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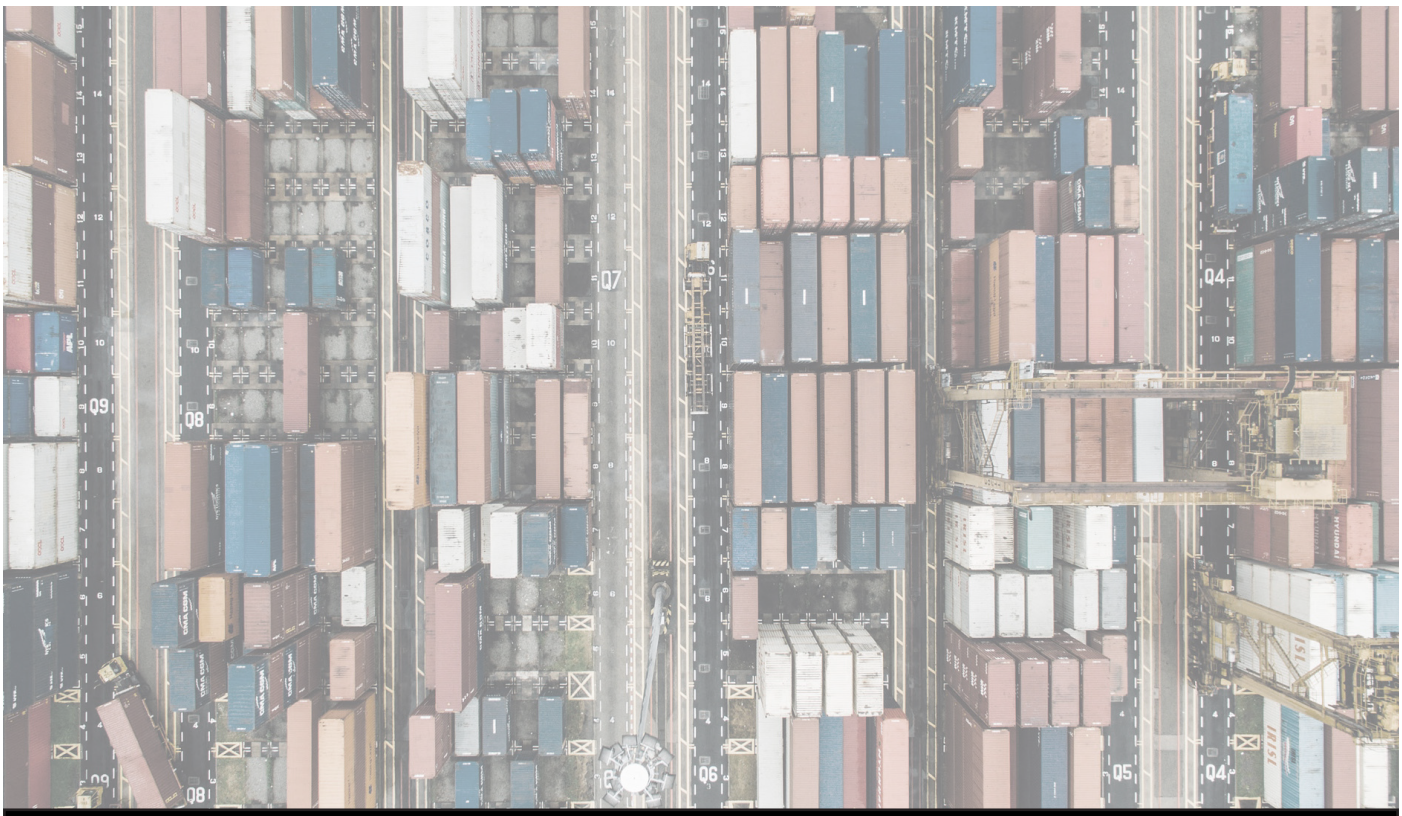

Developments in global markets for used textiles and implications for reuse and recycling

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Preface

As a part of Mistra Future Fashion phase 2, IVL Swedish Environmental Research Institute (IVL) and PlanMiljø have investigated recent and potential future trends in used textile markets. The objective was to estimate the effects of a significant increase in collected volumes in Europe on markets and prices for used textiles, and what measures would be needed to ensure continued economic viability for market actors in that scenario.

The assessment is based on trade statistics and information collected in expert interviews with Swedish, European and International actors involved in collection, sorting and wholesale of used textiles. On behalf of Mistra Future Fashion, IVL and PlanMiljø would like to thank all companies and organisations that have contributed with input to our work.

Gothenburg, January 15th, 2018
Hanna Ljungkvist, task leader

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Summary

As part of efforts to reduce the environmental impacts caused by the consumption of textiles, the Swedish Environmental Protection Agency (EPA) has proposed a goal of reducing the amount of textiles in residual waste by 60 percent in 2025, compared to 2015, and that 90 percent of separately collected textile waste shall be prepared for reuse or recycling.

The ability to achieve these ambitious goals depends to a large extent on whether collection and processing of collected used textiles remains economically attractive for the actors in the value chain. The economics of these activities are dependent on both collection conditions in Sweden and on global reuse and recycling markets since a large part of used textiles collected in Sweden is exported.

This report looks at the market dynamics governing the used textile industry. The lead research question is: how would the value chain react to a doubling of collected used textile volumes in Sweden and in Europe as a whole and what measures would be necessary to maintain economic viability? Swedish, other European and international actors involved in collection, sorting and wholesale of used textiles were interviewed to get their perspectives on this research question.

The responses provide a picture of a changing market, where new types of actors are becoming involved in collection and where economic margins are becoming tighter for collectors and professional sorters. The new actors include municipalities and retailers, providing increased competition in a sector previously dominated by charities. There is also an increased tendency for municipalities to charge the established collectors a fee for collection of textiles on public land and at the same time an increased expectation that they should collect worn out, non-reusable textiles along with the re-usable. This both increases collection costs and reduces revenue per collected kilogram of used textiles.

The demand for European used clothing has reduced in many markets that have previously been important consumers of European used clothing, such as many African countries[1]. Reduction in demand is partly due to strong growth in exports of used textiles from China and other Asian economies, but also reflects higher quality demands expressed by customers in these markets. On-going discussions concerning import bans for used clothing in East African markets are also disrupting the value chain. China has itself banned imports of a number of waste streams from Europe including used and waste textiles.

These developments have forced wholesalers to find new markets for used textiles intended for both reuse and recycling. It is especially the market for lower grade reusable clothing that has been affected; a share of the collected lower grade textiles has been forced towards recycling instead of reuse. As collection volumes grow in Europe, respondents expect an increase of mostly lower quality textiles.

Most current recycling practices produce lower quality products compared to the original textiles; in so called down-cycling processes. With historically low prices for non-reusable textiles, on recycling markets the needs for new fibre-to-fibre recycling solutions are stronger than ever. Investments in the development of such new recycling technologies and automated sorting solutions could facilitate a shift to more high quality fibre-to-fibre recycling that would be more economically viable and sustainable than current practices. There is significant ongoing research within the Mistra Future Fashion program and elsewhere, on chemical recycling technologies, i.e. for separating mixed fibre textiles and generating the same fibre quality as virgin.

Respondents also call for economic support for collection and sorting to be able to handle the expected increase in the share of low quality textiles in their collections as countries strive to meet circular economy targets. This could come from producers via extended producer responsibility payments, or from local and/or central government in return for environmental (and social employment) services carried out by the collectors.

Other important measures pointed out by respondents include reduced administrative barriers to handling and trading used textiles, and the introduction of codes of conduct to make sure that “grey actors” are kept to a minimum.

We make the following recommendations:

- Develop systems to improve statistics on collection, reuse and recycling of used textiles, in order to monitor quantities and quality levels of collected used textiles in European countries.

- Introduce minimum transparency, environmental and social standards for collecting and sorting actors for example through the voluntary certification scheme developed under the Nordic textile reuse and recycling commitment

- Provide economic support to collectors and/or sorters using such standards in order to enable increased collection and sorting capacity in Europe. This could be via extended producer responsibility regulations, wage support for workers, payments from municipalities or other means

- Remove administrative barriers and better harmonise regulation connected to collection, storage and shipment of used textiles, to enable easier collection and processing within the value chain.

-Support fibre-to-fibre recycling of textiles by funding for development and establishment of automated textile sorting. This would
a) create a market pull for recycled fibres, and
b) increase the profitability of collecting lower quality used textiles

[1] Interview responses

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abbreviations

CN	Combined Nomenclature (Codes used for product trade statistics)
EPA	Environmental Protection Agency
EPR	Extended Producer Responsibility
MFF	Mistra Future Fashion
NCM	Nordic Council of Ministers
TRA	UK Textile Recycling Association

1. introduction

1.1 background

The consumption of textiles has been shown by various studies to be the most impacting European consumption area after mobility, food and housing (EEA, 2013; JRC, 2014; Tukker et al 2006 etc.). Textiles are one of the most environmentally damaging product categories in our society. Reuse for as long as possible, and when clothing and household textiles are finally worn out, recycling, are key means for reducing the impacts of our consumption of textiles (Schmidt et al, 2015).

