFD's requirement for separate collection, but also in terms of assessing who may collect textiles and how the textiles may be treated and transported across borders, etc. Here we have gathered knowledge concerning:

a. How selected countries differentiate between used textiles collected for reuse and textile waste
b. How each country's legislation is formulated in relation to the above
c. How the legislation is communicated, interpreted and enforced
d. What implications the definitions have had for collection schemes and the way in which textiles must be transported within and between countries.
e. Whether there are national end-of-waste criteria for textile waste and how these are utilised

C. Organisation of textile collection

Here we have examined how the collection of textiles and textile waste is organised in the selected countries:

a. Who carries out collection
b. Cooperation between actors
c. How collection is carried out (kerbside collection, bring-banks etc.)
d. What is collected (clothing, shoes, home textiles, etc.) and what is not wished for
e. What quantities are collected separately annually and what proportion of new textiles placed on the market does this represent
f. What is the role of the government authorities
g. Whether there are plans / consideration for adopting extended producer responsibility (EPR) regulations/systems
h. Whether there is a national strategy / vision for textile collection including goals
i. Who may establish take-back systems for products and under what circumstances
j. How countries' plan to implement the 2025-requirement.

D. Information on how data on quantities of separately collected textiles are collected and reported

In order to meet the requirement for separate collection of textiles from 2025 and the contribution of the textiles to the updated targets for recycling and preparation for reuse of municipal waste[5], it may be advantageous in the future to register separately collected textiles. It has therefore been examined whether the selected countries:

a. have requirements for the registration of separately collected textiles and/or textile waste
b. collects and records such data and how this is carried out
c. have a concise and efficient recording system or whether they experience deficiencies in data registration and reporting

E. Technological options for sorting and recycling

[5] According to the revised Waste Framework Directive, all EU Member States must achieve 55% recycling or preparation for reuse of municipal waste by 2025, 60% by 2030 and 65% by 2035. Treatment of textile waste can contribute to these goals. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L0851&from=EN

Large quantities of non-recyclable textiles will be collected across Europe by 2025, and new sorting and recycling technologies will be needed to process them. Development of such technologies is happening across Europe, and it was agreed that the neighbour-check should not be limited to the five countries. This topic focuses on:

a. Available and new / planned sorting technologies (including manual sorting, automated sorting, detailed sorting and pre-sorting)
b. Technologies for mechanical and chemical recycling of various fiber types and fiber blends
c. Time horizons and the level of development of these technologies in terms of maturity, capacity and potential relevance to current and future Danish collection of textile waste

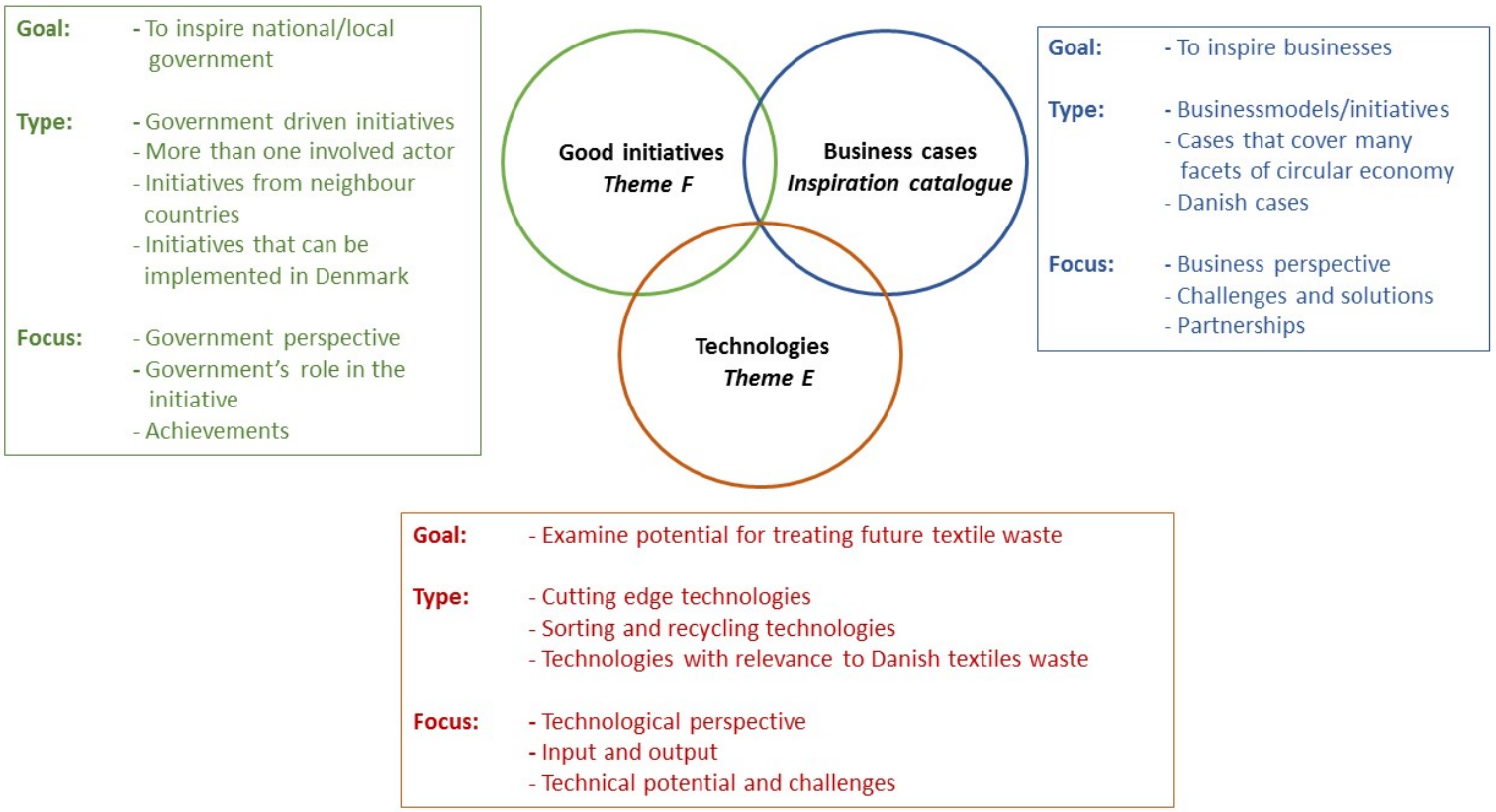


Figure 3.1: The difference between cases selected for the Technology chapter, the Initiatives chapter and the Inspiration Catalogue

F. Good initiatives in circularity of textiles

To inspire future political work in Denmark, good cases of initiatives in the selected countries should be identified. The initiatives should be at a level where they can in principle be implemented at national, regional or local level in Denmark. The initiatives can cover all aspects of the value chain from design to waste management. Selection of initiatives also took a starting point in those that the authorities of the selected countries themselves find most relevant and important.

Inspiration Catalogue

In addition to the above topics, the assignment included the preparation of an Inspiration Catalogue, the purpose of which was to conduct a screening of the Danish textile industry to identify cases in which businesses or other actors have included circular principles into their business model and / or activities. In collaboration with the Danish Environmental Protection Agency, 11 cases were selected from a longlist, which has subsequently been compiled into an Inspiration Catalogue targeted at other Danish companies and startups who want to implement circular initiatives in the textile field. The Inspiration Catalogue is published as a separate case wallet but is currently only available in Danish.

Scope and focus of selected cases

Topics E and F and the Inspiration Catalogue all consist of cases that are aimed at informing and inspiring within the respective thematic area. Although there are some possible overlaps, both the purpose and focus of cases differ. This is illustrated in Figure 3.1.

3.3 Collection of information

A wide range of sources were used to gather information on neighbouring countries' state of play and framework conditions within each of the six topics. The method has been built on finding at least one key expert within each country who could then identify other useful sources. The key experts are identified in Table 3.1.

Tabel 3.1: Key experts in the selected countries

Land	Ekspert	Organisation
Denmark	Nikola Kiørboe	*About Waste (consultant)*
	David Watson	*PlanMiljø (consultant)*
	Mikkel Clausen	*Danish EPA*
	Maria Bøje Petersen	*Danish Ministry for Environment and Food*
Finland	Dahlbo Helena	*SYKE (Finnish EPA)*
	Sini Ilmonen	*Lounais-Suomen Jätehuolto Oy (Finnish waste company)*
	Jussi Kauppila	*Ympäristöministeriö (Finnish Environment Ministry*
France	Maud Hardy	*EcoTLC (Producer Responsibility Organisation for textiles and footwear)*
	Morgan Mozas	*Ministère de la Transition écologique et solidaire (French Environment Ministry)*
Germany	Nicole Kosegi	*Solutions for Business (consultant)*
Netherlands	Emile Bruls	*Rijkswaterstaat (Authority for Infrastructure and Water Management)*
Sweden	Maria Elander	*IVL (consultant)*
	Hanna Ljunqvist	*IVL (consultant)*

The key experts were sent a checklist with all the information needed for each topic. The checklist corresponds to the sub-topics listed under each item in section 3.2 above. The key expert has filled in the checklist with possible sources under each topic. This has resulted in a mix of reports and other documents and experts. In Topics E and F, the experts referred to cases that they thought best suited the submitted selection criteria and contact information for these.

Subsequently, the referenced documents have been reviewed and experts have been contacted and interviewed. More than 30 interviews have been carried out during the project.

3.4 Structure of the report

This report is divided into four parts:

Chapter 4 presents an overview of the framework and practices for textile collection in the five countries as well as Denmark to provide a foundation for the reader to better understand the subsequent more detailed analyses.

Chapter 5 presents analysis in relation to the following areas:
• Definitions of 'textiles' and the context in which these definitions are used (Theme A)
• Definition and practice for when textiles are considered to be waste / not waste (Theme B)
• Organisation of separate collection of textiles (Theme C)
• Systems and practices for collecting and reporting data on quantities of separately collected textiles and textile waste (Theme D)

Chapter 6 provides an overview of technology for sorting and recycling of used textiles and other relevant technology as well as an analysis of its relevance to Denmark (Theme E).

Chapter 7 presents good initiatives in the textile field in the five countries as well as a few additional initiatives from other countries that can inspire in other countries. All the initiatives presented provide an opportunity for a national, regional or local authority or another actor to play a role, either by funding, guiding or participating as an active part of the initiatives. The initiatives that have been selected relate to a wide range of aspects in the value chain for used textiles (Theme F).

Chapter 8 presents a discussion of the results of the Neighbour Check seen principally from a Danish perspective but also with relevance for other countries.

4. Textile collection in 6 countries – an overview

4.1 Overview of consumption and collection

Table 4.1 provides an overview of consumption and separate collection of textiles in the six countries. Details are presented in the subsequent six country specific sections. It should be noted that mapping exercises from which data have been derived have been carried out for a range of years and have used different data collection methods. Therefore, the results cannot be directly compared.

Table 4.1: separate collection of used textiles as a share of new textiles placed on the market in the same year

Country (data year)		Denmark (2016)	Finland (2012)	Germany (2013)	France (2018)	Nether-lands (2018)	Sweden (2013)
Consumption of new textiles	Ktonnes	85	72	1347[i]	624[i]	305	121
	Kg/person	15.0	13,2	16.7[i]	9.5[i]	17.7	12.6
Separate colleciton of used textiles	Ktonnes	37	16	1011[i]	239[i]	136	23
	Kg/person	6.4	3.0	12.5[i]	3.6[i]	7.9	2.4
Indsamling som andel af nye tekstiler	%	43%	23%	75%	38%	45%	19%

[i] *Includes footwear*
Source: see individual country chapters

4.2 Denmark

Policy framework

There is currently no national strategy on collection of used textiles and textiles waste in Denmark. The government's resource strategy for 2013-18, *Denmark Without Waste*[6], includes a 50% target for recycling and preparation for reuse of household waste by 2022 within seven fractions (paper, cardboard, glass, food waste and wood). Textiles are not named specifically with respect to this goal. The more recent Strategy for a Circular Economy[7] adopted by the previous government in 2018 doesn't name textiles either.

Municipalities have responsibility for collecting household waste in Denmark and are responsible for developing waste plans at least every six years[8]. A few municipalities have included goals for textiles in their waste plans. Copenhagen's draft waste plan 2019-2024[9], for example, includes a goal to increase reuse and recycling of used textiles through cooperation with actors in the used textile value chain.

Collection of used textiles

Denmark has a long tradition for used textile collection by charities and private actors. More recently municipal waste companies have begun collecting used textiles and textiles waste in civic amenity centres and via door-to-door collection. Some brands/retailers have also experimented with collection but only H&M has continued this for a number of years[10].

93% of the 36 000 tonnes of used textiles collected from households in 2016 were by the traditional collectors. The 36 000 tonnes represent just under half (48%) of new textiles purchased by households in the same year (75 300 tonnes). Collection is carried out via bring-banks and over shop counters. Collection of used textiles from hospitals, nursing homes and other publicly run institutions is minimal, as is collection of workwear from business[11].

Treatment of collected textiles

Many of the traditional collectors and a few of the municipal waste companies skim off the best quality used textiles for resale in own shops in Denmark. This is estimated at approximately 10 000 tons. A large part of the remainder is (21 800 tonnes) is exported for detailed sorting in other countries and subsequently for sale on global markets for reuse and, where possible, recycling[12]. Around 70% (15 400 tonnes) of exported textiles are sold for reuse after detailed sorting and 19% (4 140 tonnes) are recycled on global markets. The remainder (2 300 tonnes) ends in landfill or incineration in the sorting country[13].

There is only one facility for comprehensive sorting of used textiles within Denmark. The facility sorts between 500 tonnes and 1000 tonnes each year for global used textile markets and some selected recycling markets.

Cooperation/interactions between actors

Cooperation between actors include the following:

- Municipalities give permission to one or more charitable or private collectors to collect textiles on public land (very widespread)
- Municipal waste companies contract out textile collection on public land to a single collector (rarer)
- Municipalities collect used textiles themselves, skim off the cream for sale in their own shops and donate the remainder to a traditional collector (around ten examples)

[6] https://mst.dk/affald-jord/affald/affaldshaandtering-strategi-aktiviteter/danmark-uden-affald-strategi-plan/
[7] https://mfvm.dk/fileadmin/user_upload/MFVM/Miljoe/Cirkulaer_oekonomi/Strategi_for_cirkulaer_oekonomi.pdf
[8] Danish Waste Regulations § 13 https://www.retsinformation.dk/Forms/R0710.aspx?id=207367#id2c99286f-49c9-4723-a84f-ec2acd210753
[9] https://blivhoert.kk.dk/hoering/udkast-til-ressource-og-affaldsplan-2024
[10] Watson et al, (2018a)
[11] Ibid
[12] Ibid
[13] Ibid

- A brand collects in their own shops and donates/sells the collected textiles to a collector for processing (single example)

Textiles waste

In Denmark collection of used textiles is not considered to be waste collection if the collector makes it clear that it only wishes to receive clean, reusable products. However, if a collector, despite this communication, receives *significant* quantities of non-reusable textiles the collection is considered to be waste collection[14] (see Section 5.2). With a few exceptions, charitable and private collectors do make it clear through signage on bring-banks that they only wish to receive clean and reusable textiles and shoes. For the collectors, this is mostly due to the negative impacts that collecting non-reusable textiles would have on their economies since non-reusable clothing has little or no economic value[15].

These collectors, nevertheless, receive some unwished for non-reusable textiles in their bring-banks (typically 20-30%). Since most detailed sorting of Danish used textiles is carried out in other countries, it is in these countries where the non-reusable textiles are separated from the reusable and undergo waste treatment (including recycling). A share of this is recycled and the remainder is incinerated or landfilled in the sorting country[16].

There are a few cases where municipalities have tendered for used textile collection, where the winning bidder must also advertise for and collect textile waste[17]. This has reportedly had negative effects on the economic viability of collection[18].

A handful of municipal waste companies have taken a different approach, where they have established containers for separate collection of textiles waste in civic amenity centres where there are also placed bring-banks for reusable textiles. For at least one municipal waste company[19] - a waste company that manages waste for several municipalities on Zealand - this is part of a wider strategy for increasing separate collection of all waste streams by removing containers for small flammable waste from their civic amenity centres. A further municipal waste company[20] collects waste textiles in kerbside collection services in bags on which it is written that reusable textiles should be donated to charitable collectors and that the bags should only be used for non-reusable textiles waste. Nevertheless, in both cases the municipalities also inadvertently receive reusable textiles in their collections. The municipalities that collect textile waste are in general experiencing difficulties in finding recycling options for this.

The Danish government and supporting parties agreed in June 2020[21] to require Danish municipalities to carry out the separate collection of textile waste from 2022.

Domestic recycling options

There are very few recycling options for textiles waste within Denmark and none are at industrial scale. A few innovative examples have emerged in recent years including: Really[22] that primarily collects cotton waste textiles from hospitals and textile service companies for use in laminate boards; Lendager and Affaldplus[23] that are developing insulation boards for heat and sound for use in the building sector. These both make use of Danish company Convert[24] that carries out shredding and production of non-woven matting and granulates. These initiatives together process a few hundred tonnes per year.

[14] Mikkel Clausen (Danish EPA) personal communication
[15] Watson et al, (2018a)
[16] Watson et al (2016)
[17] For example, Amager Resource Centre in Copenhagen
[18] Kaj Pihl (UFF) personal communication
[19] https://argo.dk/farvel-stort-smaat-braendbart/
[20] Vejen Municipality in Jutland in cooperation with Dansk Affald. Dansk Affald presentation to DAKOFA textile network, 1st March 2018
[21] Klimaplan for en grøn affaldssektor og cirkulærøkonomi 16.juni2020 https://kefm.dk/media/13158/aftaletekst.pdf
[22] https://reallycph.dk/
[23] https://www.affaldplus.dk/tekstilaffald-future
[24] See Box 3 in Chapter 6

At a much lower volume of scale there are a handful of socio-economic organisations and start-up businesses that upcycle textile waste collected in Denmark into new unique high value textile products.

4.3 Finland

Policy framework

The Finnish road map to a circular economy 2016–2025[25], focuses on five interlinked themes one, of which – Technical Loops – is relevant to, but does not specifically mention textiles. A general goal within this theme is to return unwanted goods in to the loop, for reuse and recycling and to promote the sharing economy.

The Waste Act gives municipalities or publicly-owned companies appointed by them, responsibility for collecting household and other municipal waste[26]. The government must develop a waste plan every 6 years which is supported by/implemented through regional waste plans[27]. The national waste plan for 2023[28], *From Recycling to the Circular Economy,* sets targets for waste management and waste prevention. There are no specific targets for textiles, but the waste plan recognises that preparation for reuse and recycling of textiles can give important contributions to recycling and preparation for reuse targets for municipal waste.

The Finnish Waste Act is currently under development to bring it in line with the revisions to the EU Waste Framework Directive. It is expected that the revisions will require municipalities to establish collection points/bring banks, if needed in collaboration with other municipalities, no later than the beginning of 2023[29]. The draft revisions will be put before parliament during summer 2020.

Collection of used textiles

It is thought that used textile collection is dominated by charities and that the majority of collection is carried out via is carried out with bring banks, although this has not been mapped in detail. It is normal for bring banks to be placed at the same sites as packaging collection under the EPR system for packaging run by RINKI Oy[30]. All bring sites for all fractions are identified on a regularly updated map-based application[31] provided by municipalities and producer organisations. This site currently[32] identifies 1200 collection sites across Finland for used textiles.

In addition, there is some collection across the counter in second-hand charity shops, some in-store collection by retailers and several socio-economic enterprises that collect, sort and repair/upcycle clothing for resale. An example is Nextili[33] where sorting, repair and reuse is carried out in combination with employment/activation of marginalised groups.

Only one municipal waste company is currently known to collect used textiles and textile waste. This is LSJH owned by 17 municipalities in the south west and has been separately collecting textiles since 2017. The collection is relatively small at 118 tonnes[34]. More municipal waste companies are likely to begin collection after the revision of the Waste Act[35].
The last mapping of used textile collection was carried out in 2013[36]. This estimated, through interviews with the five largest charitable collectors, that 16 400 tonnes of used textiles were collected separately in 2012. This represented 23% of new textiles placed on the market in the same year.

[25] Sitra (2016)
[26] Section 32 of Finnish Waste Act https://www.finlex.fi/fi/laki/alkup/2011/20110646#Pidp446253440
[27] Section 87-90 of Finnish Waste Act https://www.finlex.fi/fi/laki/alkup/2011/20110646#Pidp446253440
[28] Finsk Miljøministeriet (2018)
[29] Jussi Kauppila, Finnish MoE, pers. comm.
[30] Salmenpera (2017)
[31] See https://www.kierratys.info/
[32] Last accessed 12th December 2019
[33] See https://www.nextiili.fi/?lang=en
[34] Laaksonen (2019)
[35] Jussi Kauppila, Finnish MoE, pers. comm.
[36] Dahlbo et al (2017)

Treatment of collected textiles

It isn't clear from the 2013 mapping report where sorting takes place. However, later interviews with two of the largest collectors (UFF Finland and Finnish Red Cross) identified that 56% were exported as original for sorting elsewhere, with the remainder pre-sorted or fully sorted in Finland[37].

According to the 2013 mapping, 20% of separately collected textiles were sold/donated for reuse in Finland, 50% were exported for direct reuse and/or sorting in other countries, 6% was recycled in Finland and the remaining 23% was rejected and sent to incineration. There is no record of the final fate of the exported textiles, but it is assumed that approximately 75% were reused on global markets[38].

Cooperation/interactions between actors

Until the Telaketju project began in 2017, cooperation between actors in Finland was mostly limited to:

- Municipalities are responsible for giving permissions for textile collection on public land. Bring-banks may also be subject to building permit issued by municipality (widespread).
- Municipalities contract charities/private collectors to collect textiles (rare)
- A brand or retailer collects in their own shops and donates/sells the collected textiles to a collector for processing (few examples)

The Telaketju project that has just entered its second phase, is focused on forming partnerships and networks to solve the various aspects of the circular economy of textiles. This includes many different partners from all elements of the pre-consumer and post-consumer value chains. The project has expanded the degree of cooperation, including within the collection of textiles. Partners within collection include charities, municipal waste companies, private waste companies, social enterprises and brands. A detailed description of Telaketju is given in Case 8 in Capter 7.

Textiles waste

Most charities and private collectors make it clear on their bring-banks that they only wish to receive clean and reusable textiles and shoes. Under Finnish interpretations of the waste definition, such collection is not considered to be waste collection even if non-reusable textiles are included[39].

Almost all in-store collection initiatives collect both reusable textiles and textile waste. According to a guidance document[40] developed for the Ministry of Environment this should be interpreted as waste collection. However, these chains do not need to be included in the Finniah waste registry because the collection of used textiles is not their core business[41].

Most of these volumes are exported and sorted for reuse or for recycling as e.g. industrial wipers or insulation. Rest fractions are incinerated or landfilled, depending on the sorting country.

Municipal waste company LSJH also actively collects textiles waste along with reusable textiles. LSJH reports that only one third of the textiles it collects is suitable for reuse or current available recycling technologies in Finland[42]. An important part of the company's communication to residents is that textiles are collected for research purposes to make the recycling process work in

[37] See Watson et al (2016) Table 1.
[38] UFF Finland was the largest exporter and they report 80% reuse for exported original
[39] Salmenpera (2017)
[40] ibid
[41] See Section 3.2 in Salmenpera (2017)
[42] Laaksonen (2019)

the future and, therefore, they should continue to deliver their textiles. Sorting of these textiles by fibre-type is being carried out through a handheld sorting scanner developed for LSJH (see technology section).

Domestic recycling options

In 2015 there was only one commercial company in Finland that recycled textile waste into non-woven products, such as covering blankets, waddings, absorbing blankets, etc.[43] In addition, small amounts of worn-out clothes and textiles are recycled as raw material for cleaning rags by social organizations such as Nextili.

However, under the Telaketju project new recycling innovations are under development. One key example is a plan by municipal waste company LSJH to construct a pilot scale recycling plant in Turku[44]. The recycling facility will be capable of recycling old garments and other used textiles into mechanically regenerated fibres and will be designed for 1 tonne per hour processing capacity.

