Is Sweden ready to implement a textile recycling system?

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MOA PORSE
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SUMMARY

It is problematic from an environmental point of view when consumers have damaged or worn out textiles and need to dispose of them (Domina and Koch, 2002). Domina and Koch (2002) explain that unwanted consumer textiles that are not suited for donation to charity organizations, are simply thrown into the trash. Textiles are nearly 100 percent recyclable and according to Hawley (2006), nothing in the textile and apparel industry consequently should be wasted. It will be a major positive impact on the environment if we can reduce the amounts of textile waste through recycling. In addition, recycling will reduce the emissions arising from new manufacturing by making use of existing resources (Naturvårdsverket, 2013).

Recycling signifies any recovery operation by which waste materials are re-processed into products, materials or substances (Tojo., et al. 2012). It is an ecosystem-inspired design approach where all waste from one component of the system becomes food for another (Fletcher, 2008). There is currently no large scale recycling of textiles in Sweden, nor is there any major export for recycling of Swedish textiles (Palm, 2011). But Swedish producers and retailers have started to consider the value of re-establishing a recycling plant within the country (Tojo et al., 2012).

The future market of the textile industry faces an inevitable challenge. It is important to find materials that could replace the large amount of cotton used today and find solutions on how to produce synthetic fiber without increasing the yield of oil (Sandow, 2012). In addition, the demand for textiles has been growing sturdily during the last decade and the world wide annual consumption has reached approximately 73 million tons. The expected growth rate is three percent per year (Renewcell, 2012). Consequently, there might be a greater demand for recycled textile fibers in the future.

However, the issue of the implementation of a textile recycling system in Sweden is complex with many aspects to take into account. The aim for this report was to explore the areas of research in textile recycling, and by dint of seven experts, determine whether or not Sweden should implement a textile recycling system, and how that should be done. The essential factors for implementing a textile recycling system in Sweden was concluded to be: environmentally sustainable growth, better technology and chemistry, consumer responsibility, producer responsibility, supply of textiles for recycling, demand for recycled fibers, facilitating the voluntary organizations (optimizing reuse), pricing and profitability, sustainable and economical logistics, supporting policies, sustainable products that are easy to recycle, global collaborations.

It was concluded that Sweden should implement a textile recycling system. The initial phase of the system (within ten years) should be to establish collecting arrangement for textiles in all conditions. The discarded textiles should be sorted in Sweden and exported for recycling. If the textile industry will shift to having a near-sourcing strategy and if synthetic cellulose fibers will revive the Swedish textile industry, Sweden could benefit from having a complete recycling system within 20 years.
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1. Introduction

The major challenge of our time is to find a way to use available resources in a societal effective way and to create sustainable development (Ekström and Salomonson, 2012). Textile production shows a significant environmental impact. Due to a heavy use of pesticides, chemicals, herbicides, salt, water and energy; the textile industry eventuates in global warming, eutrophication, acidification, toxicity, and so on. To lessen the impact of these factors, we need to reduce our consumption, reuse what is still intact, and recycle the textiles that are at their final stage (Palm, 2011). It requires joint efforts from different operators involved in consumers purchasing and disposal of clothes (Ekström and Salomonson, 2012).

Recycling is part of the concept of elimination of waste. Recycling is an ecosystem-inspired design approach where all waste from one component of the system becomes food for another (Fletcher, 2008). The textile recycling industry is one of the oldest and most established recycling industries (Hawley, 2006). But due to economical, technical and institutional obstacles, recycling in Sweden is a non-existing market (Palm, 2011). However, Swedish producers and retailers have now started to consider the value of re-establishing a recycling plant within the country (Tojo et al., 2012). A reduction of the amounts of textile waste, through recycling, would have a major positive impact on the environment. In addition, recycling will reduce the emissions arising from new manufacturing by making use of existing resources (Naturvårdsverket, 2013). Recovering and recycling textiles provides both environmental and economic benefits by (Bureau of International Recycling, 2013):

- Reducing pressure on virgin resources. This includes materials traditionally used in textiles such as cotton or wool, as well as oil and other chemicals employed to produce synthetic fibers.
- Reducing pollution as well as water and energy consumption.
- Reducing the demand for dyes and fixing agents. This, in turn, lowers the number of problems caused by their use and manufacture.

For a sustainable human economic system, the life cycle assessment needs to follow the “cradle-to-cradle” concept, rather than the “cradle-to-grave” notion (El Haggar, 2007). The aim of implementing the waste management strategy, generally known as the 3R:s (reduce, reuse, recycle), is to extract maximum benefit from products by extending their life; either as a whole product, or as fabrics or fibers. The purpose of waste management strategies is to disrupt the linear flow of materials through the industrial system; flows where materials are obtained from the nature, processed, used and eventually move out the system and back into the environment as emissions and waste (Fletcher, 2008).
Recycling is any recovery operation by which waste materials are re-processed into products, materials or substances; whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials meant to be used as fuels (Tojo, et al. 2012). Textile products are made of spun or filament yarns. Most filaments are of synthetic origin; the only natural filament is silk (Kalliala and Talvenmaa, 1999).

Depending on the fashion accuracy, quality and overall condition, there are four different paths for discarded textiles. They can be used again, recycled into new textiles or other products, incinerated to energy and as landfill in waste dumps (disposal) (Palm, 2011). The EU waste directive from 2008 ranks the different paths in relation to their environmental impact (Palm, 2011). The primary goal is to avoid creating waste, thereafter reusing and recycling is recommended (Ekström and Salomonson, 2012). Energy recovery and landfill is the least preferable option (Palm, 2011).

Textile recycling materials can be divided into two categories; pre-consumer and post-consumer waste. Pre-consumer waste consists of byproduct materials from the fabric, fiber and cotton industries that are re-manufactured for industries such as automotive, aeronautic, home building and furniture industries. Post-consumer textile waste is defined as any type of garment or household product that is discarded by the owner and are sometimes given to charities or deposed into the trashcan (Hawley, 2006). However, the main applications of recycled textiles are for wiping rags, fiber production and applications in the paper industry (European Commission, 2013).
2. Problem description

The textile industry is a $1 trillion worldwide business (Bureau of International Recycling, 2013). Consumption of clothing and textiles in Sweden has increased by nearly 40 percent during the period 2000-2009 (Naturvårdsverket, 2013). The market is in most industries changing from a rather stable to a highly unstable system, characterized by short product life cycles, high volatility and a high degree of impulse buying by the consumer (Ericsson, 2011). Increased consumption rates poses serious effects on the state of our environment, however, a decrease in consumption can impact, for example, employment rates. An alternative to decreasing consumption is to consume more environmentally friendly products. The complexity of the problem lies in our current economic system dependent on the GNP, which in turn is affected by consumption growth (Ekström and Salomonson, 2012). The environmental entrepreneur Yvon Chouinard states that we need to instigate change in order to survive in the long run. In his book Let my people go surfing (p. 254), he enforce that “Only those businesses operating with a sense of urgency, dancing on the fringe, constantly evolving, open to diversity and new ways of doing things, are going to be here one hundred years from now”.

According to a study made by SPEA (2011), the clothing and home textile consumption in Sweden adds up to about 15 kg per capita and year, which amounts to a total of roughly 130 000 tons annually in Sweden (the figure has been calculated using statistical data for domestic production, imports and exports). Of this approximately 8 kg are incinerated and 3 kg are reused by charity organizations. The remaining 4kg is either stored (e.g. in a closet or wardrobe) or are handled through other means of waste management where it is difficult to measure (e.g. recycling centers) (Zamani, 2011). The considered amount does not include industrial- and furniture textiles, so the definite figure may therefore be somewhat higher. In addition, there has been a 40 percent increase in textile consumption between the years 2000 and 2009 (Palm, 2011). However, between the year of 2010-2012 sales have been dropping due to the recession (Kjellberg, 2013).

Fashion is an important factor in apparel purchase and discard (Domina and Koch, 2002). Fashion fuels the momentum for change, creating demand for ongoing replacement of products. In other words, fashion contributes to consumption at a higher level than need (Hawley, 2006). The production of virgin textiles uses large amount of water, energy and chemicals and poses a risk for the environment and the human health (Zamani, 2011). Synthetic such as polyester and nylon are obvious villains since they are made of petroleum, but the production of “natural” products like cotton and wool are no better, in fact, in some cases they are worse (Chouinard, 2006). Cotton requires heavy irrigation and is often grown in arid countries where the production has a serious effect on the local water supply. Synthetic fibers release
large amounts of greenhouse gases and are not bio-degradable. In addition, they are produced from a fossil fuel (Renewcell, 2012) which is a non-renewable resource and consequently not sustainable (Zamani, 2011). The demand for textiles has been growing sturdily during the last decade and the world wide annual consumption has reached approximately 73 million tons. The expected growth rate is three percent per year (Renewcell, 2012).

Unlike most household goods, apparel is frequently discarded merely because of shifting fashions or boredom (Domina and Koch, 2002). This creates a gap between the aesthetic and the technical lifetime of a fast fashion product (Palm, 2011). Today, textiles are usually not enduring enough to enable second hand use. In addition, fast fashion products quickly get out of style. When fashion changes, a large supply of these types of garments is created, but the demand is small. To some extent, this is solved by exports to less demanding markets, but it also leads to creating waste, followed by incineration (Palm, 2011). It is problematic from an environmental point of view, when consumers have damaged or worn out textiles and need to dispose of them (Domina and Koch, 2002). Domina and Koch (2002) explains that unwanted consumer textiles that are not suited for donation to charity organizations, are simply thrown into the trash as a convenient means of disposing of an unwanted material. The textile waste flows are small by weight but large by environmental impact (Zamani, 2011). Even though the household refuse in Sweden is burnt and creates energy recovery, this alternative involves a needless waste of resources compared to reusing and recycling (Ekström and Salomonson, 2012). Textiles are nearly 100 percent recyclable and according to Hawley (2006), nothing in the textile and apparel industry consequently should be wasted.

Switzerland has been a pioneer in the recycling of other materials (Ekström and Salomonson, 2012). According to the organization Avfall Sverige (2011), Sweden is still doing rather well in recycling its waste, but there is currently no recycling of textile materials in Sweden (Naturvårdsverket, 2013). Although Sweden has come a long way towards a more sustainable waste management, Avfall Sverige states that there is still plenty of room for improvement. A big challenge is the fact that the quantities of waste are getting bigger and bigger. Since 1990 the amount of waste per person and year has risen from 300 kg to 500 kg. Future scenarios indicate that we risk throwing away at least the double amount in 20 years if nothing is done to turn the trend (Avfall Sverige, 2011).

During the spring 2013 master course Art of Business, Professor Simonetta Carbonaro discussed the fact that we need to develop new sustainable business models of prosperity. Carbonaro has developed this simple but distinct model for growth:
Carbonaro said that the previous industrial model built on low input costs, high productivity, convenient production regions, high demand, access to free water and a stable climate will be replaced by high energy costs, scarcity of raw material, scarcity of water and an unstable climate. She continued by stating that we will move from the centralized system of modern society into local, small, connected and distributed systems. Carbonaro argued that we need to combine the interest of our economy with the interest of our civilization, and without the union of these two, there will be no long term growth.

**Figure 2.** Carbonaro’s model of growth (Carbonaro 2013)
3. Research questions

The aim of this report is to explore the areas of research in textile recycling, and by dint of seven experts, determine whether or not Sweden should implement a textile recycling system, and how that should be done. The focus of this thesis will be on the handling and possibilities of post-consumer textile waste in Sweden. Due to the time- and space limit, the thesis has a general approach to every subject concerned. The intention is to answer the following research questions, that are structured into one main- and three sub questions:

Should Sweden implement a textile recycling system?

- To what extent should a textile recycling system in Sweden be implemented?
- What are the essential factors in implementing a textile recycling system in Sweden?
- What are the possibilities for a textile recycling system in Sweden?
4. Theoretical frame of reference

4.1 Current situation in the EU and Sweden

The European Union consumers shed 5.8 million tons of textiles every year. Merely 1.5 million tons (25 percent) of these post-consumer textiles are recycled by charities and industrial enterprises. The remaining 4.3 million tons end up as landfill or is burnt in waste incinerators (European Commission, 2013). EU nominated textiles as a priority waste stream since the recycling of textiles is considered to result in significant environmental and economic benefits. In December 2008, EU legislated on textile recycling in the form of a revised Waste Framework Directive (WFD). The legislation aims to make it easier for EU citizens and corporations to recycle (Newbery and Rani, 2011). The Directive 2008/98/EC, determines some basic waste management principles: it requires that waste needs to be managed without endangering human health and harming the environment, and in particular without risk to water, air, soil, plants or animals. EU Member States shall adopt waste management plans and waste prevention programs, and apply these regulations by prioritizing them according to the following waste management hierarchy (European Commission, 2013):

![Figure 3. The EU Waste Management Hierarchy (European Commission, 2013)](image)

Consumers throw away nearly half of all purchased textile products. In a poll made by the consumer association in Stockholm, 21 percent of the surveyed citizens stated that the reason for throwing away clothes was growing tired of them. This answer was slightly more common among women aged between 16 and 19, which could be explained by the tendency to be more fashion sensitive when in young ages (Ekström and Salomonson, 2012). According to SMED (2011), the majority of textile waste in Sweden comes from households. Textiles that end up in household waste is burned
and converted into energy use, for purposes such as district heating (Naturvårdsverket, 2013). The picture below shows the Swedish textile flow in 2010 (figures are referred to in tons and are based on Carlsson et al., with additional calculations by Tojo et al., 2012)

**Figure 4.** The Swedish textile flow in 2010 (Tojo, et al., 2012)

4.2 Significant factors to an implementation of a textile recycling system in Sweden

4.2.1 Execution and technology

Rag collectors and “shoddy” manufacturers have been recovering and recycling textiles for ages. The method of extracting fibers from fabric has been the same for the last 200 years (Fletcher, 2008). But after synthetic fibers came onto the market in the 20th century, the recycling process became more complex: fiber strength increased, which made it more difficult to shred the fibers, and the fiber blends made it hard to purify the sorting process (Hawley, 2006).

If the fabric is treated mechanically, it is torn apart with carding machines in order to break the fibers. In result, the fibers get shorter and tend to produce a bulky, low quality yarn. However, to increase the quality, pre-consumer sources of higher quality
can be used. Another option is to blend the recycled fibers with longer virgin fibers. Apart from mechanical recycling methods, synthetic fibers can be recycled chemically (Fletcher, 2008). The garments are cut into small pieces, crushed and turned into polyester chips (Bureau of International Recycling, 2013). Fibers such as polyester, nylon and polypropylene can be broken down at the molecular level and then re-pollinized (Fletcher, 2008). The chips are melted and spun into new filament fibers used to make new polyester fabrics (Bureau of International Recycling, 2013). The chemical recycling process is more energy intensive than mechanical pulling, but the result of the fibers tends to be of better quality when using chemicals. In addition, fibers with mixed synthetic and natural content can be treated chemically to extract one component. Normally the synthetic is removed in order for the natural material to be reused (Fletcher, 2008).

A large quantity of the fibers gained from textile waste will be used for manufacturing nonwoven products such as upholstery, carpet underlay, disposable diapers, napkins and tampons (Zamani, 2011). Wool and similar materials are reused in car insulation, roofing felt, loudspeaker cones, panel linings and furniture padding. Cotton and silk is commonly used for producing paper and wiping cloths. Other types of textiles can be reprocessed into fibers for padding, insulation, and building materials. The recycling process is usually completed as follows (Bureau of International Recycling, 2013):

- Sorting: collected textiles are manually sorted and graded according to their condition and the types of fibers used.
  - Wearable textiles: Shoes and clothes are resold either in the same country of origin or abroad.
  - Unbearable textiles: These are sold to the 'flocking' industry for shredding and re-spinning.
- Re-sorting: Mills-grade incoming material according to their type and color. The color sorting means no re-dying is needed, saving energy and avoiding pollutants.
- Shredding and pulling: Textile materials are shredded or pulled into fibers. Depending on the end use of the yarn, other fibers may be incorporated.
- Carding: The blended mixture is carded to clean and mix the fibers.
- Spinning: The yarn is re-spun ready for later weaving or knitting.