However, collection rates of used textiles (quantity collected divided by quantity of new textiles put on the market) are low in Sweden at around 20 percent (Elander et al 2014). This is the lowest separate collection rate in the Nordic countries (Palm et al, 2014) and one of the lowest collection rates in Northern Europe (Watson et al, 2018). Most textiles end up in incineration. P; picking analysis from 2016 (Hultén et al 2016) estimated that 7.5 kilogram of textiles per person are discarded in mixed household waste, of which an estimated 59 percent was suitable for reuse prior to discarding.

The Swedish Environmental Protection Agency (EPA) has proposed a goal to decrease the amount of textiles in residual waste by 60 percent in 2025, compared to 2015 (Naturvårdsverket 2016). The Swedish EPA also made proposals for achieving this goal in 2016 that are still being considered by the Swedish Government. These include two alternative policy measures for separate collection of textile waste: a mandatory extended producer responsibility for textiles and an obligation for municipalities to separately collect textiles from households and businesses (Östlund et al 2015). Meanwhile, recent years have seen an increase in different types of collection activities such as in-store collection by brands (Elander et al, 2017).

At European level, as part of the Circular Economy Package, recent proposals for changes to Article 11 of the Waste Framework Directive, among other things require Member States to adopt separate collection systems for used textiles by 1st January 2025. it is looking increasingly as if separate collection of used textiles and textile waste will become mandatory for Member States (though probably not before 2025). A number of European countries, including the UK, the Netherlands, Belgium and France have already taken steps to increase collection rates (Watson et al, 2018). As a result it is of key importance to determine whether there will be a market for increased quantities of collected used textiles in the future.

As identified by Watson et al (2016) over 80 percent of the textiles collected by the larger collectors in Nordic countries are sold on global markets. This maximises reuse rates for used textiles and thus the environmental benefits gained from collection. It also creates jobs in receiving countries pulling many thousands out of poverty (Watson et al, 2016). Sweden exported a net of 20 600 tonnes of used textiles in 2016 (SCB 2017). Such exports are likely to increase as collection rates increase since under current demand patterns for second-hand clothes, only the top 10 to 15 percent best quality volumes of collected textiles are likely to be of interest to Swedish consumers. The demand for second-hand clothing might, however, not increase at the same rate as the collection, then resulting in increased export of also premium qualities.

It is of key importance to ask the question of how global markets may respond to a marked increase in supply. Moreover, increasing collection is also likely to increase the share of lower quality used textiles. Both issues may affect the economics of collection and processing of used textiles.

This report examines these issues, via interviews with Nordic and European actors with long-term experience in collection and processing of textiles and in selling used textiles on global markets. The report also takes a first tentative look at how to tackle problems that may arise.

The Swedish Environmental Protection Agency (EPA) has proposed a goal to decrease the amount of textiles in residual waste by 60 percent in 2025

1.2 objectives and research questions

The main objective of the report was to answer the lead question:

How would a doubling of collection rates of used textiles in Sweden and in Europe as a whole impact the value chain for used textiles and what measures would be necessary to maintain economic viability?

This question is important in many European countries where there is political discussion on increasing collection rates of used textiles. To better understand the economic landscape of the used textile sector, the lead question is supported by a number of contributing questions:

- What are the recent developments in global markets for used textiles? How have these affected:

    1. the potential for wholesalers/sorters to find markets for various quality grades for reuse
    2. the kilogram price for unsorted used textiles (termed in the market as 'original')
    3. margins for sorters and other actors in the value chain

- What are the economic margins for collectors and how have the margins changed in recent years? What have been the key causes of change?

- What further changes in global markets and prices might we see in the future?

- Would a doubling of used textiles collected in Sweden have an effect on global prices or on the economy of collectors, sorters and wholesalers (market actors)?

By providing some answers to these questions, this research carried out within Mistra Future Fashion aims to further build the knowledge base upon which policy makers and actors in the industry make decisions. According to our interviews, there is a perception among some politicians and actors with no direct connection to global markets that used textiles provide high profits for all involved.

This research nuances this perception by presenting the experiences and views of market actors actively involved in the daily business of collecting, sorting and trading used textiles. Understanding the market dynamics for used textiles is fundamental when considering the introduction of measures aimed at supporting an increased collection of used textiles both in terms of economic and environmental sustainability.

1.3 scope

The value chain for used textiles is a global one – just like the value chain of new textiles. A large proportion of the used textiles collected in Sweden are sorted elsewhere in Europe. Furthermore, Tthe sorted used textiles are then sold on different international reuse and recycling markets. This research has therefore taken a global perspective on sorting, reuse and recycling activities, market changes and market effects of used textiles. Interviews have been carried out with different actors in Sweden as well as in other Nordic and European countries and one from Asia.

In this research the term 'used textiles' includes used clothing and household textiles as they make up the core of the used textile industry.

1.4 method

Figure 1 gives an overview of the activities and outputs of the research carried out. Watson et al. (2016) analysed fate, benefits and impacts of exported textiles for the Nordic Council of Ministers (NCM). The research presented in this report started by identifying areas for further research. Key actors in collection and sorting of used textiles were asked what areas they thought would be most relevant to investigate in more detail. Based on these inputs, the research questions in section 1.2 were formulated.

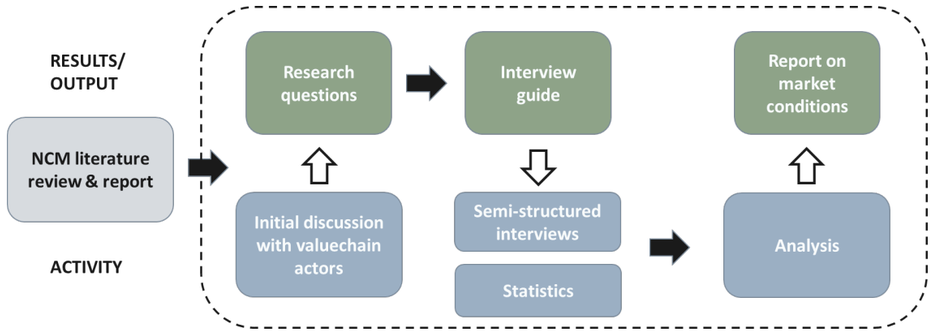


Figure 1: Overview of the methodology used in this research.

Primary data for this research were collected via semi-structured interviews with collectors, sorters, wholesalers and industry organisations in used textile value chain. An interview guide was developed and adjusted slightly for each respondent group, see appendix 1: interview guide.

A short list of different actors in the value chain of used textiles representing collectors, sorters and traders of used textiles on global reuse and recycling markets was identified, see Table 1. Focus was placed on companies and organisations that have been working in this area for many years and therefore have a good understanding and overview of developments in global markets for used textiles. The short list includes a range of actors from small to very large in order to reflect potentially different perspectives of organisations of different size.

Interviews were carried out by phone, skype or email, depending on the availability of the interviewees. The interview questions were provided in advance in order to give the interviewees a possibility to prepare and reflect over the questions beforehand, leading to more elaborated answers. For a more elaborate list of respondents, see the reference section.

Table 1: Interviewed actors, including nationality and main type of activity

Collectors	Sorters & wholesalers	Industry organisations
• Röda korset (SE) • Humana (SE) • UFF/Humana (DK) • Emmaus Fredriksdal (SE) • Emmaus Björkå (SE) • Trasborg (DK) • Fretex International + Myrorna (SE, NO, DK)	• Boer Group (DE) • Kishco Group (INT) • TexAid (DE, CH, ES) • I:Collect/SOEX (INT)	• UK Textile Recycling Association (UK)

Apart from data on exports of used textiles from Sweden, the results of the research are qualitative rather than quantitative due to the limited number of interviews carried out. The representation is biased towards Swedish and European stakeholders, and represents the stated views and experiences of such actors on issues such as changes in market prices, collection and sorting costs, global demand for used textiles etc.

Impressions and observations described by interviewees are for the most part not substantiated via comprehensive data. Rather the results of this research represent a first glimpse of changing markets and market pressures in the used textile value chain which may need to be followed up by deeper, more evidence-based research. This should be kept in mind when interpreting the results but does not reduce its value in pinpointing aspects that need to be further assessed and taken into account when introducing political measures with the objective of increasing the collection of used textiles.

2. overview of used textiles exported from Sweden

The vision of Mistra Future Fashion is to close the loop in fashion and clothing – enabling a systemic change in the Swedish fashion industry, leading to a sustainable development of the industry and society. In this context the export of used textiles collected in Sweden was considered of particular interest.

Data regarding imports and exports of used textiles to and from Sweden were retrieved from the foreign trade statistic in the Statistical database of Statistics Sweden (SCB 2017). The foreign trade statistics on textiles define products according to the Combined Nomenclature[2] (CN). The data extraction was made on CN 6-digit level as this is the most detailed level that is adjusted for non-response. The data relevant to imports and exports of used textiles are reported under the following three CN codes:

- 630900 Used clothing and other used articles
- 631010 Textile waste, including clippings and similar wastes, sorted
- 631090 Textile waste, including clippings and similar wastes, unsorted

According to Watson et al. (2016) collectors tend to report exports of unsorted used textiles ('original') as CN 630900, which is intended for reusable textiles, even though they may include non-reusable textiles. Thus used textiles imported and exported as CN 630900 include both used textiles for reuse and waste textiles for recycling, whereas textiles imported and exported as CN 631010 and CN 631090 probably primarily consist of textile waste intended for recycling.