[43] Dahlbo et al (2015)
[44] https://telaketju.turkuamk.fi/in-english/recycling-line-for-post-consumer-textile-waste-invitation-to-participate/

4.4 France

Policy framework

France is the only country in the EU to have mandatory extended producer responsibility (EPR) for textiles. The EPR system for textiles is part of an overall waste management strategy in France which places significant focus on EPR as a solution for ensuring higher levels of collection, reuse and recycling of waste[45]. The EPR for Clothing, Home textiles and Footwear was issued in 2007. It is solely products purchased by households that are included in the EPR regulations[46].

Under the regulations, producers, distributors and importers are obliged to take care of the products that they place on the market when they become waste. They can either organise their own collection, reuse and recycling system which needs to be accredited by the French public authorities or contribute to an accredited Producer Responsibility Organization (PRO) that takes on this responsibility for members in return for a producer fee[47]. Requirements for accreditation are detailed under the EPR legislation. Eco TLC is the only accredited PRO and accounts for 95% of the market[48]. The remaining 5% are free-riders. No producer has attempted to establish a separate EPR for its own products[49].

Eco TLC's was accredited in 2008 and operates under a mandate negotiated with the Ministry of Ecology, Energy, Sustainable Development and Spatial Planning every 6 years. A new mandate is currently under negotiation[50]. The current mandate includes targets of 50% of textiles placed on the market to be diverted from landfill by 2019, with at least 95% of the collected textiles going to reuse, recycling or energy recovery and no more than 2% being landfilled[51].

Collection of used textiles

Collection of textiles (and footwear) is organised by EcoTLC. Collection is carried out by accredited charitable and private organisations. To reach collection targets EcoTLC sets running goals for the density of collection points set up by accredited collectors. The collection point (CP) goal for 2019 was 1 per 1500 people. In 2018 it had already reached 1 CP for 1 455 inhabitants in 2018 up from 1 CP per 1 535 inhabitants in 2017. The larger cities have the lowest densities e.g. the lowest number of collection points per inhabitant, and as a result lower collection rates[52]. All accredited collectors' collection points must carry the EcoTLC logo.

239 000 tonnes (of which 19% is footwear) were collected in 2018 representing 38% of textiles/shoes placed on the market by weight[53]. Collection has risen from 175 000 tonnes in 2014 and from 65 000 tonnes in 2006[54], the year before the EPR regulations for textiles became law. Despite this sharp improvement, EcoTLC is unlikely to reach the 2019 target of 50% collection. 85.1% of collection in 2018 was via containers placed on streets, in civic amenity centres or private ground, 10.6% across the counter in charitable shops, 2.5% in high street retailers and just under 1.8% via door-to-door collection[55]. There is some additional unregistered collection by non-accredited collectors working outside the EPR system[56].

Treatment of used textiles

[45] Article 541-10 in the French Environmental Code https://www.legifrance.gouv.fr/affichCode.do?idSectionTA=LEGISCTA000023268652&cidTexte=LEGITEXT000006074220&dateTexte=20150819
[46] Article 541-10-3 in the French Environmental Code
[47] Article 541-10 in the French Environmental Code
[48] EcoTLC (2019a)
[49] Maud Hardy, EcoTLC (personal communication, 4th November 2019)
[50] Ibid
[51] EcoTLC (2019a)
[52] Ibid
[53] ibid
[54] See Figure 8 i Bukhari et al (2018)
[55] EcoTLC (2019a)
[56] Maud Hardy, EcoTLC (personal communication, 4th November 2019)

The collectors skimmed off ca. 52 000 tonnes of the best quality used textiles for resale in own shops or export for reuse elsewhere, before selling the remainder to sorters. The remaining 187 000 tonnes of textiles/footwear were then sorted in both charitable and commercial sorting facilities supported by EcoTLC. 52 of the sorting centres are located in France and 16 elsewhere in Europe. 85% of all sorting occurs in France as a result of the financial support (see below). The sorters in France employ just over 1 500 FTE, of which just under half are people with difficulties coming into the job market[57].

Sorted fractions are sold on both domestic and global markets. Treatment shares for the sorted quantities in 2018 were: 58.6% reuse, 32.6% recycling, 8.4% incineration with energy recovery and 0.4% landfill. The latter two are non-recyclable or contaminated. 5-10% of sorted fractions are reused in France. The remaining reuse is on global markets. Of the 32.6% recycled textiles, roughly one third represents cutting into household and professional cleaning wipers and the remaining two thirds are mostly downcycled as insulation, padding or geotextiles[58].

Cooperation/interactions between actors

All cooperation between actors is formally organised or influenced by EcoTLC[59]:

- Municipalities can receive financial support from EcoTLC in return for communicating to their citizens on collection points within the municipality and encouraging donations of used textiles. EcoTLC provide communication materials. Financial support is dependent on 1) EcoTLC approving their communication plans and 2) meeting a minimum collection point density in the municipality (I CP per 2000 citizens in this period increasing to 1500 citizens in the next 6 year period). The number of cooperating municipalities almost doubled between 2014 and 2018, and the total support rose from 1.3 to 2.4 million Euro.
- Municipalities are responsible for giving permissions to collectors to collect textiles on public land. Cooperating municipalities use this permission process to ensure meeting the minimum CP density above. Only CPs run by approved collectors are valid for the minimum density. The collection is sometimes organised via formal tender procedures.
- Sorters are supported financially by EcoTLC, but only for the textiles that they purchase from EcoTLC-approved collectors. In return sorters must report on quantities sorted and subsequent treatment. They must also employ a minimum share of marginalised workers.
- Collectors themselves do not receive financial support from EcoTLC but they have a strong incentive to become EcoTLC accredited because they receive higher prices from supported sorting facilities. In return they are expected to report to the sorting companies on total collection quantities including those that they resell in their own shops.
- EcoTLC collectors have set up collection inside high street retail shops in cooperation with the retail companies

Textiles waste

EcoTLC-accredited collectors must accept all textiles including non-reusable textile waste. Under normal circumstances this would reduce the market value of what they collect. However, sorters are willing to pay a higher price for textiles from accredited collectors than non-accredited collectors even if the latter is of higher quality and has higher shares of reusable textiles[60]. This is because sorters only receive financial support for the textiles they process from accredited collectors. Sorters are third party audited to ensure compliance[61].

[57] EcoTLC (2019a)
[58] Ibid
[59] Ibid
[60] Maud Hardy, EcoTLC (personal communication, 4th November 2019)
[61] EcoTLC (2019a)

Domestic recycling options

Much of the textile waste suitable for recycling is exported elsewhere within Europe and most recycling comprises downcycling. In order to stimulate more recycling in France, some of the producer fees are channelled into research and development and pilots into various types of open loop and closed loop recycling. There have so far been 8 rounds of bidding for R&D funds, and 44 projects have been funded with a total of 3.9 million Euro[62]. Only a few of these projects have continued following end of funding. EcoTLC have learnt that open loop recycling projects that include partnerships with manufacturers that can make use of the recycled material have highest chance of success[63].

EcoTLC believe that improving recycling rates and improving the quality of outputs of recycling processes are the is the biggest challenges to overcome in the circular economy of textiles. In the negotiations for the next 6-year contract period with the government, they are pushing for most of the financial support to sorters being channelled to recycling projects and technologies instead[64].

[62] EcoTLC (2019b)
[63] EcoTLC (2019a)
[64] Maud Hardy, EcoTLC (personal communication, 4th November 2019)

4.5 Netherlands

Policy framework

The Dutch Circular Economy Strategy from 2017[65] includes policy and targets for 5 priority value chains and sectors, including consumer goods. The Strategy also includes the target that residual household waste is to be reduced to maximum of 100 kg per capita by 2020 and 30 kg by 2025.

For each of the five priority value chains/sectors a team has been established by the Dutch government to develop recommendations for circular transitions. The transition report for consumer goods[66], includes recommendations to develop a circular economy plan for textiles, to introduce a textiles EPR scheme, and to develop so-called Circular Valleys that pool innovative companies to develop circular economy solutions for textiles. The scope and operation of a potential EPR scheme is currently under investigation.

The national waste management plan (LAP 3) includes a More and Better Recycling covenant. LAP 3 includes a Sector Plan for Textiles[67] to meet this covenant. The Sector Plan defines when textiles should be considered as waste and who has responsibility for separate collection, and defines minimum standards for treatment of separately collected used textiles that must be adhered to. The minimum standard is recycling but reuse is preferred where possible. Textiles can be exempt from recycling where they are heavily contaminated or where recycling is technically problematic.

In 2012 a voluntary Green Deal[68] was signed between the Dutch government and the used textile industry, with the overall goal of halving the quantities of textiles found in residual waste by 2015. This was to be achieved through better mapping of textile flows, common communication by actors, and assisting municipalities with setting achievable targets. The Green Deal, although successful in some actions, failed to achieve the halving in textiles in residual waste due to low market prices for non-reusable textiles.

Collection of used textiles

According to the LAP 3 Sector Plan, separate collection of textiles from households is the responsibility of municipalities. Municipalities have freedom of choice in the way in which they organize the textile collection, for example via textile bins or door-to-door collection. They can also use charitable or commercial organisations to carry out the collection. Almost 80% of municipalities have chosen this route[69]. The remainder organise separate collection themselves, but then sell or donate the collected textiles to charitable or commercial organisations.

It is typical for charitable organisations to create private companies to carry out the textile collection, sorting and sales operations with the revenues returned to the charitable part of the organisation[70]. This has ensured a professionalisation of the industry and also allows the professional arm of the charity to be registered as a waste collector (see later). The charitable collectors have a less dominant role in collection than in the Nordic countries. In 2013, charitable organisations collected 55% of textiles which had reduced significantly from 10 years earlier[71]. Commercial collectors have a high presence in the Netherlands and run sorting facilities at industrial scale.

[65] Government of the Netherlands (2016)
[66] Consumer Goods Transition Team (2018)
[67] Dutch Parliament (2018)
[68] https://www.greendeals.nl/sites/default/files/downloads/GD142-Duurzame-inzameling-textiel.pdf
[69] Dutch Parliament (2018)
[70] Examples are Salvation Army and Reshare and Humana and Sympany
[71] Dutch Waste Management Association (2013)

Collection is chiefly carried via bring-banks in civic amenity centres and on streets and some collection in shops. Some municipal waste companies also carry out door-to-door collection[72].

An official mapping of textile collection from 2020[73], estimated that 136 100 tonnes of textiles were collected in 2018 and the consumption of new textiles in the same year was estimated at 305 000 tonnes (although this was based on a mass balance approach and not confirmed by import, export and production data). With these figures it is estimated that 45% of textiles placed on the market were separately collected post-consumer in 2018. Collection was carried out by commercial actors (46.2%), the *Kringloop* second-hand sector (31,5%) and municipal waste companies (22,3%).

Treatment of collected textiles

Unlike in the Nordic countries, a large share of used separately collected textiles are sorted in Dutch sorting facilities (43% in 2018[74]). There is a high overall capacity of sorting facilities in the Netherlands and in 2018, in addition to the Dutch used textiles, they processed a further 98 300 tonnes of imported used textiles from other parts of Europe.

Following sorting, the resulting up to 350 different fractions[75] are sold on domestic and global reuse and recycling markets. Of the domestically collected textiles, 4.6% was reused in the Netherlands, 1.5% recycled in the Netherlands, 81.1% exported and 9.7% incinerated as waste in the Netherlands. It is not known what happens to the remaining 3%. For the exported textiles, 57% were reused in other parts of the world, 38.1% recycled and 4.9% incinerated or landfilled.

Cooperation/interactions between actors

Cooperation between actors include the following:

- Municipalities give permission to one or more charitable or private collectors to collect textiles on public land (up to 80% of municipalities). Often the charitable organisation acts as a commercial wing of the charity.
- Municipalities contract out textile collection on public land to a single collector (more rare)
- Municipalities collect used textiles themselves and sell or donate to a charitable or commercial collector. (20% of municipalities). One municipal waste company (Circulus Berkel) has its own sorting facility run by a Kringloop organisation with financial support from the government (see Case 2 in Chapter 7)
- A brand collects in their own shops and donates/sells the collected textiles to a collector for processing (one or two examples)

Textiles waste

Since the Green Deal of 2012-2015 (see Case 3 in Chapter 7), an increasing number of municipalities require when giving permission or tendering for separate textile collection on public ground, that the collectors accept all textiles including non-reusable textile waste. This was due to a guidance issued to municipalities as part of the Green Deal on what types of textiles should be collected. Only clothing contaminated with oil or paint, plus mattresses, duvets, pillows and carpets should be refused[76].

However, a number of municipalities have not adopted this guidance and do not insist on collectors collecting the non-reusable fraction. In general collectors do not ask for the non-reusable textiles unless they are required to do so, due to the negative effect on their economies. Where municipalities carry out used textile collection themselves in bring banks and/or kerbside collection, this includes all textiles including the non-reusable fraction. Since only registered waste

[72] For example Circulus Berkel via the so-called BEST bag in which they collect books, small electronics, games and textiles for later sorting, reuse and recycling. See page 29-33 in Watson et al (2018b)
[73] FFact, (2020)
[74] ibid
[75] https://www.boergroup.eu/sort?lang=en
[76] Emile Bruls, (Rijkswaterstaat) pers. comm.

collectors may collect textiles waste in the Netherlands, all the larger collectors are registered as such.

Domestic recycling options

The Netherlands has a high textile recycling capacity, mostly for industrial wipes and non-woven products for insulation, upholstery padding, painters' carpets etc. but also fibre-to-fibre and higher quality open loop solutions. Frankenhuis[77] is a company that specialises in producing fibres for both these types of markets. Fibres are mechanically torn from post- and pre-consumer textiles and can be provided to order according to fibre type and colour by controlling the waste inputs entering the process. These sorted fibres are sold at a higher price and for higher quality end products than more generalised shredding processes.

In addition, a number of Textile Valleys are being established which aim at innovative high-quality recycling solutions for textiles waste (see Case 3 in Chapter 7). One of these is the Dutch Centre for Circular Textiles[78] in Zaanstad, north of Amsterdam, a collaboration of a commercial used textile collector, a charitable collector, a brand making clothing with recycled content and the municipality.

[77] https://www.frankenhuisbv.nl/
[78] https://www.dutchcentreforcirculartextiles.nl/

4.6 Sweden

Policy framework

There is currently no national strategy on collection of used textiles and textiles waste in Sweden. Municipalities have responsibility for collecting household waste in Sweden and are responsible for developing regular waste plans[79]. A few municipalities have started separately collecting used textiles but are not obliged to do so.

In 2016 the Swedish EPA proposed targets for reducing textiles in household mixed waste by 60% between 2015 and 2025, and that 90% of collected textiles should go to preparation for reuse or material recycling by 2025[80]. Two proposals were made for achieving these goals, 1) giving responsibility to municipal waste companies to arrange separate collection of textiles and meet targets and 2) placing responsibility on producers and importers through establishing a mandatory EPR system. These proposals were not discussed in parliament, but the current coalition government committed at the beginning of their tenure in January 2019 to introduce an EPR for textiles in Sweden[81]. A commission was set up at the beginning of December 2019 to investigate options for implementation and will publish the results within a year[82].

A dialogue with stakeholders in the textile value chain was hosted by the EPA and the Chemical Agency between 2017 – 2019 with the objective of improving sustainability in the textile value chain[83]. The network has held five meetings so far, of which the latest concerned collection of textiles.

Collection of used textiles

Historically, charities have been the actors mainly involved in textile collection in Sweden. The majority of collection is carried out with bring banks placed in streets, recycling stations, shopping centres and civic amenity centres. The charities collected 38 300 tons (3,8 kg/person) of used textiles in 2016[84].

A few municipalities (e.g. Eskilstuna, Strängnäs and Örebro) offer kerbside collection of reusable and recyclable fractions including textiles in coloured bags for optical sorting (see Case 4 in Chapter 7 for a detailed description). These municipalities reported collecting 50% of the textile volumes normally found in household waste (around 4 kg/person) in 2018, after only one year of collection[85].

Some large textile retailers provide in-store collection (H&M, Hemtex, KappAhl, Lindex etc).. There is no reliable data for in-store collection quantities of textiles.

Treatment of collected textiles

43% (16 300 tons) of the textiles collected by charities were skimmed to find high quality products for resell in own shops in Sweden. 7 800 tons were reused in Sweden in 2016 and 100 tons were recycled. The remaining 27 700 tons of original and pre-sorted textiles were exported for detailed sorting elsewhere. Of the exported volumes, 21 300 tons were reused, 4 600 tons were recycled and 1 800 tons of collected textiles were incinerated with energy recovery[86].

Cooperation/interactions between actors

Cooperation between actors in Sweden includes the following:

[79] Naturvårdsverket (2017)
[80] Naturvårdsverket (2016)
[81] Swedish Government (2019a)
[82] Swedish Government (2019b)
[83] https://www.naturvardsverket.se/Miljoarbete-i-samhallet/Miljoarbete-i-Sverige/Uppdelat-efter-omrade/Konsumtion-och-produktion/Hallbara-textilier/Textildialogen/
[84] SMED (2018)
[85] https://www.eem.se/globalassets/privat/om-eem/arsredovisning/arsrapport-2018/eskilstuna-energi-och-miljo.pdf
[86] SMED (2018)

- Municipalities give permission to one or more collectors (traditionally charitable organisations) to collect textiles on public land (very widespread)
- Municipalities contract charities to collect textiles in civic amenity centres (widespread)
- Municipalities collect used textiles themselves and sell the volumes to professional sorters (few examples). Donation to charities has also occurred.
- Property owners/landlords cooperate with charity organisations to provide collection in multiple family houses. (widespread)
- A brand or retailer collects in their own shops and donates/sells the collected textiles to a collector for processing (widespread)

Textiles waste

Some charitable and private collectors make it clear on their bring-banks that they only wish to receive clean and reusable textiles and shoes. This approach also avoids claims by municipalities that they are collecting waste, in which case the municipality could claim it as their own if wished. However, many charities collect both reuse and recycling volumes (Björkå frihet, Myrorna etc.) and have permissions needed to handle waste[87],[88].

Almost all in-store collection initiatives collect both reusable textiles and textile waste. According to guidance documents from the Swedish EPA, the collector must have a permit for handling waste as long as the collection is targeted both towards reuse and recycling. Not all retailers offering textile collection have applied for this permit[89].

Most of these volumes are exported and sorted for reuse or for recycling as e.g. industrial wipers or insulation. Rest fractions are incinerated or landfilled, depending on sorting country. The few municipalities who collect textiles currently sell these as original to large professional sorters abroad. Some sorting out of wet or dirty textiles occurs before export[90].

Domestic recycling options

There are very few recycling options for textiles waste within Sweden and none are at industrial scale. The largest current semi-industrial recycling facility is a pilot facility belonging to Re:newcell and converting post-consumer cotton into new fibres (see section 8.5.2 for a detailed description). Annual technical maximum capacity of the facility is 7000 tons, but until not it has operated on much lower capacity. Re:newcell plans to build a larger facility in the coming years, most probably not in Sweden[91].

In the latest report on Swedish textile collection from SMED[92], also remake/upcycling (like sewing bags, clothes or other items from used textiles) is considered as recycling. There are probably many Swedish businesses that import industrial wipers, but there is no available data for those volumes.

In 2020, the world's first industrial scale automated textile sorting facility is planned to start operations in Malmö[93]. The plant will be owned and operated by the municipal waste management company Sysav Industri and target textile waste aimed for material recycling.

[87] https://www.myrorna.se/om-du-vill-skanka-klader/
[88] http://emmausbjorka.se/skanka/
[89] Naturvårdsverket (online ressource)
[90] Personal communication with Vesa Hiltula, ESEM.
[91] https://www.nyteknik.se/premium/renewcells-planer-ny-fabrik-blir-fyra-ganger-storre-6975645
[92] SMED (2018)
[93] https://www.sysav.se/Om-oss/pressrum/pressmeddelande/varldsunik-anlaggning-for-textilsortering-i-malmo--2928729/

4.7 Germany

Policy framework

There is no national strategy for collection, reuse or recycling of textile waste. Germany has as yet no guiding Circular Economy Strategy although a Circular Economy Initiative[94] has been established to move towards this. The government Coalition agreement on *Climate, Environment and Energy*[95] commits to evaluating the recycling potential of fractions that are currently not covered by separate collection regulations: waste wood, old textiles and used tires and to use these more intensively. A recently commissioned study by the Federal Environment Agency is considering options for more circular textiles.

Some federal states in cooperation with the German Environment Agency have drawn up a draft state communication on *Requirements for the collection, sorting and recycling of used textiles* with the aim of clarifying the legal framework for, and optimising treatment of used textiles (see Case 6 in Chapter 7 for a detailed description). The communication includes definitions of when used textiles are waste, under what conditions end-of-waste criteria are achieved, who may collect waste textiles and a code of conduct for collectors.

Collection of used textiles

A number of supreme court decisions have determined that all textiles collected via bring-banks or other collection points where there is no immediate quality check, are waste according to the National Waste Law[96]. As such where these come from households they are the responsibility of the municipal waste management authority (MWMA) although exemptions can be given to charitable and commercial collectors.

Roughly 30% of MWMAs take primary control of used textile collection, either through collecting the textiles themselves or via outsourcing to other organisations. This is mostly carried out through tendering processes. In the remaining 70% of municipalities collection is carried out by charitable and commercial collectors. In these cases, exemptions have been awarded not by the municipality but by a third party (competent authorities of the federal states) that can overrule the wishes of the municipality.

There is no available data in Germany on the split in collection quantities between charitable, commercial and municipal actors. Most textile collection is carried out through bring banks on public or private land (88%). With respect to the remaining 12% these comprise collection in permanent containers submerged under street level (5%), collection over the counter in shops (4%) and kerbside collection (3%)[97].

The last official mapping of textile collection from 2015[98], estimated separate collection of 1.01 million tonnes compared to a consumption rate of new textiles at 1.35 million tonnes giving a 75% collection rate which is the highest in Europe by a large margin. However, it was only based on responses from 40% of collectors. A new mapping is currently underway.

Treatment of collected textiles

Similar to the Netherlands, Germany has a high capacity of textile sorting facilities. 66% of used textiles collected in Germany were sorted in German sorting plants in 2013, with most of the remainder exported for sorting in the EU. Only 7% was exported outside the EU for sorting[99]. There is a high overall sorting capacity in Germany which also sorts textiles collected elsewhere in Europe.

[94] German Government (online resource)
[95] See page 140 in German Government (2018)
[96] Paragraph 3 (1) of KrWG https://www.gesetze-im-internet.de/krwg/
[97] GftZ estimates
[98] FTV og BVSE (2015)
[99] Ibid

Following sorting, the various fractions are sold on domestic and global reuse and recycling markets. Reuse, recycling and incineration/fuel rates in 2013 were; 54%, 38% and 6% respectively. 2% was landfilled. More than half the recycling was as industrial wipes (212 000 tonnes), the remainder was mechanically recycled to produce fibres mostly for downcycling applications such as insulation and automobile seat padding etc.[100]

Cooperation/interactions between actors

Cooperation between actors include the following:

- Municipalities give permission to one or more charitable or private collectors to collect textiles on public land (widespread)
- Municipalities contract out textile collection to a single collector (widespread) often taking money from the collector
- A commercial collector carries out collection and transport and sorting of textiles under a charity's franchise (widespread)
- Charities sell their collected textiles to a commercial collector after skimming off the shop quality textiles for sale in own shops (less widespread)
- A brand collects in their own shops and donates/sells the collected textiles to a charitable or commercial collector for processing (several examples)

Textiles waste

Many commercial and charitable collectors state that they only wish to collect reusable, clean and uncontaminated textiles (and shoes). However, despite this there will always be a non-reusable fraction delivered to unmanned collection points. Since all textiles delivered to such collection points are considered as waste, this does not affect the collector's status since these must in any case be registered was waste collectors. However, it does reduce the economic viability of collection.

Domestic recycling options

Germany has a high textile recycling capacity, mostly for industrial wipes and non-woven products for insulation, car seat padding, carpets and other car industry applications etc. One technology under development is the Tomra automated sorting equipment for sorting textile waste by fibre type[101]. Moreover Circular.Fashion is creating a digital platform based on RFID-technology that provides information to users and to textile sorters on the material content of textile products that will improve conditions for textile recycling.

