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Towards a More Circular Post-Consumer Textile Waste Management

The Case of Finland

by

Jeni Särmäkari
je4752sa-s@student.lu.se

There has been a substantial increase in demand for textile and clothing with huge implications for post-consumer textile waste management systems. The current 'buy-and-throw-away' culture has led to larger quantities of textile and clothing ending up in landfills and incineration than before. This has become an increasing problem in the world and the linear way of operating is no longer sustainable. This study focuses on the post-consumer textile waste management in Finland with the aim to map out legislations formed between 2008-2018 concerning post-consumer textiles and to see how the legislations support transition towards a circular economy. The second focus of the study aims to understand the role of charitable organizations in Finland and their insights on post-consumer textile waste management. A qualitative case study is conducted with interviews and document analysis. The results of the study show that five legislations have been formed concerning post-consumer textile waste management in Finland between 2008-2018 and things are moving well towards transition to circularity. Furthermore, the results highlight the importance of charitable organizations as an actor in the post-consumer textile waste management and the outcome of the interviews indicates progress in policy coordination between actors that is important.

Keywords: Circular economy, post-consumer textile waste, reuse, recycling, clothing industry

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1 Introduction

The textile and clothing industry is essential to our society and economy worldwide. The textile and clothing industry employs millions of people worldwide and it represents a large share of the manufacturing industry in Europe (Ellen MacArthur Foundation, 2017; European Environment Agency, 2019). In addition, textiles and clothing are an integral part of people's life around the world daily. However, in the past decades there has been a large global demand for textile products and this trend is expected to continue in the coming years as a result of population growth and economic development (Peters & Sandin, 2018).

According to Ellen MacArthur Foundation (2017) the production of textiles has doubled between 2000–2015 and the increase has been mainly explained by the phenomenon of fast fashion that has changed consumers attitudes towards consumption within the industry (McNeill & Moore, 2015). Fast fashion provides more clothing cycles than before to meet the demand and usually with lower prices (Ellen MacArthur Foundation, 2017). Pohls (2020) considers that globalization and digitalization has enabled consumers to have easier ways to access and buy the newest trends. Furthermore, the production is located in areas with cheaper labor, often in low and middle-income countries, to keep the prices down (Bick, Halsey & Ekenga, 2018). Production of textiles and clothing is resource intensive as it requires a lot of water, energy, and chemicals throughout its life cycle (Bick, Halsey & Ekenga, 2018; European Environment Agency, 2019). Consequently, this has led the clothing industry to become one of the most polluting industries that does not only use resources but also has negative environmental and social impacts (Bick, Halsey & Ekenga, 2018; Boström & Micheletti, 2016; Coscieme, Samtani & Pulawska, 2020; Riba et al., 2020; United Nations, 2019). Moreover, there is a distribution in the world when it comes to production and consumption in the supply chain of textiles and clothing. Most of the production of textiles and clothing is taking place in developing countries whereas consumption commonly takes place in developed countries (Niinimäki et al., 2020). This has led to an uneven distribution of environmental impacts and developing countries often carry the environmental and social burden of developed countries with the production process, where most of the negative impacts are created (Coscieme, Samtani & Pulawska, 2020; Dahlbo et al., 2015; Niinimäki et al., 2020).

Increase in the production and consumption of textiles and clothing leads to an increasing amount of discarded textiles. The average number of times clothing is used before discarding it, i.e., clothing utilization, has shortened substantially due to the fast fashion phenomenon (Ellen MacArthur Foundation, 2017; Kant Hvass, 2018). Ellen MacArthur Foundation (2017) has estimated that clothing utilization has decreased by 36% within the past 15 years and most of the used textiles and clothing in the world ends up in landfills or incinerated. This equals to a large loss in materials and economic value, especially considering that almost 100% of textiles are considered to be recyclable (Hawley, 2009; Kant Hvass, 2018).

European Union (EU), along with United States and United Kingdom, are considered the major consumers of clothing and textiles and the countries also produce extensive amount of post-consumer textile waste with the current “buy-and-throw-away” culture (Coscieme, Samtani & Pulawska, 2020; Niinimäki et al., 2020; Riba et al., 2020). Post-consumer textile waste consists of textiles and clothing that is discarded by consumers but could still potentially be reused and recycled. It has become an increasing problem in the world and especially in the linear system where the increasing volume of post-consumer textile waste ends up in landfills or incinerated (Kant Hvass, 2018). For example, in the EU consumers discard on average 11 kilograms of textiles and clothing per person per year (European Environment Agency, 2019).

1.1 Research Problem

Phenomenon of fast fashion and the change in consumers behavior has created a shift in the textile and clothing industry that is not sustainable and follows a linear take-make-waste model. If the current trend of fast fashion continues to grow similarly, the production and sales of clothing is expected to triple by 2050 (Ellen MacArthur Foundation, 2017). When adding the shorter clothing utilization time, the number of discarded textiles and clothing will result in high increase. To change the path of this trend, action is needed to start finding and implementing systemic solutions towards more sustainability in the industry.

In recent years, the textile and clothing industry and its consumers have gained more awareness of the negative impacts of the current system. Main focus has been so far to reduce the impacts of the current linear model, such as using more efficient production techniques (Ellen MacArthur Foundation, 2017). However, a focus to the root causes of the system and its impacts would bring more benefits and decrease the negative impacts. In particular, finding and implementing solutions to the low rate of recycling after post-consumer textile waste and low clothing utilization could be of help tackling and improving the current situation (Aalto, 2014b; Ellen MacArthur Foundation, 2017). Dahlbo et al. (2015) states that reusing and recycling textiles and clothing could decrease the production and therefore decrease the use of resources and the negative impacts. Currently it is estimated that 73% of textiles and clothing ends up in landfills and incinerated (Kant Hvass, 2018) and it is argued that more sustainable solutions in the textile and clothing industry should start from waste prevention and minimizing landfilled waste (Koszewska, 2018; Niinimäki et al., 2020; Peters & Sandin, 2018). Additionally, to create large-scale changes around textile waste recycling, governmental interventions are needed (Dahlbo et al., 2017).

Linear economy model is not enough to adopt sustainability to the textile and clothing industry therefore circular economy model is gaining more attention (Koszewska, 2018). For example, European Union has started to move towards a circular economy to start tackling the impacts of the textile and clothing industry (European Parliament, 2020). European Union considers that efficient waste management is a crucial act towards a circular economy where many products and materials are recycled and reused repeatedly (European Parliament, 2017).

It is evident that the textile and clothing industry cannot continue with the current linear economy model and production processes and consumption attitudes need to be changed. More research is needed on national and international level to comprehend how circular economy model can bring sustainability to the textile and clothing industry. Moreover, post-consumer textile waste management is a pressing matter and further research is needed to find methods to increase levels of reuse and recycling. This study will look into these areas in the context of Finland.

1.2 Aim, Scope and Research Questions

1.2.1 Aim and Scope

Circularity of textiles and clothing in Finland has become a more current topic in recent years and it is also being discussed at European Union level. New legislations have been applied to the industry with the aim of moving towards a circular economy model and creating solutions to increase reuse (Dahlbo et al., 2017; European Parliament, 2020). From the perspective of Finland, new legislations have been made on both the level of the EU and Finland that require a shift from the current processes. New legislations are affecting Finland's textile and clothing industry and they have initiated action to increase reuse and recycling. Additionally, the importance of research, innovation and development in the field has increased.

Adapting to the new legislations also needs collaboration with different actors to create a working ecosystem for understanding and aligning new processes to advance current waste management system. In Finland, a few projects have been executed to create further expertise on the topic and to help finding ways to better utilize textile waste. The projects are beneficial as there is a need for improvement in capacities and infrastructure to be able to shift to circular economy methods to process adequate amount of discarded textiles and clothing. Enough dialogue and interactivensness is needed from all the actors from the field to form a working textile circulation system that can increase the level of reuse and recycling in Finland.

Based on these the aim of this study is twofold. First aim is to map out the legislations concerning post-consumer textile waste management in Finland from 2008 to 2018 and to see how the legislations support the circular economy model. The period 2008-2018 has been chosen as multiple legislations affecting textile waste have been implemented during the period from both Finland and the EU level. The aim is to gather and analyze the legislations to see if there is consistency within the levels of Finland and the EU. The second aim is to investigate the role of charitable organizations involved in handling of discarded textiles and clothing. The point of view from these companies will offer valuable insight to the current process for discarded clothing as they have first-hand experience. Additionally, the current studies lack the focus on the charitable organizations and their insights to the discussion of circularity of textiles and improving current waste management system as they are one of the actors in this field.

Finland has been chosen as the case to this study and it serves as an interesting country to research. Finland is aiming to be at the forefront in developing textile recycling and advancing towards circular economy (Santalo, 2019). The intention is to offer innovative and pioneering solutions as well as knowhow to the textile ecosystem from collection to waste handling. Furthermore, new projects, solutions and technologies are created for large-scale recycling with various actors to achieve goals and adapting to the new legislations. In Finland it is estimated that 70-100 million kilograms of textile waste is produced each year, which means 13-18 kilograms per person (Heikkilä, 2019). Based on a study from 2015, 23% of the discarded textiles in Finland ended up to charitable organizations for further reuse and 77% was discarded as waste (Dahlbo et al., 2015). The study shows that there is room for improvement to increase recycling and reuse as well as to develop circular economy model.

1.2.2 Research Questions

To create a better understanding for the aims of the study, the following research questions have been formed.

RQ1: What legislations have been formed at Finnish and the EU level during 2008-2018 to increase circularity in post-consumer textile waste management?

RQ2: What experience and insights do the Finnish charitable organizations have in post-consumer textile waste management?