Sweden is a transit country for used textiles collected in Norway[3]. In order not to include used textiles collected in other countries in the Swedish statistics the net-export (export minus import) of used textiles CN 630900 were mapped. For textile waste and rags CN 631010 and CN 631090 the total import is more than three times greater than the total export. It is assumed that the imports primarily comprise industrial wipes. Therefore, for categories CN 631010 and CN 631090, total exports rather than net-exports, were mapped.

Since 2010 the export of used textiles collected in Sweden varied from 14 000 tonnes (in 2014) to over 21 000 tonnes (in 2016), as illustrated in Figure 2. The amount of exported used textiles is dwarfed by the net-import of new textiles to Sweden. In 2016 almost 138 000 tonnes of new clothes and household textiles were put on the Swedish market, corresponding to almost 14 kilogram per person per year (SCB, 2017).

[2] For a definition see https://ec.europa.eu/taxation_customs/business/calculation-customs-duties/what-is-common-customs-tariff/combined-nomenclature_en

[3] Swedish Myrorna and Norwegian Fretex cooperate in exporting joint collected used textiles through the company Fretex International (Watson et al., 2016). In 2016 the share of used textiles CN 630900 imported from Norway from the total import of used textiles CN 630900 to Sweden was 96 percent.

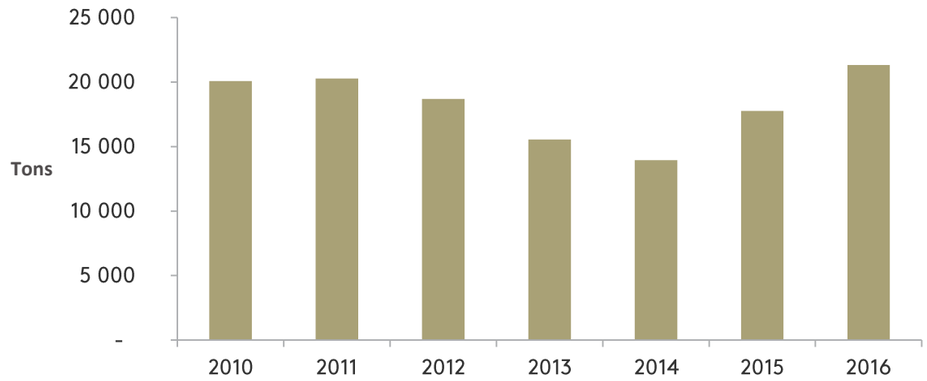


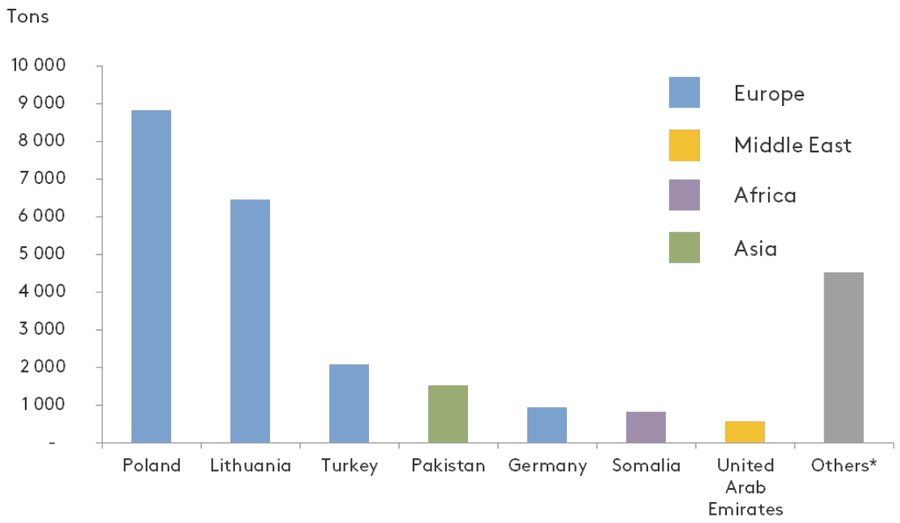
Figure 2: Exports of used textiles collected in Sweden 2000-2016 (adjusted for non-response). For category CN 630900 net-exports have been considered in order to avoid including used textiles collected in other countries (primarily Norway) in the Swedish statistics. (Source: SCB, 2017)

Figure 3 and Figure 4 (below) show the countries to which Sweden exports used textiles. The data presented in the figures are also retrieved from Statistics Sweden. However, they are not direct comparable with the data illustrated in Figure 2 as they are from another data set that is not adjusted for non-response, and quantities that transit through Sweden (see prior remarks) are not deducted from the total export. According to this data set the total export of used textiles from Sweden was 26 000 tonnes in 2016.

Figure 3 shows first destination countries that receive more than 500 tonnes of used textiles from Sweden. Most of the first recievers are European countries (Turkey is considered as part of Europe here), but also include one Middle Eastern, one Asian and one African country.

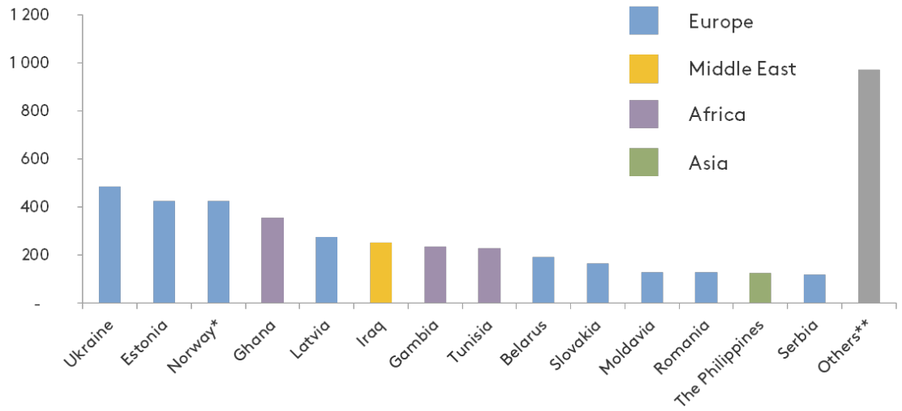
This fits with Watson et.al. (2016)'s findings where 75 percent of exports from the Nordic countries were found to be 'original' (unsorted) and are exported for detailed sorting in Eastern Europe and the Baltic States, and to a lesser extent special economic zones in non-EU countries. The economic zones legally act as a separate part of the country and must obey certain rules concerning treatment of the textiles and the resulting waste. Following sorting much of the sorted textiles are re-exported to other countries according to demand. Final destination countries vary significantly from first destination countries for Nordic exports of used textiles.

Figure 4 shows first destinations countries that receive less than 500 tonnes of used textiles from Sweden. A number of the countries are likely to be final destinations for textiles sorted in Sweden.



* First destination countries with exports ≤ 500 tons.

Figure 3 First destination countries of used textiles exported from Sweden 2016 receiving volumes greater than 500 tonnes (not adjusted for non-response) without regard to amounts of transit volumes of used textiles CN 630900 in the Swedish trade statistics in tonnes. (Source: SCB, 2018)



* Sweden exports 379 ton CN 631010 to Norway
** First destination countries with exports ≤ 100 tons.

Figure 4 First destination countries (imported amounts ≤500 tonnes) of used textiles exported from Sweden 2016 (not adjusted for non-response) without regard to amounts of transit volumes of used textiles CN 630900 in the Swedish trade statistics in tonnes. (Source: SCB, 2017)

Since 2010 the export of used textiles collected in Sweden varied from 14 000 tonnes in 2014 to over 21 000 tonnes in 2016.

75 percent of exports from the Nordic countries were found to be 'original' (unsorted textiles) and are exported for detailed sorting in Eastern Europe and the Baltic States, and to a lesser extent special economic zones in non-EU countries.

3. changes in the used textile market

3.1 sorting used textiles into different quality grades

Unsorted used textiles are often referred to as “original” when sold on global markets i.e. in original condition. Just over three quarters of used textiles exported from Sweden are exported as unsorted original[4]. Following detailed sorting, textiles are sold both for reuse and recycling in different fractions with regard to their quality and where they should be used, see Figure 5.

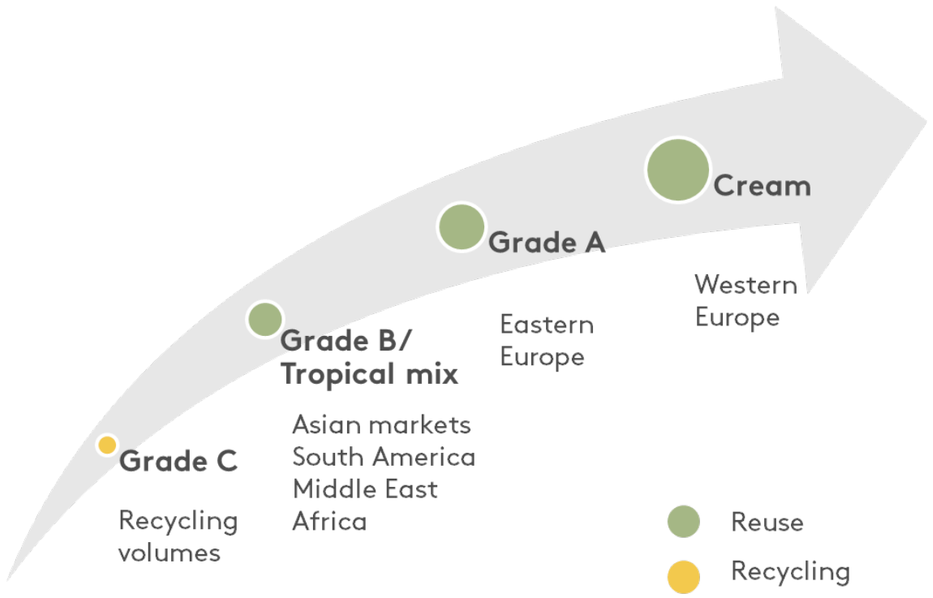


Figure 5 Collected used textiles are sorted into different reuse and recycling fractions which are sold on different global reuse and recycling markets.