[100] FTV og BVSE (2015)
[101] http://boergroup-recyclingsolutions.com/projects/tomra/

5. Cross-country comparison of policy, law and practice

5.1 Definitions of the word 'textiles' and in which context it is used

The revised Waste Framework Directive[102] does not define what is to be included under 'textiles' in the requirement for separate collection by 1st January 2025. Nor is it yet clear whether the EU Commission will develop guidelines that define this scope or whether Member States will decide themselves where to set the boundaries.

This section examines how textiles and textile products are defined in the selected countries in legislation, guidelines and practices in the collection of used textiles for recycling and recycling. See Box 2 for a more general definition of textiles and textile products.

Box 2: what are 'textiles'?

Textiles are most often defined as a flexible material consisting of a blend of natural or artificial fibers (yarn or thread). Yarn is produced by spinning raw fibers of wool, flax, cotton, hemp or other materials for making long threads. Textiles are formed by weaving, knitting, crocheting, knitting, lace, felting or braiding the yarn.

Textile products are designated by the European Parliament and the Council * as " any raw, semi-worked, worked, semi- manufactured, manufactured, semi-made-up or made-up product which is exclusively composed of textile fibres, regardless of the mixing or assembly process employed". Products 'containing at least 80 % by weight of textile fibres' are also referred to as textile products.

* https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011R1007&from=DA

Of the six selected countries, **only France** has regulations concerning the mandatory collection, reuse and recycling of textiles and thus, the only country that has a strict definition of the products and the streams that are covered by textile collection regulations.

The remaining countries for the moment have no strict, legally binding definitions. However, some norms have been established for what is considered to be 'used textiles' through strategies, mapping reports, guidelines for collectors or other means.

Which product types?

In regulations, strategies and guidelines concerning textile collection **all countries** focus on final products**.** Fabrics and factory offcuts and other semi-manufactured products are generally not considered within the same regulations, strategies, guidelines etc. With respect to types of final products, most countries consider clothing and home textiles and exclude mattresses, duvets, pillows, carpets with heavy backing, leather and textiles which are an integrated part of furniture. This tends to follow a *material type approach* where the products that are included are those for which textile fibres are the main component by weight.

[102] EU Parliament and Council (2018)

France has the most detailed description of what is and isn't included within the scope. Nevertheless, somewhat surprisingly, given that this description provides the basis for which producers need to pay fees and how much, the list[103] has a relatively weak legal status and, moreover, begins with the words 'This notice lists, *in a non-exhaustive and only indicative way,* the products that fall within the scope of Article L. 541-10-3 [the EPR law for textiles and shoes] of the Environment Code'. The scope is similar to above. Excluded items are clothing and accessories made from fur and leather; sleeping bags, duvets, pillows and furniture textiles. However, curtains and carpets don't appear in either the 'included' nor the 'excluded' list. This was tackled by an amendment[104] to the EPR regulations that from 2020 would require inclusion of curtains and some other home textiles but not furniture textiles. The situation with respect to carpets remains confusing and will be clarified during 2020[105].

Importantly, both **France and Germany** also include shoes in the scope**,** regardless of the materials that they are made from. Moreover, the current Sector Plan 5 of the Dutch Waste Plan (LAP3)[106] - that defines minimum reuse or recycling standards, transport requirements for textiles etc. - also includes shoes. A future EPR in the **Netherlands** may also include shoes[107].

Including shoes along with clothing and home textiles is in line with a *market-based or a functional approach* rather than a material based one. Although the products are not necessarily comprised of textiles, they have a similar functionality e.g. they are worn on the body. Moreover, they have traditionally been collected and processed along with textile products by charitable and commercial collectors[108] - primarily with the intention of being sold for reuse. When reporting on quantities, it can be difficult for collectors to differentiate between textiles clothing, accessories and non-textiles like leather jackets and shoes. Thus, this approach to delineation of product types is rather pragmatic.

The approach, based as it is on the reuse market, may be less appropriate for the future. The 2025 requirement will certainly in addition require the collection of non-reusable textiles. Recycling markets are material-defined rather than functionality defined, and this would suggest a more material-based approach to scoping of products under future regulations.

Textiles from which organisation/unit types?

In **France, Germany and the Netherlands** the scope in terms of which organisations/sectors are covered by used textile/textile waste regulations and guidelines seem to have followed a *responsibility-based approach*. The scope has followed those waste streams for which municipal waste companies have responsibility e.g. textiles from households as well as shops and service companies whose waste is similar to household waste (In France it is only households). Interestingly, it is these same countries where used textile collection in bring-banks is defined as waste collection, regardless of whether the textiles are reusable or not (see Section 5.2). This approach could have advantages for regulations under the 2025 obligation, if national governments assign responsibility for implementing the 2025 requirement to municipalities.

It may be less appropriate under an EPR system where responsibility is assigned to producers placing new products on the market. CN- and ProdCom product codes do not distinguish between products intended for households from those intended for private businesses. Only including households and other organisations covered by municipal waste regulations can, thus, be problematic for mapping and reporting. The French EPR system has, however, coped with this issue. Producers report themselves to EcoTLC on the quantities of products they place on

[103] The list is provided here: https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000019345114&categorieLien=id
[104] https://www.legifrance.gouv.fr/affichCodeArticle.do?idArticle=LEGIARTI000031066466&cidTexte=LEGITEXT000006074220&dateTexte=20150819
[105] Morgan Mozas (French MoE) personal communication
[106] Dutch Parliament (2018)
[107] Emile Bruls, RWS, pers. comm.
[108] See page 3 in Dutch Parliament (2018)

the market according to the product scope described in the *non-exhaustive list,* and are expected to differentiate between products aimed at households from products aimed at businesses. Third-party audits are carried out on a significant share of producers to assure accurate reporting.

Recent mapping and policy approaches in **Denmark and Sweden** also consider used textiles from government and businesses. In **Denmark**, these textiles represent approximately 12% of total volumes placed on the market. Although the potential could be promising, primarily due to larger and rather homogenous amounts, reuse and recycling of these textiles is minimal. It could therefore be considered important to include these streams in future regulations. A voluntary agreement (Green Deal) in **France** is developing measures for increasing reuse and recycling of uniforms and other workwear from the French post service and rail service (see Case 5 in Chapter 7). However, there are currently no plans to extend the EPR to these waste streams[109].

A further stream that is increasingly coming under the spotlight is unsold textiles from retailers/brands.

None of the countries consider pre-consumer textile waste from textile production under regulations, most likely because these are in all cases covered by separate regulations on industrial waste. Nevertheless, particularly with respect to future recycling markets, there are some potential advantages in collecting post-consumer and pre-consumer textiles under a single strategy.

5.2 Requirements and practice for when textiles are defined as waste and the consequences of this status

Definitions and guidelines for when textiles are waste

The Waste Framework Directive's definition of when an entity should be considered to be waste - *'any substance or object which the holder discards or intends, or is required to discard'* - has, without exception, been included with the same equivalent wording in each of the six countries' national waste regulations.

As for all waste streams, question marks can arise concerning the interpretation of the word 'discards' in this definition. This is particularly the case for textiles where on the one hand the holder is often aware of the further value of the clothing and intends for the product to be reused following delivery to a receiver.

In practice, textiles delivered to unmanned bring-banks almost invariably include a mixture of reusable and non-reusable textiles. This is also the case even where the collector has made it clear through signage that it only accepts clean, reusable textiles. This may be a result of lack of knowledge of deliverers on what is and what isn't reusable, or a lack of consideration by the holder on what happens to delivered textiles. An overview of the circumstances under which textile collection is defined as waste collection or not is given in Table 5.1.

Germany is the only country where the WFD definition has been tested for textiles collection and precedents have been firmly established by case law. In other countries, guidelines for interpreting the definition particularly for textiles have been published which have varying forms of status (**Finland and Sweden**). In a third group (**Denmark and France**), the municipalities or national EPA have made interpretations which are not necessarily clearly communicated or enforced.

[109] Morgan Mozas (French MoE) personal communication

In general, in recent years there appears to be a move towards firmly establishing clear definitions as a lack of certainty and clarity has been identified as an inhibiting factor for actors in the used textiles sector. Differences in interpretations across Europe has also been identified as an inhibiting factor by international collectors and companies (e.g. H&M, SOEX, Boer Group)

Table 5.1: overview of when textile collection is defined as waste collection or not

	Denmark	Finland	Sweden	France	Netherlands	Germany
Collection over the counter in second-hand shops where textiles are checked through on delivery.	Not waste					
Kerbside collection and bring-banks where the collector clearly communicates that it ONLY receives clean, undamaged and reusable textiles.	Not waste			Waste		
Kerbside collection and bring-banks where the collector communicates that all types of textiles may be delivered.	Waste					
Indoor collection in a retailer where the collector clearly communicates that it ONLY receives clean, undamaged and reusable textiles.	Not waste				Unclear	Waste
Indoor collection in a retailer where the collector communicates that all types of textiles may be delivered.	Waste					

To completely remove uncertainty, guidelines can also be accompanied by clear definitions of when waste textiles no longer should be considered as waste through the setting of end-of-waste criteria (see later).

The broad result of **German** case law[110], is an interpretation that can be divided according to the mode of collection rather than the intent of the holder of the textiles. The interpretation can be broadly summarised up as follows:

- **Collection in Bring Banks and kerbside collection**: the collected textiles are considered as waste regardless of what is communicated on the container or who runs the container
- **Indoor-Collection by retailers**: textiles are considered as waste due to lack of inspection of individual items when receiving textiles from consumers etc.
- **Online-Collection**: for example, systems where consumers use return logistics when they receive new clothing to donate used clothing: so far there is no court decision on this.
- **Delivery across the counter in second-hand shops**: textiles is a product and NOT waste since the receiver has had a chance to inspect each item to check suitability for reuse

[110] https://www.juraforum.de/urteile/bverwg/bverwg-urteil-vom-19-11-1998-az-bverwg-7-c-3197
https://dejure.org/dienste/vernetzung/rechtsprechung?Gericht=BVerwG&Datum=11.07.2017&Aktenzeichen=7%20C%2036.15
https://dejure.org/dienste/vernetzung/rechtsprechung?Gericht=VG%20W%FCrzburg&Datum=10.02.2015&Aktenzeichen=W%204%20K%2013.1015

In **France**, the general interpretation is similar to that of the German. All collection by bring-banks and kerbside collection to EcoTLC-accredited collection points are considered to be waste, but textiles collected over the counter and checked individually in shops are not. There are, however, no official guidelines on this interpretation[111].

In **Finland,** guidelines have been produced by a coalition of private and public actors, supported by, and in close cooperation with the Finnish Ministry of Environment[112] which amongst other things interpret the waste definition for textiles. These are somewhat less stringent than the German interpretation with respect to waste, and are based largely on the communication and intention of the collector. They can be summarised as follows:

- **Collection by a charitable or commercial collector** should not be considered as waste **if the collector makes it clear to the deliverer that they are only interested in clean, intact and reusable clothing and textiles**. This is based on the fact that the activities and business models of these organisations are focused on reuse. According to the guidelines, the fact that non-reusable textiles are also delivered to these organisations (approximately 20% of total) is perceived as being caused by mistakes by the deliverer and are not sufficient to require that all the material is classified as waste.
- On the other hand, **where collection is accompanied by communication that non-reusable textiles are also accepted**, the collected textiles are defined as waste regardless of their composition.

The latter, however, doesn't immediately demand that the collector is registered as a waste collector. Additional criteria are used to determine that (see next section).

Sweden's guidelines[113] formulated by the Swedish EPA, identify personal contact between the holder and receiver as being a critical factor. Where this occurs, and the receiver is only interested in reusable items, then these items are not considered as waste. As with Finland, where there is no personal contact between the holder and the receiver (e.g. at a bring-bank), communication by the receiver is of key importance; if they communicate that they only wish to receive clean, reusable textiles this is not considered to be waste; if they communicate that they receive everything then it is waste.

The **Danish** EPA's interpretation of the waste definition with respect to textiles is similar to the Swedish and Finnish guidelines with one addition: if the textiles collected under clear communication that the textiles should be reusable, yet contain a significant share of non-reusables, then the collector must make amends or risk being defined as a waste collector[114]. However, what comprises a 'significant share' is not specified. The Danish EPA's interpretation has not been communicated clearly to actors through guidelines or other media.

In its national waste management plan, the **Netherlands** has produced guidelines for the interpretation of when used products should be considered as waste[115], but these do not specifically refer to textiles. When interpreting the definition of waste, the guidance points to the dual objectives of the Waste Framework Directive: 1) protection of the environment and human health through limiting the impacts of waste management; and 2) encouraging resource efficiency and the circular economy.

According to the guidelines, when considering whether an object should be classified as waste or not, this should balance up the risk to the environment and/or human health with the potential

[111] Morgan Mozas (French MoE) personal communication
[112] Salmenperä (2017)
[113] Naturvårdsverket (online ressource)
[114] Mikkel Clausen, Danish EPA, pers. comm.
[115] Section B6 of the national waste plan (LAP3): https://lap3.nl/beleidskader/deel-b-afvalbeheer/b6-onderscheid/

benefit to the circular economy of classifying as a product. In general, textiles waste is not considered to pose a particular risk to the environment or human health.

Nevertheless, much like in Germany, most **Dutch** municipalities define all collection of used textiles via bring-banks and kerbside collection as waste collection regardless of who carries out the collection and what they communicate to the holders[116]. This may be because municipalities do not consider or do not have evidence demonstrating that by defining used textile collection as waste collection, they inhibit the circular economy.

Consequences of definition as waste

The definition of when used textiles become waste can have a number of consequences for the collector and subsequent actors in the value chain:

- The collector must **gain permission for the collection of waste** and possibly also be registered as a waste collector on a national waste registry
- The waste must be transported according to relevant **waste shipment regulations**.

See Table 5.2 for an overview over conditions in the six countries.

Table 5.2: Consequences of used textile collection being defined as waste collection

	Denmark	Finland	France	Netherlands	Germany
Must one be registered as a waste collector if one collects textiles defined as waste?	Yes	Only if waste collection is the organisation's chief activity	Yes		
Are there special rules for transport of waste within country borders?	Yes	No	Yes, for transport over 10 tonnes	No	Yes
Are there specific end-of-waste criteria for textiles?	No		Yes	Partially	No

The countries are relatively similar with respect to the **first issue**. In all countries, if the textiles being collected are considered under the waste regulations as being waste then the collectors must also be registered as waste collectors. However, in **Denmark**, this is only true if the textiles waste is being collected from commercial sources. If it is being collected from households then they do not need to be registered, since the final responsibility for these wastes always lies with the municipality.

In **Finland,** although collection of used textiles by high street retail chains that communicate clearly that they accept non-reusable along with reusable textiles, is considered as waste collection, these retailers do not need to be in the waste registry because the collection of used textiles is not their core business[117]. In the other countries such retailers ought to be registered as waste collectors. As far as we know no retailers that carry out such collection have as yet been registered as waste collectors in these countries and thus the regulations appear not to have been enforced.

In countries where charitable and commercial collectors are not generally required to register as waste collectors (**Denmark, Finland, Sweden),** there is a degree of resistance to registration as a result of perceived additional burdens placed on the collector. Registration as a waste collector often requires training of a minimum number of workers as waste collectors and adds administrative burdens in the transport and/or export of the collected textiles (see

[116] Emile Bruls, RWS, pers. comm.
[117] See Section 3.2 in I Salmenperä (2017)

below). It may also have an effect on the tax and VAT status for charities. For an overview of the consequences in Denmark, see Box 3.

Box 3: Registering as a waste collector in Denmark

Waste collectors in Denmark are registered through the Danish Energy Agency's website Virk.dk. Here companies can register as waste carriers, waste collectors or waste treatment companies. A waste collector is also automatically registered as a waste carrier. Companies must also record what types(s) of waste they manage. It costs DKK 600 (85 Euro) a year by being registered.

To register as a waste collector, a certain number of employees in the companies must have a waste collector's certificate. How many employees depends on the size of the company and the number of different 'production units' (registered under a separate so-called P-number). There must be at least one person with a waste collector's certificate in the company and each production unit with more than 10 employees must also have one person with a certificate. The certificate is personal and is obtained by passing an online exam on a webpage* set up by the Danish Environmental Protection Agency. Essential reading materials are available including a 43-page guidance.

The certificate costs DKK 1620, which pays for up to 3 attempts to pass. For each attempt, one has 60 minutes to answer 25 multiple choice questions. To pass one must answer at least 20 questions correctly. A collector's certificate lasts for 5 years. It takes approximately 1-1.5 man-days to train and pass the test.

The resources needed to obtain the necessary number of collection certificates and to be registered as a collecting company on Virk.dk are reasonably limited. The largest burden connected with registration as a waste collector is rather the administrative resources needed to register waste data in Denmark's Waste Data Registration System (ADS). This is described more in Box 4 later.

In addition, there is a potential risk that charities registered as waste collectors may lose their VAT exemption status if they have one although this has never been tested. A potential solution to this issue should it arise is to establish a collection company that is administratively separate from the charity.

* https://mst.dk/affald-jord/affald/indsamleruddannelsen/

On the other hand, in countries where registration is a general requirement for used textile collectors (**France, Germany, and the Netherlands**) there is reportedly a positive response from the established collectors as it is perceived that registration has led to a professionalisation of the sector and has reduced access to the market for 'grey' actors that collect textiles using street-side containers or kerbside collection without permission from local authorities[118].

In the **Netherlands,** to tackle additional burdens caused by registration as a waste collector and to professionalise the sector, it is common for charities to split operations between two arms: a registered company that carries out a collection and processing of used textiles, and the charitable organisation that takes the proceeds from the collection for use in charitable activities[119]. Examples are ReShare which is the professional arm of the Salvation Army and Sympany which first emerged as a professional arm of Humana.

With respect to the **second issue** on transport of textiles waste in all cases, where waste is transported over national borders then the EU waste shipment regulations[120] apply. As such textiles waste must be shipped as green-listed waste. This is often the case for mixed textiles

[118] Emile Bruls and Nicole Kosegi, personal communication
[119] Emile Bruls, RWS, personal communication
[120] European Parliament and European Council (2006)

exported for sorting in other countries. It should be noted that the strictest definitions within the two countries either side of the border apply. For example, a shipment of 'original' which has been collected in Finland and does not meet criteria for waste, will nevertheless be considered as waste in Germany. Thus, shipments of 'original' from Finland to Germany need to be transported as green-listed waste regardless of how it was collected in Finland.

Normally a permit is required for transboundary shipments of waste. However, shipment of green-listed waste for recovery (including sorting, reuse and recycling) is exempt from this requirement provided that exports are to other OECD/EU countries. Green waste should normally comprise clean fractions that can relatively easily be recycled or prepared for reuse[121]. Textile waste can generally be classified as green waste provided that it isn't contaminated with hazardous waste such as electronics[122]. The waste exporter is obliged to verify whether a permit is required for the waste shipment. The exporter also needs the following documents[123]:

- a so-called Annex VII document[124] that should accompany the waste until it reaches the processing facility;
- a contract between the exporter and the consignee according to Article 18 of the regulations

In some countries, there are also special requirements for the transport of waste within national borders. In the **Netherlands** and **Denmark** transporters of waste textiles must be registered in the waste registries[125]. In **Germany** a notification according to § 53 KrWG is required and an A-sign according to § 55 KrWG must be used during transport. In **Sweden** if the textiles waste being transported weighs more than 10 tonnes then permission is required form the local authority[126]. There are no such requirements in **Finland**[127] or **France**[128]**.**

End of Waste Criteria

In all of the countries, (depending in some cases on circumstances of collection) reusable textiles can be classified as waste when mixed with non-reusable textiles. End-of-waste (EoW) criteria for textiles can potentially, but not necessarily, smooth the path towards reuse following processing and separation from the non-reusable elements. This is most relevant in countries where considerable sorting occurs.

According to Article 6 of the WFD, certain specified waste shall cease to be waste when it has undergone a recovery (including recycling) operation and complies with specific criteria to be developed in line with certain legal conditions, in particular:

- the substance or object is commonly used for the specific purpose;
- there is an existing market or demand for the substance or object;
- the use is lawful (substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products);
- the use will not lead to overall adverse environmental or human health impacts.

The EU has developed EoW for five waste streams but not textiles. Whether or not EoW criteria have been specifically produced for textiles at national level often depends upon how far the country is in developing EoW for higher priority waste streams.

In **Denmark, Finland** and **Sweden** there are no EoW criteria for textiles. This may reflect the fact that in these three countries 'original' (unsorted used textiles) is not defined as waste

[121] Nordisk Ministerråd (2018)
[122] Ibid
[123] Ibid
[124] Annex VII of EC Regulation No. 1013/2006 on shipments of waste
[125] Danish EPA (online resource)
[126] §.36 Avfallsförordningen 2011:927 https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/avfallsforordning-2011927_sfs-2011-927
[127] Jussi Kauppila, (Finnish MoE), personal communication
[128] Morgan Mozas (French MoE) personal communication

where the original has been collected with the intention for reuse (see earlier). Finland is currently drafting EoW-citeria for crushed concrete and other fractions of industrial waste but is not planning the development of EoW for textiles since there are no clear indications that a lack of EoW is currently a problem with regard to re-circulation of textiles[129].

In **France**, generic EoW criteria were adopted in 2018[130] which also cover textiles and clothing that that have been prepared for reuse. To be classified as end-of-waste, the process needs to meet a number of criteria including that; the waste has undergone a visual check on arrival to check for contamination; the sorting facility has applied a quality management system; the waste has the technical characteristics (after cleaning and/or repair if necessary) that allow it to be used for its original purpose, and; it meets all relevant requirements of consumer law for that particular product type. Last but not least it is given a unique code that ensures traceability in terms of which facility it was processed in.

In **Germany,** Paragraph 5 of the German waste regulations (KrWG) repeats Article 6 of the WFD but has not been interpreted for textiles either through EoW regulations or through case law[131]. The State Communication[132] drafted by 3 Federal governments and the German Ministry of Environment (UBA) proposes that a central measure to prepare for reuse is sorting where contaminants are removed, and each individual item is evaluated according to its functionality and marketability. According to the communication, preparation for re-use can theoretically be achieved simply by looking at the used textiles. There have been calls by a number of actors (including GFTZ - Gemeinschaft für textile Zukunft and FAIRwertung) to clean up such grey areas by calling for clear definition of preparation for reuse for textiles in Germany[133].

In the **Netherlands**, Article 6 of the WFD is implemented by Part B6 of the national waste plan (LAP3). No criteria have been produced specifically for textiles at national level, but an assessment framework[134] has been developed to aid the individual assessment of individual products. This framework assists businesses and recovery organisations in determining whether a material or article meets the requirements with respect to being safe, lawful and of sufficient high-quality for reuse.

Rules for used textiles that have never been waste

In all six countries, used textiles that have never been defined as waste can be transported and sold according to ordinary requirements under consumer law just as if they were new products. They are also subject to the same minimum guarantee periods.

One interesting means by which used textiles are distinguished from new textiles is in **Sweden** where all used textiles sold second-hand, apart from those containing PVC, can be labelled under the Swedish ecolabel Bra Miljöval (Good Environmental Choice)[135]. Second hand is defined as a textile product that has been collected after having been used by a consumer or another user.

Rules for take-back systems for textiles

Take-back systems are here defined as systems where businesses take-back their own used products from consumers in order to reuse, recycle or otherwise treat these products in a responsible way.

[129] Jussi Kauppila, Finnish MoE, personal communication
[130] French Parliament (2018)
[131] Nicole Kosegi personal communication
[132] Kietz, E et al (2018)
[133] Nicole Kosegi personal communication
[134] Dutch Ministry for Infrastructure and Water (2018)
[135] Naturskyddsforeningen (2012)

Since 2014, businesses in **Denmark** have been able to establish take-back schemes for products sold to private households and/or the packaging they come in[136]. However, comprehensive documentation is required for the scheme to be approved. This must demonstrate that the take-back system and subsequent treatment is at least as environmentally responsible as the treatment that the product would have had, had it been treated in the municipal waste system. The permission is sought at national level, and if approved can be used in any municipality. The rules apply as a starting point for the company's own products, but there is also the possibility of including other companies' products in the scheme, subject to approval by those companies. So far, only a single company has sought this permission in Denmark, but not for textile products.

Germany has similar rules[137] where the voluntary take-back system is defined as a voluntary EPR and as such the take-back must promote reuse or recycling and environmentally sound recovery or disposal of the waste must be ensured. The rules were tested in a court case[138] that determined that a business could take back not only their own but also similar products from other retailers. These rules are likely to be amended within the implementation of the new WFD's requirements on EPR-systems (Article 8a of the WFD) to increase restrictions on take-back.