This study seeks to answer the research questions by using a qualitative method. Qualitative method is chosen as the approach seems most suitable to gain thorough understanding of a real-life phenomenon. Both primary and secondary data will be used, as section 3.2 on methods shows. For the first research question official documents regarding legislations are collected and analyzed and for the second research question interviews will be conducted from experts in the field. The expected results will attempt to bring additional comprehension of the post-consumer textile waste ecosystem in Finland.

1.3 Outline of the Thesis

The introduction chapter is followed by a theoretical background. Chapter two covers the theoretical background and examines linear economy and circular economy in the aspect of post-consumer textile waste with focus on Finland's current post-consumer textile waste management system. In chapter three, the qualitative case study method is presented along with motivation, data collection methods and overview of the data. The findings of the study are analyzed and discussed in the chapter four. Lastly, chapter five provides a summary of the study.

2 Theory and Literature

In the following chapter, the theoretical background is provided to give context for this study. The sub-chapters focus on previous research of textile and clothing industry with background information on negative impacts of linear clothing industry. The concept of circular economy is discussed with relation to textile and clothing and afterwards waste hierarchy principles that is often referred as a guideline for preferred treatment of waste. Moreover, a literature of the textile waste management flows and changes in Finland is covered.

2.1 Negative impacts of linear clothing industry

Textile and clothing industry is experiencing steadily increasing global demand but at the same time it is facing large environmental and resource challenges (Peters & Sandin, 2018). The increased demand is driven by the growing middle-class in the world and increased consumption per capita in mature economies that has led to a large growth in the clothing production (Ellen MacArthur Foundation, 2017). This is linked to the phenomenon of fast fashion, which is often used to describe today's fashion that is easily accessible, inexpensive, and low quality and low durability (Bick, Halsey & Ekenga, 2018). For consumers this appears as more clothing collections in a year, lower prices and the clothes have become more disposable and consequently fast fashion phenomenon has changed the consumers attitude and behavior towards consumption of the industry (Bocken et al., 2018).

Textile and clothing industry is often intertwined together but there is a difference between the two. Textile industry often refers to the production of yarn, textiles and fabrics whereas the clothing industry refers to the production of clothing (Šajin, 2019). However, clothing constitutes more than 60% of all utilized textiles that are manufactured in the world (Ellen MacArthur Foundation, 2017). In 2015, the annual fiber production for clothing was 53 million tonnes, where nearly all were from virgin feedstock, and after use 73% ends up in landfilled or incinerated (Ellen MacArthur Foundation, 2017). This demonstrates that the textile and clothing industry currently follows the linear 'take-make-waste' economy model.

The supply chain of clothing has considerable environmental impacts and resource demands at each life cycle step (Dahlbo et al., 2017). Niinimäki et al. (2020) states that the rising environmental impacts of textile supply chain can be associated with the high increase in clothing consumption and therefore its production. Figure 1 shows the linear supply chain for production of clothing and it is visible that chemicals, water and energy is used, and emissions are released to the environment in every step of the life cycle of a product.

The increase in the consumption and production has led to increasing environmental impacts that are widespread. It is estimated that approximately 10% of global CO₂ emissions come from the clothing industry (United Nations, 2018). The United Nations (2018) also states that the clothing industry has energy intensive production, and it consumes more energy combined than the aviation and shipping industry. Another major impact is water usage, where water is used to produce the textiles (e.g., dyeing and textile treatment) and additionally most of chemical use occurs during the same time when water usage so when dyeing and washing, for example (European Parliament, 2020; Choudhury, 2014). Furthermore, microplastic pollution is created to the oceans during the production, where the contribution is expected to be as high as 35% globally (Niinimäki et al., 2020).

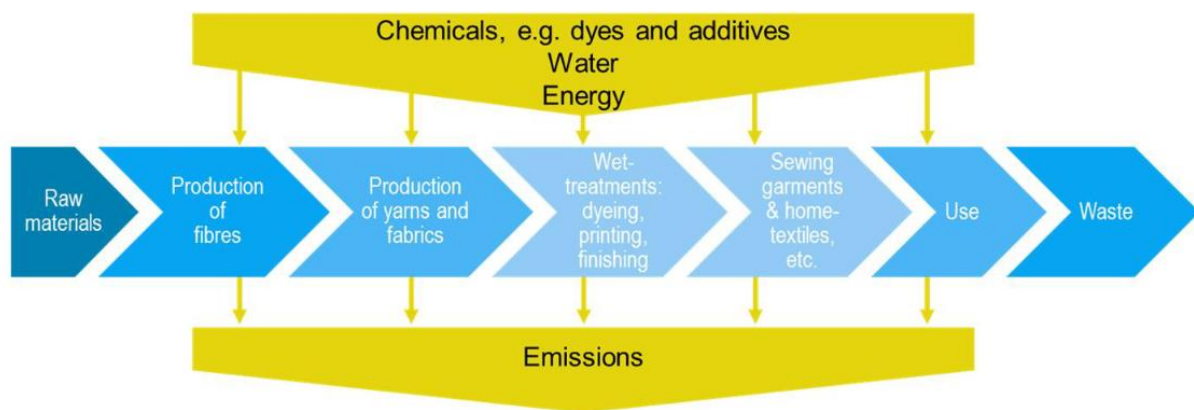


Figure 1: Linear model for clothing production supply chain (Fontell & Heikkilä, 2017, p.5)

Additional environmental impacts come from transportation and packaging. The production of textiles has been spread all around the world and it is common that products go through long-distance transport from the beginning of production before the end-product reaches consumers, creating additional emissions (Fontell & Heikkilä, 2017). Choudhury (2014) states that packaging for clothing is used in different parts of the supply chain, from transport and warehousing to end use and consumer's purchasing. Packaging has multiple purposes, such as protection and informative details, but it creates additional carbon footprint to the supply chain and often ends as waste (Choudhury, 2014; Manshoven et al., 2019).

One other major environmental impact of the current linear textile and clothing industry is facing textile waste. Waste created within the clothing industry can be divided into three main types: post-industrial waste, pre-consumer waste and post-consumer waste (Koszewska, 2018). Post-industrial waste and pre-consumer waste occur during manufacturing and at distribution centers or in retail stores (Koszewska, 2018). The waste is caused due to cutting waste, surplus materials, and unsold clothes from retailers (Heikkilä et al., 2018). Fontell and Heikkilä (2017) argue that from a recycling view such waste is easier to handle and manage as the materials tend to be clean and in large batches. This allows easier organization for sorting as long as a collecting system exists (Fontell & Heikkilä, 2017; Heikkilä et al., 2018).

Post-consumer textile waste is more challenging to handle as many countries are lacking large-scale collecting and sorting systems (Heikkilä et al., 2018). Post-consumer textile waste faces high volumes but low recycling rates due to not having specific collection and the costs

associated with sorting discarded textiles materials (Dahlbo et al., 2017; Riba et al., 2020; Sandin & Peters, 2018). High amounts of the post-consumer textile waste ends up landfilled or incinerated, which presents a large loss of materials and economic value (Kant Hvass, 2018). Consumers do not have any obligations for reuse and recycling after discarding old clothing and often governmental initiatives for it does not exist, but these could increase the level of recycling and reuse (Dahlbo et al., 2017; Kant Hvass, 2018).

The rate for textile recycling for post-consumer textile waste is rather low and the rate for reuse is even lower (Niinimäki et al., 2020). Discarded clothing can be donated for reuse and usually different charitable organizations handle the collection. Charitable organizations often experience surplus in their collections due to the constant cycle of consumption and disposal and these companies tend to collect more that can be locally retailed (Ericsson & Brooks, 2014). Large amounts of donated clothing is exported to other countries, often to developing countries such as those in Africa (Ericsson & Brooks, 2014; Fontell & Heikkilä, 2017). This can have challenges for developing countries, such as for local textile production (Fontell & Heikkilä, 2017). Moreover, the majority of the donated clothing that is exported happens via trade pattern and is not distributed without a fee (Ericsson & Brooks, 2014).

Clothing industry is considered to cause negative social impacts and especially in the developing countries where most of the production occurs. The industry generates millions of jobs worldwide, but the current linear model and its increasing demand is causing negative social impacts around the world (European Environment Agency, 2019; Manshoven et al., 2019). The labor conditions of the workers are considered rather poor, and the workers generally depend on their jobs thus making them vulnerable for exploitation (Manshoven et al., 2019). For example, low wages, long working hours, overtime, and no social security are too common for workers in textile and clothing industry (Boström & Micheletti, 2016; Fontell & Heikkilä, 2017; Kozłowski, Bardecki & Searcy, 2012). Furthermore, the working conditions can be dangerous and lack sufficient health and safety procedures (Boström & Micheletti, 2016; Manshoven et al., 2019). The world was reminded of this in 2013 when the Rana Plaza incident in Bangladesh took place killing more than a thousand workers in a textile factory collapse. Additionally, child labor and forced labor occurs in the industry (Fontell & Heikkilä, 2017). A high share of women employees is working in the textile and clothing industry and they often have positions at the lowest levels with not much opportunity for development (Boström & Micheletti, 2016; Manshoven et al., 2019).

2.2 Circular Economy

The concept of a circular economy has been gaining attention in the past few decades and this trend is also visible for the textile and clothing industry. The increasing awareness of environmental and social impacts of textiles and the current take-make-dispose model has created a need to start action to make the production and consumption system more sustainable and circular (Manshoven et al., 2019). The circular economy can be viewed as a potential

paradigm to overcome some of the environmental and social challenges the clothing and textile industry is currently facing (Bocken et al., 2018).

Circular economy has gained multiple definitions to grasp the meaning and intention of it. Geissdoerfer et al. (2017) define circular economy as a:

regenerative system in which resource input and waste, emission, and energy leakage are minimized by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling.