The environmental benefit from textile recycling is hard to estimate. Few processes exist beyond lab scale and those that do are either low grade recycling or small scale niche recycling (Palm, 2011). However, recycling saves resources. The textile recycling technologies available today seldom create products that can replace new textile and thus the environmental benefits of these are limited. However, it is twenty
times better to reuse fabric than to make biogas from textile (Jensen, et al. 2011). According to Fletcher (2008), even the most energy intense processes of shredding fabrics, reclaiming fibers and re-spinning them into yarn, adds up to less energy use than the production of new items. Despite this fact, there are a limited amount of recycled products available (Fletcher, 2008).

The recycled textiles market is influenced by color, fiber type, fiber quality and the purity of the old textiles themselves (Fletcher, 2008). Textiles are complex and hard to recycle. Fabrics consist of a countless mix of different fibers, which make it difficult to separate in automated processes (Palm, 2011) and slows down manual sorting processes (Fletcher, 2008). In addition, due to the different colors and the lack of information about the exact composition, the recycled materials are hard to re-dye (Palm, 2011). Furthermore, clothing may contain undesirable components such as buttons, plastic, and metal zippers. Moreover, work wear and textiles for public spaces or vehicles, are usually treated with substances such as flame retardant and dirt repellent coating (Sandow, 2012). To improve the possibilities of textile recycling in Sweden, Palm (2011) suggests that textiles might be differentiated and evaluated depending on what the textile should be used for. A short lived apparel, either due to fashion or to its quality, could be made out of a standardized material, suitable for recycling. A high quality garment intended to be used for many years, could be made out of a more complex and sustainable fabric. Palm (2011) also suggests that some parts of a high quality garment should be replaceable to enable easy repair, and thus make it appropriate for the second hand market. DFR (Design For Recycling), published the following checklist to promote the optimal conditions for the recycled textiles market (Fletcher, 2008):

- White textiles, which allow easy re-dyeing;
- Natural fibers, which are easier to pull and are more versatile;
- Quality (long staple) fibers, which can be processed on faster machines;
- Pure (not blended) fibers that require less processing than fiber mixes and which are less problematic in subsequent processing stages.

Current recycling technologies are quite crude and produce low value products. Due to cheap virgin production, there is little encouragement to compete with high end products. In addition, some of the materials used in textiles today (e.g. cotton) are not sustainable even with a rather high grade of reuse and recycling and thus, new materials must be developed (Palm, 2011). Palm (2011) suggests that clothing produced for fast fashion should be designed for recycling rather than reuse. Palm also emphasis the need to start using more sustainable materials and perhaps replace some of the currently common fabrics. Fletcher (2008) states that a limitation of the
number of different textile materials in the industry would improve the market for recycled fibers. However, it might as well be inappropriate and even wasteful to encourage the dominance of monoculture plantations of fiber crops like cotton, with a significant environmental burden (Fletcher, 2008).

According to Wang (2006), the key for the development of textile recycling is the availability of better technologies, which requires talent, resources and time. Fletcher (2008) suggests that the disassembly of textiles could be simplified if technology made it possible to merge a garment without using thread. She suggests laser and water-jet as examples of possible techniques to meliorate a rapid disassembly. Zamani (2011) compared the carbon footprint and energy use of different methods of textile recycling against a standard of incineration. Zamani (2011) finds that remanufacturing provides a higher saving in global warming potential than recycling. Nevertheless, all investigated remanufacturing and recycling scenarios are beneficial since avoided CO2 emissions are higher than the emissions caused by the process of remanufacture/recycling (Zamani, 2011).

The EU funded project Textiles4Textiles has been launched to develop a machine that can sort post-consumer textile waste automatically. The machine will be able to sort textile materials based on fiber composition (both pure and blends) and color. T4T claims that their reclaimed fibers are amongst the most environmental friendly textile materials available. The process of mechanical recycling of textile fibers is initiated with opening up the structure of the discarded fabric by cutting. The next step is for the broken down textile to pass through a drum rotating surface several times, to obtain fibers. The gained fibers can be dyed or blended with virgin fibers and spun to yarns if required. After treatment methods are needed for enhancing the quality of the fibers, eliminate short fibers, cleaning from dust and occasionally, blending with primary fibers (Zamani, 2011).

Synthetic fibers can be chemically recycled. Chemical processes are appropriate for fibers such as polyester, nylon or polypropylene. According to these processes, fiber molecules are broken down and the feedstock is repolymerized furthermore. In addition, chemical methods can be used for mixed fibers containing synthetic/natural materials. By applying chemical reactions, synthetic fibers can be extracted from the mixed materials. Recycled synthetic fibers can be used in home furniture and automotive upholstery (Zamani, 2011).

The Japanese company Teijin Fiber has developed a closed loop process for recycling discarded polyester. The company claims the ability to recycle polyester into virgin
quality by bringing back garments made from Teijin fabrics (Zamani, 2011). The Swedish company Re:newcell asserts to have found a unique method for regenerating textile fibers. The process was developed at the Royal Institute of Technology in Stockholm and allows an environmental friendly and economical production of new textiles from used fibers (Renewcell, 2012). While writing this report, the project is still at a lab stage. The next step will be to build a pilot plant that might be put into use in 2018 (Karlsson, 2013). Re:newcell (2012) describes the following process in producing new textile fibers from old clothing:

- Textiles are fed into the plant where they are sorted and thereafter ripped into threads.
- The threads are treated with chemicals in order to dissolve into liquid. In this step, fibers other than cotton and viscose are extracted.
- The clean liquid is treated with chemicals one again and spun into a new viscose fiber through the traditional viscose process.

4.2.2 The consumers

Consumers have become aware of the importance of recycling paper, plastic, aluminum, and glass. As consumers recycle traditional materials, it is increasingly important for recycling programs to look beyond conventionally recyclable materials, such as postconsumer textiles (Domina and Koch, 2002). For a textile collection to be successful, Domina and Koch (2002) claims that consumer education must be encouraged in order to stimulate an appreciation of the value of textile recycling. Their reasoning is amplified by a survey performed by the Gothenburg (Sweden) municipality in 2012. The purpose of the survey was to examine the attitudes among consumers towards recycling clothes. Three main conclusions were founded (Karlsson, 2013):

- The essence of proximity to a collection point.
- The need for more information about the environmental benefits of reusing clothes.
- More confidence in the collecting organizations.

To improve the confidence in collecting organizations, the municipal administration Kretslopp och Vatten (Circulation and Water) who made the survey, expressed a desire for collecting organizations to have a so called 90 account to organize fundraisers on municipal land, but this action was not legally viable (Karlsson, 2013). Ekström and Salomonson (2012) argue that consumers need to change their behavior, but to do so there must be better solutions to enable an environmentally friendly behavior.
4.2.3 The producers

The concept of a circular economy is described as a solution-focused way of dealing with sustainability. According to Carina Sundqvist, a board member of the organization Cradle Net, products today are usually designed with the intention to break and get thrown away. In a circular economy however, all products are designed in a way that enables them to be disassembled, in order to recycle different parts of different materials. Sundqvist emphasize that humans are the only animal creating waste. In nature, everything is part of a cycle, and the idea of a circular economy is to copy nature and have everything we produce return to the system in closed loops (Hohner, 2013). Identification of systems operating in closed loop has been of prime interest in industrial applications for a long time (Ljung et al., 1999). Industrial subsystems can approach closed loops, and the concept is useful as an ideal for assessing and inspiring improvements in industrial sustainability. Loops may be closed, for example, by recovery, re-use or recycling. Energy that would conventionally be wasted often can be recovered (Sustainableplant, 2013).

Current reports concerning textile waste prevention indicate that brand owners/retailers are willing to work on closing the material loop, due to the lack of a large scale textile recycling system in Sweden (Tojo et al., 2012). Textiles for Recycling Initiative (T4RI), is a voluntary initiative by some of largest companies within the Swedish textile industry: H&M, KappAhl, Lindex, Ikea, Indiska and Åhléns. The purpose of T4RI is to create better conditions for textile recycling and finding solutions that can simplify the process of working with various stakeholders in the textile recycling industry, such as consumers, producers and municipalities. The goal is to increase reuse and recycling of textiles (Sandow, 2012). T4RI also discuss how to create better conditions for cyclic material flows (closed loops). Internationally, different types of arrangements to collect reusable and/or recyclable materials are launched by actors such as Levis, Puma, and Marks & Spencer (Tojo, et al., 2012).

In February 2013, H&M launched a clothing collecting initiative world wide. On their webpage, H&M (2013) states the following: “Through the global initiative H&M’s customers can save natural resources and contribute to reduced environmental impact by avoiding textile waste. Any pieces of clothing, from any brand and in any condition are accepted. In return, the consumer will receive a voucher for each bag brought. The collected clothes are then handled by H&M’s partner, I:Collect, which provides the infrastructure in which consumer goods are repeatedly reprocessed and
made available for new use.” Currently, a share of the materials collected by H&M in Switzerland was recycled into isolation for cars (Tojo, et al., 2012).

An increasing number of Swedish garment producers and retailers have started using recycled materials. Companies such as Boomerang, H&M, Lindex and Gina Tricot, as well as outdoor and sportswear companies such as Fjällräven, Haglöfs, Houdini and Klättermusen; have all used recycled textiles in their collections (Tojo et al., 2012). The outdoor sportswear producer and environmental pioneer Patagonia has been innovative in creating solutions for recycling, making fleeces from plastic bottles and jackets from car dashboards and classroom chairs. During the recent years they have gone even further, making new clothes from old ones through its Common Threads program. The program uses the EcoCircle fiber-to-fiber system developed by Teijin of Japan, collecting unwanted polyester clothing and processing the fibers into new garments. Compared to virgin polyester fibers, this type of fiber will save 76 percent of the energy and 71 percent of the carbon dioxide emissions (Fletcher, 2008).

Another company that designed garments with utilization in mind is the German outdoor company vauDe. By making totally homogenous garments in 100 percent polyester (including the fabric, zips, snap fasteners, labels, thread, cord grips etc.), the whole product could be recycled, just like a PET-bottle. Out of the garment, new polyester resin could be extracted and used as raw material for a new garment.

In 2011, the Swedish fashion chain Lindex offered their customers more than 300’000 articles made out of recycled materials (Ekström and Salomonson, 2012). According to Ekström and Salomonson (2012), this is part of a long-term commitment towards a more sustainable development. In addition, Lindex wants their articles to be part of a more sustainable cycle when the customer finally chooses to throw them away. The goal is to create a cycle of materials with fiber recovery, generating fibers that can be used in the manufacturing of new fashion items. According to Lindex, this can help reducing the need for new raw materials in the manufacturing of new articles (Ekström and Salomonson, 2012).

The Swedish sports clothing label Intersport considers labeling their products with information regarding its life expectancy. Short-lived articles should be made of materials suitable for recycling and long-lived articles should be of high quality. According to Intersport, these measures could encourage consumers to pay for quality and reduce the "throw-away" mentality (Ekström and Salomonson, 2012).

Ericsson (2011) states that we are moving from supplier driven mass production towards a consumer driven mass customization, based on consumer insight and relationship marketing. The old models were based on low cost production of
standardized products with emphasis on operational efficiency, whereas the new models are based on strategic positioning and innovative products (Ericsson, 2011).

4.2.4 Supply & demand

The textile and apparel industry is characterized by inconstant markets, short product lifecycles and major product variety. In addition, it has extremely low profit margins which leave no option for the companies to have expensive production and big stock holdings (Bruce, et al. 2004).

Fletcher (2008) explains the limitations of the recycled textiles market as a reflection of the dominance of cheap virgin fibers and the lack of innovation in the recycling industry (Fletcher, 2008). Handling costs in Sweden for discarded textiles, such as collection, sorting and selling, are high compared to material and productions costs in textile producing countries such as India and China (Palm, 2011).

Svensk Handel Stil (a business institute for about 3 000 members in the clothing and soft furnishing industry) states that it is important to view customer’s discarded clothes and textiles as a resource. Players in the automotive industry are forced to recycle their products after use. At the end of their lives, cars have to be disassembled and the resulting parts used for the same or similar products, to reduce energy consumption and save resources (.European Commission, 2013). Because of the low cost of virgin textiles, there is little incitement to try to compete with high end products (Palm, 2011).

Stena Recycling, one of the leading recycling companies in Sweden, did run a recycling facility in Älmhult. The focus was on the sorting of textiles made from natural fibers such as cotton and wool. At its peak, Stena’s facility employed up to 200 people. Stena Recycling offered yarn made from recycled fibers and fabrics for insulation. Due to careful sorting based on materials and colors, Stena could sell the yarn without re-dying. However, because of the lack of input material and less demand for the output materials, the facility was closed in 1998. According to Stena Recycling, the amount of collected textiles that end up as waste is too small for recycling to be viable in Sweden (Tojo et al., 2012).

There is currently no large scale recycling of textiles in Sweden, nor is there any major export for recycling of Swedish textiles (Palm, 2011). But Swedish producers
and retailers have started to consider the value of re-establishing a recycling plant within the country (Tojo et al., 2012). Fisher et al. (2011) argues that increased collection of textiles can generate a positive financial impact on society, e.g. through job creation. However, there is an uncertainty regarding the volume of textiles the industry would manage to collect for recycling (Tojo et al., 2012). According to Palm (2011), the amount of discarded textiles in Sweden is too small for an efficient recycling system.

Fletcher (2008) states that mechanically recycled yarn and fabrics remain a niche market, for without demand there is no supply. In addition, the closed loop chemical recycling of polyester, today used by companies as Teijin and Patagonia, only recycles polyester of a certain grade and is presently a limited, specialized market (Palm, 2011). However, the future market of the textile industry faces an inevitable challenge. It is significant to find materials that could replace the large amount of cotton used today and find solutions on how to produce synthetic fiber without increasing the yield of oil. Being able to produce new fibers of existing material as an alternative to virgin cotton and oil-based fibers, are increasingly important and may be crucial to how we can provide all consumers on the planet with clothes (Sandow, 2012).

The demand for new types of textile fibers is large. The environmental expert Henrik Willers at the Swedish association for textile and fashion companies TEKO, stated in Radio P4 that we are facing a high increase in consumption of fibers, since the world population and in many places also prosperity is increasing, which means a heavy increase in demand. But it will not be possible to produce more cotton than we do today (which is the dominant textile fiber), due to lack of agricultural areas and water. Willers states that the global, annual consumption is 80 million tons, but the number is expected to enhance to 250 million tons within ten years (Sverigesradio, 2013).

As a result, there are high hopes for the new wood-based textile fiber CelluNova which is currently developed in Sweden. The fiber will be both cheaper and more eco-friendly than existing cellulosic textiles and it will be manufactured in existing mills where pulp and paper is produced today. Åsa Östlund at SP Technical Research Institute believes that Sweden can become a major textile producer again. Östlund’s hopes are that there will be a production of the fiber within five years (Sverigesradio, 2013).
4.2.5 Logistics

The concept logistics refers to management of materials and information as well as the task to control and coordinate material and information flows throughout the supply chain (Harrison and van Hoek, 2008). The globalization of the fashion industry supply chain is intense. Many companies choose to source the components of their products overseas, and/or moving their manufacturing to countries which can provide labor at lower cost (Bruce, et al. 2004). Despite the economic benefits of global sourcing, there is a danger in ignoring its downsides. As the pipeline gets longer the process gets more complex and mistakes are easily made, thus, the load is exposed to a greater risk. In addition to this, the shipping cost is higher compared to closer sourcing (Harrison and van Hoek, 2008).