In **France,** textile producers are allowed to operate their own take-back schemes under the EPR instead of being part of the EcoTLC system. As such they have to guarantee that they can take back 100% of the products they place on the market[139]. Under these difficult targets not a single company has attempted to set up their own system. However, as a fee-paying member of EcoTLC they are also allowed to act as collectors by setting up EcoTLC approved take-back systems in their stores[140].

In **Sweden** there are no particular rules for take-back systems beyond those concerning normal registration as a waste collector if collecting over 1000 tonnes per year or storing more than 10 tonnes at any one time, and the products are not intended for reuse[141].

5.3 Organisation of separate collection of used textiles

Table 5.3 provides an overview of the organisation of textile collection in the six countries. A detailed description is given in the following sections.

[136] Chapter 8 of the Waste Ordinance (Affaldsbekendtgørelsen Kapitel 8),
[137] Paragraph 26 of the Waste Disposal Act (KrWG)
[138] https://dejure.org/dienste/vernetzung/rechtsprechung?Gericht=VG%20W%FCrzburg&Datum=10.02.2015&Aktenzeichen=W%204%20K%2013.1015
[139] Maud Hardy, EcoTLC, personal communication
[140] Morgan Mozas (French MoE) personal communication
[141] Naturvårdsverket (online resource)

Table 5.3: Overview of objectives, responsibilities and execution of textile collection

	Denmark	Finland	France	Germany	Netherlands	Sweden
Is there a national circular economy strategy (or similar) with a goal for textiles?	No	No	Yes	No	A textile sector plan without goals	Yes, but not yet adopted
Are there EPR regulations for textiles?	No	No	Yes	No	No, but under discussion	Planned by government
Who is *responsible* for collection of textiles from households?	Municipalities	Municipalities	Producers	Municipalities (but they don't have monopoly)	Municipalities	Municipalities
Who *carries out* the collection of used textiles?	**Charitable/commercial collectors** and to a lesser extent **municipalities and/or municipal waste companies**	**Charitable collectors** and to a lesser extent **municipalities and/or municipal waste companies**	**Charitable/commercial collectors**	**Charitable/commercial collectors** and **municipalities and/or municipal waste companies**	**Charitable/commercial collectors** and to a lesser extent **municipalities and/or municipal waste companies**	**Charitable collectors** and to a lesser extent **municipalities and/or municipal waste companies**
What are the primary collection methods?	Bring-banks on public and private ground and collection over the counter in 2nd hand shops. Kerbside collection exists (except in Finland) but on a small scale					

Strategies and goal-setting for used textile collection

Relevant ***current*** strategies and policies are described in detail in the country overview and are only briefly repeated here. A first overview of how countries plan to meet the 2025 requirement are discussed at the end of Section C.

Of the six countries only **France** has waste regulations that specifically relate to used textiles. These establish an EPR for clothing and textiles (and footwear) for households. 95% of producers have elected to contribute to the collective system run by the PRO; EcoTLC. The remainder are free-riders (e.g. neither contribute to EcoTLC nor carry out their own collection). EcoTLC works within a framework renegotiated with the government every six years that includes regularly reviewed targets for collection, reuse and recycling of these products.

The current targets are for 50% of textiles placed on the market to be diverted from landfill by 2019, with 95% of the collected textiles going to reuse, recycling or energy recovery and no more than 2% being landfilled. To meet collection targets, the agreement also sets targets for minimum density of accredited collection points. The target for 2019 was 1 collection point per 1500 people. To meet reuse and recycling targets EcoTLC supports sorting operations and R&D in recycling technologies.

The **Dutch** national waste management plan (LAP 3) includes a More and Better Recycling covenant and a Sector Plan for Textiles[142] has been developed to meet this covenant. This amongst other things defines minimum standards for treatment of separately collected used

[142] Dutch Parliament (2018)

textiles that must be adhered to, but does not include concrete targets for collection, reuse or recycling.

Denmark[143], the **Netherlands**[144] and **Finland**[145] all have circular economy strategies, but none of these include goals or targets for used textiles or textile waste in any part of the value chain. The Dutch strategy includes five priority areas, one of which is consumer goods which also includes textiles. Recommendations have been made for a circular transition on these but as yet no policy has been developed.

In 2012, the **Dutch** government entered a voluntary agreement (Green Deal)[146] with actors in the post-consumer textile industry, with the overall goal of halving the quantities of textiles found in residual waste by 2015. The target was not achieved and has not been updated since then.

In 2016 the Swedish EPA proposed targets for reducing textiles in household mixed waste by 60% between 2015 and 2025, and that 90% of collected textiles should go to preparation for reuse or material recycling by 2025[147] but these have not yet been adopted as policy.

Who has responsibility for collection and how is this administered?

For **all countries except France** (which will be discussed later), it is the municipalities or municipal waste authorities that are given responsibility for collecting household waste under the respective waste regulations in each country. In **Finland, Germany and Sweden** they are also responsible for collecting household-like waste from service companies and municipal units. In **Denmark and the Netherlands**, this household-like waste is not the responsibility of the municipality but this is currently under revision in both countries, as a result of a move towards consistency in the revised WFD[148].

Municipalities can choose to carry out the collection of waste themselves (e.g. through municipal-owned waste companies) or 'outsource' the collection to other organisations. With respect to textiles, the majority of municipalities in all these countries outsource collection.

Methods of outsourcing vary. This can be an *active* process carried out via a tender process or other active processes for seeking and administering collectors. Alternatively, it can be a *passive* process, where municipalities or municipal waste companies accept or refuse requests from organisations to collect used textiles in municipal areas. The passive model is used more often than active tendering, but there is some evidence that the latter has grown in recent years as a result of increasing government focus on circularity in textiles, and a wish from the public and government for greater transparency in what happens to used textiles[149].

Note here that the type of permit depends on whether the collection is defined as waste collection or not. In **Denmark, Finland, Netherlands and Sweden** household waste is the property of the municipality. Therefore, if the collection comprises waste collection, permission must be sought from the municipality even for collection on private ground. If the collection is *not* defined as waste collection then permission is only needed for collection on public ground such as bring-banks placed on streets, publicly owned car parks or civic amenity centres run by municipal waste companies.

In **Germany** the municipal waste management authority (MWMA), does not have an overriding monopoly on household waste. The MWMA is obliged to collect textiles from households.

[143] Danish Government (2018)
[144] Dutch Government (2016)
[145] Sitra (2016)
[146] https://www.greendeals.nl/sites/default/files/downloads/GD142-Duurzame-inzameling-textiel.pdf
[147] Naturvpårdsverket (2016)
[148] Emile Bruls, RWS, personal communication
[149] Watson et al (2018b)

However, there is no obligation for other collectors to surrender textiles to the MWMA which have been collected and processed in 'an orderly and harmless manner'[150] by non-profit collections or commercial collections[151] or which are collected within the framework of a voluntary takeback redemption[152]. Collectors of textile waste must *notify* the MWMA, 3 months before the start of their collection activities but do not need to *seek permission* from the MWMA. Rather they seek permission from the waste authority at federal state level. These are likely to give permission if the collector has a history of collection in a municipality, even if this means overriding the wishes of the municipality, who, for example, may wish to collect themselves. More than one collector can hold this exemption in a municipality, but the competent authority is less likely to give new exemptions to additional collectors to reduce the risk of 'cluttering' of public areas.

France, has a radically different system of responsibility as described in Section 4.4. Here the responsibility for collection of used textiles is given to the producer. Producers can either organise their own collection, reuse and recycling system which needs to be accredited by the French public authorities or contribute to an accredited Producer Responsibility Organization (PRO) that takes on this responsibility in return for a producer fee[153]. Eco TLC is the only accredited PRO and accounts for 95% of the market[154]. The remainder are free riders. Collection is then carried out by charitable and commercial collectors under a system of incentives and accreditation as described in the France overview (see Section 4.4 of this report).

Cooperation between actors

There are many different kinds of cooperation between the various types of actors in the used textile value chain. Some of these have already been described above. Typical cooperation includes the following:

- Municipalities give permission to one or more commercial or charitable collectors to collect textiles on public land (very widespread in all countries)
- Municipal waste companies give permission to charities to collect textiles in civic amenity centres (very widespread in all countries)
- Municipalities or municipal waste companies contract out via a tender process, textile collection on public land/civic amenity centres to a single collector (some examples in Denmark)
- Municipalities collect used textiles themselves and sell/donate total volumes to commercial or charitable collectors and processors (a few examples in Denmark, the Netherlands, Sweden, Germany)
- Municipalities collect used textiles themselves, sell the best quality in their own shops in civic amenity sites and donate the remainder to charitable collectors (a few examples in Denmark only)
- A municipal waste company owns a sorting facility run by a social-economic organisation (Kringloop) (one example in the Netherlands)
- A charitable collector sells unsorted textiles to a commercial collector/sorter (widespread in all countries)
- A charitable collector sells textiles to a commercial collector/sorter after skimming off the best textiles for sale in own shops (widespread in all countries)
- A commercial collector collects textiles under franchise to a charitable organisation (widespread in the Netherlands)
- Property owners/landlords cooperate with charitable and commercial collectors to provide collection in multiple family houses (some examples in Denmark, France, the Netherlands and Sweden)

[150] § 17 Para. 2 No. 3 KrWG
[151] § 17 Para. 2 No. 3 KrWG
[152] pursuant to § 26 KrWG.
[153] Article 541-10 in the French Environmental Code
[154] EcoTLC (2019a)

- A brand or retailer collects in their own shops and donates/sells the collected textiles unsorted to a commercial collector for processing (one or more examples in all countries)

The **French** system of cooperation between actors is systemised and established through conditional financial support from the Product Responsible Organisation to both municipalities and sorters plus trickle down and trickle up incentives to commercial and charitable collectors. This is described in detail in Section 4.4.

Who carries out the actual collection and how do they collect?

In all six countries, the majority of collection is carried out by charitable and commercial collectors. In **Denmark, Finland and Sweden**, the collection is dominated by charitable organisations. In **France, Germany and the Netherlands**, commercial collectors have a reportedly higher share of the market, though there are no concrete figures on how big this share is.

As mentioned above, a few municipal waste companies in **Denmark, Germany, Netherlands and Sweden**, carry out separate collection of textiles waste themselves. In the only country with reliable data (Denmark) this remains a low figure at roughly 5%, but is also thought to be low in the remaining countries, with the possible exception of Germany.

Collection via bring-banks is reported as the dominant form of used textile collection in all countries. Only **France** has official figures on this where 85% of collection is via bring-banks of which ¾ are placed on streets and other public ground and the remainder on private ground[155]. Similarly, it is estimated that 88% of collection in **Germany** is via bring-banks[156]. Bring banks are in general placed in civic amenity centres, on streets and on private ground. In **Finland** it is normal for bring banks to be placed at the same sites as packaging collection under the EPR system for packaging run by RINKI Oy[157].

Kerbside collection is significantly less prevalent, in part due to higher costs but also due to risk of theft[158]. It comprises only 1.8% of collection in **France** and 3% in **Germany**. A handful of municipal waste companies have begun kerbside collection of textiles waste in **Denmark, Netherlands and Sweden**[159] often through the use of bags that are sealed and placed with other dry recyclables. Kerbside collection by charities and commercial collectors is very rare although some charities offer on-call pick-up services, usually in return for a fee.

Indoor collection across the counter or via small bring-banks in second-hand shops and retailers is more significant, comprising 13% of total collection in France though only 4% in Germany.

New methods of collection such as using return logistics from clothing retailers, or collection in work places are being experimented with.

What types of textiles are collected?

In **all countries except France** most charitable and private collectors make it clear on their bring-banks that they only wish to receive clean and reusable textiles (and shoes), often due to the negative impact that collecting non-reusable textiles have on their economies. In the **3 Nordic countries** this strategy also avoids claims that they are waste collectors (see under Part B above). Many collectors also state that they do not wish to collect mattresses, duvets and pillows.

[155] EcoTLC (2019a)
[156] GftZ estimate. Nicole Kosegi personal communication
[157] Salmenpera (2017)
[158] Watson et al (2018b)
[159] Ibid

However, a few charitable and/or commercial collectors in all these countries do openly ask for the non-reusable textiles despite the risk that this will classify them as waste collectors. Some charities see the collection of non-reusable textiles as part of their wider environmental and social responsibility. In other cases, where they have competed under a tender process for collection services, the municipality may have required them to collect textiles waste.

This latter is perhaps most prevalent in the Netherlands. Although, tender processes are also used relatively often by municipal waste authorities in Germany, these usually do not require collectors to ask for the non-reusable textiles. In the **Netherlands** the Green Deal in textiles 2012-2015, encouraged municipalities to include this requirement in tenders, and an increasing number of municipalities have adopted this principle[160].

In **France**, all collectors accredited by EcoTLC must accept the non-reusable textiles and shoes along with the reusable ones.

Regardless of whether collectors ask for the non-reusable textiles or not, textiles received in unmanned containers or via kerbside collection, will include a non-reusable fraction – typically somewhere between 20 and 30% where only reusable is asked for and perhaps 40-50% where they also ask for non-reusables.

Where municipalities in **Denmark, Germany, Netherlands and Sweden** collect textiles themselves via bring banks in civic amenity centres or kerbside collection, they accept the non-reusable textiles waste. There are a few examples (for example two separate municipal waste companies in Denmark[161]), where the waste company communicates to citizens that they should *only* deliver the *non-reusable* textile waste and donate the reusable fraction to charitable collectors. Despite this, detailed sorting demonstrates that there is a significant fraction of reusable textiles collected in these systems[162].

Second-hand shops that collect textiles across the counter tend to only accept reusable textiles, and often only textiles that are re-sellable in the collection country.

What are collection rates of used textiles?

Separate collection of used textiles as a share of new textiles placed on the market varies for the 6 countries between 23% in **Finland** to a reported 75% in **Germany**. Note, however, that the data years are spread between 2012 in Finland to 2018 in France. Moreover, the mapping study methodologies vary widely. The study in Germany for example only included responses from 40% of collectors[163] whereas that in France includes more than 90%. A new mapping study is underway in Germany.

For most of the countries, there are too few data-points and lack of consistency between consecutive mapping to identify trends in collection over time. Only in **France** have there been regular reports on collection. Total collection increased from 65 000 tonnes in 2006[164], the year before the EPR regulations were adopted to 239 000 tonnes in 2018[165], an increase by a factor 3.7. Moreover, collection increases have been even more rapid in recent years: total collection has increased by 56% since 2014.

This far outstrips growth rates in the only other two countries with more than one data point. In **Sweden** collection (by charities only) increased by 47% from 26 000 to 38 300 tonnes between

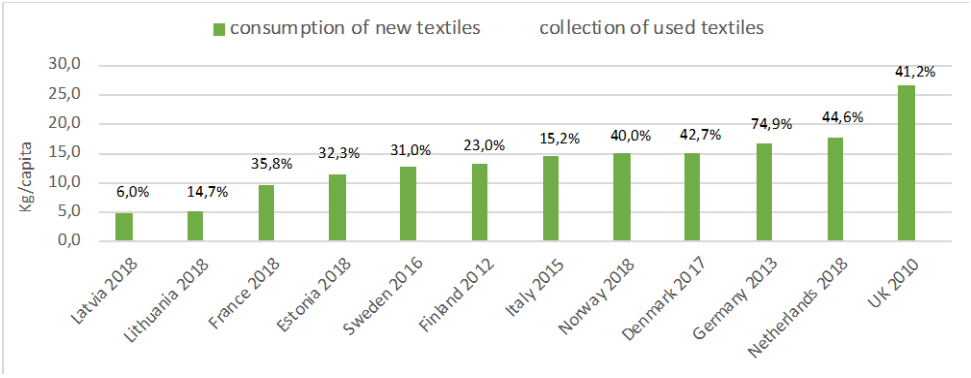
[160] Emile Bruls personal communication
[161] Watson et al (2018a)
[162] E.g. Vejen Municipality in Jutland in cooperation with Dansk Affald. Dansk Affald presentation to DAKOFA textile network, 1st March 2018. A further example is Argo in Zealand.
[163] https://www.bvse.de/images/pdf/Leitfaeden-Broschueren/150914_Textilstudie_2015.pdf
[164] See Figure 8 in Bukhari et al (2018)
[165] EcoTLC (2019a)

2008 and 2016[166]. In **Denmark** collection rates remained stable at approx. 39 000 tonnes (including shoes) between 2010 and 2017[167].

It should be noted here, however, that **French** collection rates have risen from a very low level. Even now after a factor 3.7 increase, separate used textile collection represents only 35% of new textiles placed on the market compared to 42% in **Denmark**.

Nevertheless, the French EPR system appears to have been extremely effective at increasing rates through the setting of targets and the necessary systems to achieve these. Of particular importance has been the fact that rolling targets set at national level have been translated to targets at municipal level (targets for density of collection points rather than targets for actual collection), which themselves are strengthened through economic incentives. Payments to municipalities for communication to citizens are only provided if the collection point density target has been achieved.

Figure 5.1: consumption of new textiles and separate collection of used textiles in countries with available data[168]



Note: the percent data above each country denotes the collection rate e.g. collection of used textiles as a ratio of the quantity of new textiles placed on the market in the same year

Plans for implementing the 2025 requirement on separate collection

France is the only one of the six countries that feels relatively comfortable that the 2025 requirement for separate collection of textiles (waste) is already met. The only piece of doubt might be whether the streams included in the EPR (private households only) is sufficiently broad. In a separate development, in 2016, the French government entered into a Green Deal with the French postal service and train service (SNCF) to develop systems for collection, sorting, reuse and recycling of uniforms and other workwear (see more in Case 5 in Chapter 7). This is now entering a third phase and has potential to be rolled out to a wider group of businesses and public organisations. However, there are as yet no plans to widen the scope of the French EPR system to workwear[169].

The French regulations[170] governing the many national EPR systems for various product types, are currently under review and it is not yet clear how these changes will affect the operations of the EcoTLC[171].

[166] Belleza and Luukka (2018)
[167] Watson et al, (2018a)
[168] Sourcesr: Latvia, Lihtuania and Estonia (Watson et al, in print); Flanders (OVAM, 2017); Germany (FVR og BVSE, 2015), Denmark (Watson et al, 2018b); France (EcoTLC, 2019), Italy (ISPRA, 2017), Netherlands (FFACT 2020) Norway (Watson et al, 2020b) Sweden (Elander et al, 2014), UK (Bartlett et al, 2012),
[169] Morgan Mosas (French MoE) personal communication
[170] Article L541-10 of the environmental code https://www.legifrance.gouv.fr/affichCode.do;jsessionid=D961A83ECD5CD00CF47EEC9620D0F4C0.tplgfr34s_3?idSectionTA=LEGISCTA000023268652&cidTexte=LEGITEXT000006074220&dateTexte=20150819
[171] Morgan Mosas (French MoE) personal communication

EcoTLC perceives the primary challenge for the future not to be so much, increasing collection rates, but developing solutions for the non-reusable textiles that are collected[172]. These currently have almost no value and most solutions are limited to mechanical downcycling into low quality products such as insulation, non-woven blankets and upholstery (more detail is provided in Chapter 6). Higher value and higher volume solutions are needed if the additional 1.4 million tonnes of non-reusable textiles that have been estimated to be separately collected across the whole of Europe by 2025[173] are to be treated in circular solutions. In the current negotiations for the next six years, EcoTLC is proposing a [presumably gradual] transfer of funding from the sorting organisations, to greater investments in R&D and piloting and upscaling of closed loop and open loop textile recycling[174].

This will also be one of the central challenges when developing policy/regulations to meet the 2025 requirement in the other five countries, none of which have as yet established comprehensive systems for separate collection of non-reusable textiles waste.

The Swedish government committed at the beginning of its tenure in January 2019 to introduce an EPR system for textiles[175]. A commission was set up at the beginning of December 2019 to investigate options for implementation and will publish the results within a year[176]. Under the Mistra Future Fashion Programme, consultations and initial studies and analysis have already been made[177] on possible scenarios for EPR systems, which can potentially feed into to considerations by this Commission.

The **Dutch** circular transition report for consumer goods developed under the Circular Economy Strategy, includes recommendations to develop a circular economy plan for textiles and to introduce a textiles EPR scheme. The scope and operation of a potential EPR scheme is under investigation and no details are currently available. In addition, proposals were made to develop Circular Textile Valleys that pool innovative companies to develop circular economy solutions for textiles (see Case 3 in Chapter 7).

Finland is not considering an EPR-based solution although recent development In the European agenda has meant that the government does not excluded the possibility that the EU may propose mandatory EPR for textiles within the coming years. As was mentioned in the recently launched Green Deal, the European Commission will present a proposal for a new circular economy action plan during the first quarter of 2020 in which textiles will be a focus area[178]. The European Commission is also obliged by the revised WFD to look further into target-setting for textiles by 2024.

The Finnish waste law and waste act are currently under revision in the Ministry of Environment to implement the requirements of the revised WFD including the 2025 textiles requirement. Proposals are expected towards the beginning of 2020 with a vote in parliament possible by June 2020[179]. Currently it is under discussion whether the revisions should include a requirement that "municipalities should establish collection points/bring banks, if needed in collaboration with other municipalities, no later than the start 2023". There could be exceptions if "separate collection of textile waste is not environmentally, technically, practically or financially meaningful"[180].

The **Danish** government and supporting parties agreed in June 2020[181] to require Danish municipalities to carry out the separate collection of textile waste from 2022.

[172] Maud Hardy, EcoTLC, personal communication
[173] GftZ (2019
[174] Ibid
[175] Swedish Government (2019a)
[176] Swedish Government (2019b)
[177] See Ljungkvist et al (2019) and Elander et al (2017)
[178] EU Commission (2019)
[179] Jussi Kauppila, Finnish MoE, personal communication
[180] See WFD Article 10 3(c)
[181] Klimaplan for en grøn affaldssektor og cirkulærøkonomi 16.juni2020 https://kefm.dk/media/13158/aftaletekst.pdf

The **German** government Coalition agreement on *Climate, Environment and Energy*[182] commits to evaluating the recycling potential of fractions that are currently not covered by separate collection regulations, including used textiles. A recently commissioned study by the Federal Environment Agency is considering options for more circular textiles. **Germany** has already developed a proposal for revisions to the waste law (KrWG) to implement the revised WFD[183]. This (Article 20 (2)) requires the municipal waste authority to separately collect textile *waste* from *private households* provided that (Article 9a) the treatment of these wastes is technically and economically feasible. No date is set, but the requirement would come into force on adoption of the revised waste law.

Besides this requirement and a requirement to promote waste prevention through promoting repair and reuse of amongst other products, textiles, there is no more mention of textiles in the revision. A further relevant change is a revision to the article relating to take-back-systems of used products. This revision will make the regulations harder to comply with.

5.4 Data collection and reporting on separate collection and treatment of used textiles (Theme D)

Table 5.4 provides an overview of data collection and reporting in the six countries. A detailed description is presented in the following sections.

Table 5.4: Overview of data collection and reporting

	Denmark	Finland	France	Netherlands	Sweden	Germany
Is there a data collection system for textile collection?	Only for textile waste	Only for textile waste	**Yes, for all textiles**	Only for textile waste *(but that includes all collection via bring-banks and kerbside collection)*	Only for textile waste	Only for textile waste *(but that includes all collection via bring-banks and kerbside collection)*
Who is responsible for registration of data?	Collector or treatment facility	*Unknown*	Collector and sorting facility	Municipality	*Unknown*	Municipality
Who should they report to?	Danish EPA	*Unknown*	Producer Responsibility Organisation (EcoTLC)	National statistics office (CBS)	*Unknown*	Federal waste authority
Is data collection and reporting robust/ trustworthy?	Not completely. There is uncertainty amongst collectors on when and how they should register.	*Unknown*	**Yes**	Not completely. Data is mostly robust for collection carried out by/for municipalities.	*Unknown*	Not completely. Data is mostly robust for collection carried out by/for municipalities.

[182] See page 140 in Germany Government (2018)
[183] https://www.bmu.de/gesetz/referentenentwurf-eines-gesetzes-zur-umsetzung-der-abfallrahmenrichtlinie-der-europaeischen-union/

According to the **Danish** Waste Data Executive Order[184], companies that process textile waste from either households or businesses must report the quantities. Reporting can be carried out either by the collecting organisation or the treatment facility that the waste is passed on to. There is no requirement to report on the collection of used textiles suitable for direct reuse that have never been classified as waste.