This definition has been created based on different contributions to the meaning and definition of circular economy and it combines the main idea and intention of it. It includes the idea of minimizing impacts of the current linear economy model and to create a closed loop to circulate the resources and materials in the system for as long as possible.

Circular economy is seen as one of the few solutions for a more sustainable economy and it has been adapted and promoted by the EU and several national governments, including Finland (Korhonen, Honkasalo & Seppälä, 2018; Manshoven et al., 2019). Furthermore, several businesses around the world are adopting to the circular economy model (Korhonen, Honkasalo & Seppälä, 2018). There are estimations that transition to the circular economy could bring substantial annual economic gains to countries and especially their manufacturing sector (Ellen MacArthur Foundation, 2012).

Circular economy is being seen as a viable solution, but it also faces challenges and criticism. Kirchherr and van Santen (2019) agree on the importance of the concept of circular economy but have pinpointed few critiques towards the existing literature and research of circular economy. They state that there is a lack of empirical work on circular economy and that most of the literature is geared towards developed economies. Moreover, the current literature does not emphasize enough on how to implement circular economy in real life that could benefit businesses and policymakers according to Kirchherr and van Santen (2019). Korhonen, Honkasalo and Seppälä (2018) are on the same lines and mention that there is a lot to research within the circular economy approach. Only a small part of the world's economy is circular and leaves a lot to be improved and it is a complex system that involves many different contributions from different actors from multiple sectors (de Wit et al., 2018; Korhonen, Honkasalo & Seppälä, 2018). Regardless of the challenges and criticism the circular economy model is facing, it is considered an emerging topic that is gaining increasing interest from different countries, sectors, and businesses to adapt more sustainable methods (Geissdoerfer et al., 2017).

The life cycles of linear and circular economy models differ, and Figure 2 demonstrates the distinction by showing linear economy on the left and circular economy on the right. Figure 2 shows how a linear economy destroys the value after the user whereas a circular economy retains the value after the user. The circular economy intends to keep the products added value as long as possible by designing them to be long lasting and suitable for maintenance and repair so to be able to slow the resource loops and prolong the use of the products (Achterberg, Hinfelaar & Bocken, 2016; Bocken et al., 2016).

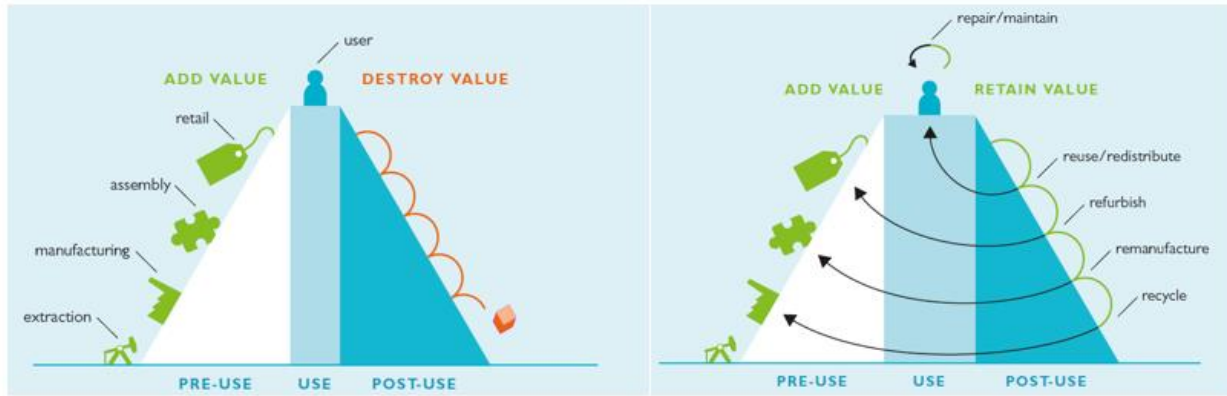


Figure 2: Life cycles of linear economy and circular economy (Achterberg, Hinfelaar & Bocken, 2016, p. 4-5)

Circular economy model applied to the textile and clothing industry is logical considering how much resources the industry uses, its environmental and social impacts and the huge amounts of textile waste created. The European Commission has identified textiles and clothing as a priority product category and as one with considerable potential for circularity (European Parliament, 2020; Manshoven et al., 2019). The goal is to stimulate innovation and boost reuse within the textile and clothing sector by legally binding targets and deadlines to ensure the member countries make progress (European Parliament, 2020; European Parliament, 2017).

Transformation to a circular economy in the textile and clothing industry needs international coordination and adaptation from businesses and consumers (Niinimäki et al., 2020). Businesses moving to a circular economy model can be considered a radical change and requires a new way of thinking and doing business (Bocken et al., 2016). Business models need to shift to circular economy methods and to generate profits from the flow of materials and products instead of selling products (Bocken et al., 2016). Additionally, consumers need to change the behavior and consumption habits (Niinimäki et al., 2020). Furthermore, support is needed in different forms, such as collaboration, innovation, legislations, and funding (Manshoven et al., 2019). For the textile and clothing industry to change the paradigm, a system-wide understanding is needed to comprehend how to transition towards circular economy (Ellen MacArthur Foundation, 2012; Manshoven et al., 2019; Niinimäki et al., 2020).

2.3 Waste hierarchy

One of the bases for circular economy is to return the materials into cycles that best regenerate and restore their value (Heikkilä et al., 2018). When considering the environment and what is best for it, there is an order on how the waste should be handled to create the most benefits environmentally. For this a waste hierarchy has been created to improve resource efficiency, prevent and reduce negative impacts of waste generation and to prolong the life cycle of materials and products (European Commission, n.d.; Manshoven et al., 2019).

A waste hierarchy pyramid, as seen in Figure 3, is often referred to demonstrate the priority principles of handling waste. There are several variations of the waste hierarchy, all covering the same idea, but here the waste hierarchy defined by the EU is chosen. The Waste Framework Directive by the EU establishes a five-level waste hierarchy that needs to be applied by EU member states. The EU and Finnish waste legislation is widely based on the Waste Framework Directive (Bacher et al., 2013). The waste hierarchy levels, from highest priority, are prevention, preparing for reuse, recycling, other recovery, e.g., energy recovery and disposal (Bacher et al., 2013; European Commission, n.d.). To follow these priorities, the resources can be kept within the circular economy as effectively as possible (Heikkilä et al., 2018).

The most preferable solution in the hierarchy is waste prevention. Waste prevention does not only include preventing waste generation but also prevention of harm (Corvellec & Czarniawska, 2014). The European Commission (n.d.) states that waste prevention is closely linked with improving manufacturing methods and for consumers to change behavior to demand more sustainable products and less packaging. Additionally, the waste prevention aspect can refer to any phase of the life cycle, such as design, production or use. For example, designing clothing for durability, consumers to avoid excess consumption or to keep products longer in use (Corvellec & Czarniawska, 2014). Moreover, reuse is considered to be either part of prevention or preparing for reuse, which is the second preferable option in the waste hierarchy. Preventing waste by reuse, reduces emissions from waste management and also reduces the amount of production (Palm, 2011). Due to this, different forms of reuse, such as second-hand shops, charitable organizations or clothes sharing, are important aspects to increase reuse within the textile and clothing industry (Palm, 2011). Preparing for reuse includes cleaning, repairing, refurbishing products or parts of the products. Textiles and clothing can be repaired and altered, and consumers can donate their clothing forward thus textile and clothing products should be kept within reuse cycles as long as possible before other options (Heikkilä et al., 2018).

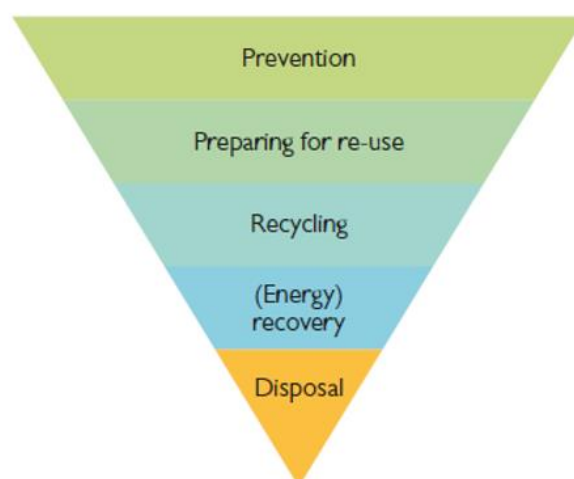


Figure 3: Waste hierarchy according to the EU Waste Framework Directive (Heikkilä et al., 2018, p. 198)

After preparing for reuse, the waste hierarchy includes recycling. Sometimes waste cannot be prevented and as much of the materials as possible should be recovered by recycling (European Commission, n.d.). Recycling includes different processes in which waste is reformed into a material or a product that can be used again in its original purpose or otherwise. Opportunities exist for post-consumer waste based on mechanical and chemical recycling processes (Niinimäki et al., 2020). Recycled yarn and fiber can be created to produce new materials, but further innovations and technologies are needed to further develop recycling in the textile and clothing industry (Niinimäki et al., 2020). If waste cannot be recycled, some value of the resources can be gained through energy recovery, which is the fourth level for waste hierarchy. Energy recovery is opted for waste that cannot be recycled in any other way and turns the waste into usable heat, energy or fuel (EPA, 2015). Incineration as energy recovery is currently the most common treatment of post-consumer textile waste in the EU (Palm, 2011). Lastly in the waste hierarchy is disposal that is to be used as a last resort. Disposal of waste is often executed as landfilling the material and it is used when waste cannot or should not be recycled, such as in case of hazardous waste (EPA, 2015). In the EU there is a ban for organic waste to be landfilled but around the world large amounts of textile waste ends up at landfills (Avfall Sverige, n.d.).