Christopher and Holweg (2011) state that the previous trend of manufacturing in low cost countries has been reversed with a near sourcing-strategy, meaning manufacturing in low costs countries that are nearer to the market. The principle of bringing supply closer to demand enables shorter lead-times and greater adaptability (Christopher and Holweg, 2011). Fisher (1997) underlined the same principle when he stated that uncertainty can be avoided by cutting lead times and increasing the supply chain’s flexibility in order to produce closer to when demand materializes.

To decrease cost in the supply chain, the partners in the process need to find ways to compress time, reduce waste and reduce unit costs. For fashion companies it is essential to be able to respond quickly to market demands, along with providing products at competitive price levels. A solution to this might be to combine cost-effective global production with short lead-time local production. The local supplier is able to guarantee getting the product delivered on time, but at a relatively high cost, and the manufacturer overseas could deliver the same product, a lot cheaper, but sometime after. This way the apparel company can make sure it meets the demands of the market in time (Bruce, et al. 2004), and still keep competitive prices or high margins. One can call it a separation of base and surge demands. The base demand can be sourced in low cost countries, whereas the surge demand can be sourced closer to the market (Christopher and Towill, 2001).

Due to the financial meltdown and the oil price hikes (affecting shipping costs), Christopher and Holweg (2011) emphasize a need for managing structural flexibility by building flexible options to the design of supply chains. Waste requires a lot of transport at different levels. Large tonnages of waste and recyclable materials are transported by truck for long distances to various facilities for treatment. Transporting by truck is not a sustainable option. Furthermore, we may lack transport fuels in the future (Avfall Sverige, 2011). Avfall Sverige (2011) suggests rail transport as major
competitive advantage. This way treatment facilities located near the railway could be provided with waste to a lower transportation cost and a lower environmental cost.

Christopher and Holweg (2011) argues that “… we are not facing a temporary shock that will quickly pass, but in fact are on the edge on the verge of an ’era of turbulence’, that will feature higher variance in key business parameters: from energy cost to raw materials and currency exchange rates”. Christopher and Holweg (2011) continues by stating that asset sharing (i.e. being prepared to share physical assets such as factories, distribution centers or trucks with other companies) and flexible labor arrangements (by making use of agency personnel, so that the employment force can be adjusted in order to meet seasonal demand swings) can be strategies to exhibit structural flexibility (Christopher and Holweg, 2011). An example of sharing assets is the initiative made by Röda Korset (the Swedish Red Cross organization) in Luleå. Röda Korset invests in recycling the textiles which they have not been able to sell. The textile excess is sent to the Dutch foundation Kici with trucks from Holland, which would otherwise have gone back empty. At Kici, a large portion is recycled for the use of house insulation, as part of denim or in blankets (Sveriges Radio, 2013).

At the post-consumer textile collection sets, there are special requirements as to how the material is handled. Textiles are sensitive to moisture; mold and other contaminants can affect the ability to reuse and recycle the collected textiles. Collected textiles have also proved theft-prone, and for this reason, textiles require specific management, which may differ from other waste fractions (Sandow, 2012). Sorting of textile can be a logistical challenge, and therefore, working with existing collection systems could be advantageous (Jensen, et al., 2011).

4.2.6 Politics and policies

According to Wang (2006), the development of a textile recycling system requires an integrated industry with a close public-private-academia co-operation. Esthetica, the sustainable activity of the British Fashion Council, suggests government incentives to encourage brands to become more eco-friendly in their product design. Esthetica, concluded that ethical companies face more challenges to become price competitive and consequently some kind of government incentive such as tax breaks would help support and develop this area (Newbery and Rani, 2011). Fletcher (2008) also suggests tax breaks to reduce cost of labor for reuse and repair. Palm (2011) states that as long as new textiles are very cheap, the consumer will likely prefer new textiles compared to reused ones. Since it is hard for Sweden to influence the
production cost, Palm (2011) argues that Sweden needs policies to work on leveling the difference in price between virgin and reused or recycled textiles.

Domina and Koch (2002) claim that convenience and access to recycling facilities would increase the recycling participation. US households with curbside collection have improved recycling rates of all traditional materials. Domina and Koch’s investigation (2002) indicates that households may be willing to recycle a wider diversity of waste materials when the system is more convenient, including nontraditional materials such as postconsumer textiles, and that if textiles were included in community curbside collection programs, the amount of textiles recycled would be considerably higher.

The organization Swedish Trade Style believes that the current legislation is unclear regarding textile waste and therefore, the opportunities to take advantage of textile waste are limited (Sandow, 2011). The handling of textile waste is interpreted to be under the responsibility of the municipalities, who in turn would claim the ownership. Swedish Trade Style therefore emphasize the importance of legislation being adapted in order for the textile waste (from households and private businesses or the public sector) to be estimated as a resource, that free agents can collect for reuse or recycling. But in order to allow the producers or retailers to make use of the textile waste for recycling, a clarification is needed. Swedish Trade Style suggests that consumers or businesses getting rid of old textiles should be free to choose who gets to take care of or purchase the textile waste (Tojo et al., 2012). However, as mentioned earlier, the survey performed by Gothenburg municipality in 2012 showed a lack of confidence in the collecting organizations (Karlsson, 2013).

Extended Producer Responsibility (EPR) can be defined as a policy principle to endorse total life cycle improvements. This is done by extending the responsibilities of the manufacturer to several parts of the product’s life; particularly to the take-back, recovery and final disposal of the product stages (Tojo et al., 2012). Sweden has producer responsibility for tires, packing, newsprint, batteries, pharmaceuticals and radioactive products, but not for textiles. Palm (2011) suggests that this might explain the lack of organized collection, even though recycling and reuse of textiles has a far greater environmental benefit than for example recycling of newsprint and packaging.

The producer responsibility policy (SFS 1998:808) is part of the Swedish environmental code and was adopted in 1993. The policy involves a regulation which obliges producers to take care of post-consumer articles, packing materials and newspapers. The basic principle of producer responsibility is called “Polluter Pays
Principle" (PPP), meaning that the players who impact the environment negatively, must pay back to the environment for the load they have caused (Repa, 2013). To organize this, the industry formed the so-called material companies (materialbolag) for the different material’s teams: plastic, cardboard and corrugated, metal and glass. By paying a fee to the company handling the collection, the producer takes its responsibility. Since the autumn of 2007, Förpacknings- och Tidningsinsamlingen (the packaging and newspaper collection), organizes the collection. Consumers are under the same regulatory framework, obligated to recycle and return consumed articles and packaging materials to the drop-off sites and recycling facilities provided (Repa, 2013). However, Swedish Trade Style and T4RI is confident that the industry and the market will show that textile is a resource worth taking advantage of, and thus that a producer responsibility is not required (Sandow, 2011).

Ekström and Salomonson (2012) argue that it must be simple for the consumer to sort textile waste, suggesting containers for unbroken and clean textiles and containers for torn textiles. In the spring of 2013, 1,800 households in the Swedish town Karlstad were among the first in the country to test a curbside collection method to increase reuse and recycling. The project is a collaboration between Ragn-Sells, Myrorna and the municipal properties of KBAB (Ragnsells, 2013). At the curbside, there are two bins; one belonging to the charity organization Myrorna for clean and unbroken textiles, and one belonging to the recycling company Ragn-Sells for worn out textiles (TV4, 2013). In order for Sweden to achieve the objectives of both increased reuse and recycling of textiles, Ragn-Sells argues that the infrastructure of the collection sites must be closer to the consumers. In addition, they want to verify whether or not it is possible to distinguish a flow of textiles that will go to recycling (Ragn-Sells, 2013).

Naturvårdsverket (the Swedish environmental protection agency) view recycling and reusing of textiles as an important part of the national waste plan. The agency brings up the following measures, among others:

- To initiate a dialogue with the textile business about which environmental improving measures need to be done on a national level as well as within the European Union.
- To drive the development of different techniques for reusing materials, which do not contribute to the diffusion of environmental contaminants.
- To cooperate with Kemikalieinspektionen (the Swedish chemicals agency) in finding solutions to reduce the quantity and danger of textile wastes.
- To participate in campaigns, research projects and networks with regard to prolonging the life expectancy of textiles.
• To bring forth better statistics on the throughput of textiles (…) and to be able to distinguish the potential in increasing the reusing of materials through different methods (Ekström and Salomonson, 2012).

Naturvårdsverket emphasizes that today's complex environmental problems cannot be solved by a single agency or entity. There is a need for a creative cooperation that generates new ideas and collaborations. The project held by Naturvårdsverket will last for 2-3 years with a budget of several million SEK in order to reduce the environmental impacts of textile flows in the Nordic countries. The aim is to achieve this through improved recycling, strengthening the region's competitiveness within the textile industry and promoting green growth (Ekström and Salomonson, 2012).
5. Method

5.1 Research approach and procedure

A qualitative research usually emphasis words rather than quantifications in the collection and analysis of data. A qualitative research method comprises the view of social reality as a constantly shifting and developing property of the individual’s (in this case, the expert’s) conception. The approach for this study has been inductive. With an inductive stance, theory is the outcome of research, involving outlining generalizable inferences of observation (Bryman and Bell, 2011).

The intention of interviewing some of Sweden’s most proficient men and women in this matter was to gain impartial angels to this issue. Since the opinions of the studied group (the experts) were to be interpreted (Bryman and Bell, 2011), a qualitative research method was chosen. The qualitative research process is reflective, interpretive and descriptive in order to understand and describe actual occurrences of the experiences from the perspective of the participants’ (Fischer, 2005).

The study has been performed by using the guidelines of grounded theory. Grounded theory is one of the most practiced approaches to qualitative research (Fischer, 2005); a method that focus directly on the analytic phases of research. The analytic strategies are essentially comparative and interactive. This method guides researchers to make systematic comparisons and to engage the data, and emerging theory actively throughout the research process (Given, 2008).

5.2 Research process

Research is a systematic investigation involving searching, collecting and interpreting information to develop understandings, theories and applications. Research design concerns planning how the project will be carried out. This includes selection of participants, specifying procedures and optimizing the chances that the data and analysis will provide meaningful answers to the research questions (Fischer, 2005).

The research process of this thesis was initiated with an exploratory research review, investigating textile recycling in general by studying the literature. The process went on with identifying and investigating the essential factors to an implementation of a textile recycling system. Textile recycling is a multifaceted topic where several
aspects are taken into account. A research gap was founded and relevant research questions developed. The methodology was developed in consensus with the research questions which lead the research to the expert angle.

I was invited to a sector meeting arranged by the Swedish School of Textiles, concerning textile recycling in Sweden. The network for reuse and recycling of clothing and textiles (NÅÅ), was established in January 2011 and includes representatives from charities, recyclers, fashion retailers, industry organizations in recycling, trading and textile, transport, consumer- and environmental organizations, municipalities, government agencies and researchers. At NÅÅ, I became further acquainted with the issues concerning an implementation of a textile recycling system in Sweden. I also had the pleasure to discuss the subject with some of the members.

The questions for the interviews were based on the theoretical frame of reference. The interviews were held and a result could be compiled. The result was analyzed in relation to the theoretical frame of reference, using a grounded theory approach, and conclusions could be made. The future research chapter was written after completing the analysis and the conclusions.

![Figure 5. Research process (Porse, 2013)]
5.3 The research gap

The making this report was initiated with the collection of data to the theoretical frame of reference. Ekström’s and Salomonson’s research (Nätverk, trådar och spindlar – samverkan för ökad återanvändning och återvinning av kläder och textil) of textile recycling in Sweden is exhaustive and comprehensive. In their research, the perspective of the members of the network NÅÅ is taken into account. They have also studied textile recycling from a consumer’s point of view. Tojo’s (et al., 2012) research (Prevention of Textile Waste Material flows of textiles in three Nordic countries and suggestions on policy instruments) focused on the flow of textile products in Denmark, Finland and Sweden. Palm’s research (Improved waste management of textiles and Avfallshandbok för kommuner Avfallsförebyggande i praktiken) offers significant facts about textile recycling in Sweden and concerns hindrances and opportunities for environmentally improved recycling processes. He also made percipient suggestions as to how the conditions for textile recycling might be improved. Zamani’s study (Carbon footprint of textile recycling) quantifies the energy usage and global warming potential of different textile recycling techniques.

After gaining an extensive understanding of the subject, an angle that had not yet been investigated was identified. The literature reviewed has taken the consumers, producers and/or the organizations points of view. Political and technical aspects to textile recycling have also been investigated. The matter of textile recycling is complex and quite hard to comprehend. The discussion of a re-implementation of a textile recycling system in Sweden requires an expertise as objective as possible. Hence, the aim was to bring forth knowledge within the textile recycling area, but without the impact of for instance, a certain company or organization’s interests in mind.

The research gap of this thesis consists of interviews with specialists within the textile recycling area. Since they are employed by companies with corporate values, it was expressed that the aim was to gain access to their knowledge as specialists, and not as employees. The result will show that their knowledge differs within different areas and that their opinions are diverse. This plurality is inevitable due to their professional backgrounds, and they are certainly to some extent influenced by the values of their employers. Nevertheless, the interviews communicate great knowledge, new ideas and opinions that are close to radical. One could call Palm, Ekström, Salomonson, Zamani, Fletcher and Tojo experts; in their research they express substantial awareness. The relevance of this thesis will be to bring forth new ideas to the subject of textile recycling and identify variations by letting seven other experts contribute with their insights to the subject.
5.4 Interviews

Qualitative interviews are intended to give rich and detailed answers. The interviews performed in this report were semi-structured. In a semi-structured interview, the interviewer has a list of questions on fairly specific topics to be covered, allowing supplementary questions (Bryman and Bell, 2011). When deciding how many experts to interview, Håkan Torstensson (researcher at the Sewdish School of Textiles) was consulted. He is advice to interview at least six experts. Fifteen experts were contacted, whereof seven agreed to participate in an interview.

For this report, an expert is defined as a person with great knowledge within the textile recycling area, who is working or has been working professionally with projects concerning this matter. The selection of which experts to interview was reached in consensus with Lisbeth Svengren Holm (professor of fashion management), Susanne Edström (coordinator) and my supervisor Joel Peterson (all three working at the Swedish School of Textiles).

Depending on practicalities and the preferences of the respondents, the interviews were held face-to-face or by telephone. A benefit of face-to-face interviews is the possibility to observe how the interviewees respond in a physical sense, such as body language (Bryman and Bell, 2011). In-person interviews are generally the best choice when interviewing individuals who are geographically accessible. But free flowing conversations can also be held and rich data obtained, from telephone interviews. By telephone interviews, participants can be offered anonymity, enabling them to talk freely, openly, and honestly. On the other hand, it can be difficult to build up trust, as well as to gain the full attention of the participant (Given, 2008). Nevertheless, telephone interviews have mostly practical benefits (Bryman and Bell, 2011).