The highest reuse quality is often called “cream” or shop quality and can be sold in Western-European markets. Grade A represents high reuse quality suitable for mostly Eastern-European markets. Grade B is of somewhat lower quality and is often sold in certain Asian markets, South America or the Middle East. A special grade B fraction is “Tropical Mix”; a mix of lightweight clothing sold in tropical regions and especially in sub-Saharan Africa.

Clothing and textiles that cannot be sold for reuse at all are referred to as grade C or “recycling volumes”. Different sorters may use different terminology to this, but this is the terminology we have used in our discussions with actors in the value chain.

[4] 78%. Derived from Table 1 in Watson et al (2016)

3.2 global market developments

As described in previous sections, the trade with used textile is global and diversified. Textiles collected in Sweden and the Nordic countries can end up in all continents, depending on quality, current demand and season.

Interviewees were asked about recent key developments in global markets for used textiles. The following issues emerged:

- **Uncertainty and reduced demand in existing large markets, especially in sub-Saharan Africa**

  Most collectors, but also the sorters interviewed in the study, refer to impending import bans or rises in import taxes in East African countries and Pakistan. Even if threats are not realised, they result in a high uncertainty, with lower demand, delayed payments and higher competition in the affected markets that have historically been important for many exporters of “tropical” and lower grade clothes for reuse. Fretex compares to the situation to Russia in 2000/2001, when an import tax of 1-2 USD/kilogram was introduced and efficiently closed that market for European exporters.

  TexAid pointed to a reducing demand in Sub-Saharan Africa as a result of unfavourable trade balances and resulting weakening in currencies which mean that imports from Europe become too expensive. TexAid claimed that impending bans would rather increase the demand for “stocking up” of imports, which is yet to be observed.

  A few respondents point to Chinese lobbying behind discussions on bans/restrictions on imports of used textiles in East Africa. They argue that Chinese importers of cheap, low quality new textiles are strongly lobbying Eastern African politicians to introduce restrictions on imports of used textiles to reduce competition for their products. Some express it as a joint effort of China and African states to restart the African textile industry, while others talk about “aggressive intervention” of China in Africa.

  A further recently closure of a market, is China itself. The country recently banned imports of used clothing from Europe, along with a number of other “waste” fractions (Reuters 2017). However, the Chinese market for European used textiles has never been significant.

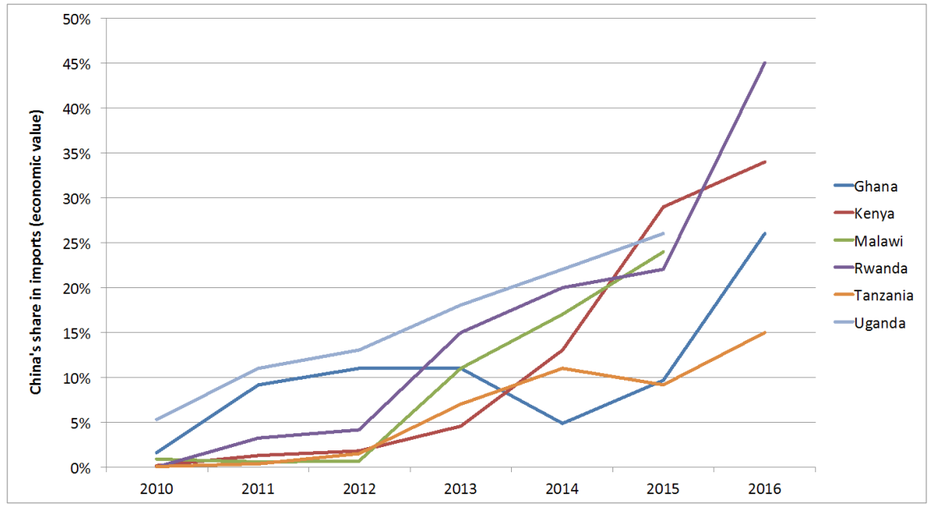


Figure 6. China's share in imports of used textiles to selected African markets
Data source: UN Comtrade data

- Strong growth in Chinese exports of used textiles

Respondents also pointed to sharp growth in Chinese exports of used textiles which are gradually flooding markets that were previously dominated by European and US used textiles exports. This is most visible in African markets. For example, in 2010 China was responsible for just 1 percent of all imports of used clothing to Kenya. By 2016 it represented 34 percent (see Figure 6).

The increase in exports is thought to be a result of improved incomes and expansion of the middle class in China, combined with a willingness to donate used goods yet a cultural unwillingness to use other people's second-hand goods.

- Demand for higher quality:

Actors also report that purchasers in many of the established markets, e.g. in Eastern Europe and parts of Africa, are asking for higher quality of second hand textiles, for the same price, since they are aware of the market situation with excessive supply and not enough demand. It has become difficult to find markets for the lower grade volumes reusable textilesfor reuse. Such volumes These then have to be sold for recycling instead, which means a lower price for the material and an excess of recycling material on the market.

3.3 changing domestic conditions for collectors and sorters

Interviewees were asked about how conditions have changed for them in collection countries. The following issues emerged:

- Increased competition in collection due to new actors:

During the last years, new actors have emergedare engaging on thein the seperate collection of textiles for reuse and recycling arena in the Nordics and other European countries elsewhere in Europethat were historically not there: namely municipalities and clothing retailers. The reasons are manifold and include focus both from governments and the industry itself on the environmental impacts of the textile industry, government waste prevention and recycling strategies and targets that include textiles and the potential for future legislation (e.g. extended producer responsibility for textiles or municipal responsibility for textile collection in Sweden) (see also Watson et al, 2018).

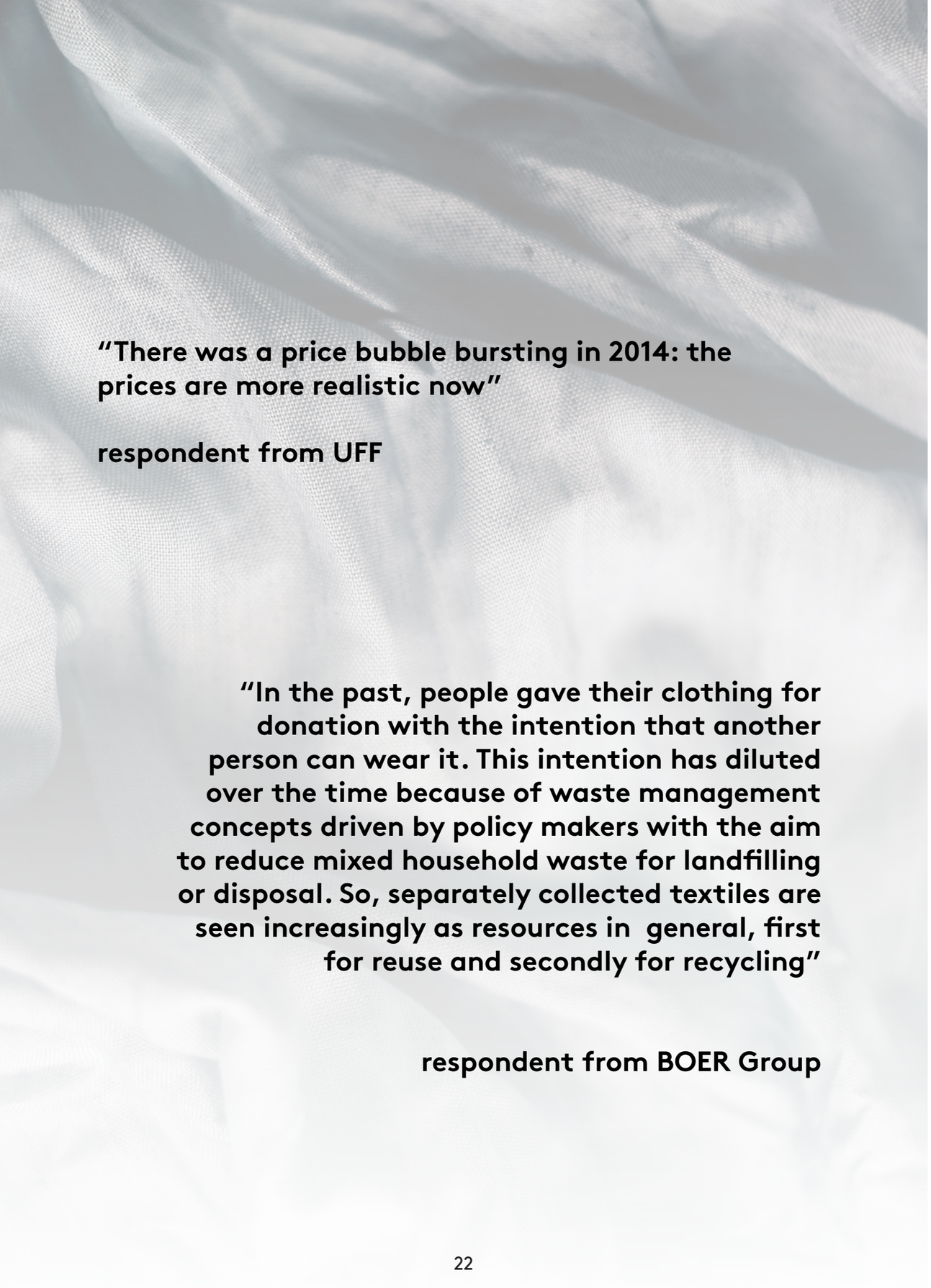
In addition, the "good years" prior to 2015 brought new actors on to the market with their eye on potential income from textile collection. This included both municipalities but also private collectors. Collectors report more containers being placed, often side-by-side at key collection points. Some collectors also claim that unserious orso-called "grey" actors – i.e. organisations that do not live up to tax requirements, employment law etc. - are affecting the market negatively., and Oone collector also reports problems with thefts from containers.