When considering textiles and clothing it is visible that there is a need to move up the waste hierarchy and aim to prevent, reuse, and recycle more (Palm, 2011). The EU considers waste hierarchy as a way to achieve a greener, more circular economy (European Commission, n.d.). The EU's waste policy provides a framework to improve waste management and views waste as an opportunity to boost growth and help reduce environmental impacts of the current system (European Commission, n.d.).

2.4 Textile waste management in Finland

The domestic production of textile and clothing is quite low in Finland and most of the textiles and clothing are imported. The production costs in Finland have not been compatible with other countries, especially Asian countries, thus most production has moved to elsewhere over time (FIT, 2017). The high labor costs have affected the relocation of production from Finland over the years and currently most Finnish production is composed of small companies (FIT, 2017; Tojo et al., 2012).

In Finland, the consumption of clothing has increased over the years with the influence of fast fashion. It is estimated that the number of clothing consumers own has doubled in the last 20 years (Aalto, 2014b). This has in turn led to an increasing amount of post-consumer textile waste, where majority would be either reusable or recyclable. Exact information about textile waste flows in Finland is hard to know as there is no national waste collection or no systemic statistics exist (Tojo et al., 2012). The estimation currently is that every year 70-100 million kilograms of textile waste is formed (Heikkilä, 2019). The textile flows have been officially

calculated last time in 2010 by Tojo et al. (2012) and in 2012 Dahlbo et al. (2015) therefore these figures are going to be used for illustration.

Textile flow consists of new clothing and textiles that are produced and imported for consumers as well as the items that consumers discard within a year (Dahlbo et al., 2015). The discarded items are either donated to be reused again for charitable organizations or sorted as waste. Textile flow also tracks where charitable organizations use the received donated clothes (Dahlbo et al., 2015). Figure 4 demonstrates the textile flow of Finland from 2012 based on a study by Dahlbo et al., 2015.

The net annual textile inflow in 2012 is approximately 72 million tonnes and majority of the textiles and clothing is imported (Palm et al., 2014). This is based on a calculation where import and production in Finland is counted together and exports are deducted (Dahlbo et al., 2015). The textiles and clothing are sold in retail stores to consumers and after usage they are discarded. After discarding the textiles and clothing go either to charitable organizations or to waste. A small portion of discarded textiles remains within consumers where they reuse the textiles themselves (Dahlbo et al., 2015). Based on the study by Dahlbo et al. (2015) the distribution is 77% to waste and 23% to charitable organizations in 2012. Waste management distributes the discarded textiles either to landfill or incinerated. More than half of the discarded textiles, approximately 59%, ends up landfilled. The collected clothing by charitable organizations is distributed to exports, resell to consumers, waste, and recycling. Exports cover about half of the donations to charitable organizations, and it is estimated that 74% stays in Europe, 24% goes to Africa and 2% to Asia (Dahlbo et al., 2015).

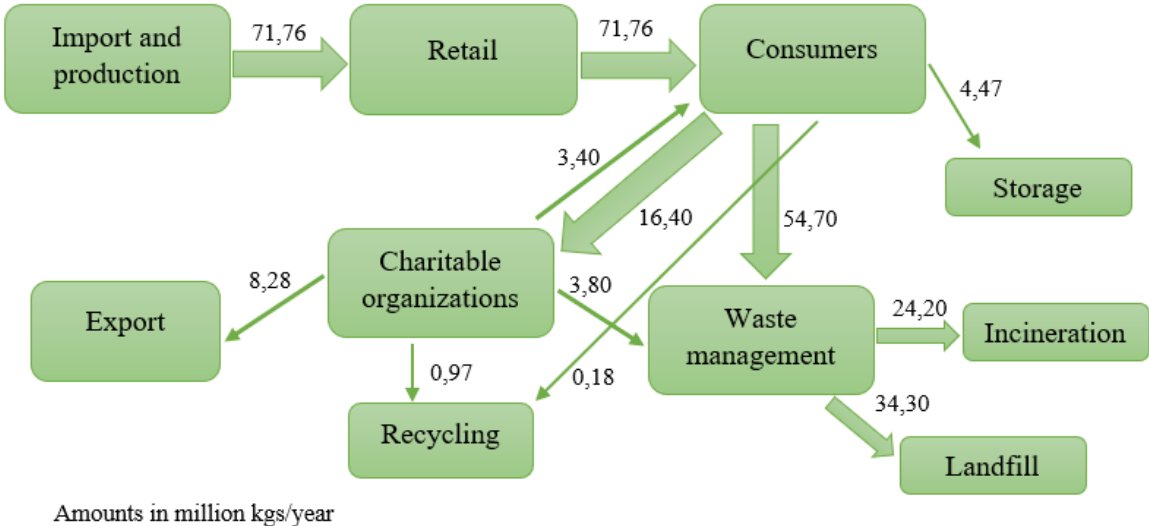


Figure 4: Textile flow of Finland in 2012 adapted from Dahlbo et al. (2015, p.15)

When comparing the textile flow from the study by Dahlbo et al. (2015) to the study by Tojo et al. (2012) one distinction can be made. The amount of post-consumer textile waste ending up to landfill decreased a little bit between 2010 and 2012. In 2010 the amount of discarded textiles going to landfill was over 60% and in 2012 it has decreased to 59% and more textiles ended in incineration. Overall, when looking at the textile flow from Finland it displays that the

majority of discarded textiles and clothing ends up as waste after consumers. On the charitable organizations side, half of the discarded items are exported. This shows that there is a lot of potential to improve the levels of recycling and reuse in the textile flow of Finland. Additionally, it can be considered that if textile waste would be reused and recycled more it could bring more market potential to Finland (Heikkilä, 2019).

In the past years there have been changes for the post-consumer textile waste management in Finland. New legislations have been put in place to start shifting the current linear economy model to circular economy model. Most notable legislation changes affecting the textile flow are landfill ban of organic waste in Finland that came into place in 2016 and European Union's circular economy package approved in 2018 that will require member countries to have separate collection for textiles by 2025 (Šajn, 2019; Takala, 2017). These legislations have started action to increase reuse and recycling in Finland and also pressure for more research, development and investments has emerged (Heikkilä, 2019). Furthermore, a few projects, such as Telaketju and TEXJÄTE, have been started in Finland based on the new legislations that bring together different actors in the field. The idea is to advance textile reuse and recycling and to create a working network for textile circularity that can help the post-consumer textile waste management in Finland to shift to a circular economy model and create more sustainable solutions (SYKE, n.d.; Telaketju, n.d.).

The shift in the textile and clothing industry and for the textile flows does not happen fast and it requires involvement from all stakeholders working in the field. According to Niinimäki et al. (2020) it needs the textile and clothing industry to invest in clean technology, businesses in fashion to establish new business models, consumers to change their consumption habits and policymakers to adapt regulations, legislations, and business rules. System-wide understanding is needed and collaboration between all stakeholders in the value chain is needed to create a new paradigm for a more sustainable textile and clothing industry (Bocken et al., 2018; Niinimäki et al., 2020).

In Finland, the discarded post-consumer textile collection is handled either by municipal solid waste (MSW) or charitable organizations. Currently after consumers discard used textiles and clothes, they are being thrown away to mixed waste and this will continue until the new legislation of separate collection will be initiated. Collection of mixed waste is handled by municipalities in Finland, and they will direct the textile waste to be incinerated (Jurkko, 2015). After 2016 textile waste was banned to be sent to landfills so all used textiles and clothing in mixed waste end up incinerated as energy recovery (FINLEX, 2013).

To increase reuse and recycling, other options than incineration are needed. To take steps towards this direction a first large-scale end-of-life textile refinement plant is going to be opened in Finland during 2021. Lounais-Suomen Jätehuolto Oy (LSJH – 'Waste Management of the Southwestern Finland Ltd.') will start processing textile waste as an industrial raw material to drive the textile and clothing sector towards circular economy (LSJH, 2020). The capacity for processing will be 12 000 tonnes of end-of-life-textile annually, which is approximately 10% of Finland's textile waste (LSJH, 2020). This serves as a pilot production by LSJH for a larger plant that will aim to handle post-consumer textile waste in Finland after

a new policy will commence for separate textile collection (LSJH, 2020). Moreover, new innovative technologies are being created to develop natural fiber from waste, including textile waste. Finnish start-up Infinited Fiber Company is focused on creating and starting to produce cotton-like material that can be used for creating new clothing that is more sustainable and reduces the environmental impacts (Business Europe, 2019; Infinited Fiber, n.d.). Such new solutions to recycle fiber have been the missing link in the value chain of post-consumer textile waste management and the solutions enable to recycle the material instead of incinerating it (Kokkonen, 2020).

Charitable organizations are big actors in Finland for clothing reuse and they handle nearly a quarter of discarded clothing. They are also the main entity collecting and handling reusable textile products by having containers around the country for consumers to leave their old clothing (Tojo et al., 2012). In Finland, the collection is dominated by four charitable organizations (UFF (U-landshjälp från Folk till Folk i Finland sr), Red Cross, Fida International and Salvation Army) but smaller ones also exist (Palm et al., 2014; Tojo et al., 2012). These organizations are dependent on the consumers and their behavior of donating used clothing and this contributes to keeping clothing away from being incinerated, which is considered a less efficient method of using resources (Kant Hvass, 2018; Kokkonen, 2020).