In order for the experts to be unrestricted (not adjusting their answers to the what their employer would or would not agree on, or expressing opinions that might put them in an undesirable position), it was explained that the answers would be handled anonymously. The interviews took 40-90 minutes. It was easier to have the respondents agree to telephone interviews, since it is more flexible (with a mobile phone the respondent could be anywhere, for instance, one expert was interviewed while travelling by car) and because it is less time consuming than a meeting. However, any difference in the quality between the face-to-face interviews and the telephone interviews could not be distinguished. It will be noticed by the reader that there is a great variety in the extent of the answers. Interviewee A and B mostly gave rich and long answers, and both of these interviews were executed by phone.
The interview guide consisted of two kinds of questions; direct questions and follow-up questions (Bryman and Bell, 2011). The questions were intentionally formulated in a way that allowed the expert to make a brief or a throughout going answer, permitting them to debate freely. The intention was to avoid repetitive answers easy to chart by having extensive questions leading to dynamic and far-reaching answers. In addition, the interviewers had a chance to comment fully on the topic concerned, giving them the opportunity to raise any issues they thought was overlooked in the questions.

Notes were taken during the interviews and right after finishing the interview, the answers were impaired. Due to technical issues, the interviews could not be properly recorded. The interviews were carried out in Swedish and translated to English. Hence, the interviews are not literally reviewed and the translation has been influenced by the authors rendering of the conversation. Thus, there might be subtleties used in Swedish that were lost in the translation, as well as additional meaning in the English wording.

5.5 Data analysis methods

Qualitative researchers do not typically set generalizability as a goal of a study; partly because the studies are done with such small samples, and partly because it is anticipated that humans’ perception and action will transform somewhat with their situations (Fischer, 2005). The qualitative approach is subjective and impressionistic; therefore the ways in which the information is categorized and interpreted often differ considerably from one investigator to another (Eysench, 2004). The analysis of data was conducted with a grounded theory approach (Bryman and Bell, 2011). The method consists of looking for indicators of categories in order to find consistencies and differences. The process used for analyzing the narrative data is often referred to as content analysis. The content analysis depends on the questions to be answered, the resources and the needs of those who will use the information. Step one is to understand the data by reading the text several times, writing down the impressions one gets. Step two is to review the purpose of the evaluation by focusing on specific questions or topics (in this case, the focus will be on topics). Step three is to categorize the information by identifying themes or patterns and organizing them into coherent categories (Taylor-Powell and Renner, 2003).

There are various problems involved in interpreting interview information (Eysench, 2004). In this study, the problem of social desirability bias (the tendency to provide
socially desirable, rather than honest answers on questionnaires and in interviews [Eysenck, 2004]), could probably be relevant. However, since the interviewees were informed that their answers would be handled anonymously, their consideration of their professional roles probably have a smaller impact than if they were quoted with names.

5.6 Assessment of research

Validity is the extent to which research measures or reflects what it claims to (Frost, 2011). The aim for this report is to explore the areas of research in textile recycling, and by dint of seven experts, gain impartial angels and determine whether or not Sweden should implement a textile recycling system, and how that should be done. This thesis is relevant since it contribute with new aspects to the debate of textile recycling in Sweden.

The experts interviewd for this thesis are some of Sweden’s most proficient men and women in within the textile recycling area. The selection of which experts to interview was reached in consensus with Lisbeth Svengran Holm (professor of fashion management), Susanne Edström (coordinator) and the supervisor Joel Peterson (all three working at the Swedish School of Textiles). The validity of the result is strong since the experts were free to speak honestly about the subject and since many new and important approaches are shared.

The extern validity however, is not that strong. Since the answers from the experts were so varied and often based on their own experiences, the result would not likely be the same if the inquiry was performed with seven other experts. However, the value of this study is not determined on whether it is repetitive or not, but on the different reasoning shared by the experts. This study contributes with different attitudes and approaches of textile recycling which could be valuable for political decision-making or players in the textile industry, in the consideration of implementing a textile recycling system in Sweden.
6. Results

In this chapter, the seven experts are introduced and the results of the interviews are presented.

6.1 Presentation of the experts

**Henrik Willers**, Environment and Quality auditor at TEKO, Stockholm, Sweden. TEKO is Sweden's textile and fashion company employer organization and represent the industry both nationally and internationally, where labor, environment and the EU is the core of the business.

**Louise Ungerth**, head of the Consumer and Environmental affairs at Konsumentföreningen (the Stockholm Consumer Cooperative Society) Stockholm, Sweden. Konsumentföreningen Stockholm is a cooperative member association to the Coop Retail Business, aiming at creating benefits for its members and contributing to a sustainable development for the environment. Ungerth works with informing and influencing authorities and politicians on retail related consumer issues and environmental matters. She is also a member of the research project Mistra Future Fashion on “Consumer Behavior” along with fashion companies such as Filippa K and H&M, as well as the environmental organization Naturskyddsföreningen (The Swedish Society for Nature Conservation) and researchers from Copenhagen School of Business.

**Mats Torring**, Manager for Product Area Service at Stena Recycling AB, Gothenburg, Sweden. Stena Recycling is one of the leading recycling companies in Sweden with approximately 100 facilities. The company goal is to facilitate for reuse of textiles among other materials as well as recycling waste in a sensible way in order to benefit the environment, as well as providing a strong waste management for their customers. Torring is well acquainted with the subject and spoke about the challenges of textile recycling in Sweden at a seminar at The Swedish School of Textiles in 2012.

**Weronika Rehnby**, Product Manager of Bra Miljöval Textiles (Eco-labeling) at Naturskyddsföreningen (The Swedish Society for Nature Conservation). By influencing politicians, legislation and major polluters, Naturskyddsföreningen is the most influential environmental organization in Sweden. Naturskyddsföreningen has
participated in Ekström and Salomonson’s research project for recycling and re-design of clothes. Rehnby has taught at the Swedish School of Textiles and has many years of experience within the textile industry.

**David Dalek**, Business Developer at Renova AB, Gothenburg, Sweden. Renova is the leading company of western Sweden in the waste and recycling industry. Their vision is to lead the way towards a sustainable waste management.

**Hans Skoglund**, Business Developer at Borås Energi och Miljö AB, Borås, Sweden. Borås Energi och Miljö AB is owned by the City of Borås. The company is active in the heating, cooling, biogas, waste management (thus, including textile waste), water and sanitation, energy, and waste service businesses. Their aim is to refine energy for a society free of fossil fuels.

**Klaus Rosinski**, head of the Textile Collection Division at Human Bridge. The association Human Bridge coordinates material assistance services for two Swedish aid organizations. Rosinski (as a representative for Human Bridge) has cooperated with the superstore Gekås in Ullared in a used textiles collection project, where the aim was to ensure that as much as possible is reused or recycled.

### 6.2 The interviews

Due to the agreement of anonymity in handling the answers, the experts are designated with letters instead of names. The order of the numbers has no correlation with the order in which they previously have been described. The reader should keep in mind that the answers are not verbatim since they are based on careful notation and thereafter translated from Swedish into English. However, the content of the answers is accurate.

Since the answers given by the experts were often inclusive to other subjects than that of the actual question, the answers (written in italic) are summarized and divided into the different factors that were brought up in the theoretical frame of reference. The chapter ends with a section where the experts give answers to the question of whether or not Sweden should establish a textile recycling system. Only some selected quotes will be presented. To get a more detailed view of the interviews, see the appendix.
6.2.1 Execution and technology

6.2.1.1 Should fast fashion be produced for recycling rather than reuse?

Question seven highlights the difficulties of recycling textiles in atomized processes, due to their complexity. The experts were asked to evaluate David Palm’s suggestion regarding designing fast fashion-garments for recycling rather than reuse. Six of the seven experts did not fully approve of this suggestion and their arguments were mutual:

• “It’s not very good. We need to focus on what is reusable. The Asian and African market reuse a lot and they would be very pleased with a Gina Tricot top. And we cannot focus on Sweden alone, we need to think internationally.”

• “The first step is to develop the recycling process. In addition, the environmental effect is a lot better if the textile waste could be reused in Asia or Africa; they gladly accept fast fashion.”

• “It’s not good. If a garment can have another life it is a lot more valuable. The focus needs to be on optimizing reuse. It’s a good thing if a garment is easily recycled, but a lot of energy can be saved by reusing it instead. The focus should not be on recyclability rather than of reusability, but if we can have both, it’s good.”

• “I don’t believe in this suggestion, because I think the focus should be on durability even if it’s fast fashion. It’s not realistic since the fast fashion companies don’t focus on the material, but on the expression of the garment.”

• “It’s not very good, but it’s possible. I cannot say how to solve it in a practical way, but if it would work, it’s a pretty good solution. But the technology today is insufficient, there’s still no way to extract raw materials from old textiles that can replace virgin fibers and such a process would mean a significant environmental load.”

• “This is quite good, but reuse is always better than recycling from an environmental point of view. After reuse, redesign is preferable and then comes recycling. And recycling in general requires a lot of resources. The market can’t be forced to apply this idea, but it could work if a profitable business concept could be developed from it. On the other hand, a certain percentage of recycled fibers should be a compulsion.”
6.2.1.2 The limitation of different types of fibers in textile products.

The following question brought up Kate Fletcher’s suggestion of limiting the number of different kinds of textile fibers in products in order to ease the recycling process. The experts approved of the suggestion, but found it too complicated to implement in Sweden alone at a present stage.

• “It’s a good suggestion, but it’s a fictive one, it’s not feasible. This is a complex question. The answer involves recycling solutions and the concept of closed loops. Since we don’t have these solutions today, there is no use in such an implementation.”

• “It’s a correct statement; it would make it easier. But this is not realistic, it’s not controllable. The designers need to start thinking in post-consumer terms, making products that are easier to handle at a final stage.”

• “You would have to consider how such a limitation would affect the quality and fashion level of a garment. Such a restriction should not be applied in Sweden only, since it could result in Swedish players loosing competitiveness against foreign players. But every designer should think in these terms while designing a product. They need to think further than the purchase and affect how the consumer can maintain the product.”

• “It should probably be applied with setting laws, alternatively with voluntary commitments, but laws if it should be applied on a global basis since the retailers often act globally.”

• “It’s a nice idea but it will be hard to legislate for such a limitation. It needs to be decided on an international level; otherwise Sweden would have to stop importing textiles that didn’t apply the requirements. In addition, it could collide with other laws. Initially, there could be recommendations.”

• “There needs to be fewer and cleaner materials in the bins that can be sorted easier. And there need to be better technology. Today, there’s basically only mechanical processing and we need to develop more options for chemical processing. Furthermore, there is a need for a bigger supply and greater demand.”
6.2.1.3 Other comments concerning this topic:

- “From an environmental point of view, you don’t actually lose that much by having the worn-out textiles incinerated, it’s not a catastrophe. You need to think of the textiles from a refinement point of view. A new garment has a refinement of 100 percent, but a donated garment might have 80 percent. The lower refinement, the lower quality of the fibers, and thus, the harder it gets to recycle into new fibers. In addition, a vast amount of energy is consumed in the fiber recovery process. With lump, there is hardly any environmental profit in refining the fibers, however, other recycling applications might be more suitable. But durability should not always be the focus. Take a wedding dress for instance; you will hopefully only wear it once. Perhaps it would be best to produce a dress of that sort in "fake-quality", using not so durable but less resource demanding fibers, such as paper fibers, instead of the traditional textile fibers. The difference between the two types of fibers is blurring.”

6.2.2 The consumers

6.2.2.1 Can the consumers be liable for handling their ragged textiles?

The interviews were initiated with a question concerning whether or not it can be required that consumers take responsibility for their worn out clothing, when the opportunities for textile recycling is as limited as they are today. Six out of seven claimed that consumers do not have responsibility to have their ragged clothing recycled due to the lack of collection systems. Some of the citations read:

- “If the textiles are ragged, then no, the consumers have no responsibility. It is a complex issue concerning who does have the responsibility.”

- “The consumers have a responsibility when it comes to the clothing that can be worn again, since there are options to give it to charity... But it needs to be accessible for the consumer. If they have to get into a car and drive for miles, there might not be an environmental benefit.”

- “There is no legal demand, so it will be hard to claim consumer responsibility. But it should be easier for the consumer to get rid of old textiles in a better way.”
The expert that stated that consumers do have responsibility, despite the lack of a recycling collection system argued that:

• “There are always gifts in the collection bins in a condition below the requests for unbroken and clean. And since the consumers can’t estimate what is useful for the organizations, they should donate all their textiles (even old underwear) in order for the organization to determine whether it’s reusable or not.”

6.2.2.2 Other comments regarding this issue:

• “There is need for an interaction between demand and supply. It’s up to the consumer to make conscious choices. If people stop buying rubbish, the rubbish will get off the market.”

• “It’s up to the consumer to tend to their garments in an appropriate way. And my impression is that the qualities of fast fashion products have improved.

• “The consumers need to feel responsible, but that doesn’t mean that it has to be legislated. It could be done by having campaigns to make sure that the consumers feel morally responsible.”

6.2.3 The producers

6.2.3.1 Do fast fashion companies have extended responsibility?

The issue of producer responsibility was recurrent during all interviews. Question two concerned whether companies that sell fast fashion garments of lower product quality have a greater moral responsibility of sustainability than companies selling products that are designed to last longer (in terms of style and durability). Two of the experts thought that the responsibility was on the consumers in terms of demanding better quality from the producers and tending to the garment in appropriate ways (in order for the garments to last longer). One expert claimed that all companies have equal responsibility in terms of making better products:

• “Well, all companies need to take responsibility, but if a company has low quality garments they should take responsibility by producing better products and support the consumers by informing them on how to handle the garment and so on. A fast fashion company manufactures at such a low level, and by
Four out of the seven asserted that the fast fashion producers did have additional responsibility:

- “If a company produces a large amount of waste, they should take more responsibility. Take plastic cutlery for instance; products which are meant to be used once will create a lot more waste than for instance metal cutlery which can last for hundreds of years. When producing short lived products, companies make it easy for the consumers to do the wrong thing.”

- “Yes, they do. In addition, a company that makes products that will last for a long time, in the terms of durability and fashion have already taken a part of their producer responsibility. On the other hand, if a company produces products with an immoderately poor quality, they might not consume that many resources in the manufacturing. For instance, a high quality jacket with different kinds of functions and applications, use up a lot more energy than a simpler jacket of low quality. So high quality often is connected to a high level of consumed resources.”

- “If you put a product on the market, you have some responsibility for the durability of the product. Producing products with a short term lifecycle is not a sustainable business model. The producers should offer their customers to retake the material after use. For instance, a t-shirt for 49.90 SEK will last for three washes, and then there will be no second hand-value.”

6.2.3.2 Should Sweden have a legislated producer responsibility for textiles?

The third question concerned if Sweden should have a legislated producer responsibility for managing discarded textiles. Three experts recommended a voluntary producer responsibility with the following motivations:

- “Optional producer responsibility enables rapid movements, flexibility and adaptability. A legislated system might be too slow moving. The industry could get stuck in a corner with inspection reports that don’t work and the process would become too tardy.”
“Creative ‘forces’ should be able to act freely to find the best solutions. Take H&M as an example, collecting used garments from customers at a global extent. If Sweden decides to have its own system, it becomes troublesome for H&M to manage their system and way too bureaucratic. We need to have a flexible system in order to face the problem the ultimate way. And since the production is global, the management of remaining textiles needs to be so as well. In addition, legislated producer responsibility systems are seldom evaluated. How do we know that the present systems are optimal if they are never compared to other options? How do we know the environmental profit of collecting glass at the collection sites, having them transported and re-melted? Perhaps it’s better to crush it and use it as filling, instead of mining rocks? There are no up-to-date data, we simply continue on doing what we have done before. My point is that if Sweden had a legislated producer responsibility, the operation needs to be evaluated every year in order to get maximum environmental benefit for the money invested.”

"An optional producer responsibility is preferable if it’s comprehensive. Such a responsibility would have to be taken by all companies in order to achieve an extensive effect. But if the system doesn’t improve significantly from where it is today, we would have to legislate the responsibility. We need to extend the volumes of textiles to recycle. Occasional events when a company offers the customers to return, say, their old jacket and get an amount to shop for in return, won’t solve anything. The volumes are too small to make any difference and they are hard to repeat since the customers will get tired of it.”