As described earlier, original (unsorted used textiles) that has been collected via bring-banks, contains a mixture of reusable and non-reusable textiles, but where the collector has not specifically asked for non-reusable textiles, it is generally not classified as waste. It does not, therefore, need to be registered and reported within the waste registration system ADS[185]. If sorting of this original takes place in Denmark, the non-reusable part must be registered as waste.

On the other hand, where the collector, retailer or municipality has specifically asked for non-reusable textiles, the full collection quantity should be registered under ADS. There is currently only one dedicated used textile collector that is registered as a waste collector in Denmark. This organisation's experience with recording data in ADS, as well as experience of municipal waste companies are described in Box 4.

[184] Affaldsdatabekendgørelsen: https://www.retsinformation.dk/Forms/R0710.aspx?id=205780
[185] https://mst.dk/affald-jord/affald/affaldsdatasystemet/indberetning-af-affaldsdata/

Box 4: Registration of textile data in the Danish Waste Data System (ADS)

Organisations registered as waste collectors and handlers in Denmark (see Box 3 earlier) are required to annually register data on collected and treated waste in the Danish waste data system (ADS). ADS is managed by the Danish Environmental Protection Agency.

As a waste collector, one is required to register the following information from last year's collection: quantities of waste received; where the waste originated (the supplier's registration number or municipality where the waste is collected); whether the waste came mainly from households or businesses; the waste type as defined by an EAK code (20 01 10 for clothing; 20 01 11 for textiles which can also include clothing) comprises; and how the waste is treated, or is intended to be treated. Companies that export waste are also obliged to register this waste in ADS. When reporting exports, an OECD or Basel code must be provided.

UFF Humana is the first dedicated collector of used textiles in Denmark that is registered as a waste collector and has begun registering data in ADS. This has been made necessary by UFF's textile collection at civic amenity centres under contracts that oblige the organisation to actively ask for non-reusable textiles. This means that the collection is defined as waste collection.

UFF has reported data in ADS for two consecutive years and finds that ADS (in its current form) is not optimal for mapping the circular economy for textiles. The system is not designed to follow the circular economy, but to follow waste. They have identified the following gaos in the circular economy picture in current ADS reporting:

- Only textiles defined as waste must be registered in ADS. By far the largest proportion of used textiles collected in Denmark is currently not defined as waste. To capture all collected textiles in ADS, the definition of waste would need to be changed to include all collection. An alternative would be to build a new data collection system for monitoring used textiles (both waste and non-waste)
- Textile collectors that export waste for processing (e.g detailed sorting) in other countries are encouraged to report what happens to the waste after it has been exported. However, in the case of textiles exported for sorting and where the subsequent treatment is not known, exporters are allowed to register that the total quantity was prepared for reuse I.e. there is no obligation to report accurate information on the proportion that is actually prepared for reuse and the proportion that is recycled

On the last point, it is clear that many collectors do not have access to information on the fate of textiles sold to operators abroad. Some collectors (including UFF) have codes of conduct or similar agreements with foreign partners / textile buyers, which allow them to obtain this type of information. The Nordic 'textile reuse and recycling commitment' provides a blue-print for a code of conduct that has been pilot-tested by several collectors in the Nordic countries (see Fråne et al, 2017).

The situation is similar in **Sweden and Finland**: used textile collection is only required to be registered and reported where this is defined as waste and because collection of original is often not defined as waste collection, this means that registration is often lacking. There is often a lack in knowledge either within the Environmental Protection Agencies (or equivalent), or amongst the collectors of when they are officially collecting waste and, when they are, how this should be reported.

The picture is clearer in **Germany and the Netherlands**. Since all collection via bring-banks is considered to be waste, and all collectors need to be registered as waste collectors (see earlier), it is clear that the used textiles that they collect via these means should be registered in waste databases. In the case of the **Netherlands**, all municipalities are required under the Statistics Act to register waste data to the national statistics office, CBS. CBS sends out a questionnaire to all municipalities with questions on all kinds of waste collection and treatment

options[186]. The municipalities are expected to collect data from third parties that are carrying out collection on their behalf. The situation is largely the same in **Germany:** the municipalities are expected to report on waste collection and treatment including collection by third parties.

In practice, reporting is inconsistent. In the **Netherland**, some municipalities deliver detailed reporting of quantities of collected used textiles, while others only report on the quantities collected by the municipal waste collectors themselves and not by third parties, or do not report at all[187]. The same is true in Germany, some report detailed datasets, while others only report on what they collect themselves[188].

The missing link is usually the third-party collectors e.g. the charitable and commercial collectors who have received permission from the municipality to carry out collection on public land etc. Where this is being carried out as a service to the municipality under a tender process, the municipality has a reasonable level of control, especially if they have included reporting requirements as part of the tender. Where the collector has only received permission, the connection is much looser as normally no reporting requirements are attached to such a permission. Germany has the added complication that collectors can receive exemptions from Federal authorities to collect on public land and only need to notify the municipalities.

Moreover, in both countries the effort made by the municipalities to gather data from third party collectors is dependent on the interest of the municipality in the data since there is no punishment for not delivering full data sets. As a result, both countries are reliant on mapping studies of used textile flows commissioned by national ministries. Only one mapping study has been carried out so far in each country, but new mapping studies are under way[189].

Only **France** has a reliable system for registering data on used textile collection and treatment, which is run via a system of responsibility allocation, incentives and external audits.

EcoTLC is required under its contract with the French government to report annually on collection, reuse, recycling/energy recovery and landfill. EcoTLC primarily collects this data via the sorting centres which are financially supported via producer fees, provided that a number of conditions are met. One of these conditions is that they provide annual data on sorting quantities and subsequent treatments in the previous year. EcoTLC carries out regular audits of sorting centres to ensure that they have complied with sorting standards. This is important since they receive financial support per sorted tonne and have an incentive to overreport. In 2018, 17 onsite audits were carried out (out of a total of 68 supported sorting facilities) and 47 remote audits of the facilities reporting[190].

The sorting centres are also expected to report on the quantities of reuse carried out directly via the collectors that sell collected textiles to them e.g. the quantity of textiles that the collector skimmed off for resale in their own second-hand shops before sending the remainder to the sorting facility. Here they rely upon the collector. Collectors themselves do not receive financial support from EcoTLC but they have a strong incentive to become EcoTLC accredited because they receive higher prices from supported sorting facilities. In return they are expected to report to the sorting companies on total collection quantities including those that they resell in their own shops.

EcoTLC also reports on the total quantities of new (EPR-eligible) textiles placed on the market each year. EcoTLC's members report on these quantities to EcoTLC. Here there is an incentive for members to under report (since they pay fees on what they place on the market), and again

[186] https://www.cbs.nl/en-gb/our-services/methods/surveys/korte-onderzoeksbeschrijvingen/municipal-waste-quantities
[187] Emile Bruls, RWS, pers. comm
[188] Nicole Kosegi, pers. comm.
[189] Emile Bruls, RWS, pers. comm. and Nocole Kosegi, pers. comm.
[190] EcoTLC (2019a)

EcoTLC carries out regular audits on members to reduce this. Of EcoTLC's 4237 members in 2018, 69 were audited with 17 of these via on-site visits[191]. EcoTLC publishes it's reports each year on the previous year's performance[192].

[191] Ibid
[192] https://www.ecotlc.fr/page-307-rapports-d-activite-et-etudes.html

6. Status of technological development

6.1 Trends and developments in the used textile markets

The amounts of separately collected used textiles in Europe is increasing while the share of top-quality reusable clothing is decreasing[193]. Traditional reuse markets are facing increasing competition, partly fuelled by both new textiles and second-hand textiles from China. A general slowdown in the market decreases the demand for industry wipes, one of the sorted recycling fractions generating revenue. As a result, European professional (manual) textile sorters report lower profitability and increasing difficulties to market both sorted textiles for reuse and recycling[194].

Textile sorters have started to turn down unsorted collected post-consumer textiles ("original") with lower shares of top-quality reusable clothing, in some cases even cancelling contracts with longer term clients. This results in increasing challenges for textile collectors to sell both pre-sorted textiles and original for sorting.

Even textile collectors in the Nordic countries, with traditionally high shares of top-quality reuse clothing ("créme"), experience an increased market pressure. Whereas collectors with long term contracts and higher than average quality still can sell collected original at higher prices, the prices for original on the spot-market has dropped to 20-26 Eurocents per kilogram[195]. This represents less than a third of market prices reached some years ago.

The reason why the decreasing shares of top-quality used textiles in the collected original and the increasing competition on traditional second-hand markets have such large implications on the profitability for manual textile sorters is that today's manual sorting predominantly focusses on sorting for reuse. Whereas non-reusable used clothing typically corresponds to at least 20 % of collected volumes, they contribute with less than 2 % of the profits[196]. The main driver for (manual) sorters to sort non-reusable garments into coarse recycling fractions is still to avoid incineration costs.

The EU-wide obligation to separately collect used textiles by 2025 in the revised EU waste framework directive (WFD) and the predicted further increases in global collection of used textiles are expected to add to the current market trends for collected and sorted used textiles. One manual sorter referred to the situation as the "beginning of the end of textile sorting as we know it", predicting a "show-down" in the months and years to come.

6.2 Current Danish textile flows

As described in Section 4.2, of the 85 000 tonnes of new textiles put on the Danish market, 36 000 tonnes or 42 % was separately collected in 2018[197]. Of the separately collected used textiles, about 14 000 tonnes or 39 % are sorted to some extent in Denmark and the rest is exported for sorting abroad[198]. The focus of the Danish sorting is to sort out top-quality reusable garments that can be sold on the Danish market, leaving the rest for export or incineration. One

[193] Euwid Recycling & Entsorgung, (2019); Ljungkvist et al, (2018)
[194] Ljungkvist et al, (2018)
[195] Euwid Recycling & Entsorgung (2019)
[196] Watson et al, (2016)
[197] Watson et al (2018a)
[198] ibid

commercial organisation, Trasborg, carries out detailed manual sorting of 500 to 1000 tonnes a year with reusable and some recyclable fractions exported for sale on global markets.

Market actors report that the export of both unsorted and pre-sorted originals is increasingly challenging which corresponds to overall trends on the reuse markets described in the previous section. One Danish market actor reported that pre-sorted original can only be sold if they come as a package-dead with a larger share of unsorted original.

6.3 Challenges in handling Danish flows up to 2025 and beyond

Quantities of separately collected textiles are expected to increase across the EU due to the obligation to introduce separate collection of used textiles by 2025. At the same time the share of reusable garments in original can be expected to drop by 15 %[199] . In a scenario with an 80% increase in separate collection across the EU, there will be an extra two million tonnes of collected used textiles, and available material for recycling will increase by 1.4 million tonnes[200].

With a current collection rate for used textiles around 42 %, Denmark lies above the European average (around 30 %), but far behind e.g. Germany with over 70 % collection rate[201]. The amount of separately collected (post-consumer) textiles in Denmark as well as the shares of the original that cannot be sold for reuse on (traditional) second-hand markets are expected to increase – both prior to and after 2025. One of the current drivers for Danish municipalities to sort out textiles separately from the mixed municipal waste is that this contributes to the targets for overall recycling and preparation for reuse rates for municipal waste.

Denmark and the other EU Member States face the challenge of creating efficient collection and treatment systems for used textiles. The business models of traditional collectors may need to be adjusted due to a combination of increased volumes, reduced shares of reusable garments and crumbling reuse markets. As a step towards less dependence on global reuse-markets, Danish second-hand markets might be promoted and supplied with tailored textile products.

As Member States must take measures to ensure that separately collected textile waste is not incinerated, a main challenge lies in the creation of circular material flows for the recyclable textile waste. This includes both collaborations with stakeholders in and outside of Denmark and strategic investments in innovative techniques enabling a more circular textile value chain.

6.4 Selected textile sorting technologies

The key for sorting and selling reusable garments on ***second-hand markets*** is to find the right buyer on the right market for the right mix of textiles, maximising the value of the used textiles. The reusable textiles are sorted into a wide range of products and mixes taking different factors into account, e.g. brand, fashion, style, type of garments, seasonal changes, end markets etc. This type of sorting must be carried out manually.

However, high quality textile ***recycling*** processes are generally optimized for recovery of certain fibre types and/or can only handle specific fibre types as inbound materials. Automated sorting of textile waste according to fibre content is a prerequisite for providing large volumes of such inbound materials in an efficient and cost-effective way[202].

[199] Kösegi (2019)
[200] GFTZ (2019)
[201] FTR & BVSE (2015)
[202] Smart Fiber Sorting (2019)

Until relatively recently there were no effective automated processes for sorting textile waste by fibre type. However, a number of technologies are now close to being developed at industrial scale. Three types of near-infrared (NIR) based recognition and sorting technologies for textile waste that have been tested in Europe are described below. Two of these are planned for full scale development during 2020.

6.4.1 SIPTex near infra-red automated sorting

SIPTex, short for Swedish Innovation Platform for Textile sorting, is part of a five-year research project funded by the Swedish Innovation Agency Vinnova and coordinated by IVL Swedish Environmental Research Institute. As part of the project a pilot facility for automated textile sorting based on near-infrared and visual spectroscopy was built and operated during 2017.

Based on the results from the pilot facility Sysav Industri, a municipal waste company owned by 14 municipalities in Southern Sweden and part of the research project, will build and operate an industrial scale automated textile sorting facility in Malmö. The plan is to continue sorting operations after the research project and the innovation support funding from Vinnova ends in November 2021 (as opposed to the pilot facility that was dismantled after one year of operation).

The automated textile sorting facility will be built in the Northern Harbour of Malmö (Sweden) with good logistic connections to e.g. Denmark (road, rail, boat) and use the same recognition and sorting technology as in the pilot facility. Sorting operations are planned to start in the middle of 2020. The designed annual sorting capacity in one shift is 8 000 tonnes (inbound material). This corresponds to about 4,5 tonnes sorted material per hour. At the start of operation, sorting operations are expected to run on lower capacity, but then gradually increase to full sorting capacity in two shifts (16 000 tonnes). By adding a third shift, the maximal annual sorting capacity would increase to 24 000 tonnes of inbound textile waste.

The sorting line consists of a feeding unit, three sorting/scanning units in series, an additional sorting unit for removal of wrongly sorted items (cleaning unit) and a baling unit.

The full upper surface of items passing under the scanning units is scanned continuously. Textile waste matching the programmed specifications for the first sorting unit (for example, a minimum 98 % cotton content) is sorted out as a positive fraction and the rest (negative fraction) continues to the next sorting unit that may be programmed to remove a second fibre/colour combination, before the remainder continues to the third sorting unit for a third sorting process. This means that three different recycling-products can be sorted out per sorting loop. Each of the sorting units can be programmed to sort out any given recycling-product. The algorithms will initially include sorting programs for recycling products with different shares of acrylics, cotton, polyester, viscose and wool fibres. Additional sorting programs will continuously be developed in dialogue with stakeholders and potential customers.

The three positive fractions sorted in the three scanning units are fed into a ‘cleaning unit’, where wrongly sorted items are removed and added to the sorting rests, i.e. the negative fraction from the third sorting unit.

Since each of the scanning/sorting units only scans the upper surface of the textile waste they have trouble identifying material mixes in some specific product types e.g. core spun elastane fibres in denim jeans (e.g. where the elastane lies in the core of the thread and is not visible from outside) and jackets with different multilayers such as lining, padding and outer material. As a result, the quality of the outbound recycling-products will, to some extent, depend on the chosen input materials which may require some pre-treatment.

In general, the sorting facility will accept garments, household textiles and industrial waste as input material. Planned input textile waste streams for the Malmö facility comprise separately

collected textile waste for recycling, mixed sorting rests from manual sorting, pre-sorted recycling fractions from manual sorting as well as pre- and post-consumer industrial textile waste. Input material is planned to be obtained from e.g. Sweden, Denmark, Germany and Poland. Output materials will be (baled) quality assured recycling-products with different minimum shares of fibre content and colours. The sorting facility will not, at least initially, include any equipment for removing buttons, zips and other non-textile components nor include fibre opening (tearing) equipment.

The objective is to sell the quality assured recycling-products for fibre-to-fibre recycling and the sorting rests for other recycling purposes, e.g. use as industrial wipers or for non-woven products such as insulation. Under the SIPTex project, the share of Swedish or neighbouring countries' non-recyclable textile waste that *cannot* be recycled with current fibre-to-fibre recycling technologies have not been estimated. However, an analysis under the Fibersort project identified that only about a quarter of Dutch textile waste can be recycled with *current* fibre-to-fibre technologies (see below).

6.4.2 Fibersort near infra-red automated sorting

Fibersortt is a three-and-a-half-year project funded by the European 2014-2020 Interreg VB North West Europe programme and coordinated by Dutch based Circular Economy. The project will end in March 2020. Within the project a demo plant for automated textile sorting using near-infrared spectroscopy was built and operated outside of Amsterdam (Netherlands) (see also Case 3 in Chapter 7).

The Fibersort demo plant uses a different technology provider than the SIPTex project and a different setup for the sorting line. The Fibersort equipment includes only one scanner unit, where an approximately 5 cm diameter circle of the surface of each item is scanned. Subsequently scanned items that fit one of the programmed wished-for fibre types are removed from the line using high pressure bursts of air. The system can sort up to 14 different fibre combinations for recycling (positive fractions). Sorting rests (negative fractions) continue down the centre of the sorting line. The demo plant does not include any fibre opening equipment (e.g. removal of non-textiles and tearing).

The scanner unit can currently handle one item per second, which would give a theoretical throughput of 1.2 tonnes per hour[203]. The originally manual supply of textile waste into the system piece by piece limited the capacity considerably. Project partners have therefore developed an automated feed-in system which is currently integrated in the demo facility[204].

Input material to the demo facility is post-consumer textile waste that has been manually presorted (reusable items removed), for example by Circulus Berkels sorting facility (see Case 2 in Chapter 7). The sorting algorithms developed by Valvan Baling Systems include sorting programmes for pure fibres (wool, cotton, acrylic, polyester, viscose and polyamide) as well as blends (polycotton, wool-polyamide and wool-acrylics). Algorithms have so far only been developed for fibre-types and blends that have a current or upcoming recycling market. Theoretically algorithms can be developed for all types of fibre blends, with the exception of multi-layer textiles that are problematic.

An assessment made during the Fibersort project of 5 tonnes of textile waste (1 tonne each from Belgium, France, Germany, Netherlands, UK) estimated that 24% of separately collected textile waste are suitable for fibre-to-fibre recycling (after removal of reusable items). Articles made from 100% cotton wool, 100% viscose, 100% polyester, 100% poly cotton blends, 100%

[203] Circle Economy (2019)
[204] European Regional Development Fund (2019)

wool and more than 80% wool content together make up 77% of this proportion (see Table 6.1)[205].

Table 6.1: composition of the 24% of non-rewearable textile waste that is suitable for fibre-to-fibre recycling

Content	Share
100% Cotton	49.5%
100% Polyester	6%
100% Viscose	0.9%
100% Wool	0.5%
100% Acrylic	1.7%
Other pure fibres	1.3%
Other blends	20.3%
+80% Wool blends	1.1%
Cotton/poly blends	18.7%

Source: Fibersort

6.4.3 LSJH semi-automatic sorting

Lounais-Suomen Jätehuolto Oy (LSJH) is a municipal waste management company owned by 17 municipalities in the Southwest of Finland. LSJH is currently investing in a combined sorting and fibre opening line (pilot facility) in Turku (Finland) as part of the Telaketju project (see Case 8 in Chapter 7). The investment is primarily driven by the anticipated obligation to separately collect textiles by 2023 in Finland and the objective to treat used Finish textiles in Finland instead of exporting them. An additional objective is to create prerequisites for re-establishing a textile industry in Finland.

Inbound material to the sorting and fibre opening line will be obtained from municipal separate collection of textile waste in collaboration with municipalities. LSJH began collaborations with 4 municipalities and expand over the following years. LSJH already collected 118 tonnes of textiles in 2017 in these municipalities[206].

The municipalities will have the opportunity to collaborate on different levels in terms of pre-sorting. The *basic level* is to manually remove contaminants and non-textiles from the separately collected textile waste. The *second level* of manual pre-sorting includes additional removal or reusable/rewearable items – either by the municipalities themselves or by local partners. The *third level* of manual pre-sorting is removal of items not suitable for mechanical textile recycling, multilayer garments. The *fourth* and last level of pre-sorting includes sorting of mixed textile waste into different recycling products with specific material compositions (100% cotton, polyester, wool and viscose as well as 50:50 polycotton) using handheld infra-red (IR) scanners plus a remaining sorting rest.

An external technology provider has developed the IR (hardware) scanner. The scanner is the size of a mobile phone and is designed to be used by sorting staff, at the same time that they sort textiles according to the first three levels describe above. Sorting algorithms (software) have also been developed by LSJH's supplier, and LSJH owns all intellectual property rights. The sorting algorithms are stored on a cloud-based platform that can be accessed by all project participants. Handheld scanners can be rented from LSJH by the municipalities.

[205] Interreg Nord-Vesteuropa (2018)
[206] https://telaketju.turkuamk.fi/in-english/post-consumer-textiles-ended-up-in-the-clothing-collection/

LSJH takes a waste management fee for the pre-sorted textiles that is set lower than the normal per kg cost of incineration. This encourages municipalities to sort the textiles as far as possible. The more the municipalities (or their local partners) sort, the lower the management fee they have to pay to LSJH. The goal is to completely eliminate processing fees, and in the long term, the municipalities may even be able to sell the pre-sorted fractions to LSJH.

To the extent that the municipalities only pre-sort at the first, second and third levels, SLJH will carry out level four sorting themselves at their sorting plant in Turku.

It is currently envisaged that garments which are not suitable for Finnish second-hand markets will be considered as non-reusable textile waste. This approach risks reducing the overall share of reuse since many of the garments not fit for Finnish reuse markets could have been sold for reuse on global markets. This risks significantly reducing environmental benefits of used textile collection. The partners, however, are preparing for a future situation where global reuse markets are saturated.

Sorted recycling-products will subsequently enter a fibre opening line. The pilot facility will only include one fibre opening line, but the number of lines is expected to increase as the project is scaled up. The fibre opening line is an integrated line including cutting in ribbons, removal of hard items, tearing and baling. In the planned upscaled facility parallel opening lines with (potentially somewhat adjusted) equipment will be operating for different fibre types. Additional equipment might e.g. include grinding equipment. The planned fibre-opening line in the pilot facility is designed for an annual capacity of 5 000 tonnes and is expected to be operational in the second part of 2020.

Output material from the sorting and fibre opening facility will be reuse items for local/regional markets, bales of recycling material (cotton, viscose, wool, polyester and 50:50 polycotton), sorting rests for other types of recycling (e.g. use in composites) and sorting rests for incineration. The ambition is to keep the textile waste in Finland as far is possible, reducing exports of used textiles and textile waste. LSJH have not estimated the share of Finnish textile waste that *cannot* be recycled with current fibre-to-fibre recycling technologies. An analysis under the Fibersort project, above, identified that only a quarter of Dutch textile waste can currently be recycled fibre-to-fibre.

6.5 Textile recycling technologies

6.5.1 Current solutions

Current recycling options for textile waste include a variety of mechanical processes that produce inputs for end products / end uses of somewhat lower quality than the original textile products. This is often referred to as 'downcycling'. This includes processes where the textile waste is used for industry wipes, padding, filling, acoustic and thermal insulation as well as for non-woven (painters') mats. Table 6.2 summarizes the main processing steps for each application type. Usually, non-textile components, such as zippers and buttons, are removed prior to the process. The incoming textile waste for these recycling processes varies between different product groups, but normally allows for (specific) fibre-blends.

Approximately 20% of the 2.7 million tonnes of used textiles that are separately collected in Europe each year are used as industry wipes or other recycling purposes on European and global markets[207]. European countries with these types of conventional recycling processes include Germany, the Netherlands and the United Kingdom.