As the amount of discarded clothing has increased it has also increased the amount of clothing donated to charitable organizations. Charitable organizations sort the collected clothing and have a couple of different processes on how to utilize them. Largest flow for collected clothing is exports to other countries for reuse, mainly to larger sorting centers in Europe, yet the centers might not be the final destination for the clothing (Watson et al., 2016). The used clothing can be exported outside of Finland for several reasons, for example the demand of used clothing is not enough locally compared to the amount of donated clothing (Ericsson & Brooks, 2014). The donated clothing can be thought not to be trendy and retail stores are selling clothes with low prices due to the phenomenon of fast fashion (Ericsson & Brooks, 2014). Exports of clothing have also been criticized as at times the donated clothing is not distributed for free to potential final destination countries in Africa and Asia, but they are being traded with profits (Ericsson & Brooks, 2014). Moreover, the consumers donating clothing might not be aware of this potential trade pattern (Ericsson & Brooks, 2014; Manshoven et al., 2019) and more transparency is considered important factor for consumers in the life cycle of clothing and textiles (Kant Hvass, 2018; Niinimäki et al., 2020)

Approximately fifth of donated clothing ends up back to consumers either by donations or through sales done by charitable organizations retail stores (Aalto, 2014a). Retail stores for charitable organizations selling reusable clothing and textiles tends to be part of the income and helps cover the costs for collecting and sorting (Palm et al., 2014). Charitable organizations need to pay for clothing and textiles taken to incineration after sorting items that are not suitable for recycling or reuse (Palm et al., 2014). About fifth of donated clothing ends up incinerated due to bad quality or condition of the clothing (Dahlbo et al., 2015; Tojo et al., 2012). There is also a small amount of textiles going into recycling but it has not been significant business in Finland but volumes and interest have been increasing in the last years (Palm et al., 2014). Additionally, there is an uncounted amount of clothing exchanged between families, friends and flea markets that have not been accounted for in the textile flow as no information exists

(Aalto, 2014a). Overall, the role of charitable organizations in Finland is important for the reuse of clothing and textiles. They are a major actor ensuring textiles and clothing are being reused and have established a strong market in Finland as the collectors of discarded textiles and clothing in the past decades.

3 Methodology

In this chapter, the methods applied to approach the aim of the study and to create an answer to the research questions are described. Firstly, the research approach and design are defined as well as motivation for qualitative research. Hereafter, the methods of data collection and analysis along with overview of the data are presented. Furthermore, limitations of the method and data are considered.

3.1 Research Approach and Design

The focus of this study is post-consumer textile waste management in Finland, and it is aimed at identifying and analyzing legislations concerning textile waste management between the years 2008-2018 and to investigate the role charitable organizations have in the field. Qualitative approach is chosen as the method to attempt answering the research questions as it is most fitting to get a deeper understanding of the topic. Creswell (2014) identifies that qualitative approach is most suitable when the aim is to understand a particular social situation, role, group, or interaction and to make sense of a real-life social phenomenon. Furthermore, a focus of participants' perceptions and experiences is common in a qualitative approach (Creswell, 2014).

Additionally, a case study approach has been chosen for the study. Morgan (2012) describes that the case study approach allows research directly in a 'real-life' context that creates depth of engagement with the topic that often is a complex issue. The case study design in a qualitative context tends to use interviews, observations, and document analysis to gain in-depth analysis and understanding to generate knowledge of the phenomenon in a specific context (Rashid et al., 2019; Simons, 2009). Thus, Finland is chosen as the case to investigate and to gain a deeper understanding of the post-consumer textile waste management field and to focus on angles that have not been previously investigated in detail.

The study starts with an approach to collect specific information of the main focuses and moves on to detect themes and patterns via primary and secondary data collection, so an inductive approach is taken to find generalizations to conclude answers for research questions (Soiferman, 2010). However, deductive nature is included as evidence is used to support conclusions and the researcher has gained aspects from the literature study which affected how observations are interpreted (Creswell, 2014). Awareness of the researcher is needed so that no confirmation bias is caused when verifying or falsifying evidence (Creswell, 2014).

Creswell (2014) mentions that the researcher is an important tool in qualitative research, and they often gather information themselves for the study. This indicates that the researcher has a major role in design, collect and arrange of data for the study and to interpret outcomes from the findings and to draw conclusions (Creswell, 2014). The researcher needs to be aware of any bias when analyzing data in order to assure inclusiveness and the accuracy of the research data (Peräkylä, 2021). Furthermore, the researcher needs to ensure that measurements for validity of the study are considered. Transparency, consistency and documenting the steps of the study thoroughly are key aspects to guarantee validity (Peräkylä, 2021).

3.2 Data Collection Method

Qualitative research and case study methods often consist of multiple sources of data rather than relying only on a single one and it simultaneously strengthens reliability and validity. (Creswell, 2014). For this study primary data in the form of interviews is collected and secondary data is gathered through document analysis. For document analysis, legislations on Finnish and the EU level are collected to see what legislations have been implemented in Finland between 2008-2018 and how they support the shift to a circular economy. Additionally, a few projects and progresses have been collected. Interviews have been conducted with the main idea to get in-depth insight about the role charitable organizations have in post-consumer textile waste management in Finland and to see what experience and insight charitable organizations have in the topic.

Document analysis has been formed from official documents from Finland, such as the Ministry of the Environment, and from the European Commission. Including official sources to collect legislations created regarding textile waste management are important as they represent an official stance and have been put to use by both Finland and the EU. The legislations can be seen in Table 1 which also indicates the sources of the legislations. A research of official documents has been handled to locate and collect all major legislations. After collecting, the legislations have been analyzed to see what the main effects are, and further analysis has been done to see how the changes support the shift to a circular economy. Furthermore, during conducted interviews insights of the legislations and their effects was discussed to create additional input to the legislations. The goal of the document analysis was to create an overview of the legislation changes between the timeframe when both Finland and the EU has put efforts to increase circularity of textiles and clothing.

Primary data for the study was collected through interviews to gain information from experts working in the field of post-consumer textile waste management in Finland. The sample for interviews was limited to these individuals due to their knowledge and experience in the field as the focus of the interviews was defined to gather more information of charitable organizations role and their experience handling post-consumer textile waste. Due to the criteria, several charitable organizations and researchers on the field were contacted for interviews. Additionally, snowball sampling was applied to get more interviewees. Snowball

sampling is used in qualitative research when a specific and small population is a target group, and it is hard to locate (Naderifar, Goli & Ghaljaei, 2017). This method was ideal to use in the study as the post-consumer textile waste management field in Finland is relatively small and different actors are familiar with each other.

In total seven interviews, with nine people, were conducted with charitable organizations and researchers. The number of interviews is considered to reach saturation as the aim is to conduct in-depth interviews with experts on the field and not to generalize population but to focus exploration of a real-life phenomenon (Creswell, 2014). Obtaining other interviewees than charitable organizations allowed to include further points of view and would additionally reduce possible bias from charitable organizations on their own role and processes. The interviews were conducted in a semi-structured manner either in English or Finnish, based on the preference of interviewees. Semi-structured interviews allowed open-ended questions to be prepared in advance to give a guideline to the interviews and allow follow-up questions where needed.

When conducting interviews, there are risks for several biases that need to be taken into consideration. The bias risks should be acknowledged and attempted to reduce as much as possible (Shah, 2019). To reduce the risk for bias the interview questions should be phrased carefully and allow the interviewees to feel accepted and discuss the topics freely without the interviewer prompting the interviewees to go in any direction (Shah, 2019). To avoid this, the interview questions, which can be seen in appendix A, have been formed as open as possible and started with more generic questions and moving on to more specific ones. Moreover, the identities of the interviewees are kept confidential in order to allow them to express their insights and experiences more freely. The data collection of both primary and secondary data has been done acknowledging bias and avoiding it wherever possible.

3.3 Data Overview

Total of five legislations were found applying to post-consumer textile waste management in levels of Finland and the EU. The overview of the legislations can be found in Table 1. Three of the legislations come from the EU level and the information was found from official online sources, namely from the European Parliament and the European Commission. Two of the legislations have been established in Finland and the information was found on official governmental sources. The legislations have been analyzed to pinpoint the main changes to the waste management and connections to how circular economy is taken into account was investigated. The legislations will be discussed in more detail in the next chapter to review the content and intention of the legislations.

During the document analysis on investigating legislations in relation to post-consumer textile waste management, it was noted that several projects were carried out during the timeframe of 2008-2018 to support the implementation of the legislations and to create solutions for the value

chain of handling post-consumer textiles. These projects were also gathered and investigated to see their role on top of the legislations by Finland and the EU in advancing circularity in post-consumer textile waste management. Table 2 includes the projects and their aim.

Table 1: Overview of legislations concerning post-consumer textile waste in Finland between 2008-2018

Year	Legislation	Level	Source
2008	Waste Framework Directive, Directive 2008/98/EC	The EU	European Parliament
2011	The Waste Act 646/2011	Finland	Finlex, Ministry of Justice
2015	Circular Economy Action Plan, Closing the loop	The EU	European Commission
2016	Government Decree on Landfills 331/2013	Finland	Finnish Government
2018	Circular Economy Package, Amendment to Directive 2008/98/EC	The EU	European Parliament

Table 2: Overview of projects in connection to legislations of post-consumer textiles

Project	Area	Goal
Telaketju	Large-scale network cooperation project	To advance sustainable textile production, use and circulation and to create a base for business in circular economy
Infinite Fiber Company	Creating new cotton like fiber from waste	Increase textile circularity by a new way to regenerate new textile fiber
TEXJÄTE	Collaboration with actors in Finland focusing on textile recycling	To create an understanding of possibilities and challenges in regards of textile recycling and its impacts
End-of-life textile refinement plant	New refinement plant in Finland to recycle end-of-life textiles	To create a recycling solution for end-of-life textiles and increase recycling of post-consumer textiles

Altogether seven interviews were conducted between 3-18 of May. One of the interviews had three people from the same organization thus the total number of interviewees was nine. Table 3 displays the schedule for interviews and the organization or field of the interviewees.