The remaining four experts supported a legislated producer responsibility. The primal reason for this was that every company would have to take responsibility, not only the bigger ones. In addition, it would be a system that could be followed up and applied in the long-range. One expert stated the following:

“Since the textile industry is hard to regulate, a legislated producer responsibility would mean that everyone would have to start taking responsibility. Usually, a legislated producer responsibility works best. The system would have to be more or less bureaucratic and the responsibility would be on the producers to handle the restrictions themselves and they would need to work with sanctions. Producer responsibilities for materials are not handled with the police if the rules are not followed. It’s optimal if the market can solve the issue themselves, but they would need some help getting there. It’s important to have a working economy on the market, but by policies, the end would justify the means.”
Another expert considered the need for producer responsibility to go as far as for the companies to handle “their own” post-consumer products:

- “There has to be a mandatory producer responsibility since it would be hard to overcome the problem otherwise. By having a legislated responsibility, the companies would have to consider what they produce and how they produce it. A company producing products with poor durability would get back a lot of the clothes and they would have to handle big volumes and that would be costly. So there needs to be an economic value in making products that lasts longer. In addition, the contents of a garment, such as chemicals and rivets, would matter to the handling of the post-consumer textile. It’s harder to recycle a product with prints or sequins for instance, and if it would affect the company, the designer would have to take the post-consumer process into account.”

6.2.3.3 The Polluter Pays Principle

The fourth question concerned the “Polluter Pays Principle” that was described in the theoretical frame of reference. The question concerned whether the same system (currently used for tired, packing, newsprint, batteries etc.) could be applicable to the textile industry. Two experts answered that it would, with the motivation that it ought to work for textiles since it works for other materials. The remaining five stated that the system would not be suited for discarded textiles. The main contention was that it would be too complicated and that it would undermine the voluntary organizations:

- “It would be troublesome since textiles are more valuable than tin cans and newspapers. As a consumer, I own my products and I’ll gladly donate old clothing to charity, but when a company gets revenue of my product, I should be the one who gets it.”

- “It would be too complicated. Röda Korset (the Swedish Red Cross movement) does this and H&M does that. It would be hard to develop a corporation for textiles that is dynamic; a good enough solution for everyone.”

- “It’s possible but it’s not a favorable option. It would be a deathblow for the voluntary organizations since they would lose their source for revenue. It would force them to develop new systems in order to become competitive, and it’s doubtful that they have the financial strength to do so.”
• “There are probably more effective solutions. Textile waste doesn’t occur as often as packing and newspapers. The best solution would be to have the retailers offering consumers to return their textile waste in the shops or close to the shops. The different players in the industry could share collection sites and a deposit system could be put into practice; for instance, if someone returns a garment, they could get a discount of the next purchase.”

6.2.4 Supply & demand

6.2.4.1 The Ragn-Sells, Myrorna and KBAB collaboration.

The volume of discarded textiles is presently too small to provide for an effective recycling system in Sweden (Palm, 2011). Question six was about how to increase the supply. The cooperation between Ragn-Sells, Myrorna and KBAB in Karlstad (described in the theoretical frame of reference) was used as an illustration to how this can be done. The experts were asked to evaluate this solution and the opinions differed. However, most of them thought that it was an overall good initiative:

• “It’s good, but it is not certain that the consumer can estimate what is sellable or not, so there is a risk that we’ll lose valuable products.”

• “It’s great! It’s accessible for the consumer, no need to store the products at home, and no car is needed. And it’s an offer, the consumer has a choice to donate or not."

• “It’s no use to divide it into two bins, since it has to be sorted manually anyway; there is no market for unsorted loads. The voluntary organizations don’t get compensated for the expense connected to the unsellable products, but the value of high quality clothing generate a profit, which can be invested in the handling of future bins. Thus, there is no profitability in collecting clothing in poor conditions, since the costs of handling them (personnel, transport, processing and so on) is too high.”

• “The idea is good, but according to my experience, you tend to get a large share of undesired materials, so there is a risk that they’ll get a lot of garbage.”
6.2.4.2 How to increase the demand for recycled textiles.

Question nine concerned how the demand for recycled textiles could be increased. The experts proposed the following factors:

- Ability to guarantee a certain volume
- Ability to guarantee a certain quality
- Competitive price levels (compared to virgin fibers)
- Consumer demand for sustainable fabrics
- An international system
- A better system for deposing worn out consumer textiles
- Waste plans and legislation
- Better technology for extracting and reclaiming used fibers
- Better ways to integrate reclaimed fibers in the production

One expert gave the following suggestion:

- “If there was a regulatory requirement or some sort of labeling system for textile products that contains a certain percentage of recycles fibers, it would intensify the demand. But it would have to be applied globally, not only in Sweden. In that case, it’s important to start at smaller percentages. If every garment contained as little as five percent of recycled fibers, the environmental profit would be immense. It would reset the entire production system.”

6.2.4.3 Would recycled fibers from Sweden be competitive against virgin fibers?

The following question dealt with whether recycled textile fibers from Sweden can compete price wise with new fibers from countries closer to production, with higher output. Two experts suggested that the recycling facilities should be placed closer to the manufacturing markets.

- “Perhaps it would pay off, both economically and environmentally if we could send the textile waste in bales to China instead, since they have better technology.”
• Other aspects were the following:

“We can’t offer recycled textiles in a large scale, so they will probably get more expensive. The lack of supply of textiles to recycle is a major obstacle. In Europe, there is an existing recycling industry in countries such as Italy, Germany, Holland and England, but their customers are not from the textile industry. The recycled materials they produce are down cycled (perhaps sometimes up cycled) in other industries, thus, no closed-loops. But we need to distinguish companies producing fillings for cars and new, re-spun fibers.”

• “There are hardly any local buyers. But there are textile recycling companies in Germany (where H&M sends their collected garments) and Italy, and these companies have managed to make it profitable. But to compete with virgin fibers? Doubtful.”

• “There is a reason to why Stena Recycling had to shut down and that is the access to cheap virgin fibers. But with new technology, maybe. It’s important to have a consistent flow of textiles that enter the facility and that the recycled product is good enough, as well as the fact that there has to be buyers to that product. Only at that stage could it be profitable. At the initial phase, someone might subsidize the project, but at a long term it needs to be self-sufficient.”

• “Within certain segments of the market, such as premium products, then yes. But for fast fashion it’ll be difficult.”

6.2.4.4 Other comments of supply/demand were:

• “There are existing recycling systems abroad. If Swedes donated the estimated 8 kg of textiles/person that is incinerated today, the volume collected would still be too small for our own recycling system. We would have to coordinate flows from central Europe to be able to implement a comprehensive system. Germany has just below a million tons of textiles, but in Sweden we could hardly collect 25’000 tons. The ones making the calculations in Sweden don’t separate textiles from shoes and other stuff.”

• “We are facing a future where the supply of certain virgin fibers (such as cotton) will be scarce. Furthermore, there is a need for a shift to more sustainable fabrics, such as viscose. The environmental damage of cotton is huge compared to viscose.”
6.2.4.5 Policies for leveling the price between virgin and reused fibers.

In question 14, David Palm’s suggestion of introducing policies for leveling the difference in price between virgin and reused or recycled textiles was raised. The experts were asked to evaluate this suggestion and comment on how such a policy could affect the Swedish commerce, and the opinions differed. Four of the seven experts found that it would be better to let the market regulate itself in this matter. The remaining three were more or less optimistic; consumer impact and fair prices were mentioned in their reasoning.

- “It’s not that good. I don’t approve of that kind of policies. If we can make something of the fibers, there is an application and companies need to find their niche on the market. It is better for companies to find their natural role in the production flow.”

- “It’s not good. I think we would have a lot of wangle with such a system. And how are we supposed to be able to verify that the policy is followed? It would require an ability to control the exact content of a garment. In addition, many companies export a large proportion of their products, and to restrict the Swedish market and having different regulations for flows to local and foreign markets would be complicated. And if products got more expensive in Sweden, customers would probably turn to foreign web based shops where it would be cheaper.”

- “It’s not very good. The options are too limited when it comes to production with recycled fibers. If there was a supply it might work, but as for today, it’s a fictive solution. Such a policy would encourage producers to find good solutions to integrate recycled fibers. But Sweden is too small, what’s done here doesn’t matter in a larger context.”

- “This will be tricky to solve. But most people look at the price tag and it would be of value for Sweden to express our standpoint in the matter. And if recycled fibers are cheaper, the demand would increase. A policy would signal a sustainable approach, and the industry couldn’t probably operate such a system themselves.”
• “It’s good, but we need to work on consumer behavior in order for them to know what they buy and what life-span different products have. It will be hard to control it on an economic basis.”

• “It’s a good solution since people that usually don’t afford to choose the garment that is produced in an environmentally sustainable way, can afford to choose ecological solutions as well.”

6.2.5 Logistics

6.2.5.1 How can a textile recycling system be optimized logistically?

Question eleven was about how a textile recycling system in Sweden could be optimized logistically. The experts agreed on that consumer access to an ingathering system is fundamental:

• “Access to an ingathering system is primal. Perhaps combining waste plants with curbside collection sites and at strategically chosen places in the public sphere. If a more extensive flow is generated, the logistics will follow the development and improve gradually.”

• “It needs to be easy for the consumer to get rid of the garment. And it’s preferable if the different stages are close to each other. For instance, textile waste from Skåne shouldn’t be sent to Norrland for processing.”

• “I think it’s a good idea with withdrawals. Take Marc’s and Spencer’s for instance, their trucks should have gone back from the stores empty, but they collected garments from their customers and sent them with the empty trailers. So if one could find a solution where there’s a collection bin at a mall for instance, they could use the same method and send the collected waste with the empty trucks.”

• “The best logistic solution would be to have collection sites close to the stores where the consumer would be given two options when donating: reuse or recycle (the latter option if the product is broken but clean and in a good material). Logistically, there would be a flow of new textiles into the shops, and a flow of old textiles out of the shops.”
Other points were:

- “To fill containers with used textiles to a maximum level, and send them by boat to recycling facilities, could be a good solution; pricewise and environmentally.”

- “It would have to be done in three steps: 1; designate who is liable for collecting the used textiles, 2; setting new aims, which would include making the system sustainable economically, 3; finding logistic solutions and this is not that hard to do; textiles are not more complicated to handle than other materials, but it’s important that they are kept from damp.”

6.2.5.2 The Röda Korset initiative.

Röda Korset’s initiative to send textile waste in empty trucks to Holland was raised in question 12. The experts were asked to evaluate this example and everyone agreed on that it was a good solution but some of them questioned if the trucks really were about to go back empty (stating that the trucks usually bring freight back).

6.2.6 Politics and policies

6.2.6.1 The regulation of ownership to the textile waste

Question five concerned how the ownership of the textile waste should be regulated. On this topic, the concept of waste played a leading part:

- “Worn out textiles need to be disclaimed as waste. Textiles remaining from industrial production are considered to be waste and a permit is needed to handle waste. And when textiles are defined as waste, the township is the owner.”

- “It’s important to keep the collected textiles apart from the waste classification. Some local authorities consider all waste to be included in their monopoly, while others don’t. Thus, there is a need to determine the ownership legally.”
The township has a monopoly in dealing with waste from households and they have a possibility to make it easy for the consumers to deal with their worn out garments, with help from the recycling industry.”

“Perhaps a consortium between all the players.”

6.2.6.2 Policies

Question 13 aimed to submit significant policies for an application of a textile recycling system in Sweden. Long-term solutions, making it easier for the consumers to engage, Konsumentverket and Naturvårdsverket were mentioned.

“By providing more information to the consumers. Konsumentverket (the Swedish consumer agency) should be more active with educating consumers on how to estimate the quality of a product and how to care for it in order to last for a long time. But if there were policies at an EU level for having a certain percentage of recycled fibers in textile products, the demand would increase, new business plans would form and a recycling system would be established automatically. Take the transition from light-bulbs to LED-lamps for instance; if the consumers won’t be able to buy the traditional light-bulb, the industry will adapt and invest in new solutions. But to have such a restriction at a national level would only be to disfavor the industry in that country. Thus, if limitations are introduced, it needs to be at a EU level. And perhaps starting with labeling and continuing on to be regulatory requirements.”

“Making it easy for the consumers, regulations for the incineration market and guidance towards utilization of existing materials. There is a need for a 100-years perspective where it is vital to make use of what we already have.”

“It’s essential with long-term policies. One decides how it’s going to be, and one sticks with it. It’s important that the policies are clearly formulated; there shouldn’t be any options for discretion.”
• “A producer responsibility where the environment and the human health plays a big part, for instance fees for toxic substances in the products. Pretty much the same regulations that’s used for children’s toys.”

• “There’s a need for a legislation to regulate responsibilities. Which actor ”own's” the issue, who is promoted to give licensee for collecting textile waste. Someone needs to take charge to prevent that anyone can do anything (for instance, placing a collecting bin). There are many fishy organizations out there.”

• “Perhaps it should be costly to incinerate textiles? (The interviewer asks: for whom?) It’s hard to answer. But considering environmental issues, policies tend to have the best effect.”

• “To impose the industry. Start with a governmental proposal and have Naturvårdsverket (a Swedish national administrative authority dealing with environmental issues) issue directives to the industry. “

6.2.6.1 An additional comment concerning politics was the following:

“On a Swedish level, a material company (materialbolag) is important for collecting consumer textiles, but no regulations further in the process.”

6.2.7 Should Sweden establish a textile recycling system?

The last question concerned whether or not Sweden should establish a textile recycling system. All seven experts were positive, but their answers concerning to what extent and how it should be done varied:

• ”Yes! But if Sweden should implement the whole process or not, I don’t know, but we should make sure that the fibers are recycled. Perhaps it’s better if they do it in Denmark?”

• “Yes, if we are serious and want to develop from the low levels of recycled fibers that we have today, such a decision would be a distinct indication that
would increase the volumes. As a consequence, new systems would have to evolve.”

• “Yes, the textiles need to be collected so they can be used as resources, rather than incinerated. The private players need to have access to textiles to recycle, therefore, the municipality need to resign their monopoly.”

• “Yes, due to the environmental argument. But we will need directives for reuse and recycling.”

• “We can strive for it, but an implementation is based on someone taking charge and determines the rules, and today there’s nobody. We should try to collect as much as possible and link the system to central Europe in order for the final processes to take place there. But in doing so, we have gained a lot. “

• “There is no competitive basis in Sweden for such a system, it should be handled internationally. There should be a system that we have access to, but it shouldn’t be placed in Sweden. But if competitive business plans emerge, it’s great.”
7. Analysis & Discussion

The implementation of a textile recycling system is a complex matter. The experts underlined that long term solutions are essential. One expert said that there is a need for a 100-year perspective where it is vital to make use of what we already have. Nevertheless, a 100-year perspective would have to be divided into milestones, and within the different milestones, different factors would have various significance. Svensk Handel Stil emphasizes the importance of viewing discarded clothing as a resource, rather than waste. The tricky part is to develop a system that enables old textiles to be handled and treated with a profitable outcome.

7.1 The ten year perspective

7.1.1 Producer responsibility

The opinions concerning whether or not to legislate on producer responsibility in the handling of discarded textiles were divided. Three experts recommended keeping it voluntary, arguing that a legislated system would be too slow moving and complicate the competitive landscape for Swedish companies. Flexibility, freedom to find creative solutions and international competition were the main factors that spoke for a voluntary responsibility. Tojo (et., al, 2012) wrote about how brand owners and retailers in Sweden are willing to work on closing the material loop. Initiatives such as T4RI, Swedish Trade Style and NÅÅ points to the fact that some Swedish companies do strain for creating better conditions for textile recycling in Sweden. One expert said that an optional producer responsibility is preferable, but if the situation does not improve significantly from where it is today, legislation would be required. Furthermore, the same expert considered that the volumes of clothing collected by companies are too small for adapting a recycling system, as well as for making an environmental difference.