[207] Kösegi (2018)

Table 6.2. Existing commercial recycling options for textile waste (based on Östund, et al., 2015)

Product group	Main process step(s)
Industrial wipers	Cutting
Filling and padding (nonwoven)	Tearing, needling and cutting
Insulation and fibre-mats (nonwoven)	Tearing, forming, heat treatment

6.5.2 Fibre-to-fibre recycling

Far less than 1% of separately collected used textiles are estimated to be recycled using current fibre-to-fibre recycling technologies[208]. However, several different fibre-to-fibre processes for textile waste are currently under development at a range of scales. This development has been triggered by the anticipated, increased demand for recycled textile fibres illustrated by brands' stated targets to increase recycled content in the production of new textiles[209].

According to Circle Economy (2018) about a third of non-rewearable textile waste comprises items that are not suited for future fibre-to-fibre recycling, e.g. multi-layer garments and garments with fibre blends containing three or more different fibre types. Creating a circular textile value chain includes using such textile waste, including e.g. sorting rests from automated textile sorting, as input materials for other recycling processes, often referred to as *downcycling* processes.

Some recycling processes have integrated pre-treatment of garments (fibre opening), e.g. removal of non-textiles and shredding, whereas other processes only can accept pre-treated textile waste.

A number of processes have been selected for presentation here that are under development in northern Europe in relatively close proximity to Denmark and are at a reasonably mature level of development. Three of these are fibre-to-fibre processes. The first two, re:newcell and Södra Cell, are currently at practical demonstration scale with proximity to handle Danish textile waste. Both companies have plans to upscale in the coming years. A third somewhat different fibre-to-fibre process has under development by Worn Again and is currently assessing suitable locations in Europe for establishing a demo facility, taking critical factors such as access to enough feedstock, its price and the proximity to the source into account.

The final described recycling process (RETEX) develops products suitable for the furniture industry. This process is able to handle sorting rests in large volumes that are not suitable for fibre-to-fibre recycling. The first industrial scale plant is likely to be established in Finland over the next two years, and RETEX plans over a longer period to establish several additional industrial recycling facilities in Europe.

re:newcell

re:newcell is a Sweden based company that has developed a chemical textile recycling process focussing on fibre-to-fibre recycling of cotton producing dissolving pulp. The recycling process itself corresponds to dissolving pulp production from virgin cellulose. It also includes pre-treatment in terms of stripping, removal of contaminants, e.g. buttons and zippers, and de-inking.

[208] Ellen Macarthur Foundation (2017)
[209] E.g. H&M (2018) and IKEA (2019).

re:newcell has built a demo plant with the technical annual production capacity of 7 000 tons in Kristinehamn in the middle of Sweden. The outbound product from the recycling process is dissolving pulp in the form of fibre boards called Circulose. The next step in the value chain uses these fibre boards to produce man made cellulosic fibres such as viscose, lyocell and acetate fibres.

By 2019 the upscaled process had been proved in the whole value chain and the first commercial production has begun with about 150 tonnes textile waste already processed. Feedback from customers verifies the quality corresponding to virgin dissolving pulp and the first commercial end products with 60 % Circulose and 40 % organic cotton have been produced. Towards the end of 2020 the demonstration plant is expected to operate at full capacity.

Input materials comprise both industrial (pre-consumer) textile waste such as clippings, overstocks and damaged products and pre-sorted post-consumer recycling fractions from manually sorted 'original'. Currently the de-inking process cannot remove reactive colours and, thus, re:newcell is focussing on denim and light colours waste streams. Pre- and post-consumer textile wastes are processed separately from one another and have been used to a similar extent.

The current specifications on inbound materials include a minimum content pf 98 % cotton. The recycling process can cope with any fibre types, also elastane and polyamide, in the remaining 2 %. However, only cotton fibres are recovered in the recycling process. The objective is to lower the tolerance of non-cotton fibres in the specifications to 93-94 %, enabling e.g. manually sorted denim as input to the recycling process, but the expected timing of these improvements is as yet not known.

re:newcell experiences the main challenge to be scaling the recycling solutions up fast enough. The market is hesitant to accept small volumes of new feedstocks into large, optimized production lines and re:newcell, therefore, sees the need to scale up capacity rapidly. As a step on the way re:newcell is planning to build a full scale recycling plant with annual production capacity of about 30 000 tonnes in the coming years in Europe; potentially in Germany where large inbound flows are available. re:newcell's target is to recycle one billion garments per year by 2025.

Södra Cell

Södra Cell is one of Europe's leading manufacturers of pulp for the pulp market and operates three pulp mills in Sweden. Since 2011 the pulp mill in Mörrum in southern Sweden has one production line for paper pulp and one production line for dissolving pulp for textile purposes. Södra Cell has developed a chemical textile recycling process focusing on cotton, polycotton and manmade cellulosic fibres, e.g. viscose and lyocell.

The process currently only recovers the cellulosic content in the textile waste and Södra Cell therefore focusses on viscose, lyocell, cotton and polycotton as input materials. Although the process can handle 50:50 polyester/cotton blends, polycotton with relatively high cotton content is preferred as the polyester content is incinerated for energy recovery rather than used in new production following the recycling process.

Due to risks of clogging of the equipment the process cannot handle waste with elastane or polyamide content. The process does not yet include any de-inking process. In order to produce white dissolving pulp, therefore, only white textile waste is accepted. The tests so far have been carried out with industrial (post-consumer) textile waste from the laundry and textile service sector, e.g. sheets, towels and tablecloths.

The recycling process itself is the same as Södra Cell is using to produce wood-derived textile pulp. The textile waste is mixed with virgin cellulose as input material to the production. In 2019 Södra Cell has so far recycled 30 tonnes of textile waste producing dissolving pulp with 3 % recycled content. The first test batches have been delivered to customers for testing and the first feedbacks are positive. The objective is to gradually increase the recycled content to 20-30 % and Södra Cell's long-term target is to add 25 000 tonnes a year of textiles to the company's pulp production[210].

Currently the main challenge for Södra Cell is to get access to sufficient input textile waste of high quality enabling the company to start scaling up to large-scale production during 2020. The cotton-rich white textiles that they currently need can already be sold on existing recycling markets such as markets for industry wipes.

In addition to the scaling of the process, further development of the recycling process might include de-inking, material recovery of the polyester content and adjustments enabling the acceptance of textile waste with polyamide content. This will significantly expand the range of input materials to the process.

Worn Again

Worn Again Technologies is a UK based company that has developed a chemical recycling process focusing on textile-to-textile circularity of polyester and polycotton blends. The decision to focus on these fibre types is based on an assessment that the market needs a solution for blended fibre textiles[211].

The recycling process can take cotton fibres, viscose fibres, polyester fibres and polycotton fibres (preferably with higher share of polyester than 50 %) as well as used PET-bottles as input materials. The process can handle up to 10-15 % of other fibre types, e.g. elastane, polyamide and wool. However, these fibre types are not recovered in the process.

The Worn Again processing specification includes pre-processing steps e.g. clip and strip (cutting/tearing into smaller pieces and removal of zippers etc.) and pre-treatments where dyes and other contaminants are removed. The polyester fibres are dissolved but remain as polymers in order to keep the properties as similar to the virgin fibres as possible. The output products from the recycling process are PET resin/pellets and cellulosic pulp in water which will be compressed in sheet, both which can be spun into virgin equivalent quality fibres/yarns.
The eight-year R&D phase is expected to end in 2020 with a sub-pilot plant in operation, producing first output in 2020. The commercial phase (2020-2021) includes establishment of a demonstration plant to further develop and demonstrate performance and reliability of process, providing proof of concept through grounded data at scale. The growth phase (2022-2023) includes establishing a first industrial plant generating commercial output. The goal is to set up and license 40 plants globally over the next ten years.

Worn Again currently faces the main challenge in creating a network enabling scaling up of the technology, including e.g. sourcing suitable input materials into the recycling process and investments in the demonstration facility.

RETEX

RETEX is an Estonian company that has developed a mechanical recycling process for producing construction panels, RETEX board, made of 100% recycled textile waste. The Finnish VTT Research Institute has been a partner in developing the RETEX board as well as fibre and foam insulation technologies. The Finnish Kiilto Company has been a partner for the development of

[210] Södra Cell (2019)
[211] Worn Again Technologies (2019)

glues and adhesives for the RETEX board. The universities of Tallinn and Tartu has been involved in the production of prototypes.

The recycling process can take a mix of different fibre types, including mixed sorting rests from textile sorting, e.g. those that are not suitable for fibre-to-fibre recycling. The end product is a construction panel that can be used for construction and the manufacturing of furniture. It is designed to replace other types of construction panels e.g. plywood, laminated veneer lumber (LVL) and oriented stranded board (OSB) and is fully mould, water and fire resistant. The panels are available in variable stiffness ranging from stiff to soft (can be bent like rubber) and in different colour and texture options.

The machinery to produce the RETEX panels is similar to that already used for production of other construction boards. The manufacturing process starts with an *automated* cleaning process, where zippers, buttons and other non-textile items are removed, followed by a shredding process, where natural and synthetic materials can be processed together or separately, depending on the input textile waste. The production process includes mixing fibres with the binding material (glue), layering the mixture into a rolling machine to produce boards and, finally, pressing, trimming and sanding the boards before packaging and storage.

RETEX plans to launch a recycling facility during 2020/2021, that can annually process 60 000-75 000 tonnes of textile waste into RETEX boards. The first facility is likely to be built in Finland. Over the next two to five years, RETEX plans to establish an additional six to seven facilities of the same size on other European markets. RETEX's vision is to recycle 10 % of the textile waste in Europe.

6.6 Discussion of technologies

Creating a more circular textile value chain requires enabling circular material flows throughout the whole value chain rather than optimising single steps in the value chain. In parallel to increased collection it is imperative that efficient sorting for higher quality recycling, increased use of recycled fibres in the production of new textiles and improved design for recycling is also developed to cope with the additional volumes of collected textiles.

In 2017 approximately 14 000 tonnes of separately collected textiles were pre-sorted in Denmark (skimming off the best quality for domestic second-hand sales). This represented approximately 16% of the new textiles annually placed on the market[212]. The pre-sorting is primarily carried out manually by charitable organisations[213]. The pre-sorted textiles and much of the unsorted original is exported for detailed sorting elsewhere. There is, however, one commercial detailed sorting facility operating in Denmark that sorts approximately 1 000 tonnes a year into more than 100 fractions for sale on global reuse and recycling markets.

EU Member States must introduce separate collection of textile waste by 2025 and ensure that separately collected waste is not incinerated. The anticipated increases in separately collected textiles combined with current negative trends in the used textiles markets (see previous section) call for strong action in Member States to develop strategies for handling of non-reusable textile waste. If Denmark increase separate collection of used textiles by 50 % by and beyond 2025 compared to current levels, this would result in about annually 54 000 tonnes collected used textiles, assuming no major changes in current consumption levels. If under the same scenario, the proportion of non-recyclable textiles increased from the current 28% to 40% of total collection, it will yield just under 22 000 tonnes of textile waste per year that would need to be managed - ideally through material recycling.

[212] Watson, et al (2018a)
[213] ibid

Large-scale fibre-to-fibre recycling processes, especially chemical recycling processes, are dependent on large volumes of these relatively homogenous fibre types in order to work efficiently. Efficient sorting of large volumes of textile waste according to fibre composition requires automated textile sorting. SIPTex, starting operations after summer 2020, will be the first industrial scale automated textile sorting facility that can carry out this operation.

Maximum annual sorting capacity in SIPTex (in three shifts around the clock) correspond to 24 000 tonnes but will initially be considerably lower. This is similar to the quantities of textile waste that would be collected annually in Denmark in the above scenario. Parts of the Danish collected textile waste could potentially be handled in the SIPTex facility but it would need to compete with textile waste from Sweden, Poland and other neighbouring countries.

Furthermore, the SIPTex facility's geographic proximity to Denmark is only an advantage if the non-reusable textile waste is separated from reusable textiles within Denmark's borders. Currently, the vast majority of detailed sorting of Danish used textiles occurs in other countries. For the SIPTex plant to be useful for Danish non-reusable fractions would require detailed sorting to take place in Denmark to a much higher degree than it does now. An alternative would be to take a new strategy to used Danish textiles and prioritise recycling before reuse (this is discussed more at the end of this section).

The exact quantities of Danish non-recyclable textiles and textile waste that could be processed in the SIPTex facility will also depend on price, handling fees, shares of various fibres in Danish 'original', transport costs, etc.

The outputs of SIPTex and other automated sorting facilities, can be fed into fibre-to-fibre recycling facilities such as those being developed by re:newcell (mid/long term capacity 30 000 tonnes), Södra Cell (long term capacity 25 000 tonnes) and Worn Again (capacity unclear).

Even when these types of fibre-to-fibre recycling technologies have been scaled up to industry level, it will only be a solution for a minor part of the 22 000 tonnes of non-recyclable textiles that will be collected annually in Denmark in the above scenario. In the Fibersort project, it was estimated that only 24% of non-recyclable textiles are suitable for current fibre-to-fibre recycling technologies[214] (see Table 6.1 above).

Box 5: Convert and Lendager

Convert is a Danish company that can convert textiles and other fibre-based wastes into a non-woven material that can be used in a wide variety of applications. Convert uses a mechanical-thermal process that first divides the input into fibres or granulates, after which a thermal binder is applied which gathers the various material into a non-woven felt layer. The felt is pressed into a solid material of the desired thickness and hardness in both 2D and 3D applications, dependent on the customer's wishes.

As part of a larger European Interreg project, architect group Lendager, waste company AffaldPlus and consultancy Ramboll have teamed up to investigate how to increase recycling of the used textiles that are not suitable for direct reuse. In collaboration with Convert, the parties have developed and tested various materials for their suitability for use in construction, and the result has been an acoustic panel that is expected to be launched during 2020.

Kilder: https://convert.as/
https://www.affaldplus.dk/tekstilaffald-future

[214] Interreg Northwestern Europe (2018)

The remaining approximately 76% of non-rewearable sorting wastes can potentially be used as input to other recycling processes, for example the RETEX process for production of construction panels and the Lendager/Convert process for production of insulation and acoustic panels (see Box 5). Whether there are sufficient markets for such materials to absorb the more than 1 million tonnes of textile waste in Europe by 2025 that will not suitable for fibre-to-fibre recycling (according to the Fibresort tests) is unclear. However, according to RETEX the quantity of wood based panelling used for construction and furniture sold in Europe in 2017 was 57.6 million cubic meters which corresponds to approximately 30 million tonnes.

The location of large-scale sorting and recycling facilities is of interest with respect to the Danish used textiles. In general, due to the low values of textiles waste for recycling compared to textiles for reuse, it is most appropriate for these facilities to lie close to manual sorting facilities where reuse fractions are sorted out for reuse markets. Currently manual sorting of Danish textiles mostly takes place elsewhere in Europe e.g. in Poland, Lithuania, Bulgaria, Germany. It is possible, but far from certain, that these centres of sorting will also attract investments in large sorting and recycling facilities.

On the other hand, in order to reduce dependency of Denmark on fluctuating and currently hardening global markets for second-hand garments, Denmark may wish to initiate steps to secure increased *domestic* detailed sorting and treatment of collected textiles. Danish market actors could also seek collaboration with initiatives in neighbouring countries related to manual textile sorting for reuse and recycling, automated textile sorting for recycling (e.g. SIPTex in proximity to Copenhagen) and fibre-to-fibre recycling contributing to a regional eco-system of companies handling textile waste in and close to Denmark.

However, such a strategy will need financial support either from the state / municipalities or from producers, for example, under an extended product responsibility (EPR) system such as that in France. Due to relatively high labour costs in Denmark, domestic manual sorting of used textiles into 300-400 different categories will most probably not be competitive in the light of the higher share of non-reusable textile waste expected in coming years.

Another possibility is to separate only the top-quality rewearable garments suitable for sale in Denmark and Europe and send all the remainder for automatic or semi-automatic sorting to high quality fibre-to-fibre recycling plus downcycling. (See Table 6.2 for an overview of textile recycling technologies under development.) This is the strategy planned under the LSJH-project in Finland.

Such a strategy risks reducing the share of reuse, resulting in reduced environmental benefits and economic benefits, since some of these garments could have been sold for reuse on global markets. However, these global reuse opportunities may not exist in the future if global reuse markets become saturated as some predict. A detailed assessment of the environmental, economic and social impacts of the various strategies is needed before these choices can be made.

Table 6.2: Links to additional textile recycling processes

Company	Country	Link
Advance Nonwoven	Denmark	https://advancenonwoven.dk/contact/
Altex Textil Recycling	Germany	https://www.altex.de/
Amber Cycle	USA	https://ambercycle.com/
Antex	Spain	https://www.antex.net/
Cardato	Italy	http://www.cardato.it/

Convert	Denmark	http://www.convert.as/
Econyl	Italy	http://www.econyl.com/
ETS H. Moncorgé	France	http://divi-extra.com/en/
European Spinning Group	Belgium	https://www.esg-group.eu/en/collections/green
Evrnu	USA	https://www.evrnu.com/
Frankenhuis	Netherlands	https://www.frankenhuisbv.nl/
Infinited Fiber Company	Finland	http://www.infinitedfiber.com/
Ioncell	Finland	http://www.ioncell.fi/
Jeplan	Japan	https://www.jeplan.co.jp/
Leigh Fibers	USA	https://leighfibers.com/
Lenzing	Austria	https://www.lenzing.com/
MPO Recycling	Netherlands	https://www.mporecycling.nl/producten/
North American Wool Stock	Canada	http://www.nawsinc.com/
Pure Waste	Finland	http://www.purewastetextiles.com/
Re.Verso	Italy	http://www.re-verso.com/
Really	Denmark	https://reallycph.dk/products
Recover	Spain	http://www.recovertex.com/
Rifo	Italy	http://www.rifo-lab.com/
SaxCell	Netherlands	http://www.saxcell.nl/
SOEX Recycling	Germany	http://www.ico-spirit.com/
Teijin	Japan	https://www.teijin.com/
The billie upcycling	China	https://thebillieupcycling.com
Wolkat	Netherlands	http://www.wolkat.com/
Woolagain	USA	http://www.woolagain.com

7. Gode initiativer på tekstilområdet (Emne F)

This section presents eights initiatives, including six identified by key experts in the five 'neighbour' countries, and two additional initiatives from other European countries. All the initiatives represent examples of where national, regional or local authorities have played a role, either through funding, guiding or participating as an active part of the initiative. The initiatives cover a wide range of aspects in the value chain for used textiles. The initiatives are as follows:

- **Case 1: De Collectie in Antwerp, Flanders:** An innovative municipal procurement process that created a unique partnership in textile collection and treatment
- **Case 2: Circulus Berkel Sorting Centre, the Netherlands:** Kerbside collection of used textiles and a local textile sorting centre that creates traceability and circularity
- **Case 3: Dutch Circular Textiles Valley**, **the Netherlands:** Clusters of companies within the textile industry working on circular textile initiatives
- **Case 4: Eskilstuna Municipality, Sweden:** A reuse shopping centre and smart sorting facility that breathes new life into textile waste and the municipal economy
- **Case 5: FRIVEP, France:** Pilot collection, reuse and recycling of uniforms and work clothes from two large state-owned companies
- **Case 6: Guidelines for collection, sorting and reuse, Germany:** Guidelines developed by three federal states to assist municipal tendering for textile collection services
- **Case 7: Love Your Clothes & Love Not Landfill, UK:** Campaigns that encourage more sustainable clothing behaviour amongst young consumers
- **Case 8: Telaketju, Finland:** Network development programme that creates circular business opportunities in the textile industry

Each initiative includes the following information:

- Goal
- Description
- Involved actors
- Results
- Challenges and solutions

Case 1: ”de Collectie” in Antwerp, Flanders

Innovative municipal procurement process that created a unique partnership in textile collection and treatment

Goal
The municipality of Antwerp wished to gain greater control over textile collection in the city, increase the quantities of textiles collected, ensure that collection led to local jobs and that the collected textiles were reused and recycled locally as far as possible.

Description
In order to achieve these goals and to eliminate the problem of waste accumulation around the many textile bring-banks on the street, the municipality tendered for textile collection services in 2016. The tender process contained many innovative elements: street-based bring-banks should be phased out in favour of alternative collection channels such as kerbside collection, collection in civic amenity centres and staffed collection points in post-offices libraries etc. The tender documents also required that the collected textiles should be handled locally as far as possible, and the municipality would reward local anchoring and cooperation between different partners within evaluation of tenders.

Five waste collectors chose to bid together in a consortium; "De Collectie". They comprised used textile collectors already operated within the municipality and whose collection activities varied, which meant that they were not direct competitors but could rather supplement one another. The consortium won the tender and formed the partnership whose aim was to double the collection of textiles in the five years (2016-2021) over which the contract would run. De Collectie is also socially responsible, and one of the main partners, a so-called *Kringwinkel* organisation, received financial support from the region in return for hiring socially disadvantaged people to carry out their textile activities. De Collectie has built a common brand that manages to convey strong and clear messages to the citizens of the city on the benefits of delivering textiles to De Collectie collection points.

Involved actors
De Collectie consists of five actors:
- **De Kringswinkel Antwerpen (KWA)** was the initiator of the partnership and runs eight large secod-hand shops in Antwerp and also offers free door-to-door collections on call and collection in businesses.
- **Oxfam** which collects textiles at civic amenity centres.
- **Wereld Missie Hulp** is a charity that, in order to live up to the demands of the offering, went from collecting on the streets to libraries, post offices and shops.
- **Kindervriend** and **Mensenzorg** are two smaller charities which carry out notified household collection.

Results
De Collectie increased the collection of textiles by 29% between 2016 and 2019 and has created 30 new jobs.

Challenges and solutions
Despite De Collectie's successes in Antwerp, the cooperative brand has not expanded to other cities, due to 1) the partners have difficulties in downplaying their own brand for the benefit of the partnership 2) competitors have been dissatisfied with the offer and oppose these types of consortia.

In addition, local reuse markets are limited for lower quality reusable textiles, and local recycling opportunities for the textile waste are very limited. However, the partnership is experimenting with various solutions such as identifying actors who can use the textiles as well as chemical recycling processes.

A further key challenge is that financial support for the employment by *Kringwinkel* organisations of socially vulnerable and long-term unemployed, is being phased out in the Flanders region, making it less profitable to handle and sort textiles locally. However, they have managed to continue with lower levels of financial support. A final challenge is that competing used textile collectors set up textile containers in private areas within the municipality, which the municipality cannot prevent.

Links

- Webside for de Collectie (in Flemish): http://decollectieantwerpen.be/
- Longer case description (in English): page 22 to 28 in Watson et al (2018b)

Case 2: ”Circulus Berkel Sorting Centre” in Deventer, The Netherlands

Kerbside collection of used textiles and a local textile sorting centre increases traceability and circularity

Goal

The aim of the project was to achieve increased municipal control over the used textile value chain, diversion of used textiles from mixed household waste and at the same time create new local jobs by creating a textile sorting centre in Deventer.

Description

Eight Dutch municipalities (Apeldoorn, Bronckhorst, Brummen, Deventer, Doesburg, Epe, Lochem and Zutphen) and their joint municipal waste management company, Circulus Berkel, entered into an agreement with ReShare (the textile collection arm of the Salvation Army) and employment agency Deventer Werktalent to create a textile sorting centre in Deventer. The project is coordinated by Circulus Berkel.

The project originates from a need to increase separate collection of textile waste in line with the objectives of the Dutch Textile Green Deal (see Case 3), and at the same time to increase transparency in the value chain as it is often unclear to citizens and government what happens to used textiles following collection.

Circulus Berkel collects (through kerbside collection and 250 bring-banks distributed in the region) and delivers used textiles for sorting at the sorting facility. Kerbside collection is carried out via so-called BEST bags (BEST = books, electronics, games and textiles) and has been implemented in response to findings that convenience is of decisive importance as to whether citizens are willing to separate and deliver their used clothing and other used goods for reuse or recycling. Households receive BEST bags from Circulus Berkel, insert their unwanted books, minor electronic waste, toys and textiles, seal it and place it on the sidewalk on the scheduled collection day. By gathering several different fractions (that do not cross contaminate) in the same collection bag, collection costs are reduced. Collection costs were further reduced in 2018 by reducing collection frequency from six to four times a year. Textiles make up about half of the items collected (by weight).

All textiles are sold to ReShare who sort the reusable textiles and sell them mainly to second-hand stores in the Netherlands or in other parts of Europe. Around 10% of the collected textiles are suitable for resale in local ReShare stores and 60% of all collected textiles are reused in the Netherlands or elsewhere.