- Higher collection rates and shift to including recycling

The increase in focus on used textile collection and an increased range of means opportunities for donating textiles have in some cases led to higher volumes of textiles being collected. Moreover, collectors are increasingly accepting and advertising for delivery of worn-out or damaged items along with the reusable textiles. This is sometimes voluntary but can also be a respond to demands from municipalities under dispensation of permissions to put up containers on public ground. This implies that more reuse and recycling volumes than before are diverted from incineration and landfilling.

- Municipalities increasingly demanding payment from collectors

Respondents reported that they are increasingly being asked to pay a material fee per kilogram for textiles that they are collecting via their own containers on public land e.g. in recycling centres. More and more municipalities in e.g. Sweden, Denmark, Netherlands and Germany are setting up tender processes for permits to collect on their land that include competition on price that the collectors are willing to pay per kilogram. Reporting and traceability requirements are often included as part of the bidding process and in some cases collectors are also obliged to take non-reusable textiles along with the reusable (see above).



“There was a price bubble bursting in 2014: the prices are more realistic now”

respondent from UFF

“In the past, people gave their clothing for donation with the intention that another person can wear it. This intention has diluted over the time because of waste management concepts driven by policy makers with the aim to reduce mixed household waste for landfilling or disposal. So, separately collected textiles are seen increasingly as resources in general, first for reuse and secondly for recycling”

respondent from BOER Group

3.4 effects of changes on the activities and economy financial performanceeconomic viability of actors in the value chain

What kind of effects have the recent developments in the used textile markets and domestic conditions had on the activities and profitability of collectors and sorters? The interviewees conveyed the following main messages.

- A need to search for new markets

Some of the volumes normally sold oin African markets can find customers elsewhere, but not all of them. TexAid stressed the need for local market knowledge and local connections to be able to sell at a reasonable price for the sorter. For example, Grade B volumes that are output from sorting facilities in sorted in Eastern Europe can be sold in local or neighbouring markets, but similar volumes sorted that are output from in German sorting facilitiesy cannot.

This is partly due to the need for local contacts and knowledge, but also because the margins on Grade B can no longer pay for long-distance transport. One area where markets are improving is the Middle East, but that was the only positive example given. In general, smaller actors dealing with smaller quantities have the ability to adjust to changing markets more rapidly than larger ones although there are exceptions (see discussion).

- Lower market prices for ‘original’

During the last years, prices for used textiles have been increasingly volatile, with an overall downward trend. Almost all respondents agree that prices for original (unsotted textiles) have reduced since 2015. However, different price ranges are given depending on the collection country (Nordic used textiles have in general a higher value and quality than German used textiles for example) and the duration of trade partnerships (a long-lasting sales agreement between partners will likely give a higher kilogram price than a shorter one due to the value of trustworthy partners). One collector obtains 70 Euro cent/kilogram for original compared to 85 Euro cent two years ago, while another states that prices have fallen from 49 Euro cent to 25 Euro cent.

Some charities like the Swedish Red Cross only sell pre-sorted material, but agree that “there is a lot of talk about pricing everywhere”. Some point to exchange rates as part of the problem. British collectors temporarily saw an increase in prices paid by Central European customers for original after the British Pound Stirling weakened following the Brexit vote, but this is thought to be a short-lived effect

-Lower quality of original/lower amount of "cream"

The share of high quality clothing - so called "cream"- in original has decreased. This is reported by both collectors and sorters, and those who give numbers report 9 to 11 percent of original being cream. Only Humana stated no change in quality except where they are being expected by municipalities to advertise for and accept textile waste along with reusable textiles as part of new permit agreements. When waste is included they have also seen a fall in share of cream which means they've had to reduce the kilogram price for original. As shown in Figure 6, the share of cream in original has a significant impact on its sales value. At the same time, the share of non-reusable volumes have gone up, further squeezing the economic margins of both collectors and sorters (see later).

Some Swedish charities meet these challenge by sorting out more waste from their original and packaging material to more specific needs of customers (Emmaus Björkå, Emmaus Fredriksdal & Myrorna). They also try to sell more of the collected material in Sweden where the prices are higher (Emmaus Björkå & Emmaus Fredriksdal).

- Low prices for recyclables

Due to increased collection and lower demand for lower grade reusable textiles, it has been hard for some actors to find markets for that type of material. Some of the Grade B volumes have thus been sold for recycling instead of reuse, which in turn has led to price reductions for recyclables as recycling markets become saturated.

Many respondents agree that price for recyclables have hit "rock bottom". According to Kishco Group, products made from mechanically recycled fibres (e.g. blankets) are currently only 20 percent cheaper than blankets made from virgin fibres because of cheap new material from (mainly) China. The price difference needs to be 50 percent for customers to choose recycled-content blankets, which means that demand is currently low. Many respondents hope for high quality fibre-to-fibre recycling in the future, which they think may be the only way of valorising the increased amounts of collected non-reusable textiles.

One particularly affected recycled textile market is that for industry wipes, which according to Trasborg has almost disappeared over the past 10 years. Prices have reduced from one Euro per kilogram to 20 Euro cent per kilogram for white cotton wipes. For coloured wipes the price is even lower and can hardly pay for transport to the point of use.

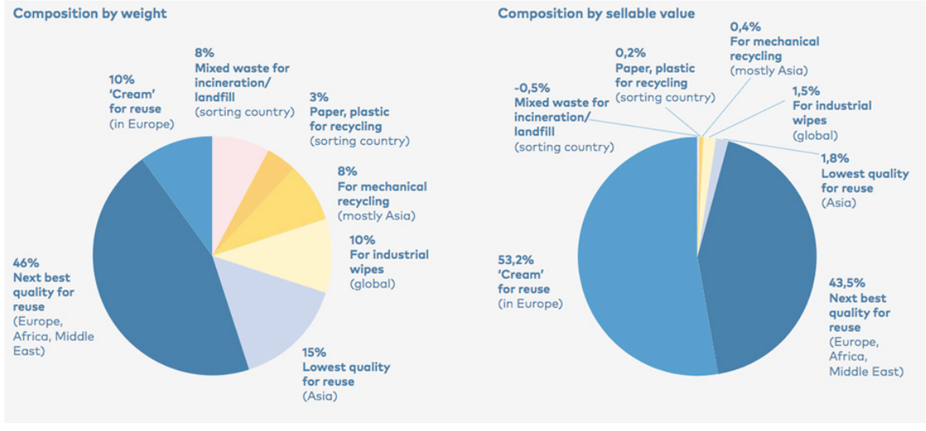


Figure 7: Typical composition of original by weight and sellable value (Source: Watson et al, 2016)

- Higher costs for collection and sorting

The increase in collection costs is partly due to municipalities, and their waste companies, increasingly asking for a kilogram price in return for a permit to place a container in a recycling centre or elsewhere. As described earlier, respondents claim it has become more common for municipalities to sell the right to collect to the highest bidder. Some municipalities do not include other criteria, i.e. service quality or reporting practices, in their tender evaluations. The extent of this problem on the Swedish market is not known, but respondents are worried.

Another reason for increased collection costs is the need to "clean" the 'original' more before selling to sorters due to increased demand for quality from the sorters. This means removing residual waste – e.g. damp or dirty textiles and non-textile waste - and items like duvets and pillows. At the same time sorting costs have increased due to higher wages, in some cases pushed by unions. In the UK for example the UK National Living Wage of 10£/h was introduced in 2016 and has potentially affected the economics of sorters. One collector noted that charities that are not paying VAT and have access to voluntary labour have economic benefits compared to other collectors.

There are different perceptions among respondents regarding their ability to adjust to changing price levels. Both small and large actors believe they have advantages due to their size. Smaller collectors noted that they are able to make up for some of the cost increases described above through more efficient algorithm-controlled logistics for emptying containers that respond to actual fill rates and driving distances.