Permission to share the name of the organization was obtained from the interviewees at the start of the interviews. However, further information of the interviewees is kept confidential, and their views are not directly linked to them in the analysis section. There are four interviewees from charitable organizations in Finland and three from perspective of researchers working within the post-consumer textile management field. Thus, all the interviewees have experience and knowledge of the post-consumer textile waste management in Finland and therefore they offered significant input to the aims of the study. The interview questions covered different questions relevant to the topic, such as circular economy and capacity in Finland to handle post-consumer textiles. Prior to the interviews, an interview guide was created, which was followed in the interviews and the guide can be seen in appendix A. In addition to the interview guide, potential follow-up questions were thought beforehand when doing test interviews and follow-up questions were also asked on the spot during the interviews when it was needed.

Table 3: Overview of conducted interviews

Company or organization	Date
UFF – U-landshjälp från Folk till Folk i Finland sr	May 3
Hope – Yhdessä & Yhteisesti ry	May 4
Helsinki Metropolitan Area Reuse Centre Ltd.	May 4
Fida secondhand	May 6
Finnish Environment Institute	May 11
Academia – PhD researcher	May 18
Academia – Expert	May 18

All interviews were conducted through online platforms, either by Zoom or Microsoft Teams, due to the on-going pandemic that restricts face-to-face meetings. Additionally, all interviews apart from one were conducted in Finnish as per the preference of interviewees. The length of the interviews was expected to be approximately 30 minutes, and this was the case for most interviews. However, the interview’s length varied between 21 minutes to 43 minutes. The interviewees gave a consent for being interviewed before starting and they were informed of the right to revoke their consent at any time. In addition, a permission for recording the interviews was also asked for.

The recorded interviews were transcribed by using Amberscript audio transcription software. Amberscript was chosen as it supports Finnish, and the output quality was proven rather good. After the transcripts were created, they were used for analyzing the data using NVivo. The content of transcripts was organized by creating categories and themes to code the data. The categories and themes allowed easier understanding of the main outcomes from the interviews to support creating answers for the research questions based on the obtained data.

3.4 Limitations

The chosen qualitative case study approach seems the most suitable method for this study, but it still contains some limitations that should be considered. Firstly, qualitative case studies should not generalize findings to outside of the study as it is specifically developed in a specific context (Creswell, 2014). This study is focusing on post-consumer textile waste management in Finland, and it necessarily cannot be generalized to other contexts or countries as the structure and management of waste handling varies based on countries, even within the EU countries. Furthermore, charitable organizations have a large role in Finland in handling post-consumer textiles, but this may not be the case elsewhere.

Qualitative study benefits of using multiple sources of data to ensure better validity and reliability (Creswell, 2014). Both primary and secondary data is used to establish validity and reliability as well as the collected data different point of views have been intended to include in the study. Furthermore, for validity and reliability, all the stages of the study have been included and shared in detail. Collected data can also be incomplete or biased, such as interviewees comments or documents gathered can be misconstrued. To avoid this, official documents have been used as much as possible and for interviews different backgrounds have been used to get more perspective than just from charitable organizations.

4 Analysis and Discussion

The chapter is focused on the findings of the study. The findings are presented, analyzed, and discussed in relation to the collected data and theory. This chapter aims to answer the research questions and give an understanding of the post-consumer textile waste management in Finland based on the legislations formed between 2008-2018 and to investigate the role of charitable organizations as one of the actors handling post-consumer textile waste. The following sections are divided based on the research questions and their focus to create an overview and understanding of the collected data to identify the main outcomes.

Even the aim of the study being twofold, the aims are related to each other as well as complete each other. Legislations affect the way post-consumer waste management and charitable organizations can operate. The legislation creates frameworks and goals on how to handle post-consumer textile waste and the preferred methods of handling it. The legislation can additionally increase the impacts of post-consumer waste management to preferred direction and as in the case of the study the legislations have been aimed at increasing the circular economy.

4.1 Findings for Legislations

The first research question aims to map out what legislations have been formed at Finnish and the EU level during 2008-2018 and to see how these legislations increase circularity in post-consumer textile waste management in Finland. First, the legislations, which are collected in table 1, are presented and discussed to see their main functions and aims. Moreover, the legislations are looked at to see how they support the shift to circular economy in the context of post-consumer textiles. The legislations have started action in Finland in terms of different projects and their part is also considered. Additionally, perspectives for the legislations from the interviewees are included as the role of legislations and their effect were covered in the interviews. Lastly, the main findings for the first research question are discussed.

4.1.1 Legislations Formed During 2008-2018

Legislations are often created to ensure a proper function of economies and societies and they aim to guarantee the safety, environmental and social outcomes in life. Legislation towards waste management is not a new phenomenon and there is a history of mandating legislations to waste. The goal is to minimize and eliminate waste and more recently to reduce the negative impacts excessive waste causes. Finland created the first specialized waste legislation in the

1970s (Stenmarck, 2012). The Waste Management Act 673/1978 was matched with a similar Waste Act done in European level (Stenmarck, 2012). Stenmarck (2012) mentions that the legislation involves responsibilities towards municipal waste management and producer responsibility. After this, there have been a handful of waste acts concerning waste management. In the past 15 years, the management of increasing amounts of textile waste has become a pressing matter and legislation directly affecting textile waste has been created.

The first waste legislation that concerned textiles directly was created in 2008 at the EU level. The Waste Framework Directive (Directive 2008/98/EC) sets up a legislative framework for handling waste in the EU (European Parliament, 2008). It forms principles for waste management and the foundation for waste hierarchy. It requires waste to be managed without harming the environment or endangering human health (European Commission, n.d.; European Parliament, 2008). The legislation sets a foundation for a better management of textile waste by creating a preference order for handling waste. The waste hierarchy guides actors to handle waste in a better manner to create environmental benefits and prolong the life cycle of materials and products. The Waste Framework Directive serves as a defining and creating principal concept of managing waste better and allowing a start for a shift to more circular waste management in the EU.

Finnish waste legislation is largely based on the legislation of the EU but at times it can have stricter standards and limits than those applied in the EU (Ministry of the Environment, n.d.). Finland adopted Waste Act 646/2011 based on the Waste Framework Directive of the EU to comply with the decisions made at the EU level, such as the waste hierarchy model. In addition, this Waste Act aims to increase the level of municipal waste recycling to 50% (Ministry of the Environment, 2012).

In 2015, the EU adopted Closing the loop – Circular economy action plan. This was the EU's first circular action plan, and it has guided the EU's transition towards a circular economy. As of 2019, the action plan was fully completed, and its main objectives was to help 'closing the loops' of product life cycles through better reuse and recycling and additionally bringing benefits to the environment and the economy (European Commission, n.d.). To increase reuse and recycling, improvements in waste collection and sorting were needed. The European Commission (2015) highlighted the importance of transparency and cost-efficiency in the waste management and brought up textile waste creating more benefit when ending up incinerated instead of landfills when considering last resort solutions. This action plan also underlines the importance of the waste hierarchy and its priorities to reduce the amount of reusable and recyclable waste ending up to landfills and incinerated (European Commission, 2015).

Finland applied a new landfill ban on organic waste that came into force in 2016. The Government Decree on Landfills 331/2013 included that municipal waste and recyclable waste cannot be taken to landfills anymore (FINLEX, 2013). The landfill ban covered textile waste, meaning that textiles and clothing will no longer be directed to landfills. The decree intends for the waste to be used as a material or energy and therefore to decrease the impacts of waste management to the environment (Korhonen, Pitkänen & Niemistö, 2018). Consequently, the landfill ban has advanced development of new business around the circular economy and has

initiated action to increase reuse as well as recycling in Finland, especially for post-consumer textiles (Korhonen, Pitkänen & Niemistö, 2018).

In 2018, the EU adopted a circular economy package that amended the Directive 2008/98/EC. The circular economy package includes proposals for waste management to further support transition to a circular economy and to improve waste management in the EU member countries (Bourguignon, 2018). It introduced targets for reuse, recycling and landfilling as well as strengthened provisions for waste prevention (Bourguignon, 2018). A major change for textile waste management was included in the circular economy package and it requires all member countries to start a separate collection for post-consumer textiles by 2025 (Šajin, 2019). Finland is aiming to start it ahead of schedule in 2023 (Mäki, n.d.). The separate collection is seen as beneficial in extending the life cycle of textile and clothing and advancing circularity. However, only having a separate collection will not be enough and there needs to be a plan on how to increase the reuse and recycling of the post-consumer textiles and to have all steps of the value chain in place to be able to direct post-consumer textile flows away from incineration.

4.1.2 Projects Supporting Adoption of the Legislations

Adopting new legislation does not happen overnight and it requires careful planning, research, and organization. The legislations adopted between 2008-2018, and especially the legislations from 2016 and 2018, include changes to the waste management system and processes that need planning before their implementation. To meet the goals and aims for the legislation, there needs to be new processes put in place and different actors affected need to have time to adapt and innovate their systems. In order for Finland to adapt to the new legislations a lot of effort has been needed from different actors. A few projects were found that had occurred at the time of the formation of the legislations in Finland and they are examined in this section. Overview of the projects can be found in table 2.

Two projects focusing on collaboration and cooperation were found when investigating legislations affecting post-consumer textiles. In Finland, Telaketju and TEXJÄTE projects have been initiated within the past decade that are related to post-consumer textiles and its management. TEXJÄTE project was a collaboration between Finnish Environment Institute, charitable organization UFF, Centre for Consumer Society Research and Häme University of Applied Sciences and it took place between 2013-2014 (Finnish Environment Institute, 2015). The main aim of the project was to evaluate opportunities and obstacles for promoting textile recycling in Finland, analyze environmental, cost, and social impacts of increasing textile recycling and to present proposals for measures to promote textile waste recycling (Finnish Environment Institute, 2015).