The opponents argued that a legislated responsibility would make more of a difference, mainly because it would include every company but also because it would be followed-up on. One expert agreed with Wang (2006) who asserted that the development of a textile recycling system requires an integrated industry with close public-private cooperation. This expert said that the optimal solution would be for the industry to handle the monitoring themselves, but that they would need some help getting there. The expert continued by underlining the importance of having a working economy on the market, but by having strict policies the end would justify the means.
An interesting approach to the issue of consumer responsibility was the expert that wanted each company to handle their own post-consumer waste, meaning that the companies would truly have to engage in their products afterlife, beginning at the design stage of the product. This expert explained that in formulating the responsibility this way, companies producing products with poor durability would get back a lot of clothing which would be costly to handle. However, the expert did not have a suggestion as to how this type of producer responsibility could be operated in practice.

7.1.2 Collection of post-consumer textiles

Most experts emphasized the importance of accessibility to collection sites as a key factor when it comes to implementing a textile recycling system. This coheres with the conclusions of the survey made by Kretslopp och Vatten. Many experts claimed that the consumers have responsibility for the textiles that can be used again, since there is a present system in use. It could therefore be assumed that the consumers would have a responsibility if a textile recycling system should be applied.

The experts emphasized the importance of disclaiming discarded textiles as waste, since it gives the proprietorship to the municipality and limits the opportunities of taking advantage of the waste. Sandow (2012) and Tojo (et., al, 2012) raise the same issue. Tojo (et., al, 2012) writes about the importance of legislation being adapted in order for the textile waste to be estimated as a resource, which free agents can collect and reuse or recycle. However, the investigation made by Avfall och Vatten showed that there is a problem with consumers not trusting the collectors. One of the experts said there is a need for a legislation to regulate responsibilities and to determine who is promoted to give license for collecting textile waste, preventing anyone from being able to do anything (for instance, placing a collecting bin). Therefore, the so called 90 account to organize fundraisers on municipal land suggested by Kretslopp och Vatten could be applied to make sure that there are no more “fishy” organizations out there.

All experts deemed that the producers should take more responsibility for the afterlife of textile products. But most of them agreed that the Polluter Pays Principle- system would not be suitable for textiles since it would be too complicated to establish and since it would undermine the businesses of voluntary organizations. One of them suggested that Sweden could have a material company (materialbolag) for collecting consumer textiles, but that there should be no further regulations in the process. This could be accomplished by having additional collection sites operated by the producers, offering the customers to hand in textiles at convenient locations. Places
such as the public sphere, in-store or close to the stores (for instance a mall) were suggested by the experts. Christopher and Holweg (2011) write about how asset sharing can reduce costs and waste. One of the experts mentioned a consortium between all the players as a way to take producer responsibility. Based on the statements of Christopher and Holweg, one option might be for the producers to share collection bins, transport and so on, as well as having flexible labor arrangements in order to meet seasonal swings.

Jensen recommends working with existing collection systems and the experts underlined the importance of maintaining the voluntary organizations. Therefore, a combination of giving sellable products to voluntary organizations, ragged textiles to recycling companies and both sellable and discarded textiles to the producers might be a good solution. One expert expressed a delight in giving clothing to charity, but he would not approve in donating to a recycling company that would make a profit of his donation. He, and another expert, suggested that the consumer should be financially compensated when offering clothing to profit-driven companies. H&M put this into practice by giving the customers a voucher for handing in any pieces of clothing, from any brand and in any condition. The suggestion of having a flow of new textiles into the shops and a flow of old textiles out of the shops was suggested by two experts as a sustainable logistical solution.

### 7.1.3 Educating the consumers

In order for the consumers to take responsibility, they need to know the importance of doing so. The investigation made by Kretslopp och Vatten showed that there is a need for more information about the environmental benefits of reusing clothes, a matter that the Swedish Red Cross and Domina and Kotch (2002) agrees on. These ideas are in line with the expert who said that the consumers need to feel morally responsible and that this should be done by having campaigns.

The initiative of collecting reusable and recyclable textiles in Karlstad (Ragn-Cells, 2013) was mostly met with positive comments; however, the experts saw many problematic factors in this solution. The fact that the consumer would estimate whether or not a product is sellable could lead to the loss of valuable products. Furthermore, one expert claimed that the collected textiles would have to be sorted manually anyhow, and therefore, there is no use in having two bins. However, since the labor cost for sorting manually in Sweden is relatively high, perhaps it would still be profitable to let the consumers handle the first step? If so, consumer education and clear instructions on the bins would be necessary. Valuable products would however be lost to some extent, but would the costs of the forfeited products exceed the costs
of distinguishing ragged textiles from sellable ones? This is a question that would have to be answered with further research.

7.1.4 Sorting

The high cost of handling post-consumer textiles in Sweden is a problem observed by many of the experts. Palm (2011) too explained that the handling costs of discarded textiles in Sweden are high compared to material and production costs in producing countries such as India and China. One of the experts suggested that Sweden should link our system to recycling facilities abroad. One solution might be to organize the initial sorting process in Sweden, in order to distinguish what could be sold on the Swedish market and what should be worn again in developing countries. The remaining textiles could thereafter be sent to already existing recycling facilities, where they could be re-sorted and prepared for recycling.

7.1.5 Recycling abroad

All experts said that Sweden should implement a textile recycling system to some extent. However, they doubted if it would be profitable for Sweden to take care of the whole process. Even if Sweden would establish a functioning collecting system where no textiles were incinerated; according to an expert, the amount would still be too small for an efficient system. This is a problem that is also discussed by Tojo (et., al, 2012) and Palm (2011). And according to one expert, Sweden is too small to make sufficient difference in the sustainability of the planet. In addition, according to the literature reviewed and the experts interviewed, it is doubtful that reclaimed fibers from Sweden could compete pricewise with virgin fibers.

One expert suggested that a fine solution pricewise and environmentally, would be to fill containers with ragged textiles to a maximum level, and send them by boat to recycling facilities. Several experts mentioned existing facilities in Europe, and two experts said that it would be reasonable to place the recycling process closer to the manufacturing markets. One solution could therefore be to have the remaining textiles sent to Asia, due to the considerably lower handling costs and since it would be closer to the manufacturing markets.

To send our textile waste to manufacturing countries such as India and China would increase the pipeline that Harrison and van Hoek (2008) writes about and could expose the load to great risk. In addition, the shipping cost would be higher than
handling the waste directly in Sweden. However, reclaimed fibers produced in Sweden would need to be provided close to the manufacturing markets, thus, the fibers would probably have to be sent across the globe anyway. Furthermore, the financial risk is greater with processed fibers than with post-consumer textiles.

In Asia, the textiles could be sorted according to adequacy. Hawley (2006) asserts that textiles are 100 percent recyclable. However, one of the experts talked about the refinements of fibers, claiming that a new garment has a refinement of 100 percent, while a donated garment might have 80 percent. The lower the refinement, the lower the quality of the fibers and the harder it gets to recycle into new fibers. Supposedly, the majority of the textiles sent to Asia have a refinement below 80 percent. These textiles would be suited for mechanical recycling methods (it would probably not gain that much environmentally to have poor quality fibers be recycled in chemical processes, but this requires further research). The textiles with higher refinement and consistent fiber blends could be recycled chemically, and re-spun into new fibers. These fibers would be provided close to the manufacturing market and perhaps even competitive in price in relation to virgin fibers, implementing a closed-loops system. If not, one of the experts thought that there would probably be a niche market interested in recovered fibers. And since many fashion companies use recycled fibers in their collections as tools for brand building, the demand would probably increase further.

The solution of sending textile waste for recycling to Asia could be applied as a collaboration between the Nordic Countries and/or other countries in EU in order to increase the volume and thereby, the efficiency and profitability. Since there are recycling facilities in Europe that manage to stay profitable, and because the labor cost is cheaper in Asia than in Europe, it would probably be profitable for recycling facilities in Asia as well. However, further research is required in this area.

7.1.6 Execution and technology

One of the experts claimed that one does not actually lose that much by having the worn-out textiles incinerated. However, both Jensen (2011) and Fletcher (2008) claimed the opposite. According to Fletcher, even the most energy intense processes of shredding fabrics, reclaiming fibers and re-spinning them into yarn, adds up to less energy use than the production of new items.

The experts agreed with Wang (2006) about the need for better technology for extracting and recovering fibers. Processes need to require less environmental and
financial resources than it does today, and produce high quality products in large volumes. Hopefully, initiatives such as Textiles4Textiles, Tejin Fiber’s closed-loops and Re:newcell’s regeneration of fibers from old clothing will bring the development forward. However, it will probably take a couple of years until recycled textiles will meet the requirements of the market.

7.1.7 Competitiveness

The importance of finding solutions that can be applied on an international basis was pervading throughout the interviews. Since the textile industry is global and Sweden is a member of the EU, the experts stressed the risks of implementing policies for the Swedish market alone. In addition, since Sweden is a small country, national policies would not make that much of an environmental difference on the whole. Furthermore, the risk of having Swedish players losing competitiveness against foreign players was once again addressed, as well as the complexity that would follow when importing products.

Palm’s (2011) suggestion of introducing policies for leveling the difference in price between virgin and reused or recycled textiles was not popular with the experts. Once again the experts emphasized that the Swedish market should be free from restrictions of this sort since it could damage the Swedish companies’ ability to compete internationally. Therefore, legislations such as the EU revised Waste Framework Directive, need to implement general improvements of the textile waste issue.
7.1.8 The ten year perspective-model

Based on the theoretical frame of reference, the result and the section 7.1; a potential short term solution that could be applied from now and ten years ahead, has been developed:

![Diagram of the ten year perspective model](image)

**Figure 6.** The ten year perspective model (Porse, 2013)

The municipality have disclaimed their ownership to discarded textiles, and by having campaigns, the consumers have learned the importance of handing in their old textiles at collection sites. The collection sites are accessible and operated by either charity organizations with a 90 account, or a consortium between the players in the textile industry that are present on the Swedish market (the liability would vary due to market shares). At the initial phase, the government might need to subsidize the project, but at a long term it has to be self-sufficient.

The collected textiles are sorted in Sweden where products that could be sold on the second hand market are separated from products that could be shipped to developing countries. The products that are not suited for a second hand use, are be sent for recycling abroad (preferably by boat) where they are re-sorted and recycled. One solution could be to have the remaining textiles sent to Asia, due to the considerably lower handling costs and since it would be closer to the manufacturing markets. The recovered fibers would be used in new products and perhaps sold on the Swedish market. When the consumers need to dispose of these products, they would be utilized in full according to the EU Waste Management Hierarchy (European Commission, 2013).
7.2 Sustainable products

Most experts did not agree on Palm’s (2011) suggestion of designing fast fashion-garments for recycling, underlining that reuse needs to be optimized. This reasoning complies with the EU’s waste management hierarchy. However, the experts considered the design stage to be of great importance in achieving sustainability, by making fashion of higher quality (in terms of durability and long lasting style). In addition, they deemed that designers need to become more aware of post-consumer terms, making products that are easier to handle at a final stage; a reasoning that can be linked to the principles of a circular economy and the concept of closed-loops. One expert argued that it is not a sustainable business model to produce products with a short term lifecycle; an opinion that is shared by Chouinard (2006), who states that we need to instigate change in order to survive in the long run.

While most of the experts interviewed, as well as the researchers represented in the theoretical frame of reference, underlined the significance of product quality, one expert was opposed to this conventional issue. This expert argued that durability should not always be the focus, using a wedding dress that only need to last for one day as an illustration. This expert stated that ”fake quality” could be an option, claiming that products in poor quality are often produced with less resources than products with higher quality. This reasoning raises the question if durability really should be the leading argument or if it actually intensifies the gap between the aesthetic and the technical lifetime of a product, observed by Palm. Further research is needed in this area.

7.3 The twenty year perspective

During the spring 2013 master course in Art of Business, Professor Simonetta Carbonaro argued that we need to combine the interest of our economy with the interest of our civilization, and without the union of these two, there will be no long term growth.
Suppose that Sweden would establish a system for textile recycling similar to the “ten year perspective -model” (Figure 6, 7.1.8) that was previously suggested. We would then have environmentally conscious consumers and an extensive collecting system of discarded textiles within ten years. Sandow (2012) states that the future market of the textile industry faces an inevitable challenge; finding alternatives to virgin cotton and oil-based fibers are increasingly important and may be crucial to how we can provide all consumers on the planet with clothes. Sandow’s statement was confirmed by Willers in the interview with Radio P4.

The need for new, more sustainable materials heighten the expectations on the wood-based textile fiber CelluNova, which could make Sweden a major textile producer again. Östlund hopes that a production could be put into practice within five years from 2013. If this indeed is the case - if the Swedish textile industry is headed for a recapture - the issue of a textile recycling system in Sweden could be seen in a different light. If the technology for automatic sorting and the ability to regenerate fibers from old clothing will be good enough within ten years to meet the requirements of the market (and enable profitable and environmentally sustainable solutions), Sweden would be able to fully take care of its own textile waste and make it profitable.

With an already extensive collecting system, the flow of old textiles could be consistent. If needed, discarded textiles could be imported from the adjacent Nordic countries. The Swedish synthetic cellulosic fiber industry would sweep the path in penetrating the market and facilitate the abilities for recycled textiles to serve as a complement to wood based fibers. New, sustainable business plans could emerge and Sweden might become a major supplier of eco-friendly textiles. Thus, the Swedish textile industry would cohere with Carbonaro’s (2013) model of growth.

**Figure 2.** Carbonaro’s model of growth (Carbonaro 2013)
Christopher and Holweg (2011) states that the previous trend of manufacturing in low cost countries has been reversed with a near-sourcing strategy. If this is true, new clusters of textile manufacturing companies will pop up closer to the European market. If so, recycled fibers from Sweden could be provided close to the demand, which according to Bruce (et., al, 2004) is essential for fashion companies in order for them to have a quick responsive supply chain. Due to the oil price hikes described by Christopher and Holweg, the Swedish textile industry would be a cost-effective option for the potential European textile industry. Apart from the benefits of having a quick response supply chain, near sourcing is beneficial to the environment since shorter distances means less emissions.

7.3.1 The 20 year perspective-model

Based on the theoretical frame of reference, the result and the sections 7.1-7.3; a potential long term solution that could be applied in Sweden within 20 years has been developed:

![Diagram of the 20 year perspective-model](image)

Figure 7. The 20 year perspective-model (Porse, 2013)

The environmentally conscious Swedish consumers would hand in their old textiles via an extensive collecting system described in the “Ten years perspective-model”. If needed, discarded textiles could be imported from the adjacent Nordic countries. The
collected textiles would be sorted in Sweden, where products with a second hand value would be separated from the products with no demand. The remaining textiles should be sorted automatically according to type and adequacy. The fibers should be regenerated in a profitable and environmentally sustainable process, that generates high quality materials.

The recycled fibers would serve as an alternative to virgin cotton and oil-based fibers, responding to the demand for sustainable materials. Sweden could become a major supplier of eco-friendly textile fibers and provide these fibers close to demand for the putative future European textile industry. The recovered fibers would be used in new products and perhaps sold on the Swedish market. When the consumers need to dispose of these products, they would be utilized in full according to the EU Waste Management Hierarchy (European Commission, 2013).