“I am worried about the approach of some municipalities who care less about sustainability than they do about price. Certification or recommendations will be needed to address this”

respondent from Fretex

-Volatile shipping costs

Shipping costs have gone from stable to volatile and increasing, according to both BOER Group and Kishco Group. This is partly due to the bankruptcy of the large company Hanjin Shipping in August 2016.

- Lower margins, especially for sorter

The combination of higher costs for collection and sorting and lower prices for ‘original’ and sorted fractions, are squeezing margins for both collectors and sorters. Many respondents, both collectors and sorters, describe the sorters as the most vulnerable actors in the value chain. They are affected first and hardest in times of economic decline. The reduction of margins in the last years has led to some sorters going out of business, and some of the remaining companies have merged and consolidated themselves. One concrete example from the interviews is the UK sorting sector, which has scaled back and outsourced to e.g. East Europe. Sorters have shrunk in numbers from comprising 50 percent of the UK Textile Recycling Association’s members to just 20 percent in the last three to four years.

Other actors are eventually also affected by lower market prices. The municipalities were named as the last in the chain to feel or notice squeezing economic margins for used textiles. According to respondents, many municipalities still believe that collection and subsequent handling of used textiles remains as lucrative as it was in 2012-2013 which some respondents felt was the reason that they are increasingly engaging in their own collection or are demanding payment for collection permits. Some respondents noted that municipalities will first become aware of the changing market conditions when they no longer receive applications for permits at their given asking price. According to TexAid this is just beginning to happen in Germany.

- Regulatory and administrative burden on sorters and wholesalers

Used textiles are subject to import duties and licenses in many countries, which lays both economic and administrative burdens on exporters such as sorters and wholesalers. In India, used textiles can only be imported into free trade zones, and companies dealing with textile recycling must be net exporters according to law.

This is mainly driven by intense lobbying from the domestic textile industry. Much of the administrative work is connected to import and export restrictions for waste, since even sorted used textiles are sometimes classified as waste. In Germany collectors are increasingly obliged to be registered as waste collectors, especially if they are exporting original (TexAid). This could also become reality for charity collectors in Sweden, who have so far been seen as collecting “products” for reuse only.

“Collection and processing of used textiles is not treated as a serious industry, but is suffering from too many regulations and restrictions. There is a huge potential demand in India. Without restrictions the used clothing would take market shares from new clothing”.

respondent from Kishco Group

“Subsidies for sorters will be needed, or they will disappear, both charities and commercial ones”

respondent from BOER Group

“Hard times cascade from the sorters to the collectors and down to the municipalities, who will start feeling the squeeze soon.”

respondent from TexAid

3.5 future case: doubling of volumes

Respondents were asked what would happen if the collected volumes of used textiles doubled in their main operating countries, and across Europe as a whole? This could be the case in Sweden for example if extended producer responsibility for textiles or separate collection of textile waste, is realised.

Respondents did not believe that a significant increase in textile collection in a single (smaller) country such as Denmark or Sweden would have an effect on global markets or global prices, but that it would affect the share of good quality textiles being collected in the country and thus the price they could obtain per kilogram.

Respondents were unanimous in believing that a doubling across Europe as a whole, on the other hand, would have dramatic effects. Figure 8 illustrates the respondents´ expectations regarding future quality and price levels for collected used textiles. Both quality and market prices will go down as a result of increased volumes (“scraping the bottom of the barrel”) and increased competition for the same size of markets. Some respondents also think that global demand for reused clothing will reduce over time, despite increasing global populations.

Price development may differ between qualities, with the price for ‘cream’ remaining relatively stable (TexAid) since increased collection will probably not significantly increase quantities of cream. The price for the lower qualities will reduce, however, as collected quantities increase but demand does not follow sui

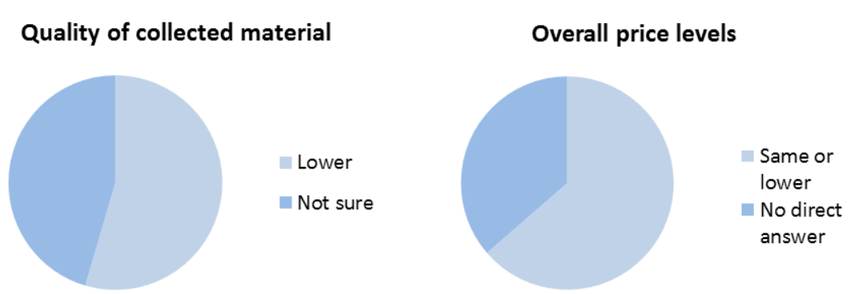


Figure 8: Respondents expectations regarding future quality and price levels for collected used textiles.

The reduction in quality means lower share (but not total volume) of cream and a higher share of non-reusable textiles in collected original. The respondent from BOER Group gave the imaginary example on doubling of volumes and the resulting quality shares in Table 2, based on an estimated current collection rate of about 3 kilogram/inhabitant.

Table 2: Estimation of European volumes by quality (BOER Group respondent).

	Today (tonnes)	Today (percent)	Double (tonnes)	Double (percent)
Reuse	1 320 000	55	2 160 000	45
Recycling: wipers	480 000	20	720 000	15
Recycling: insulation	480 000	20	1 680 000	35
Waste	120 000	5	240 000	5
Total volumes	**2 400 000**	**100**	**4 790 000**	**100**

Since the revenues from reusable volumes and especially the top quality textiles are the "bread and butter" of the whole used textile industry (see Watson et al, 2016), the scenario above presents a serious challenge for all actors, particularly the sorters since their collection costs will increase at a higher rate than their revenue. This is especially true if prices for non-reusable textiles continue to be as low as they currently are. One respondent questioned if it was worthwhile to mechanically recycle such textiles or if it would be better to incinerate them.

The respondent from Kishco describes the effects of doubled European volumes on more global scale:

"Prices would go down. While demand and supply usually has a 10-20 percent mismatch, a doubling somewhere in the world would increase that mismatch. New handling/sorting/recycling capacity would have to be built to retain balance, and this would take a few years. Then the market would be "balanced" again. A change in one market affects the whole industry: e.g. if EU volumes doubled, prices would go down and Kishco would adjust the supply base to buy more from Europe (today 15 percent) than from North America (today 80 percent)."

3.5.1 suggestions by respondents on how to cope with the double volume scenario with lower quality and lower prices

- **Extended producer responsibility**

  The need for extended producer responsibility of some kind is stated by many respondents, from a more general "producers should support collection activities" to the notion that a mandatory extended producer responsibility regulation or at least separate collection of textiles within the new Waste Framework Directive is needed to make a real difference (BOER Group). UK Textile Recycling Association (TRA) is sceptical towards regulations on extended producer responsibility for textiles as they believe that such regulations to a certain extent justify business as usual ("pay a fee and it´s done…").

- **Revolution in sorting and fibre-to-fibre recycling options**

  There is a great need to find new recycling markets, preferably with higher quality (and thereby higher price levels) than the currently available mechanical recycling options. Automated sorting is another potential game changer that could handle high volumes of low quality textiles at a lower cost than manual sorting. The Swedish Red Cross wishes for an automated sorting facility in Sweden.