The second project, Telaketju, is a large-scale network project that is funded by the Ministry of the Environment and Business Finland. It was launched in 2017 and was initially supposed to last for two years but due to its success and interest it was continued (VTT, 2019). Telaketju consists of multiple partners, including VTT Technical Research Centre of Finland, few charitable organizations, companies and two universities among others (Telaketju, n.d.). The

first project of Telaketju focused on textile recycling and the second was aimed to understand consumers and their behavior (Telaketju, n.d.; VTT, 2019). Telaketju projects has supported Finland's handling of post-consumer textiles in creating all the steps of the value chain to be ready to start a separate collection of textiles already in 2023 (VTT, 2019).

In addition to the two projects, two new companies and processes have been created in Finland to support the aim of increasing post-consumer textile recycling. The ground for both is to increase textile circularity by creating solutions to recycle and handle the large amounts of post-consumer textiles. Infinited Fiber Company is a Finnish start-up that creates new cotton like fiber from waste, including textile waste (Infinited Fiber, n.d.). Their goal is to increase textile circularity and regenerate new textile fiber from waste to reduce the negative impacts of the textile industry (Infinited Fiber, n.d.). Infinited Fiber Company is in the pilot phase and is planning to build a factory in Finland to start producing their new fiber and reach the global market (Infinited Fiber, n.d.). The other process occurring in Finland is an end-of-life refinement plant that aims to start processing post-consumer textile waste as an industrial raw material (LSJH, 2020). It offers a recycling solution for end-of-life textiles that could otherwise be incinerated thus reducing the use of natural resources (LSJH, 2020). LSJH is launching a pilot process in 2021 and in 2023 a larger plant will process end-of-life textiles from Finnish households (LSJH, 2020). In addition, Infinited Fiber Company and LSJH have launched a collaboration where they will develop the textile circular economy in Finland (LSJH, 2021). LSJH will provide raw materials to Infinited Fiber Company and they can use the raw materials to create their new fiber on a larger scale (LSJH, 2021).

4.1.3 Insights from the Interviews

The conducted interviews for the study included questions from the interviewees on their point of views about the legislations for post-consumer textile waste management and its impacts. The main insights from the interviews regarding the legislation are presented in the following paragraphs. The interviewees are all knowledgeable of the field of post-consumer textile waste management and its procedures and therefore they have experience how the legislations affect Finland.

All the interview participants agreed on the importance of the legislation that has been formed between 2008-2018. Especially the legislations on the ban on landfills and the latest circular economy package requiring separate collection for textiles was brought up as important changes to the management of textiles and clothing. It is being viewed as beneficial that Finland has started to pay increasing attention to the problem of post-consumer textiles and are creating solutions to increase reuse and recycling. Moreover, the legislations on the levels of Finland and the EU have been considered to be consistent with each other and no discrepancies were noted from the point of view of interviewees.

The new legislations were considering supporting waste hierarchy and highlighting more reuse and recycling that are considered the most preferable steps of the waste hierarchy. While it was agreed among the interviewees that legislation is a step in the right direction, a few concerns

were highlighted. Two interviewees emphasized that in order to be able to increase reuse and recycling, there needs to be a working value chain with opportunities and users for it to be sustainable and reasonable. Additionally, collaboration for different actors across the value chain were emphasized. Interviews from charitable organizations stated that they consider that focus has been more on finding new recycling processes for the materials with the new legislations and reuse should not be forgotten.

More than half of the interviews also highlighted the projects, namely TEXJÄTE and Telaketju, that have been done in Finland over the past years. These projects were considered important for the value chain of post-consumer textile waste management. In addition, these projects have been noted to bring different actors together across the value chain and improve the cooperation amongst them. Moreover, development has been seen with recycling technologies and Infinited Fiber Company and the end-of-life refinement plant was mentioned as local investments and innovations in Finland.

4.1.4 Discussion of the Findings

The main findings related to the first research question have been collected by document analysis and interviews. Based on the document analysis, findings have been gathered from legislations that have been formed during 2008-2018 and additionally projects, companies and processes have been found in relation to the legislation. Interviews brought insight from actors within the post-consumer textile management that are working in the field or participated in the projects.

There have been five main legislations formed between 2008-2018 that have led to changes in the post-consumer textile waste management. The goal of the formed legislations have been to create a more sustainable framework to handle waste and to transition towards a circular economy in Finland and the EU. During the timeframe there have been legislations created both on the level of Finland and the EU. However, based on the literature and document analysis it indicates that Finland's legislations often are largely based on the EU's legislations.

The EU, along with Finland, has been dedicated to promoting a circular economy and legislations have been formed to create tangible aims to speed up the transition. The main motivation for circular economy and focus on post-consumer textile waste management is the increasing amount of the waste created and the negative environmental impacts. Furthermore, the shift to more circular waste management brings not only environmental benefits but also economical as the waste will remain in use for longer in the form of reuse or recycling.

To reach the goals of the legislation, changes need to be made for the current value chain of post-consumer textile management. The literature shows that Finland has been experiencing a rather linear post-consumer textile waste management system so far as around 77% of textile waste ends up incinerated. Worth noting is that before the organic landfill ban, the majority of post-consumer textile waste ended up at landfills. The legislations are supporting to tackle this linear waste management by applying targets to decrease incineration and increase reuse and

recycling. Different goals have been set by the legislations to ensure that the circular economy methods are applied in a timely manner.

The study indicates that the legislations support the increase of circularity in post-consumer textile waste management. They intend to prioritize the waste hierarchy model, promote prolonging the life cycle of products and materials as well as decrease the environmental impacts. Nevertheless, it should be noted that legislations require increasing amount of reuse and recycle, and for example the upcoming legislation requires the separate collection of textiles by 2025, but support is also needed for implementing solutions for post-consumer textile waste handling. One of the interviews stated that “solutions are an integral part of reuse and recycling and it should be pursued with solutions, not just for the sake of recycling”. Investments and innovations are needed to create solutions that will actually have a better chance to improve the circularity in the post-consumer textile waste management.

In Finland, a few projects have been launched to ensure a sustainable transition to the new legislation and to increase collaboration within the actors to create a working value chain. The projects have been considered valuable and they advance the collaboration. This indicates that Finland is aiming to create more durable solutions for more circular post-consumer textile waste management, and they are aiming to shift towards a circular economy according to the formed legislations.

4.2 Findings for Charitable Organizations

The second research question aims to investigate the role of charitable organizations involved in handling discarded post-consumer textiles and clothing in Finland and to focus on their experiences and insights of the field. To gain an understanding of the aim, interviews have been conducted. In addition to interviewing charitable organizations, few interviews have been conducted with researchers to get additional perspective to the study. The following subsections cover the outcomes of the interviews and attempt to answer the second research question. Firstly, the role of charitable organizations is analyzed and discussed. Secondly, the experiences and insights of the post-consumer textile waste management is covered and finally, discussion of the findings is presented.

4.2.1 Role of Charitable Organizations

Charitable organizations in Finland are the largest collectors of post-consumers textile waste and are often non-profit organizations. Notable to mention about the term of post-consumer textile waste is that it does not only refer to waste but also includes products that have been discarded by consumers but are still reusable and recyclable, which are the majority of the discarded textiles. According to the latest information on textile flows, charitable organizations collect 23% of the discarded post-consumer textiles in Finland. In interviews, the researchers

considered charitable organizations having a significant role in the post-consumer textile waste management in Finland and especially in the reuse of clothing. Furthermore, researchers thought that charitable organizations have valuable knowledge on collecting and sorting post-consumer textiles.

According to charity organizations their work is based on circular economy and reuse is their main work. They collect and sort clothing and textiles and aim to reuse as much of the clothing as possible to maintain all the possible value. Reuse brings profit to the organizations on which they can support their operations and potentially also fund development coordination. Moreover, during the interviews the charity organizations emphasized that they value sustainable development, environment work and promoting reuse.

Clothing collected by charitable organizations is aimed to be reused but at times it is not a possibility. One of the main reasons for this was stated in the interviews as a poor-quality of the discarded post-consumer textiles and clothing. This leads charitable organizations with a need to find other solutions, such as sending the items to incineration. The charitable organizations mention in the interviews that incineration is used as a last option and they would prefer to recycle the clothing as materials if a place for that is found. The poor-quality clothing donated to charitable organizations causes issues for them and they have seen an increasing trend in the past years of poor clothing. Both charitable organizations and researchers assume that this is due to the fast fashion phenomenon, where production produces lower quality products. Additionally, the expected reason for poor-quality post-consumer textile waste ending up in charity organizations is due to the consumers not having knowledge where discarded items should be placed.

Alternatively, some of the collected post-consumer textiles are not reused in Finland. It has several reasons, such as supply being higher than demand or the donated clothing are not considered trendy anymore. Some of the charitable organizations export collected post-consumer textiles and clothing outside of Finland, mainly to sorting facilities in the EU. The most common reasons for export mentioned in the interviews is that there are not enough customers in Finland and reuse via exports is considered better than incineration. However, the charitable organizations indicate that they would prefer to keep everything in Finland if it would be possible to reuse or recycle all.

The export of post-consumer of textiles has also been criticized as covered in the theory section. The researchers mentioned in the interviews that it is a complex topic with benefits and disadvantages. Researchers discuss in the interviews that exports can be beneficial as long as only reusable clothing and textile are exported. If products that are not suitable for reuse are exported it can create additional issues in the destination country and it could be seen as transferring Finland's waste problem to elsewhere, while Finland is more equipped to handle the waste.

4.2.2 Experience and Insights of the Post-consumer Textile Waste Management in Finland

The interviews covered questions about the post-consumer textile waste management in Finland to understand better what the main insights to the current processes are and what trends and changes are visible. In the next paragraphs, the main themes discussed in the interviews are presented.