7.4 Answers to the research questions

Should Sweden implement a textile recycling system?
Yes, according to the seven experts interviewed for this thesis.

To what extent should a textile recycling system in Sweden be implemented?
Based on the theory, the interviews with the experts, Carbonaro’s statements, and the analysis, the initial phase of the system should be to establish collecting arrangement for textiles in all conditions. The discarded textiles should be sorted in Sweden and exported for recycling.

If the textile industry will shift to having a near-sourcing strategy and if synthetic cellulose fibers will revive the Swedish textile industry, Sweden could benefit from having a complete recycling system within 20 years.

What are the essential factors in implementing a textile recycling system in Sweden?
Based on the theory, the interviews with the experts, Carbonaro’s statements, and the analysis, the following factors are essential factors for implementing a textile recycling system in Sweden:
What are the possibilities for a textile recycling system in Sweden?

There will be demand for alternative textile fibers, and recycled textile fibers could serve as a sustainable option. A textile recycling system could make Sweden a supplier of sustainable fibers.
8. Conclusions

The following conclusions concerning the application of a textile recycling system in Sweden is based on the theoretical frame of reference, the interviews with the experts, and the analysis:

- There will be a demand for alternative textile fibers, and recycled textile fibers could serve as a sustainable option.

- After taking the environmental aspects into account, profitability in a textile recycling system is primal.

- The development technology to produce recycled fibers of high quality, with a sustainable and low-cost chemical processing, and mechanical sorting, is overriding in order to implement a closed-loop system for textiles.

- Regulations and legislations related to post-consumer textiles are best applied on an international basis. Furthermore, for best results, it must not be too complicated to implement and followed up on.

- Solutions need to optimize reuse before recycling.

- Producer responsibility in handling post-consumer textile waste should be restricted to the collecting phase. This could be done by offering consumers to hand in any textiles in any condition, close to the stores (preferably inside to avoid damp and garbage in the containers). The containers could be handled by a consortium between the players in the textile industry that are present on the Swedish market (the liability would vary due to market shares). At the initial phase, the government might need to subsidize the project, but at a long term it has to be self-sufficient. Collection could be combined with vouchers or other types of compensations to the consumers. The collected textiles could be sorted in Sweden and sold in the stores, to players in the second hand market, to recycling companies, or donated to Swedish charity organizations/developing countries as good-will branding.

- The producers take part of their responsibility when providing high quality products. However, durability should not necessarily be the focus. The serviceability of a product should be regulated according to the intended life-span and the level of consumed resources. In addition, the producers need to take the final stage of a product into account at the design phase to simplify reuse, repair, redesign and recycling.
➢ The system must not undermine the conditions for the charity organizations. There needs to be regulations by which organizations are allowed to have containers in public areas. Consumer education is needed to inform about the ethical profits of donating textiles to charity.

➢ Consumers cannot be liable for handling their worn-out textiles until a system for handling is available. However, they do have the responsibility to influence the market by demanding more sustainable options.

Sweden should implement a textile recycling system and the initial phase of the system should be to establish collecting arrangement for textiles in all conditions. The discarded textiles should be sorted in Sweden and exported for recycling. If the textile industry will shift to having a near-sourcing strategy and if synthetic cellulose fibers will revive the Swedish textile industry, Sweden could benefit from having a complete recycling system within 20 years.
9. Future research

Textile recycling is a complex matter with many aspects to take into account. Further research is needed to determine what policies are necessary to improve the implementation of a textile recycling system on an international basis. More research on how textile products should be designed in order to ease the recycling process, without compromising on the product quality or fashion level is needed. In addition, options to durability (such as ”fake quality” for garments only meant to be worn a few times) that are less resource consuming need to be investigated and environmental gain need to be estimated.

One of the experts said that the companies would truly have to take responsibility for the entire life-span of their products if they were accountable for the final stage of their own products. Further research is needed to investigate if this is effective and how it could be solved in a practical and financial way. Whether or not is profitable to have the consumers sort ragged textiles from those that could be worn again needs to be investigated and calculated upon.

Due to lack of time, the Asian market for recycling could not be investigated; further research is needed in this area. Further research concerning effectiveness, price worthiness and environmentally sustainable logistic settlements of a textile recycling system in Sweden is also necessary. It needs to be determined if it makes any profit or environmental sense to recycle poor quality fibers chemically. And, of course, more research on technology is required to develop better recycling processes.
10. References


Carbonaro, S., 2013. Notes taken by the author of this thesis from lectures of the Art of Business course given to the Applied Textile Management students of The Swedish School of Textiles, Borås, Sweden.


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APPENDIX

1. It is estimated that Swedish consumers throw away about 8 kg textiles each year for incineration (Zamani, 2011). Can we require that consumers take responsibility when the opportunities for textile recycling are as limited as they are today?

If yes: how can the consumer take such a responsibility?

D
There are always gifts in the collection bins in a condition below the requests for unbroken and clean. And since the consumers cannot estimate what is useful for the organizations, they should donate all their textiles (even old underwear) in order for the professionals to determine whether it’s reusable or not.

If no: who is responsible?

A
If the textiles are ragged, then no, the consumers have no responsibility. It is a complex issue concerning who does have the responsibility. The township has a monopoly in dealing with waste from households and they have a possibility to make it easy for the consumers to deal with their worn out garments, with help from the recycling industry.

B
The consumers have a responsibility when it comes to the clothing that can be worn again, since there are options to give it to charity. But from an environmental point of view, you don’t actually lose that much by having the worn-out textiles incinerated, it’s not a catastrophe. But it needs to be accessible for the consumer. If they have to get into a car and drive for miles, there might not be an environmental benefit. You need to think of the textiles from a refinement point of view. A new garment has a refinement of 100 percent, but a donated garment might have 80 percent. The lower refinement, the lower quality of the fibers, and thus, the harder it gets to recycle into new fibers. In addition, a vast amount of energy is consumed in the fiber recovery process. With lump, there is hardly any environmental profit in refining the fibers; however, other recycling applications might be more suitable.
C
Considering the situation we have today, no. We need to develop better options.

E
No, they don’t. The producers and the township should share the responsibility.

F
There is no legal demand, so it will be hard to claim consumer responsibility. But it should be easier for the consumer to get rid of old textiles in a better way and I would say that the producers have the primal responsibility for making it happen.

G
No, that’s hard to do since there are no opportunities for dispose of worn out textiles (apart from the one who know that Weekday accepts worn out clothing as well).

2. Consumption of clothing and textiles has increased by almost 40 percent during the period 2000-2009 (Naturvårdsverket, 2013). Fashion influence consumption to be governed by desire rather than needs (Hawley, 2006) and leads to consumers getting rid of clothes simply because of shifting trends (Domina and Koch, 2002). Does companies selling fast fashion garments of lower product quality have a greater moral responsibility than companies selling products that are designed to last longer (in terms of style and durability)?

If yes: why, and how should they take that responsibility?

A
Yes they do. If a company produces a large amount of waste, they should take more responsibility. Take plastic cutlery for instance; products which are meant to be used once will create a lot more waste than for instance metal cutlery which can last for hundreds of years. When producing short lived products, companies make it easy for the consumers to do the wrong thing.
B
Yes, they do. In addition, a company that makes products that will last for a long time, in the terms of durability and fashion; have already taken a part of their producer responsibility. On the other hand, if a company produces products with an immoderately poor quality, they might not consume that many resources in the manufacturing. For instance, a high quality jacket with different kinds of functions and applications, use up a lot more energy than a simpler jacket of low quality. So high quality often is connected to a high level of consumed resources. But durability should not always be the focus. Take a wedding dress for instance; you will hopefully only wear it once. Perhaps it would be best to produce a dress of that sort in "fake-quality", using not so durable but less resource demanding fibers, such as paper fibers, instead of the traditional textile fibers. The difference between the two types of fibers is blurring.

C
Yes. The companies that produce garments to deposit after a short while should consider it. They might offer the customer to hand in clothes in store.

F
If you put a product on the market, you have some responsibility for the durability of the product. Producing products with a short term lifecycle is not a sustainable business model. The producers should offer their customers to retake the material after use. For instance, a t-shirt for 49.90 SEK will last for three washes, and then there will be no second hand-value.

If no: why not?

D
There is a need for an interaction between demand and supply. It’s up to the consumer to make conscious choices. If people stop buying rubbish, the rubbish will get off the market.

E
No, it’s up to the consumer to tend to their garments in an appropriate way. And my impression is that the qualities of fast fashion products have improved.

G
Well, all companies need to take responsibility, but if a company has low quality garments they should take responsibility by producing better products and support the consumers by informing them on how to handle the garment and so on. A fast fashion company manufactures at such a low level, and by doing so, they cause greater harm
to the environment, so they need to compensate that. But every company has the same moral responsibility.

3. Should Sweden have a voluntary or a legislated producer responsibility regarding the management of discarded textiles?

If voluntary:

What are the benefits of a voluntary producer responsibility?

A
Optional producer responsibility enables rapid movements. Flexibility and adaptability.

B
Creative "forces" should be able to act freely to find the best solutions.

D
An optional producer responsibility is preferable if it’s comprehensive. Such a responsibility would have to be taken by all companies in order to achieve an extensive effect. But if the system doesn’t improve significantly from where it is today, we would have to legislate the responsibility. We need to extend the volumes of textiles to recycle. Occasional events when a company offers the customers to return, say, their old jacket and get an amount to shop for in return, won’t solve anything. The volumes are too small to make any difference and they are hard to repeat since the customers will get tired of it.

What are the disadvantages of a legislated producer responsibility?

A
A legislated system might be too slow moving. The industry could get stuck in a corner with inspection reports that don’t work and the process would become too tardy.

B
Take H&M as an example, collecting used garments from customers at a global extent. If Sweden decides to have its own system, it becomes troublesome for H&M to manage their system and way to bureaucratic. We need to have a flexible system in
order to face the problem the ultimate way. And since the production is global, the management of remaining textiles needs to be so as well. In addition, legislated producer responsibility systems are seldom evaluated. How do we know that the present systems are the optimal if they are never compared to other options? How do we know the environmental profit of collecting glass at the collection sites, having them transported and re-melted? Perhaps it’s better to crush it and use it as filling, instead of mining rocks? There are no up-to-date data, we simply continue on doing what we have done before. My point is that if Sweden had a legislated producer responsibility, the operation needs to be evaluated every year in order to get maximum environmental benefit for the money invested.

If legislated:

What are the benefits of a legislated producer responsibility?

C
Producer responsibilities usually work out pretty well, so a producer responsibility for textiles is a good solution in the long run. It would mean a financial basis to build a system that creates resources. However, the administration and different kinds of fees can be quite negative; it doesn’t always work.

E
To get it done, it can be followed up on and economic policies can be used.

F
Since the textile industry is hard to regulate, a legislated producer responsibility would mean that everyone would have to start taking responsibility. Usually, a legislated producer responsibility works best. The system would have to be more or less bureaucratic and the responsibility would be on the producers to handle the restrictions themselves and they would need to work with sanctions. Producer responsibilities for materials are not handled with the police if the rules are not followed. Its optimal if the market can solve the issue themselves, but they would need some help getting there. It’s important to have a working economy on the market, but by policies, the end would justify the means.

G
There has to be a mandatory producer responsibility since it would be hard to overcome the problem otherwise. By having a legislated responsibility, the companies would have to consider what they produce and how they produce. A company producing products with poor durability would get back a lot of clothes and they
would have to handle big volumes and that would be costly. So there needs to be an economic value in making products that lasts longer. In addition, the contents of a garment, such as chemicals and rivets, would matter to the handling of the post-consumer textile. It’s harder to recycle a product with prints or sequins for instance, and if it would affect the company, the designer would have to take the post-consumer process into account.

**What are the disadvantages of a voluntary producer responsibility?**

C
If there is no legislation, it’s hard to ”get everyone on the train”.

E
That all companies might not take responsibility. It might be limited to bigger companies.

G
There are some companies that take some responsibility, for instance the companies in NÅÅ that work with these issues in order to maintain their brand. But then there are many companies that don’t mind these matters, and they wouldn’t care.

4. **Sweden has producer responsibility for tires, packing, newsprint, batteries, pharmaceuticals and radioactive products (Palm, 2011). The standard is called "Polluter Pays Principle" (PPP), meaning that the players who impact the environment negatively must pay back to the environment for the load they have caused. To organize this, the industry has formed corporations for the different categories of materials. By paying a fee to a collector, the producer fulfills its responsibility (Repa, 2013). Would the same system be applicable to the textile industry?**

If yes: why?

C
It works for other materials; it should work for textiles as well.
E
There is no major difference between the materials.

If no: why not?

A
It would be troublesome since textiles are more valuable than tin cans and newspapers. As a consumer, I own my products and I’ll gladly donate old clothing to charity, but when a company gets revenue of my product, I should be the one who gets it.

B
It would be too complicated. Röda Korset (the Swedish Red Cross movement) does this and H&M does that. It would be hard to develop a corporation for textiles that is dynamic; a good enough solution for everyone. In addition, textiles thrown in the garbage are not as toxic as a TV thrown in the garbage.

D
It’s possible but it’s not a favorable option. It would be a deathblow for the voluntary organizations since they would lose their source for revenue. It would force them to develop new systems in order to become competitive, and it’s doubtful that they have the financial strength to do so.

F
There is probably more effective solutions. Textile waste doesn’t occur as often as packing and newspapers. The best solution would be to have the retailers offering consumers to return their textile waste in the shops or close to the shops. The different players in the industry could share collection sites and a deposit system could be put into practice; for instance, if someone returns a garment, they could get a discount of the next purchase.

G
No, because in that case, clothing from different brands would mix in the container and the companies wouldn’t get back their own products. This way, they wouldn’t get to see the aspects that they need to take into account when developing and designing the products. The worn out textile need to return to the producer in order to improve the parts of a products that is not sustainable. One option would be for the consumer to be able to return it to the store. The interviewer asks: would consumers...
take the time to return their old garments in different stores? No, that is the tricky part; to find a system.

5. Textile waste can be utilized by various actors, such as municipalities that own the household waste (Tojo, et al, 2012), charity organizations, private second-hand shops and businesses that recycle textiles, etc. How should the ownership be regulated?

A
The individual owns the garment. We already have a well-functioning system of aid organizations that took many years to build. These organizations are dependent on the material flows and it is necessary to proceed with caution when making changes and letting in private operators. It is best to build a system based on what already exists. We need to move away from a mindset of “old” and “new”. We need to learn how to look at a product for its function without minding if it’s been used before or not. If I buy a car for instance, I don’t care whether the steering wheel is of the same edition as the car, it might be an old steering wheel, but if it works just as well, there is no need to buy a new one. That’s why we need to see more vintage clothing in the regular fashion stores, where a blouse is a blouse, no matter if it’s been used before or not.

B
First of all, worn out textiles need to be disclaimed as waste. Textiles remaining from industrial production are considered to be waste and a permit is needed to handle waste. And when textiles are defined as waste, the township is the owner. We need to upgrade the textile waste in the processing chain; that way companies will start to pay for it. We need to cherish innovative ideas that will take the development further.

C
I don’t have the knowledge to answer that.

D
Containers for collection in public areas would be effective. But it’s important to keep the collected textiles apart from the waste classification. Some local authorities consider all waste to be included in their monopoly, while others don’t. Thus, there is a need to determine the ownership legally.
E
Perhaps a consortium between all the players.

F
The ownership would pass to the owner of the container at the collection site.

G
The priority must be to optimize the collection of old textiles. How to legislate this is not solved by the parties yet, but I cannot answer to how it should be regulated.