Non-reusable textile waste is passed on for automated sorting at the Wieland Textiles sorting centre in Wormerweer and some fractions are used in the development of new solutions for increased textile recycling (see Fibre sorting in section 6.4.2 and the Circular Textile Valley initiative in Case 3 below). The remaining waste is sold to textile manufacturers or other companies where fibres are included in downcycling solutions such as the production of insulation and cleaning products, or is sent for incineration.

ReShare pays the eight municipalities 150 euros per tonne of used textiles received, which goes towards covering Circulus Berkel's collection costs. ReShare does not currently generate a profit on the operation of the sorting centre, but still wants to continue the cooperation, since they have to carry out sorting for their ordinary operations anyway and that their circular business model is expected to be supported by future regulation. ReShare was earlier supported by

the Dutch Government's Participation Act[215], which subsidises employment of people with a distance from the labour market, but has now opted out of this due to associated bureaucratic costs.

Involved actors

The involved actors comprise:

- **Eight municipalities:** Apeldoorn, Bronckhorst, Brummen, Deventer, Doesburg, Epe, Lochem and Zutphen who are the initiators of the centre's establishment and finance Circulus Berkel's collection of textile waste.
- **Circulus Berkel,** municipal waste company, designed the tender for the establishment of the center and collects textile waste for sorting.
- **ReShare,** the collection arm of the Salvation Army, won the tender and is responsible for the daily operation.
- **Deventer Werktalent** mediates contact with relevant labour.

Results

The sorting centre carries out detailed sorting of 2 000 tonnes of used textiles each year (with plans to increase the quantity to 5 000 tons). Of this, 60% goes to reuse. The remaining 40% goes to respectively to further sorting and experimentation (14%) and combustion (26%). Code of conduct agreements between ReShare and its buyers ensure increased transparency and traceability, and that the textiles are mainly sold in the Netherlands or internally in the EU. The project has resulted in the equivalent of 12 full-time workplaces for particularly disadvantaged people in the work area.

Challenges and solutions

The project aimed specifically at encouraging a transition from a strong focus on export for detailed sorting to focusing on local sorting. This was forced by a specific requirement in the tender. During the project, there have been a number of challenges in connection with developing effective management of used textiles and integrating many different actors across the value chain.

The project is also challenged by a lack of market for non-reusable textiles. A higher share of non-reusable textiles has been collected during the project than the share that ReShare normally collects via its own bring-banks. There is a need for clothing manufacturers to design for ease of recycling e.g. through using quality fibres and avoiding mixes of different fibre types in their products. Also, there is a need for the development of technology for automated sorting and chemical recycling of fibres. Circulus Berkel is working with similar companies and the Dutch government to develop the necessary solutions and formulate policy in the textile sector.

ReShare experiences problems with the contamination of the textile waste in street-side bring-banks, but is working to solve this by adjusting the bring-banks' placement.

Links and contact details

- Circulus-Berkel: Aruba 16, Postbus 1372, 7301 BP Apeldoorn. Tlf. 088 - 7 082 088. www.circulus-berkel.nl
- ReShare: Zeehaenkade 30, Postbus 2055, 3500 GB Utrecht. Tlf. 0800 0322. https://www.reshare.nl/

[215] https://business.gov.nl/regulation/participation-act/

Case 3: Dutch Circular Textiles Valley

Clusters of companies within the textile industry working on circular textile initiatives

Goal

The purpose of the Dutch Circular Textiles Valley (DCTV) is to create a circular value chain for textiles to reduce the amount of textile waste and the use of virgin resources. This is done, among other things, by establishing five regional textile clusters involving actors from the entire value chain in a geographically defined area.[216].

Description

DCTV originates from a so-called "green deal" for textiles. Dutch green deals are voluntary partnerships between the Dutch government, industry and civil society within a given industry, aimed at creating green growth which is initiated by the government. Green deals are ground breaking as they bring together stakeholders from across the value chain to create common sustainable solutions while providing government advice on legislation, administration and finance.

In 2012, a green deal was signed on textiles between the Dutch government, the textile industry, textile collectors and other actors with the overall goal of halving the quantity of textiles in mixed household waste from 2012 to 2015. The agreement included activities in the form of a mapping of textile circularity, a joint communication from actors about what can and should not be delivered to containers, actions aimed at consumer behaviour change and assisting municipalities in setting achievable goals for textile collection. The overall goal of halving textiles in mixed household waste was not achieved, but the Green Deal succeeded in creating a collaboration on a common vision to reduce the environmental impact of used textiles. The main obstacles was a lack of viable markets for non-reusable textiles.

When the agreement was finalized in 2016, the project partners organized themselves in the so-called "Dutch Circular Textiles Valley" (DCTV)[217] to continue to work towards the goal of reducing the environmental impact of textiles. DCTV established four regional textile clusters[218] with a focus on respectively, development of recycling technology ("Twente"), circular workwear ("Tilburg"), bio-based materials (Arnhem / Wagenien) and circular brands and business models (Amsterdam).

DCTV provides a platform for knowledge sharing across the four clusters and the rest of the textile industry and has developed an action plan for circular textiles[219] to achieve the goal of the Netherlands textile industry being circular. Three conditions are identified that must be met in order to achieve the goal: Textile products must be designed to be easily recycled; a recycling system must be implemented and; new textiles must contain recycled materials. The strategy points to five tools that need to be developed: Innovation capacity, collaboration across the value chain, development and sharing of knowledge, new business models as well as financing and supporting policies.

One of the clusters that already existed prior to DCTV was the "Dutch Center for Circular Textiles" (HCCT). HCCT connects companies in and around Amsterdam that make up the majority of the textile value chain as well as Amsterdam and its neighbouring municipality of Zaanstad. Amsterdam assists with knowledge, staff and administrative work[220]. HCCT aims at closing the textile loop regionally by focusing on the entire value chain. HCCT has both production facilities and an innovation workshop to ensure full utilization of collected textiles[221].

[216] https://www.dutchcirculartextile.org/
[217] https://www.afvalcirculair.nl/onderwerpen/afvalstromen-ketens/textiel/duurzame-mode/
[218] https://www.dutchcirculartextile.org/
[219] https://www.afvalcirculair.nl/onderwerpen/helpdesk-afvalbeheer/publicaties/downloads-0/on-the-road-towards/
[220] https://dakofa.dk/element/nyt-hollandsk-center-for-cirkulaere-tekstiler/
[221] https://www.dutchcentreforcirculartextiles.nl

Involved actors

- **Modint:** coordinates DCTV. Modint is an industry organisation for manufacturers and wholesalers of clothing and home textiles
- **MVO Nederland:** a non-governmental organisation for entrepreneurs working on a more sustainable economy. MVO Nederland handles interests within climate and energy, circular economy, tax regulation and financing for sustainable entrepreneurs.
- **ABN Amro:** Dutch bank that has invested in DCTV
- **Fashion for Good**: a member-based innovation house that brings together actors from the entire textile value chain, which facilitates innovation processes and projects, and has a fund.
- **Het Groene Brein**: a network for innovative and sustainable companies and 140 researchers
- **Circle Economy**: Is a social and member-based company specialised in circular economy
- Companies, municipalities, educational institutions and actors across the value chain participate in the specific clusters and DCPV knowledge-sharing activities, e.g. Zaanstad Municipality, the Wieland Textiles sorting company, the brand Loop.a.life[222], the Reshare collection organisaiton and Texteilher Use (part of the Dutch Center for Circular Textiles).
-

Results

DCTV has brought together the entire textile industry and has set out a common and circular direction for this in the Action Plan. With the establishment of regional clusters, DCTV has also created room for innovation and regional solutions. More concrete results are expected to emerge from these clusters.

Challenges and solutions

It is challenging to increase the proportion of used textiles that are recycled due to lack of technologies and systems. In light of this, the four textile clusters have been established with the aim of developing and implementing regional solutions to this challenge.

Links

- Dutch Centre for Circular Textiles: https://www.dutchcentreforcirculartextiles.nl
- Dutch Circular Textile Valley: https://www.dutchcirculartextile.org/
- Dutch Circular Textiles Platform: https://www.afvalcirculair.nl/onderwerpen/helpdesk-afvalbeheer/publicaties/downloads-0/on-the-road-towards/

[222] https://loopalife.com/over-loop-a-life/

Case 4: Eskilstuna Circular Municipality, Sweden

A reuse shopping centre and smart sorting facility breathes new life into textile waste and the municipal economy

Goal

Eskilstuna Municipality wished to be a green pioneer municipality, attracting a broad target group and disseminating knowledge about sustainability and circular economy. They also wanted to make it easy for citizens to make climate-friendly choices in everyday life and reduce the municipality's own environmental impact through strong public and private partnerships.

Description

One of the initiatives in the circular municipality of Eskilstuna is the reuse shopping centre, ReTuna, and an associated civic amenity centre, Returen, both run by the municipal-owned service company, Eskilstuna Energi och Miljö (EEM).

The concept entails that the inhabitants of Eskilstuna deliver their reusable used goods to the civic amenity centre in five fractions: toys/games, furniture, clothing, decorative items and electronics. Here they are received by staff from the AMA (Eskilstuna Municipality's resource unit for long-term unemployed), which is responsible for the first stage of sorting. Next, the goods are passed on for more detailed sorting and processing in the 10-12 shops in the reuse shopping centre, where usable products are repaired, transformed, refined and eventually resold.

ReTuna opened in August 2015 and operates out of remodelled warehouses. The shops have a relatively low rent compared to regular shopping centres. Rents begin low to allow stores to establish themselves. In the first year the rent is set at SEK 700 per week, the following year at SEK 1000 and only in the third year rises to full price of SEK 1400 per week. In 2018, the shopping centre for the first time made no loss and no longer needs subsidisation from the municipality.

A further initiative in the municipality of Eskilstuna (and the neighbouring municipality of Strängnäs) is kerbside collection of textile waste from households through the so-called Optibag system, whereby the citizens sort various waste fractions (paper, plastics, metals etc.) into different coloured bags and place them for collection in a container at their own household. The waste is sent for further sorting at the optical sorting facility in Lilla Nyby, which is operated by the municipal-owned company, Eskilstuna Strängnäs Energy and Environment (ESEM), which is owned by EEM and SEVAB (the latter is the municipal energy and environmental company in Strängnäs Municipality). Here the bags are sorted in an automated facility and passed on to the respective preparation for reuse and recycling channels.

The Optibag system has been in use in the municipalities since 2011, but it was not until 2017 that they introduced a new pink bag for clothing and textiles waste to 28,000 inhabitants, after the municipalities had entered into a collaboration with the charity, Human Bridge. Human Bridge arranged for the sorting, reuse and recycling of the received textiles. About 84 tonnes of textiles were collected in the first year. Municipalities also collect used textiles through containers at recycling centres and other public spaces. Household collection through Optibag represents approx. 30% of the total collection of textiles in the municipalities.

By 2019, the collection had become too large (about 17 tons a week) for Human Bridge’s available sorting capacity. An agreement has been made with a large sorting plant in Germany, which now receives all textiles collected by the municipalities.

Involved actors:

- **Eskilstuna Energi och Miljö** operates ReTuna reuse shopping centre and the civic enmity station and is co-owner of Eskilstuna Strängnäs Energi och Miljö (EEM), which also runs Lilla Nyby sorting centre.
- **Resursenhet för Aktivitet, Motivation och Arbete (AMA)** contributes with labour to ReTuna's civic emenity station
- **Eskilstuna Municipality** invested SEK 19.5 million in ReTuna for construction and subsidisation of the shopping centre and the individual stores.
-

Results

ReTuna has created over 50 new full-time jobs. In 2017, ReTuna gained international attention through social media, foreign television reports and study visits. A film about ReTuna on Facebook, made by the World Economic Forum, has over 16 million views. In 2018, reused products were sold for SEK 11.7 million on ReTuna. About 900 tonnes of textiles are collected annually by the municipality, which are exported for sorting in Germany (company FWS GmBH).

Challenges and solutions

Customers' attitude to the price of reused products has challenged the operation of the shopping centre. An expectation of low prices places pressure on individual shop owners. The Swedish tax relief for repairing goods has not helped, as the municipality considers that the quantities of the repaired and sold goods are too low to justify the resources needed for the application procedure. The municipality thinks that a VAT-exemption would have been better suited. Instead, the problem has been solved through municipal subsidy of shop owners' costs.

The municipality is concerned with whether it will continue to be able to export textiles to Germany after EU countries begin to implement the 2025 requirement for separate collection and the amount of textiles collected increases. However, the textiles collected in Eskilstuna are of relatively high quality and are sought after by sorting plants.

Links

- Eskilstuna Energi och Miljö https://www.eem.se/privat/ Kontakt: *Vesa Hiltula* sws@planmiljoe.dk
- https://www.eskilstuna.se/naringsliv-och-arbete/arbetsmarknad/arbetsmarknads-satsningar.html
- https://www.eskilstuna.se/bygga-bo-och-miljo/miljo-och-klimat/miljo--och-klimatarbete-i-kommunen/retuna-aterbruksgalleria.html
- https://www.retuna.se/english/
- https://www.theguardian.com/environment/2019/jun/18/eskilstuna-how-a-swedish-town-became-the-world-capital-of-recycling
- https://optibag.nu/en/portfolio-items/1694/
- https://www.dr.dk/nyheder/udland/sveriges-groenneste-kommune-sorterer-toej-paa-lige-fod-med-glas-og-plast

Case 5: FRIVEP, France

Pilot collection, reuse and recycling of uniforms and work clothes

Goal

The goal of FRIVEP (Filière de Réemploi et de Recyclage Industrielle des Vêtements Professionnels) is to seed the recycling and reuse of work clothes by investigating how a profitable uniform recycling system can be developed and implemented[223].

Description

The Extended Producer Responsibility regulations for textiles and footwear in France only cover textiles from households and thus not work clothes and other textiles from public services or private companies. Moreover, textiles with logos – e.g. police uniforms – are challenging for such a system since it is is important that they don't end in the hands of people that may misuse them. Therefore, it requires special systems to reuse and recycle work uniforms. This is the challenges that "FRIVEP" is attempting to address.

FRIVEP is in French an acronym for Industrial Recycling and Reuse of Workwear. FRIVEP is the product of the first of four French "Green Deals" initiated by the Ministry of the Economy and the Ministry of the Environment in 2016. Inspired by the Dutch green deals, French voluntary public-private partnerships have been established with the aim of developing and testing innovative technologies and generating green growth[224]. The public-private partnership for textiles included, among others, the French Post Office, the SNCF railway company and industry organisations[225].

FRIVEP comprises three stages. The first phase concerned experimenting with preparation for reuse and recycling technologies. For the partners, it has been important that the work clothes be treated in a way that ensures traceability and control of outlets, so that there is monitoring of what the textiles are used for and where they end up. The second phase of FRIVEP was to pilot the identified technologies under real conditions. Under the third and final phase sorting and separation technologies were tested and the total cost of logistics, sorting and implementation of technical solutions assessed. This phase was expected to be completed by December 2019[226].

Involved actors

- **Orée** is the coordinator of **FRIVEP**. Orée is an association for more than 180 companies and organisations working to promote circular economy and sustainability in France.
- **Ministry of the Environment** and **Ministry of Economy** contributes with knowledge of circular economics.
- **The French Post Office, French Railway Company (SNCF), City of Paris, the Ministry of Defence and the Ministry of Home Affairs** are responsible for specifying user needs and providing used work clothes**.**
- Actors from the entire textile value chain: Manufacturers, collectors, sorters, reuse and recycling companies helped develop concrete solutions.
- In addition, a number of companies assist in the technical part of the project, including: **Federation of Cleaning and Associated Services Companies of Ile-de-France** and the European Centre for Innovative Textiles **(CETI)**[227].

[223] FRIVEP (2017). Démarches sur les filières – FRIVEP: http://www.oree.org/frivep.html
[224] Den franske regering (2016). *Les engagements pour la croissance verte: https://www.entreprises.gouv.fr/files/files/directions_services/conseil-national-industrie/dossier-presse/economie-circulaire-dossier-presse-2016-04-26.pdf*
[225] FRIVEP (2017). Démarches sur les filières – FRIVEP: http://www.oree.org/frivep.html
[226] FRIVEP (2017). Démarches sur les filières – FRIVEP: http://www.oree.org/frivep.html

[227] FRIVEP (2017). Démarches sur les filières – FRIVEP: http://www.oree.org/frivep.html

Results

In the experimental phase, the project has found a technical solution for how the work clothes should be handled. In addition, the suppliers of used workwear together with the City of Paris have managed to collect 20 tonnes of uniforms/work clothes that have been processed during the first experimental phase. The final results have not yet been published.

Challenges and solutions

The overall challenge was to develop a transparent method of the handling of uniforms either by direct reuse within an organisation or by recycling:

- Reuse of uniforms can be challenging if they have logos that cannot be removed or if the uniform is otherwise uniquely designed to be used by an authority (such as police or military uniforms) that prevents other organisations reusing the uniforms. In addition, many uniforms are specially designed based on specific functional requirements that do not necessarily apply in other organisations.
- Recycling of work clothes may be challenged by the fact that the textiles contain chemicals such as to make the fabrics more durable. Moreover, uniforms often consist of many different materials that further challenges recycling.

FRIVEP has attempted to develop solutions to these problems by testing different technologies and sorting solutions that ensure that the workwear is re-circulated without being misused.

References

- The French government (2016). *Les engagements pour la croissance verte:* https://www.entreprises.gouv.fr/files/files/directions_services/conseil-national-industrie/dossier-presse/economie-circulaire-dossier-presse-2016-04-26.pdf
- FRIVEP (2017). *Démarches sur les filières – FRIVEP*: http://www.oree.org/frivep.html

Case 6: Guidelines for collection, sorting and reuse, Germany

Guidelines developed by three federal states to assist municipal tendering for textile collection services

Goal

The goal is to ensure that German municipalities, national authorities and policy makers have a common understanding of the framework for the collection of textiles and a tool for ensuring optimal treatment of the collected textiles. The guidelines also help municipalities develop tenders for textile collection services and to deal with illegal collection.

Description

LAGA is the official working committee of the German federal states in the field of waste made up of federal ministers for the environment. One of LAGA's tasks is to draw up guidelines for waste management. Several players in Germany have identified the need for guidelines on the collection, sorting and reuse of used textiles as there are misunderstandings and uncertainty concerning waste collection legislation and how best to handle collected textiles.

However, LAGA did not see a need to develop such guidelines and as a result three federal states - Länder Baden-Württemberg, North Rhine-Westphalia and Saxony - joined forces to develop some draft guidelines to fill the gap. Draft guidelines were published in November 2019 and are expected to be published in final adopted form in early 2020. The Guidelines target all German municipalities, and not only municipalities in the federal states that contributed to the development of the guidelines.

The guidelines developed are not to be regarded as an executive order or law, but as a detailed manual for the collection, sorting and reuse of used textiles, containing relevant background knowledge on textile and used textile definitions, and when used textiles should be classified as waste and non-waste. The manual also explains the waste hierarchy for used textiles.

The guidelines thus aim at all levels of treatment and processing of used textiles, so that these have the greatest opportunity for reuse and failing that, for recycling.

The guidelines also cover the legal cnditions in connection with the collection of used textiles, including classification, reporting obligations, requirements for collectors, possible prohibition on collection, rules for bring-banks, etc. In addition, the guidelines contain good advice on how to tackle illegal collection and how to transport, unload and sort collected textiles. They also provide guidance on when textile waste should no longer be considered as waste (end-of-waste criteria).

In addition, the document contains guidelines for the export process of used textiles if the collected textiles are not to be reused or recycled in Germany. Finally, the document contains guidelines on how to document quantities of collected textiles and their subsequent treatment.

A large part of the guidelines can be interpreted as a code of conduct, which municipalities can impose on collectors as part of a procurement process.

Involved actors

- The German **Länder Baden-Württemberg, Nordrhein-Westfalen** and **Sachsen** has contributed to the development of the guidelines.
- **GftZ (Gemainschaft für Textile Zukunft**) has provided advice on content, but GftZ has not been involved in the writing process itself.

Results

As the guidelines are not expected to be published until the beginning of 2020, no results can yet be directly linked to their development. However, there is an expectation that the guidelines will assist in ensuring better quality of the collected used textiles and to prevent illegal collection.

Challenges and solutions

Prior to the development of guidelines, a manual was already in place for handling textile collection services. These have been implemented in the new guidelines. However, there were no guidelines focusing on the entire process of collecting, sorting and reusing textiles, and this is the knowledge gap that the guidelines fill.

Links and contact details

Link to guidelines: not available yet.
GftZ (Gemainschaft für Textile Zukunft): http://textile-zukunft.de/

Case 7: Love Your Clothes & Love Not Landfill, UK

Campaigns that encourage more sustainable clothing behaviour amongst consumers with a focus on the young

Goal

The goal of the campaigns "Love Your Clothes"[228] and "Love not Landfill"[229] is to make Britain's consumers and London's young consumers' clothing consumption more sustainable.

Description

Love you Clothes was launched in 2014 as part of UK WRAP's "Sustainable Clothing Action Plan" (SCAP) from 2013. The purpose of SCAP was to bring together textile manufactures, brands and other actors in the textile value chain on a common goal of reducing water consumption, CO_2 emissions and waste from the lifecycle of garments. Love Your Clothes targets consumers and is motivated by the recognition that consumer behaviour has a crucial impact on the life cycle of clothing textiles.

Love Your Clothes guides and inspires consumers on how to buy, share, repair, maintain and dispose of textiles in a sustainable way. The campaign uses images, videos, maps, guides and other written and informative material shared via Social Media[230], Youtube[231] and their own website[232]. On their website, consumers can search for information on specific types of clothing and materials, and the site caters for beginners, intermediates and experts in sustainable clothing consumption.

The information targets the purchase-, consumption- and disposal phases. In the purchase phase, consumers are advised on how to plan their wardrobes to reduce consumption, purchase second-hand clothes and purchase high quality and socially responsible clothing. During the consumer phase, consumers are guided in how to maintain and repair their clothing. When the consumer no longer wants their clothes, the campaign provides inspiration and tips on how to upgrade and how to best pass clothing on through selling, swapping and donating.[233].

The campaign is interactive and invites consumers to reflect on their own consumer behaviour as well as to share their best tips for a more sustainable clothing consumption. The visual and video materials often feature role models or ambassadors for sustainable textiles, who tell e.g. of their personal interest in sewing, fascination with quality textiles etc..[234].

Love not Landfill is a similar campaign that draws on knowledge and content from Love your Clothes, but whose channels and formats are adapted and targeted to young Londoners between the ages of 16-24. Launched in April 2018, Love not Landfill is funded by the European Commission and the London Waste and Recycling Board (LWARB). EU funds will cease at the start of 2020, however, and LWARB intends to extend and fund the campaign.

To customise the campaign for teenagers in London, the campaign leaders invited the target audience to talk about their clothing usage, fashion relationship and clothing, climate and resource footprint. In addition, it was investigated which communication channels young people use and how it could be made easy for young people to change their clothing consumption to become more sustainable. The campaign took shape based on this analysis of the audience and content from Love your Clothes,

[228] https://www.loveyourclothes.org.uk/about
[229] https://www.lovenotlandfill.org/
[230] Twitter, Love your clothes; Facebook, Love your clothes; Instagram, Love your clothes
[231] https://www.youtube.com/channel/UC3R7GHD1b15rgtd59CpRisg
[232] https://www.loveyourclothes.org.uk/about
[233] https://www.loveyourclothes.org.uk/search
[234] https://www.loveyourclothes.org.uk/refashion-upcycle

The campaign uses communication channels where young people are already present including social media and Instagram, in particular, as well as physical spaces in the form of shopping centres and cafes where the young people spend their time. The campaign uses a young language and visual communication to convey the three overall messages of the campaign: buy second-hand, maintain and repair and avoid discarding clothes in mixed waste.

Influencers[235] have been involved in sharing the campaign and participating in physical events. At a particularly successful event, influencers selected and styled used clothing, which was subsequently sold in a pop-up recycling shop. 4 500 visited the pop-up shop, the clothing was torn away and generated a turnover equivalent to 200 000 Danish kroner. This type of event illustrates that reuse can be smart and fashionable. In addition to pop-up shops, the campaign has held exchange markets, panel debates, workshops and other activities that encourage and inspire more sustainable consumption. The campaign also draws on "experience economy" and tries in particular to collaborate with brands that, in addition to shopping, offer cafés or similar where events can be held.