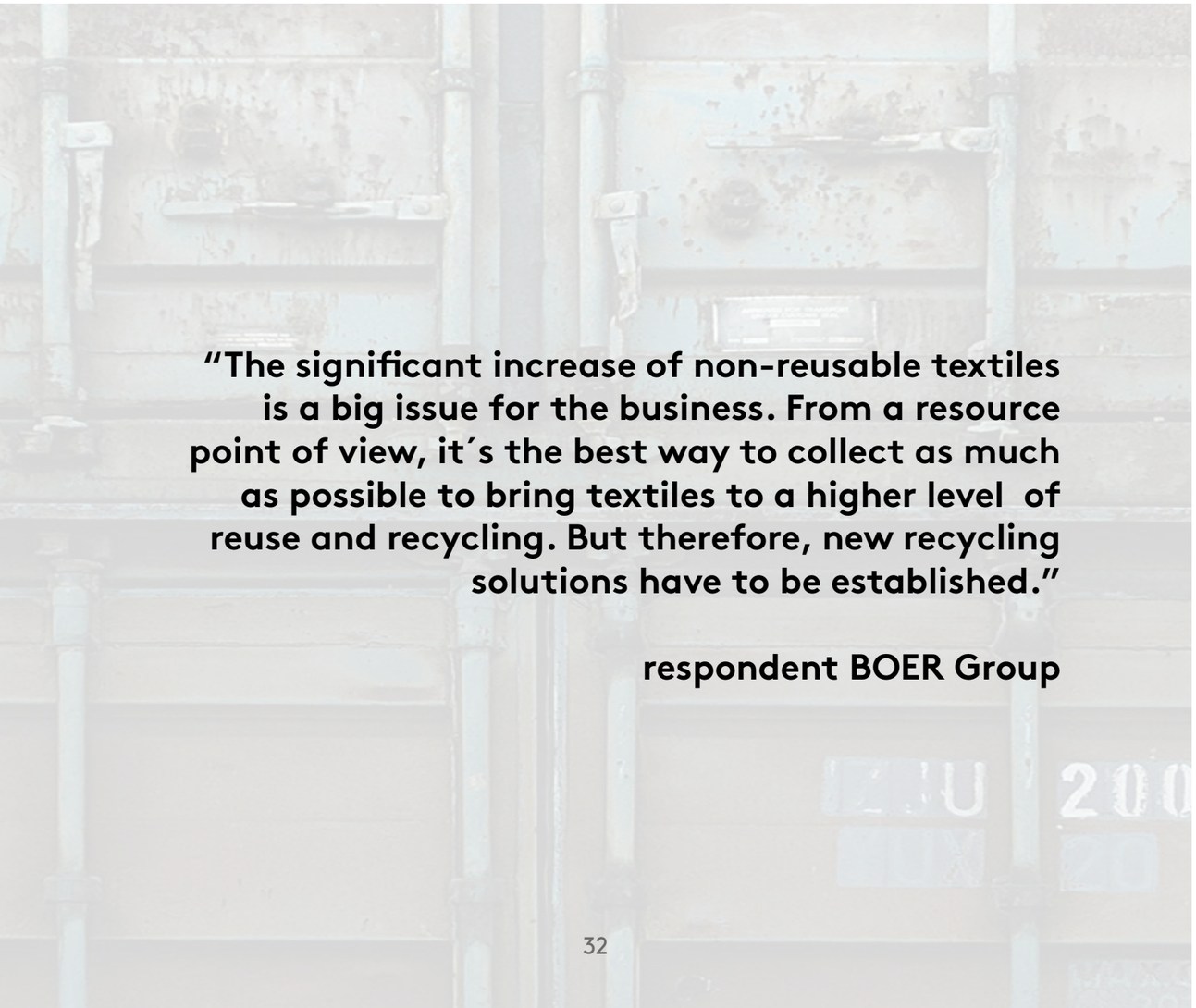
  There is currently a lot of development in the fields of chemical recycling and automated sorting all over Europe. In Sweden, the project SipTex has run trials with automated sorting of recyclable textiles for the past year, and Renewcell is setting up a pilot plant for chemical fibre-to-fibre cotton recycling.

  Respondents look to these developments and similar with hope, but concluded that it may take five to ten years before new solutions are in place on a large scale. Raw material prices will be one key aspect affecting the speed of development (TexAid). Economic incentives may also be needed to support new technologies as they establish themselves on the market (UFF). Until there is a breakthrough, non-reusable textiles remain a challenge for the used textile industry.

- Less consumption, more reuse and new business models

TRA stresses that we cannot continue to export large volumes of used textiles from Europe, and rather believes we must begin addressing the consequences of our own textile consumption through more sharing, greater reuse and less fast fashion. Emmaus Björkå also touches on this by stating that there should be increased demand for reuse in all European market segments in the future. This would also reduce consumption of new textiles and thus eventually reduce the glut in supply of reusable textiles.

Time will tell if Europeans are willing to adapt more sustainable and circular uses of textiles in the future or not. In India, Kishco proves that old habits can be changed, even though it takes time. Their new national platform for branded used clothes shows promise among younger people who are not as influenced by the historical stigma of used clothes only being for poor people.



“The significant increase of non-reusable textiles is a big issue for the business. From a resource point of view, it´s the best way to collect as much as possible to bring textiles to a higher level of reuse and recycling. But therefore, new recycling solutions have to be established.”

respondent BOER Group

4. discussion

Some interesting patterns and differences are found in the interviews. The following reflections were made in the analysis of the answers from the interviews:

- High level of agreement between actors on the main messages

All respondents are in agreement regarding the main features of the used textile market, namely more competition in collection, lower prices, higher collection costs, uncertainties in many markets and the need for improved demand for recycled material. They also agree that the reduced margins affect the sorters first. This reflects an interconnected market where a change somewhere is felt by every actor, although with different timing.

- Collection rates are expected to increase, but the level of quality is more uncertain

Given the proposal on an EPR by the Swedish Environmental Protection agency, and on-going discussions on European level about separate textile collection, volumes of collected textiles are likely to increase in the future. The respondents are expecting higher volumes in the future and some are concerned about what this could mean for the quality of collected material. To verify this type of expectations, it would be interesting to conduct further research on the quality of collected used textiles, and to monitor the quality over time.

- Tighter margins push development towards higher efficiency

The market developments have led to a smaller economic operating space for collecting and sorting actors. This, together with the higher quality requirements from buyers of second hand textiles spurs the trimming of organisations towards higher efficiency. The Swedish Red Cross believes that the development of the market is good from an overall perspective, driving better and more efficient uses of used textiles in the long term. However, the lower price levels also mean that some organisations are disappearing from the market. Humana believes that it´s the non-serious actors that disappear first. This could be the case, if such actors are driven by high returns and do not feel it is worthwhile continuing the business when margins get smaller. However, TexAid argue that “grey” actors may have lower costs to begin with (lower administrative costs, not meeting employment laws etc.), which could give them an economic advantage.

- Actors ability to adjust to new market developments

An interesting feature in the interviews is the perceived ability of organisations to cope with the shifts in the market. Big and small collectors have different views. Smaller actors such as e.g. Trasborg think they will be able to adapt more easily, while some larger companies such as e.g. TexAid think that they will have an advantage ´due to their large size meaning they can spread themselves between different locations and markets.

However, the BOER Group as another large sorter expresses a limit in flexibility due to their large size. Actors who employ codes of conducts (UFF/Humana, Red Cross) have difficulties to switch partners quickly, irrespective of their size. This reduces their ability to quickly turn to new markets etc. At the same time, long-term relationships can be positive when negotiating prices, as reported by Trasborg.

- The structure of the value chain is changing

Given the descriptions of current market trends by respondents and the many on-going initiatives in automated sorting and chemical recycling technology, it seems the landscape of the used textile industry could change substantially during the coming years. The trend of more differentiated collecting actors will most likely continue, while the number of manual sorting actors may be reduced due to cost issues.

Figure 9 shows an example of how the Swedish value chain structure could look within the next five to ten years, in response to current challenges and trends. The figure could be seen as a "best case", if the wishes and hopes for new recycling solutions and more efficient sorting expressed by respondents come true. Automated sorting would probably need to be regional in order to get sufficient volumes and economies of scale. Local reuse and remanufacturing has the potential to increase from current low levels, if customers adapt more resource efficient trends and lifestyles. Some export for reuse outside the EU would probably still take place.

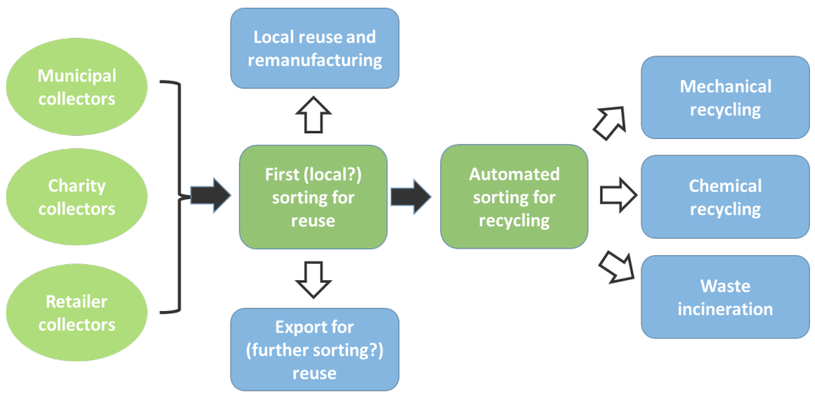


Figure 9: Possible future outline of the Swedish used textile value chain.

"Texaid can survive because it is a large company with collection and sorting in many countries and is therefore able to diversity and react to changing stuations. We are better off than most because are fully integrated vertically and are widespread so more able to resilient to change than smaller collectors."

respondant from Texaid

- There is need for economic support for handling of used textiles

Many actors see a need for economic support if the industry handling used textiles (including collection, sorting, trade) is expected to collect higher volumes and with increasing shares of non-reusable textiles with limited economic value. This support could be in the form of extended producer responsibility but it could also take other forms, for example, subsidies from municipalities to support collection, sorting and processing of non-reusable waste textiles.

If extended producer responsibility regulations are introduced in Sweden and/or other European countries, it is important to consider the structure of the market as well as interactions between different actors and market segments. Looking at experiences from the French extended producer responsibility organisation for textiles and shoes, EcoTLC, and considering how to deal with lower quality and higher volumes are important considerations to ensure an efficient regulation able to achieve ambitious environmental targets. It is also important to connect economic support to codes of conduct requirements, in order to avoid non-serious actors.

Another form of economic support is municipal or regional subsidies to collectors. Municipalities and regions could potentially support textile collection since this means that their waste costs will be reduced. In the Netherlands and Flanders collection and sorting is partially subsidized by the region/municipality via employment subsidies. This has the dual goal of environmental benefits, reductions in waste costs and social support/ training for long term unemployed, socially marginalised groups (Watson et al, 2018).

5. conclusions and recommendations

This research has put focus on current developments both in global markets for reusable and non-reusable textiles and in the local frameworks in Sweden and elsewhere in Europe under which collectors and sorters operate. It has considered how actors operations and economic viability have been affected by recent developments in the markets, and how they would be affected by a future doubling of collected used textiles in Sweden or Europe.