6. The volume of discarded textiles is presently too small to provide for an effective recycling system in Sweden (Palm, 2011). In Karlstad they are testing a system for collection of old textiles. In KBAB’s (owned by Karlstad municipality) residential areas there are now two containers; one that belongs to Myrorna for clean clothes that can be reused, and one that belongs to Ragn-Sells for torn clothes that can be recycled (Ragnsells, 2013). In order to increase the supply of textiles for recycling is this solution advantageous?

A
It’s good, but it is not certain that the consumer can estimate what is sellable or not, so there is a risk that we’ll lose valuable products.

B
It’s great! It’s accessible for the consumer, no need to store the products at home, and no car is needed. And it’s an offer, the consumer has a choice to donate or not.

C
The organization I work for have a similar project in public, but it’s still at a small scale in order to test it.

D
It’s no use to divide it into two bins, since it has to be sorted manually anyway; there is no market for unsorted loads. The voluntary organizations don’t get compensated for the expense connected to the unsellable products, but the value of high quality clothing generate a profit, which can be invested in the handling of future bins. Thus,
there is no profitability in collecting clothing in poor conditions, since the costs of handling them (personnel, transport, processing and so on) is too high.

E
If the evaluation shows that it works, it’s good. It makes it easy for the consumers. If there is enough information for the consumers on how to handle this, it should work out well.

F
The idea is good, but according to my experience, you tend to get a large share of undesired materials, so there is a risk that they will get a lot of garbage. It’s important to keep the clothing dry, and if there is garbage in the containers they will damp the textiles and the whole batch could become moldy.

G
This is a very good imitative.

7. Textile products are difficult to recycle in automated processes since they are complex and often consist of several different types of fibers and comes in many colors. David Palm at Svenska Miljöinsitutet (the Swedish environmental research institute) suggests that clothing produced for "fast fashion" should be designed for recycling rather than reuse (Palm, 2011). How good is this approach?

A
It’s not good. If a garment can have another life it is a lot more valuable. The focus needs to be on optimizing reuse. It’s a good thing if a garment is easily recycled, but a lot of energy can be saved by reusing it instead. The focus should not be on recyclability rather than of reusability, but if we can have both, it’s good.

B
This is quite good, but reuse is always better than recycling from an environmental point of view. After reuse, redesign is preferable and then comes recycling. And recycling in general requires a lot of resources. The market cannot be forced to apply this idea, but it could work if a profitable business concept could be developed from it. On the other hand, a certain percentage of recycled fibers should be a compulsion.
C
It’s not very good. We need to focus on what is reusable. The Asian and African market reuse a lot, and they would be very pleased with a Gina Tricot top. And we cannot focus on Sweden alone, we need to think internationally.

D
It’s not that good. The first step is to develop the recycling process. In addition, the environmental effect is a lot better if the textile waste could be reused in Asia or Africa; they gladly accept fast fashion.

E
It’s interesting. David is a clever person, so it’s likely that it’s sensible, but I don’t have enough knowledge to answer this question.

F
It’s not very good, but it’s possible. I cannot say how to solve it in a practical way, but if it would work, it’s a pretty good solution. But the technology today is insufficient, there is still no way to extract raw materials from old textiles that can replace virgin fibers and such a process would mean a significant environmental load.

G
I don’t believe in this suggestion, because I think the focus should be on durability even if it’s fast fashion. It’s not realistic since the fast fashion companies don’t focus on the material, but on the expression of the garment. I wish that fast fashion companies would focus more on quality and preserving the environment, but they don’t keep track on what is viable from a sustainable point of view; what kind of chemicals are used or what kind of metals are used in the details. They care about the fashion level and the time to market.

8. The author Kate Fletcher underlines that the possibilities for textile recycling would improve if the number of different kinds of textile fibers in products were limited. What is your opinion of that, and how could such a limitation be imposed?

A
It’s good. It can be done with pressure from the consumers, leading to a shift in the industry. Or by provisions from global authorities; that would mean a more immediate change. But the best solution would be for the industry to come together and take an initiative.
B
You would have to consider how such a limitation would affect the quality and fashion level of a garment. Such a restriction should not be applied in Sweden only, since it could result in Swedish players loosing competitiveness against foreign players. But every designer should think in these terms while designing a product. They need to think further than the purchase and affect how the consumer can maintain the product.

C
It’s good. The fewer various types of fibers, the better, but I don’t have a statement on how to impose such a suggestion.

D
It’s a good suggestion, but it’s a fictive one, it’s not feasible. But this is a complex question. The answer involves recycling solutions and the concept of closed loops. Since we don’t have these solutions today, there is no use in such an implementation.

E
Yes, I’ve heard that it makes it easier, so I guess that is correct. It should probably be applied with setting laws, alternatively with voluntary commitments, but laws if it should be applied on a global basis since the retailers often act globally.

F
It’s a nice idea but it will be hard to legislate such a limitation. It needs to be decided on an international level, otherwise Sweden would have to shop importing textiles that didn’t apply the requirements. In addition, it could collide with other laws. Initially, there could be recommendations.

G
It’s a correct statement, it would make it easier. But this is not realistic, it’s not controllable. The designers need to start thinking in post-consumer terms, making products that are easier to handle at a final stage.
9. There is demand for recycled materials such as plastic, metal and paper. What is required to increase the demand for recycled textiles?

A
The ability to guarantee a certain volume in a certain quality. But the environmental aspects and the absence of harmful substances are essential as well.

B
This is primarily a price issue, if recycled textiles were offered at a competitive price, the demand would increase. If there was a regulatory requirement or some sort of labeling system for textile products that contains a certain percentage of recycles fibers, it would intensify the demand. But it would have to be applied globally, not only in Sweden. In that case, it’s important to start at smaller percentages. If every garment contained as little as five prevent of recycled fibers, the environmental profit would be immense. It would reset the entire production system. We are facing a future where the supply of certain virgin fibers (such as cotton) will be scarce. Furthermore, there is a need for a shift to more sustainable fabrics, such as viscose. The environmental damage of cotton is huge compared to viscose.

C
A better system for deposition of used consumer textiles and price. There is a fee to get rid of waste (by incineration) and if one could get paid for the waste (in this case textiles), it might be profitable. We need waste plans and legislations. And off course, the environmental aspect is important.

D
There is some demand today, but in order to increase it is for producers to find ways to make use of recycled textiles in their production. Recycled textiles need to be integrated.

E
The fibers need to be of good quality and that nice products are made from them, thus, high fashion level and good quality.

F
There needs to be fewer and cleaner materials in the bins that can be sorted easier. And there need to be better technology. Today, there is basically only mechanical
processing and we need to develop more options for chemical processing. Furthermore, there is a need for a bigger supply and greater demand.

G
If durable fibers could be extracted from the textile waste and if one could make attractive products that match what the customer inquire as well as the consciousness of the consumer.

10. Globalization of the fashion industry supply chain is substantial. Many companies choose to source the components of their products overseas due to low cost labor (Bruce, et al. 2004). The price of recycled textile materials manufactured in Sweden would have to cover relatively high labor- and transportation costs (Palm, 2011). Can recycled textile fibers from Sweden compete price wise with new fibers from countries closer to production with higher output?

C
I don’t have an answer to that question.

E
I don’t know, I’ve never seen a calculation of it. But perhaps it would pay off, both economically and environmentally if we could send the textile waste in bales to China instead since they have better technology.

If yes: What is required for recycled fibers from Sweden to become competitive?

F
Within certain segments of the market, such as premium products, then yes. But for fast fashion it’ll be difficult.

If no: Is the market for recycled textiles from Sweden dependent on local buyers? If so, is there a big enough market in Europe?

A
No, but it would be more sensible to place the recycling process closer to the manufacturing markets.
B
There are hardly no local buyers. But there are textile recycling companies in Germany (where H&M sends their collected garments) and Italy, and these companies have managed to make it profitable. But to compete with virgin fibers? Doubtful.

D
This is a fictive challenge, it’s not viable. We cannot offer recycled textiles in a large scale, so probably they will get more expensive. The lack of supply of textiles to recycle is a major obstacle. In Europe, there is an existing recycling industry in countries such as Italy, Germany, Holland and England, but their customers are not from the textile industry. The recycled materials they produce are down cycled (perhaps sometimes up cycled) in other industries, thus, no closed-loops. But we need to distinguish companies producing fillings for cars and new, re-spun fibers.

G
There is a reason to why Stena Recycling had to shut down and that is because of the access to cheap virgin fibers. But with new technology, maybe. It’s important to have a consistent flow of textiles that enter the facility and that the recycled product is good enough, as well as the fact that there has to be buyers to that product. Only at that stage, it could be profitable. At the initial phase, someone might subsidize the project, but at a long term it needs to be self-sufficient.

11. If one were to implement a textile recycling system in Sweden, how is the material flow optimized logistically?

A
Making it easy for the first stage, meaning the consumers. Accessibility for the consumers is primal.

B
To fill containers with used textiles to a maximum level, and send them by boat to recycling facilities, could be a good solution; pricewise and environmentally.

C
It would have to be done in three steps: 1; designate who is liable for collecting the used textiles, 2; setting new aims which would include making the system sustainable economically, 3; finding logistic solutions is not that hard to do, textiles are not more
complicated to handle than other materials, but it’s important that they are kept from
damp.

D
Access to an ingathering system is primal. Perhaps combine waste plants with
curbside collection sites and at strategically chosen placed in the public sphere. If a
more extensive flow is generated, the logistics will follow the development and
improve gradually.

E
I have no idea, this is not my area. But I think it’s a good idea with withdrawals. Take
Marcos and Spencer’s for instance, their trucks should have gone back from the stores
empty, but they collected garments from their customers and sent them with the
empty trailers. So if one could find a solution where there is a collection bin at a mall
for instance, they could use the same method and send the collected waste with the
empty trucks.

F
The best logistic solution would be to have collection sites close to the stores where
the consumer would be given two options when donating: reuse or recycle (the latter
option if the product is broken but clean and in a good material). Logistically, there
would be a flow of new textiles into the shops, and a flow of old textiles out of the
shops.

G
It needs to be easy for the consumer to get rid of the garment. And it’s preferable if
the different stages are close to each other. For instance, textile waste from Skåne
shouldn’t be sent to Norland for processing.

12. The Red Cross recently sent textile waste to Holland for
recycling. To reduce costs and environmental impact, trucks that
otherwise would had gone back empty was loaded with the textile
waste (Sveriges Radio, P4 Norrbotten, 24/4 2013). How good is this
solution?

A
It’s better than to incinerate it, so I guess it’s good. But filling empty trucks is nothing
new, it’s quite common, and if Röda Korset hadn’t used the empty trucks, probably another company would since it’s cheaper to fill it on the way back.

B
That’s great. It’s with virtually no environmental impact.

C
It’s very good. But the trucks won’t always go back empty, textiles from Röda Korset is just one kind of return cargo.

D
Since there is no better solution, it’s good. But it’s better to sort the textiles in Sweden and then have it sent to recycling facilities in Europe.

E
It’s great, unless it hadn’t been better to send it by boat.

F
If the trucks really were about to go back empty, it’s good. But most often trucks bring freight back.

G
It’s really good.

13. What kind of policies is significant for an application of a textile recycling system in Sweden?

A
Making it easy for the consumers, regulations for the incineration market and guidance towards utilization of existing materials. There is a need for a 100-years perspective where it is vital to make use of what we already have.

B
On a Swedish level, a material company (materialbolag) is important for collecting consumer textiles, but no regulations further in the process. And by providing more
information to the consumers. Konsumentverket (the Swedish consumer agency) should be more active with educating consumers on how to estimate the quality of a product and how to care for in order to last for a long time. But if there were policies at an EU level for having a certain percentage of recycled fibers in textile products, the demand would increase, new business plans would form and a recycling system would be established automatically. Take the transition from light-bulbs to LED-lamps for instance; if the consumers won’t be able to buy the traditional light-bulb, the industry will adapt and invest in new solutions. But to have such a restriction at a national level only would be to disfavor the industry in that country. Thus, if limitations are introduced, it needs to be at a EU level. And perhaps start with labeling and continue on to be regulatory requirements.

C
To impose the industry. Start with a governmental proposal and have Naturvårdsverket (a Swedish national administrative authority dealing with environmental issues) issue directives to the industry.

D
There is a need for a legislation to regulate responsibilities. Which actor ”owns” the issue, who is promoted to give licensee for collecting textile waste. Someone needs to take charge to prevent that anyone can do anything (for instance, place a collecting bin). There are many fishy organizations out there.

E
Perhaps it should be costly to incinerate textiles? *(the interviewer asks: for whom?)*
It’s hard to answer. But considering environmental issues, policies tend to have the best effect.

F
It’s essential with long-term policies. One decides how it’s going to be, and one sticks with it. It’s important that the policies are clearly formulated; there shouldn’t be any options for discretion.

G
A producer responsibility where the environment and the human health plays a big part, for instance fees for toxic substances in the products. Pretty much the same regulations that is used for children’s toys.
14. Palm (2011) claims that as long as new fabrics are cheap, the consumer will probably prefer new textiles to reused ones. Since it is difficult for Sweden to influence the production, Palm (2011) suggests that Sweden needs policies to work on leveling the difference in price between virgin and reused or recycled textiles. How good is this solution and how could such a policy affect the commerce in Sweden?

A
It’s not that good. I don’t approve of that kind of policies. If we can make something of the fibers, there is an application and companies need to find their niche on the market. It is better for companies to find their natural role in the production flow.

B
It’s not good. I think we would have a lot of wangle with such a system. And how are we supposed to be able to verify that the policy is followed? It would require an ability to control the exact content of a garment. In addition, many companies export a large proportion of their products, and to restrict the Swedish market and having different regulations for flows to local and foreign markets would be complicated. And if products got more expensive in Sweden, customers would probably turn to foreign web based shops where it would be cheaper.

C
It’s good, but we need to work on consumer behavior in order for them to know what they buy and what life-span different products have. It will be hard to control it on an economic basis.

D
It’s not very good. The options are too limited when it comes to produce with recycled fibers. If there was a supply it might work, but as for today, it’s a fictive solution. Such a policy would encourage producers to find good solutions to integrate recycled fibers. But Sweden is too small, what is done here doesn’t matter in a larger context.

E
I suppose it’s a good solution, but it’s too hard to answer since I haven’t read his report and cannot base my assumptions on anything. This question is too tricky.
This will be tricky to solve. But most people look at the price tag and it would be of value for Sweden to express our standpoint in the matter. And if recycled fibers are cheaper, the demand would increase. A policy would signal a sustainable approach, and probably the industry couldn’t operate such a system themselves.

It's a good solution since people that usually don’t afford to choose the garment that is produced in an environmentally sustainable way, can afford to choose ecological solutions as well.

15. Should Sweden introduce a textile recycling system?

A
Yes, we should.

B
No, we should not. There is no competitive basis in Sweden for such a system, it should be handled internationally. There should be a system that we have access to, but it shouldn’t be placed in Sweden. But if competitive business plans emerge, it’s great.

B
Yes, due to the environmental argument. But we will need directives for reuse and recycling.

C
We can strive for it, but an implementation is based on someone taking charge and determine the rules, and today there is nobody. We should try to collect as much as possible and link the system to central Europe in order for the final processes to take place there. But in doing so, we have gained a lot.

D
Yes! But if Sweden should implement the whole process or not, I don’t know, but we should make sure that the fibers are recycled. Perhaps it’s better if they do it in Denmark?
E
Yes, if we are serious and want to develop from the low levels of recycled fibers that we have today, such a decision would be a distinct indication that would increase the volumes. As a consequence, new systems would have to evolve.

F
Yes, the textiles need to be collected so they can be used as resources, rather than incinerated. The private players need to have access to textiles to recycle, therefore, the township need to resign their monopoly.