The campaign also offers a map that indicates where clothes can be donated. Love not Landfill has even set up 20 textile containers around London. The containers are located at junctions where young people move and hang out, for example, containers are placed in Topshop's' flagship store. The containers are also created to be eye-catching and promote the campaign. A number of the containers have thus been designed by the street artist Bambi. Londoners donating in these containers can also put a small name tag in their pockets so that the customer can see who the clothing previously belonged to[236].

Actors

- **WRAP** is the coordinator of both campaigns. **WRAP** is a UK non-profit organization working to minimise resource consumption by forming partnerships and catalysing action[237].
- *Love your Clothes* is supported by governments across the UK and involves a wide range of stakeholders such as fashion brands, educational institutions and civil society organisations[238].
- *Love not Landfill* is supported by **London Waste and Recycling Board (LWARB)** and by the EU-Commission, through the **European Clothing Action Plan (ECAP)**. Love not landfill collaborates with a variety of brands such as **Topshop, Depop** and **Conitiki**. These brands assist with stores for containers and events and promote the campaign on social media.

Results

Love your clothes

- Love your clothes has over 13 000 followers on Facebook, 11 000 on Twitter and 4122 on Instagram. The campaign also has more than 1 million views on YouTube, of which individual videos have between 8 000 and 60 000 views.
- In 2016 and 2019, surveys were conducted on consumer's handling of textiles in, among others, the UK. These show an increase in reuse purchases and an increase in washing on 30 rather than 40 degrees C. These effects may be influenced by Love your Clothes, but probably also by other initiatives[239].

Love not landfill

[235] Influencers er bloggere eller personer med profiler på sociale medier med mange følgere
[236] Baseret på interview med Hannah Carter fra London Waste and Recycling Board
[237] https://www.wrap.org.uk/about-us/what-we-do
[238] https://www.lovenotlandfill.org
[239] ECAP (2019)

- One of Love not Landfill's overall messages is to prevent textiles from ending up in mixed waste. Love not Landfill's own bring-banks have collected 14.3 tonnes of textiles.
- Today Love not Landfill has over 6 300 followers on Instagram. 32% of the target group is aware of the campaign, the majority of whom have encountered the campaign via social media.

Challenges and solutions

Love your Clothes

- Love your Clothes have a very broad target group that they try to influence, and it is challenging to affect all ages and types of consumption within a single campaign. They have therefore launched a series of sub-campaigns that have a clear message and that targets a more specific target group. Love your Clothes has created free promotional material that can be used by others and can be further tailored to a more specific target audience, as demonstrated by Love not Landfill. This free material contains cases and action plans aimed, for example, at engaging with universities or local authorities[240].

Love not Landfill

- Initially the campaign partnered with 23 local authorities around London. However, their budget and resources did not allow for the creation and management of textile containers, their focus was rather on other fractions such as plastic and food waste. Therefore, Love not Landfill had to look for other partners who ended up being brands.
- Another challenge was bring-banks being broken into and textiles stolen. By placing bring banks in shopping malls and stores, this challenge was also solved.

Links

Facebook, Love your clothes. URL: http://www.facebook.com/LoveYourClothesUK
Instagram. Love your clothes. URL: https://www.instagram.com/loveyourclothes_uk/
Love your clothes (2019). *About; Seach; Refashion and upcycle; Partners:* https://www.loveyourclothes.org.uk
Love not Landfill (2019). https://www.lovenotlandfill.org
WRAP (2018b)
WRAP (2019a)
WRAP (2019b)

[240] *https://partners.wrap.org.uk/campaigns/love-your-clothes/*

Case 8: ”Telaketju” in Finland

Network development programme that creates circular business opportunities in the textile industry

Goal

The overall goal of the Telaketju project is to improve the utilisation of used textiles by further developing the collection, sorting and processing of end-of-life textiles. In addition, the purpose has been to create a knowledge platform that can be a starting point for developing circular business models in the textile industry.

Description

The starting point for Telaketju is that the entire value chain should be involved in order to best support increased circularity in the textile industry. Telaketju is, therefore, designed as a complex network project with many involved actors and financing tools. It can be seen as an umbrella project for a number of ongoing R&D projects. The participating actors are distributed across the entire value chain and includes among others, textile collectors, sorters, actors who develop primary processing and automated sorting, companies that use end products, work centres that organise social work, waste centres, charities and municipalities.

The Telaketju project is divided into two main phases. **Phase 1 (2017-2019)** consisted of four major sub-projects named after the main financing actor (see Figure 7.1):

YM (Ministry of the Environment, 1/3-2017 – 1/12-2018, total budget: 205.000 EUR)
The project comprises three experiments that produce information for consumers, clarify conditions and legislation, test the possibilities for source sorting, test different ways and means of collection, map the appropriate quantity and quality of end-of-life textiles for the material cycle and facilitate training of textile sorters.

TEKES (Business Finland, 1/4-2017 – 1/1-2019, total budget: 2.670.000 EUR)
This project consists of several research and development projects for different companies and a supporting public project. The purpose of the project is to determine the potential and risks of textile recycling and the environmental impact of the various material fractions. The project also aims to model the business potential of textile recycling as a whole in Finland.

TEM (The Ministry of Employment and the Ministry of Economy, 1/8-2018 – 1/7-2020, budget: 600.000 EUR)
The project aims to support LSJH (Lounais-Suomen Jätehuolto Oy, a waste company owned by 19 municipalities in southwestern Finland) in the creation of a textile waste sorting and processing plant for various end-of-life textiles as a precursor to fibre-to-fibre recycling.

AIKO (Regional Council of Southwest Finland, 1/5-2018 – 1/4-2019, total budget: 73.000 EUR)
The project aims to support LSJH in the first phase of the creation of a textile waste sorting and processing plant as a precursor for fibre-to-fibre recycling.

The recently commenced **Phase 2 (2019-2021)** aims to explore and develop new types of circular economy business models that focus on material efficiency, reuse business, and an extension of the life cycle for textiles at both product and material level.

The sub-projects in Telaketju are different in nature, but basically focus on development and demonstration in textile collection, sorting, processing and product development. The following describes a number of specific projects in Telaketju:

Handheld textile scanner
LSJH has been working on developing a handheld textile scanner based on NIR spectroscopy using technology, cloud services and machine learning skills. (See more in Chapter 6).

Recycling of post-consumer textiles in new clothes
Pure Waste (clothing manufacturer) demonstrates with its Post Waste[241] collection, the possibility of using *post-consumer* textiles for the production of new clothes. It is Finland's first clothing collection that includes materials from *post-consumer* textiles. The collection is made from 20% used textiles, 40% pre-consumer waste from factories and 40% recycled polyester from PET bottles. The post-consumer textile waste originates in Europe, but is processed and manufactured at Pure Waste's plant in India. Pure Waste plans to establish a test spinning mill in Finland in 2020 to utilise post-consumer textile waste.

Sorting education
Fida (Finnish Charity Organization in Helsinki), TST (Finnish Charity Organization in Turku), Helsinki Metropolitan Area Reuse Centre (which runs a number of recycling shops in Helsinki and the surrounding area) and the Pirkanmaa Recycling and Work Association (Tampere) have designed and planned content for a textile sorting education.

Involved actors

- Telaketju consists of many different players (see Figure 2), but key players include:
- **Technical Research Center of Finland** (VTT) as coordinator of the Telaketju Tekes sub-project.
- **Lounais-Suomen Jätehuolto (**Municipally owned waste management company) as coordinator of the Telaketju YM sub-project.
- **The Ministry of the Environment, Business Finland, the Ministry of Employment and the Ministry of Economy and the Council of Southwest Finland** as the main sources of funding for the sub-projects.

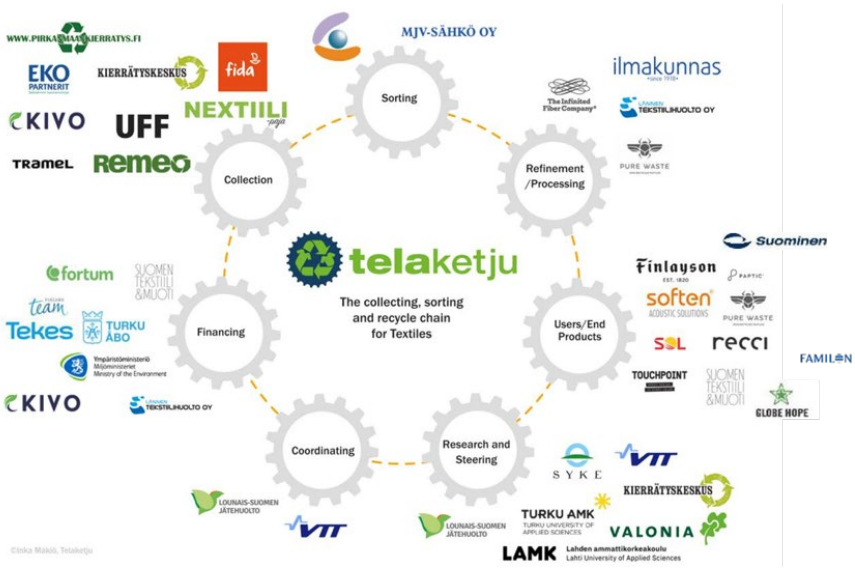


Figure 7.1: Project participants in the Telaketju YM and Tekes sub-projects

Results
The first phase of the Telaketju project, succeeded in creating an ecosystem around the circular economy for textiles based on companies and institutions with the necessary sustainability

[241] https://telaketju.turkuamk.fi/in-english/post-consumer-textiles-ended-up-in-the-clothing-collection/

knowledge. Both national and international networks were created among the participants in Telaketju, who share knowledge, hold conferences and/or participate in direct cooperation with each other. Studies and demonstrations have been carried out that clarify the potentials and risks of textile recycling, as well as obtained and published knowledge about e.g. necessary conditions for the recycling of textiles and how the existing legislation affects these.

Challenges and solutions

Due to the complexity of the project and the many actors involved, it was crucial for the coordinating actors to enter into a close dialogue with all participants in order to avoid delays in, and excessive overlap between, the various sub-projects.

A key challenge for the project has also been, that despite increased capacity and technology development for the recycling of textiles, there is still no significant demand for recycled content in new textiles. Establishing a broad commercial demand for recycled materials in the industry and the market is thus important for the future of textile recycling.

In terms of technical challenges, the development of efficient and reliable (automatic) sorting equipment for recyclable textiles is a key issue. A partial solution to this challenge may be to reduce sorting requirements by developing more robust recycling processes and applications that can use more heterogeneous recycled textiles.

Likewise, the lack of a common terminology in textile recycling was problematic in both internal and external communication. This challenge was solved when designing a terminology manual[242].

Links and contact details

- Report on the Telaketju project: https://cris.vtt.fi/ws/portalfiles/portal/24459480/Telaketju_Towards_Circularity_of_Textiles_PublicReport.pdf
- Telaketju's website: https://telaketju.turkuamk.fi
- Telaketju presentation: https://s3-eu-west-1.amazonaws.com/avfall-norge-no/dokumenter/1480.-Telaketju-Harlin-presentation_June-2019.pdf
- LSJH's website: https://www.lsjh.fi/en/business-and-environment/projects/

[242] Salmenperä (2017)

8. Discussion and conclusions

The main purpose of this report is to provide the Danish government with a basis for moving forward with the Danish implementation of the 2025 requirement for separate collection of textiles under the revised Waste Framework Directive. Therefore, this discussion mainly takes a Danish perspective, and the analysis is focused on different opportunities for Denmark in this context. The discussion is still relevant to other countries, but readers in these countries should consider how their starting point and framework conditions differ from that of Denmark.

Implementation of the 2025-requirement
The six countries ¨(Denmark, Finland, France, Germany, Netherlands and Sweden) are at various levels of readiness with respect to implementing the 2025-requirement for separate collection of textile waste. France seems to be the closest to implementation with respect to having in place 1) specific regulations on separate collection of textiles, 2) a formal definition of the scope of textiles that should be covered by collection systems, 3) a collection system where re-usable (re-wearable) and non-reusable textiles are actively sought after and accepted, and 4) support mechanisms to ensure the economic viability of collection and processing of non-reusable textiles for individual actors.

Even in France there are some potential gaps. One of these is that the French EPR regulations governing the collection, reuse and recycling of textiles currently only cover textiles from households and not from industry, commerce or public institutions.

Germany, meanwhile, has developed a draft revision to the German waste law that will place responsibility for the collection of textile waste from households on municipalities, provided that provided that the treatment of these wastes is technically and economically feasible.

The remaining countries so far lack regulations/strategies that specifically require separate collection of textile waste. Separate collection of textiles does occur, and in many cases at a higher collection rate than in France, but this is (mostly) not a result of regulation but of economic opportunity.

No economic interest in non-reusable textiles
The majority of collection in all six countries is carried out by charitable and in some cases, commercial collectors whose key driver is to raise money. With the exception of France, some collection is also carried out by municipalities but this remains relatively insignificant (with the possible exception of Germany). This has an important consequence: collection is focused on reusable textiles since non-reusable textiles currently have no value and sharply undermine the economic viability of collection. The majority of collectors do not wish to receive these textiles.

However, charities and commercial collectors still receive non-reusable textiles through their collection activities whether they want them or not. Citizens, either deliberately or accidentally deliver non-reusable textiles along with the reusable textiles to bring banks and kerbside collection. This is even the case when bring-banks are accompanied by clear information that only reusable textiles are received.

Waste collection or not waste collection?
In Germany and the Netherlands the delivery of non-reusable textiles, even under circumstances where they are not wished for by collectors, has caused such collection to be defined as waste collection. In Denmark, Finland and Sweden, on the other hand, where collectors

make it clear that they do not wish to receive the waste, this is generally not defined as waste collection and they do not need to register as waste collectors.

Producer or municipal responsibility
The six countries differ on how they will allocate overall responsibility for the collection of textiles (waste) and what systems will be set up. The European Commission's New Circular Economy Strategy envisages the development of an EU textile strategy that will refer to extended producer responsibility (EPR) as one opportunity for Member States to strengthen textile sorting, recycling and recycling, France and Sweden already, or plan to, delegate overall responsibility to producers via EPR regulations. Finland and Germany look likely to delegate responsibility to municipalities. The Danish government and supporting parties agreed in June 2020[243] to require Danish municipalities to carry out the separate collection of textile waste from 2022. The Netherlands has yet to decide who will have overall responsibility.

Ensuring the collection of non-reusable textiles
Regardless of who has ultimate responsibility, the actual collection is likely be carried out via a range of underlying systems and actors. These actors could be the same in a country with an EPR system and a country where municipalities have overall responsibility. The responsible organisations primarily need to ensure that the correct incentives and framework conditions are in place to ensure that these systems and actors operate effectively.

There appear to be two potential broad models for the organisation of collection in Denmark that would ensure the collection of both the reusable *and* the non-reusable textiles. It should ben noted that these broad models can include a large range of underlying models.

1) **A Dual model:** where collection is split between a) collection of used textiles for reuse by charities/commercial collectors and b) collection of residual textile waste by (municipal) waste companies, and
2) **A Combined model:** where all collecting organisations collect both the reusable and non-reusable textiles

Under a ***Dual Model*** charities and commercial collectors could continue with current collection activities, while municipalities would supplement these with new systems for collecting the waste fraction. But the dual model also faces some potential challenges:

a. Citizens are not good at distinguishing between reusable and non-reusable textiles and will mis-sort just as they do now. They may also not be willing to carry out this sorting and may wish to deliver all their used textiles at a single collection point.
b. The efficiency of collection and processing may be reduced compared to a combined system. Especially smaller municipal waste companies will find it hard to interact with local/global reuse and recycling markets and much of the value of the textiles may be lost.

The ***Combined Model,*** such as is implemented in France, where all collectors collect all types of textiles and transfers these to central locations, overcomes these challenges through a centralised system for all textiles. However, this model will be challenged in other ways:

a. Charitable and commercial collectors will need to be registered as waste collectors since they're activities would be defined as waste collection. Some may perceive this as a burden (see later)

[243] Klimaplan for en grøn affaldssektor og cirkulærøkonomi 16.juni2020 https://kefm.dk/media/13158/aftaletekst.pdf

b. The economy of charitable and commercial collectors will be significantly undermined if they are forced to collect non-reusable textile waste along with reusable (this fear was what led to the failure of the Dutch Green Deal)

Registration as a waste collector
As named above some charitable and commercial actors may perceive the need to register as a waste collector under Danish waste regulations, under a Combined model as a burden.

In Germany and the Netherlands all textile collectors must be registered as waste collectors and unsorted collected textiles must be transported as green waste. This does not to appear to have impacted negatively on charitable or commercial textile collectors and some see this as an opportunity to exclude 'grey' actors and to standardise the value chain for used sectors.

The effort needed to register as a waste collector and receive the necessary waste collection certificates in Denmark is limited. Moreover, transport of green waste, although requiring more documentation, is not overly burdensome and can reduce problems when shipping through countries with stricter definitions such as Germany.

Some resource demands can result in connection with the requirement to register data on collected waste in the Danish waste data system (ADS) (more on this later). A further potential challenge is a risk of losing VAT-free status for charitable collectors. This can potentially be solved as it has in the Netherlands, via the creation of separately administered companies who carry out collection and processing of used textiles, and then transfer the profits to the charitable arm of the organisation.

Supporting the collection of non-reusable textiles
By far the biggest challenge to the *Combined Model* is that collection of non-reusable textiles along with the reusable would deeply challenge the economic viability of collection and could lead to the disappearance of charitable and commercial collectors from the sector. Potential solutions include:

- Direct or indirect economic support of textile collection in return for meeting certain minimum requirements such as transparency in operations and the fate of collected textiles
- Establishing new economically viable recycling markets through investments in new sorting and processing technologies

Both types of support are included in the French EPR system. As described in Section 4.4 it is sorting companies rather than collectors that receive direct financial support from the Producer Responsibility Organisation, EcoTLC, per tonne of textiles that they receive from registered collectors. This indirectly supports EcoTLC-registered collectors through ensuring higher payments per tonne for their textiles. Emerging recycling technologies, meanwhile, are supported through an R&D fund.

Development of sorting and recycling technology
France is not the only country investing in future recycling technologies. Chapter 6 described in detail the drastic need for new technologies to cope with the additional 1.4 million tonnes of non-reusable textiles that are expected to be collected annually across Europe by 2025. In Denmark, a 50% increase in textiles separately collected would result in separate collection of 22 000 tonnes of non-reusable textiles for which viable recycling markets would be needed.

There is a need for industrial scale high-quality fibre-to-fibre recycling along with automated or semi-automated sorting of post-consumer textile waste that can provide consistent supplies of

necessary fibre types for recycling. A number of promising technologies are on the verge of being upscaled to industrial scale, in northern Europe including Sweden.

One example is the SIPTex automated sorting facility that is to be established in Malmö in Sweden, just a few tens of kms from Copenhagen, during 2020. Although, the maximum capacity of this facility would lie close to the future annual supply of Danish non-recyclable textiles, Denmark would be competing for capacity with other neighbouring countries.

In any case, the close geographical proximity of SIPTex to Denmark would only be relevant where the textile waste is separated from reusable textiles within Denmark. This currently happens to a very limited extent (1000 tonnes per year). Most Danish textiles are exported elsewhere for manual sorting due to the high cost of labour in Denmark.

Separation of waste from reusable textiles could perceivably happen within Denmark's borders under three scenarios: a) dedicated textile waste collection by municipalities under a Dual Collection Model (see earlier), b) detailed domestic sorting is supported financially by textile producers (as in France) or by national government under a Combined Collection Model, or c) after the best quality textiles have been skimmed off for sale in Denmark as currently happens, the remainder is considered as waste for recycling rather than for reuse on global markets. This latter option is discussed further later.

Most textiles are not suited to fibre-to-fibre recycling

Regardless of where automated sorting of non-reusable textile waste took place, these facilities would be designed primarily to supply fibre-to-fibre recycling facilities such as those being developed by re:newcell, Södra Cell and Worn Again. However, it is estimated that only about a quarter of non-reusable textiles are suitable for current and emerging fibre-to-fibre recycling technologies due to the need for mono-fibres or relatively simple fibre blends.

The remainder (over 1 million tonnes of non-rewearable textile waste per year across Europe) would need alternative recycling solutions. There are some examples of potential technologies including the RETEX process for production of construction panels and the Lendager/Convert process for production of insulation and acoustic panels. Such products are unlikely to offer a per tonne price for textiles waste that could compensate for increased collection costs and, moreover, may only lead to limited reductions in the overall impacts of the lifecycle of textiles.

Failing markets for second-hand textiles

Strategies for collection and subsequent reuse and recycling developed by Denmark also need to take account of the changing global markets for reuse. These are already signs that markets for lower quality re-wearable garments are drying up due to increasing supply, but constant or dwindling demand. As we approach 2025 these markets will come under further pressure.

A new approach to used Danish textiles may need to be considered to take account of these developments. In this approach Danish collectors would separate the best quality rewearable garments suitable for sale in Denmark and other parts of Europe and send the remainder for automatic or semi-automatic sorting and recycling. This is the strategy planned as part of the far reaching Teleketju programme in Finland.

Under normal circumstances, such a strategy would significantly reduce the share of used textiles that are reused and thus reduce the environmental (and economic benefits) of the used textile value chain. However, this argument will reduce in weight as global reuse markets for lower quality textiles become saturated. Importantly, such a strategy would further increase the quantity of textiles for which sorting and recycling solutions would be needed.

A need for wider policy

All these challenges suggest a need to widen the scope of policy focus further up the textiles value chain than the 2025-requirement for separate collection would immediately suggest, to both reduce the overall consumption (by volume) of textiles and to ensure that those textiles that do eventually become waste are readily recyclable.

There is a need for policies and initiatives that a) encourage eco-design of textiles for durability and recyclability, b) mainstream business models aimed at recirculating textiles until their technical life is over, and c) influence consumption behaviour towards choosing quality rather than quantity.

Registration of textile collection data provides opportunities

It is in the interest of national and local authorities to encourage or require (detailed) reporting of data in order to be able to monitor the collection and processing of used textiles. The separate collection of textiles can then begin to contribute to the revised Waste Framework Directive's ambitious targets for recycling and preparation for reuse of municipal waste. Systems for continuous monitoring of the collection of second-hand textiles will gives policy makers a better opportunity to develop goals, and legislation that can help to achieve those goals.

Of the six countries, only France currently has a robust data collection and reporting system for used textiles. France is also the only country with concrete targets for used textile collection, reuse and recycling. The regularly updated targets in France, and implementation through a well-designed system of incentives and sub-targets for producers, municipalities, collectors and sorters have led to rapid increases in collection rates, albeit starting from a relatively low level.

A Danish requirement for full transparency in the fate of the collected textiles can potentially encourage a broader application of codes of conduct for textile collectors, such as the Nordic Textile Commitment developed by the Nordic Council of Ministers[244], which increases knowledge about the fate of textiles downstream and ensures that the actors handling the textiles downstream, adhere to environmental and social standards.

[244] See e.g. Fråne et al (2017)

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Twitter, Love your clothes. URL: https://twitter.com/loveyourclothes

Towards 2025: Separate collection and treatment of textiles in six EU countries
EU Member States must establish systems for the separate collection of textiles by 1st January 2025. The Danish Environmental Protection Agency wished to gain an overview of how and under which conditions used textiles are collected and treated in other EU countries before initiating implementation of the new requirement. This report analyses the current status in Denmark and in five neighbouring countries: France, Finland, the Netherlands, Sweden and Germany. The study examines: definitions and practice of when used textiles are considered to be waste and the resulting consequences; the organisation and delegation of responsibility in used textile collection; data collection and reporting systems on used textile collection; technological opportunities for sorting and recycling of non-rewearable items and good initiatives from countries that can contribute to a more circular economy in textiles.

The results show differences between countries in the framework that guides the collection and treatment of used textiles and how the countries plan to implement the EU 2025 requirements. A clear challenge for all countries is the question of how to handle the increasing volumes of non-reusable textiles that are expected to be collected towards 2025, and how to deal with the negative impact that these textiles will have on the economy of organisations working in the used textile sector. The report presents partial solutions from countries such as France, where an extended producer responsibility system for textiles and footwear secures money for the development of recycling technologies, and Finland where an eco-system for non-reusable textiles is under development.

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