The results show a changing value chain, with further changes expected in terms of requirements as well as in actor structure and textile volumes. Respondents agree that higher volumes of used textiles are expected to be collected in Europe under the new circular economy agenda. The quality of collected used textiles is reported to be decreasing and could be further affected by increasing collection rates with lower shares of high-grade, high value materials. Current markets for second hand textiles are changing due to higher quality requirements and increasing competition with low-price new garments. Finally, potential new markets for recycling textiles might be emerging due to technological developments in sorting and recycling of textiles, but these will take time to reach maturity and be scaled up to a significant level.

Key domestic developments include an increased tendency for municipalities to charge the established collectors a fee for collection of textiles on public land. At the same time there is increased expectation that collectors should collect worn out and non-reusable textiles along with the re-usable.

Even where they aren't specifically communicating to citizens that they should deliver their worn out socks, some collectors report a reduction in the quality of textiles they receive. There can be a range of causal factors for this: an increase in fast fashion and reduction in quality of clothing put on the market; increasing C2C exchanges of clothing with money or otherwise, which means that textiles may have had more usage before they are collected, and finally; a growing awareness amongst citizens that there is also potential societal value in their worn out clothing.

Collectors are experiencing a reduction in the kilogram price they can receive from wholesalers/sorters for original, not simply because of reducing quality but also because global demand for used clothing can't keep up with increasing supply. The combined effect of these developments is a squeezing of collectors margins, as collection costs increase and income from collection decreases.

Sorters/wholesalers are similarly feeling the pinch as global markets for used clothing become saturated, not least as a result of the explosion in the supply of used textiles from China, and buyers become pickier. The challenges are only likely to increase with time as used textile collection accelerates as a result of stronger policy at EU, national and local level, and a higher engagement from the fashion and textile industry.

Increasing collection volumes is, of course, a positive trend and one that should be welcomed. More textiles will be diverted from incineration and landfill onto more resource efficient solutions with resulting environmental benefits. At the same time we need to ensure that increasing collection rates are not paradoxically destroying the used textile collection and processing industry.

Collectors are experiencing a reduction in the kilogram price they can receive from wholesalers/sorters for original, not simply because of reducing quality but also because global demand for used clothing can't keep up with increasing supply.

What measures would be necessary to obtain economic viability in the value chain? Given increased volumes and the other reported market changes, the following suggestions are made:

Many collectors and sorters argue for some form of economic support if they are expected to handle, i.e. collect, sort, trade and recycle, used non-reusable textiles along with the reusable. This support could come via extended producer responsibility regulations that (EPR) regulations that could help to shift the cost structure of the used textile industry to include producers. This could help compensate for higher collection costs due to increased collection and due to lower (average) revenues for collected used textiles as a result of a potential decline in quality. Another possibility is to regulate separate collection of waste textiles through the Waste Framework Directive. Depending on the type of future legislation and the included requirements, new actors like municipalities or retail collectors may play a larger role in the future.

The ideal scenario for all actors would be that the increasing share of non-reusable textile begins to raise real income for the collection and processing industry and not be the economic deadweight it is today. This requires both technological advancements through research and development in new sorting and recycling technologies in Europe and increased demand for recycled fibres from the fashion industry in particularly.

European automated sorting technologies for the non-reusable fractions that are being developed and showcased by projects such as SIPTex and Fibersort which are showing promising results producing high quality textile fractions for fibre-to-fibre recycling purposes. This type of novel technologies are expensive and need economic support.

So does further development of the extensive research ongoing to improve fiber-to-fiber recycling, for example the Re:Mix project (Östlund et.al. 2017) and Palme (2017). Examples and evaluation of policies to support fiber-to-fiber recycling have been given in Mistra Future fashion by Elander et.al. (2017a). Meanwhile, as identified by Watson et al (2017a) a number of brands both in Sweden and elsewhere are already engaging in using recycled materials in their products and to a lesser extent designing products for each of material recovery.

Equally relevant to future Circular Economy targets and increased profitability in the used textile value chain is the fostering of more resource efficient circular consumption of textiles within Europe. This would potentially reduce the current heavy dependency on markets outside Europe. Supporting new business models of fashion consumption (see for example Elander et.al. 2017b and Watson et. al. 2017b) and nudging consumers to adopt new habits are key to build local markets for the future. More local and regional reuse, remake/remanufacturing and recycling is hopefully growing increasingly accepted and popular in many market segments, reducing environmental burden and creating new jobs in Europe.

A more immediate need for collectors and sorters are regulatory actions to reduce the administrative burdens related to collection, storage and shipment of textile waste. Today, countries and regions have very different requirements and regulations, which is challenging for the industry actors. In this context, harmonisation of requirements would help, both across Europe and globally.

5.1 recommendations

In summary we make the following recommendations

- Develop systems to improve statistics on collection, reuse and recycling of used textiles, in order to follow up amounts and quality levels of collected used textiles in European countries.

- Provide economic support to collectors and/or sorters running transparent and environmentally appropriate operations, in order to enable increased collection and sorting capacity in Europe. This could be via extended producer responsibility regulations, wage support for workers, payments from municipalities or other means

- Introduce standards for collecting and sorting actors to promote serious businesses in the value chain, for example through the voluntary certification scheme developed by the Nordic textile reuse and recycling commitment

- Remove administrative barriers and better harmonise regulation connected to collection, storage and shipment of used textiles, to enable easier collection and treatment within the value chain.

- Support fibre-to-fibre recycling of textiles by funding for development and establishment of automated textile sorting. This would:

  a) create a market pull for recycled fibres, and
  b) increase the economic viability of collecting non-reusable textiles

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I:Collect/SOEX. Paul Dietzsch Doertenbach, Head of Sales and Marketing. 2017-12-21

Kishco Group. Nohar Nath, Executive Director. 2017-11-03

Myrorna. Emma Enebog, Sustainability Manager. 2017-10-17

Swedish Red Cross. Martina Bozic, Business development Second Hand. 2017-10-19

TexAid. Martin Boeschen, CEO. 2017-11-17

Trasborg. Steen Trasborg, CEO. 2017-11-28

UFF, Humana. Kaj Pihl, Collection Manager. 2017-12-05

UK Textile Recycling Association. Alan Wheeler, Director. 2017-10-26

Appendix 1: interview guides

Questions for collectors:

C1. How much did you export in 2016? To which countries? What was the share of pre-sorted and original?

C2. What are the recent developments in global markets for used textiles?

C3.What have the effects of global market changes been on:
- your export activities
- your economy
- collectors in general?
- Sorters/wholesalers?

C4. How marginal are the economics for collectors and how have these changed in recent years?

C5. What have been the key causes of this change? E.g. change in prices on global markets as described earlier; changes in collection costs; increase in players on the market etc. Other

C6. Have you noticed any change in quality of collected textiles as collection rates have increased (if they have increased)?

C7. Would a doubling of used textiles collected in [your country] of operation have effects on global prices, and on the economy of collectors?
Consider also that this may change the quality level of the collected textiles i.e. lower share of shop quality

C8. Would a doubling of used textiles collected across the EU as a whole have an effect on global prices and on the economy of collectors?
Consider also that this may change the quality level of the collected textiles i.e. lower share of shop quality

C9. What further changes in global markets and prices do you foresee in the future?

C10. Any other comments regarding the used textile market?

Questions for Industry organisations:

I1. What are the recent developments in global markets for used textiles?

I2. What have the effects of global market changes been on:
- the export activities of your members?
- the economy of your members?
- Sorters/wholesalers?

I3. How marginal are the economics for collectors and how have these changed in recent years?

I4. What have been the key causes of this change? E.g. change in prices on global markets as described earlier; changes in collection costs; increase in players on the market etc., other.

I5. Have your members noticed any change in quality of collected textiles as collection rates have increased (if they have increased)?

I6. Would a doubling of used textiles collected in [your country] have an effect on global prices or on the economy of collectors?

I7. Would a doubling of used textiles collected across the EU as a whole have an effect on global prices or on the economy of collectors?

I8. What further changes in global markets and prices do you foresee in the future?

I9. Any other comments regarding the used textile market?

Questions for sorters/wholesalers:

S1. What are the recent developments in global markets for used textiles?

S2. What effects have these global market changes had on:
- your import/export of used textiles
- the economy of your used textile business
- the price you offer for original

S3. How marginal are the economics for sorters/wholesalers and how have these changed in recent years?

S4. What have been the key causes of this change? E.g. change in prices on global markets as described earlier; changes in sorting costs; increase in players on the market etc.; other?

S5. Have you noticed any change in quality of collected textiles as collection rates have increased (if they have increased)?
S6. Would a doubling of used textiles collected across the EU have an effect on global prices or on the economy of sorters/wholesalers?

S7. What further changes in global markets and prices do you foresee in the future?

S8. Any other comments regarding the used textile market?

Mistra Future Fashion is a research program that focuses on how to turn today's fashion industry and consumer habits toward sustainable fashion and behavior. Guided by the principles of the circular economy model, the program operates cross disciplinary and involves 60+ partners from the fashion ecosystem. Its unique system perspective combines new methods for design, production, use and recycling with relevant aspects such as new business models, policies, consumer science, life-cycle-assessments, system analysis, chemistry, engineering etc.

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