In the interviewees when discussing the current situation of the post-consumer textile waste management in Finland, all the interviewees were on the same page that there is a need to make it more circular and to find ways to increase reuse and recycling from the current rates. The interviewees all agreed that the amount of post-consumer textile waste has increased in the past years and that it has become an increasing problem. One of the interviewees stated that “with fast fashion it feels like that people have stopped valuing clothing and considers them rather disposable”. Another interviewee pointed out that waste management is fixing problems created by other people and waste management tries its best to handle waste.

With the increasing amount of post-consumer textiles, it has created challenges for waste management. One of the challenges is the capacity to handle post-consumer textiles in Finland. Currently less than a quarter of discarded textiles is being reused and recycling of materials from clothing has been small. Interviewees noted that currently the capacity to reuse and recycle all post-consumer textile waste is not possible. In order to increase the capacity, it requires solutions on how the post-consumer textiles could better be reused or recycled, and the value chain needs to be in place. Few of the interviewees pointed out that handling discarded textiles is currently labor-intensive activity and collecting and sorting requires manual work as technologies are still lacking to see what is reusable and what not. In order to increase capacity, investments were seen as a key and it could allow building new capacity, in the forms of new technologies or innovations, as examples.

The recent legislations are believed to impact the recent action that has been seen in the management of post-consumer textile waste. The legislation and their requirements, such as the separate collection by 2025, has started action to aim to increase reuse and recycling as well as to find solutions to improve the situation. Recent focus in the field has been to find new ways to recycle the materials of clothing and textiles and new investments and research have been focusing on it. During interviews, it was mentioned that such changes are needed to increase capacity and the circulation of discarded textiles. It is seen that in Finland the solutions for increasing recycling will increase in the coming years and most of the interviewees consider that the capacity for reuse of recycled materials would increase as well as new technologies. However, charitable organizations favored that clothing reuse should be the preferred option when possible and it should be prioritized. The researchers agree that waste hierarchy should be aimed to be followed, thus reusable post-consumer textiles should be reused and the amount that cannot be reused should be aimed to be recycled.

In the interviews common highlights were the role of production and consumers. For production, the interviewees wanted to see more durable products and designs. The current

production chain was seen as broken and challenging as the majority of clothing is produced outside of Finland, which makes it harder to promote sustainable solutions from both social and environmental perspectives. One of the main insights from interviews on trying to decrease the post-consumer textile problem was seen in the production and consumption of clothing. Interviewees saw one way to intend to make changes to the current production methods is demand from consumers. Consumers are considered to have a huge role and their behavior has an effect. Interviewees considered that more knowledge of the textile and clothing industry should be shared with the consumers so they would be more aware of production and its impacts. On the other hand, charitable organizations noted that more awareness from consumers is needed about what is reusable and what is not. This could lead to better sorting habits from the consumers as currently charitable organizations receive large amounts of poor-quality clothing that is not suitable for reuse and it burdens their load. Furthermore, all interviewees agree that transparency in the production, post-consumer textile waste management and in general in the whole life cycle of textiles and clothing is important. This can shift the behavior of the consumers and additionally give more credibility to charitable organizations according to the interviewees.

Several interviews brought up the importance of communication to the consumers as well as terminology used. Charitable organizations considered that terminology should be aligned to be clearer between different actors within the value chain of post-consumer textile waste management as well as to consumers. This would allow a better understanding for all actors involved. Furthermore, a few interviewees mentioned that post-consumer textile waste management should be made as easy and clear as possible for consumers to facilitate the process of donating and recycling of clothing.

Lastly, the interviews covered ideas and expectations for the coming years for post-consumer textile waste management. The interviewees viewed that more awareness will be given to the topic in the coming years, and this could allow increase of more reuse and recycling. Charitable organizations mentioned that the demand for reused products have been an increasing trend in the past years, especially among women. Additionally, it was mentioned that in the past years, second-hand stores and online platforms have gained interest, which leads interviewees to consider that there is more will and interest from consumers' side than before. Interviewees are hoping that there will be advances in the coming years to increase levels of reuse and recycling and that the value chain will collaborate to facilitate a more circular post-consumer textile management in Finland.

4.2.3 Discussion of the findings

The conducted interviews included several insights and experiences from the interviewees that support answering the second research question. The interviews covered the role charitable organizations have and different inputs of the current post-consumer textile waste management have in Finland. This subchapter concludes the main findings for the second research question.

The charitable organizations have a large role in Finland as collectors of post-consumer textiles and they have been working on increasing the reuse of textile and clothing over the past decades. Charitable organizations additionally have first-hand knowledge of the post-consumer textile waste management and of the collection and sorting processes. Research shows that they collect and sort nearly a quarter of the post-consumer textile waste in Finland which supports their importance as one of the actors of the field. Charitable organizations work is based on a circular economy and they work with the highest step of the waste hierarchy, which is waste prevention and reuse. This further indicates that their role is important, and they are aiming to decrease the negative impacts of the textile and clothing industry with their work. However, the literature recognizes charity organizations' role as collectors for post-consumer textile waste in Finland, but it often overlooks their knowledge and experience in the field and importance in reuse.

The data gathered from interviews of the textile flows of charitable organizations support the theory and literature. Charitable organizations in the literature have gained increasing attention for exporting textiles and clothing from Finland. It has been criticized mainly for two reasons, either for exporting post-consumer textiles that are not in condition to be reused or that there is no guarantee where the textiles end up from the sorting facilities in the EU. The matter is complex. Charitable organizations discussed in the interviews that their aim is to ensure the reuse of clothing and there is not enough demand in Finland to reuse everything that is being collected.

In the past decade, more attention has been given to the circular economy and the large amounts of post-consumer textile waste in Finland. Incineration has been the largest share of textile flow since the organic landfill ban came into place in 2016. In the past years more focus has been put on reuse and recycling to decrease the amount of post-consumer textiles ending up incinerated. The interviews indicate that more capacity is needed in Finland to be able facilitate higher levels of recycling. Nevertheless, both literature and the data, shows that there is collaboration between actors and new projects, such as an end-of-life refinement plant, which advances the recycling possibilities in Finland in the coming years.

The role of consumers and their behavior was highlighted in the interviews. The interviews suggest that more efforts would be needed to increase awareness of the textile and clothing industry and its production as consumers are seen as one way to demand more sustainable textiles and clothing. Furthermore, consumers' knowledge of the post-consumer textile waste management could be increased as the charitable organizations indicated in the interviews that they receive large amounts of donated clothing that is not suitable for reuse. Hence, communication and terminology of the post-consumer textile waste processes and management could be aligned and informed better to increase awareness.

5 Conclusion

The production of textile and clothing industry has increased substantially in the past two decades and this has led to negative social and environmental impacts. Consequently, the consumption of textiles and clothing has increased and created a problem of post-consumer textile waste. The post-consumer textile waste mainly ends up in landfills and incineration, which causes loss of materials and also economic value. Post-consumer textile waste management has gained more attention and awareness in the past years and action has been started to be done to start tackling the negative impacts of the current linear model. In countries where a high amount of post-consumer textile waste is consumed, such as in Finland, the focus is to start tackling the negative impacts by moving towards a circular economy. New legislations and innovative solutions are being created to start increasing reuse and recycling in the post-consumer textile waste management.

This study aimed to understand the post-consumer textile waste management in Finland with two main aims. The first aim was to map out legislations formed concerning post-consumer textile waste between 2008-2018 and to see how the legislations support the transition towards circular economy. The second aim was focusing on the role of charitable organizations in post-consumer textile waste management and to investigate experiences and insights on the topic. In order to create an understanding of the aims of the study and to answer the research questions, a qualitative method was chosen. Data was collected by conducting interviews and document analysis. Interviews were conducted with charitable organizations and researchers who specialized in post-consumer textile waste management whereas document analysis was based on official documents by Finland and the EU.

Firstly, the findings of the study shows that in recent years, increasing attention has been given to the circular economy and the post-consumer textile waste management in Finland. Between the time period of 2008-2018, a total of five legislations have been formed at the level of Finland and the EU concerning post-consumer textile waste management. The study indicates that the effect of the legislations has been to cause a shift towards circularity in Finland. Secondly, it was noted that the charitable organizations have an important role in the post-consumer textile waste management in Finland. They not only act as the major collector of post-consumer textiles with valuable knowledge of collecting and sorting discarded textiles but also work and promote the reuse of clothing and textiles. The knowledge of charitable organizations is important as the formed legislations will require higher levels of recycling and reuse in Finland.

The post-consumer textile waste management capacity in Finland to reuse and recycle discarded textiles has been quite low. The formed legislation will require Finland to adopt its current post-consumer textile waste management system by creating new solutions on how to recycle and reuse more. This research has revealed that while Finland is moving in the right direction when

considering formed legislations as well as the work done by charities. However, this research has shown that post-consumer textile waste management needs all actors to come together. Charitable organizations are currently bearing the bigger burden of this growing problem. Moreover, the study highlights that the role of consumers and their behavior is central. Efforts to increase consumers' awareness of the clothing industry and its negative impact as well as knowledge of post-consumer textile waste management could affect consumers' consumption behavior in a more sustainable direction.

The topic of post-consumer textile waste management is gaining more attention and offers a lot to research to create a better overview of the current situation. Further research should be conducted on different actors of the value chain of post-consumer textile waste management. A more in-depth understanding of the value chain and its actors in the post-consumer textile is needed to ensure a smooth adaption to more circular post-consumer textile waste management in Finland. Moreover, one of the biggest stakeholders is consumers themselves. A lot more is required in terms of consumption patterns research as well as increasing awareness programs to bring more knowledge for consumers.

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Appendix A

Interview guide

Introduction

The thesis has two main aims to comprehend in the post-consumer textile waste management in Finland. First the thesis aims to map out the legislations concerning post-consumer textile waste management during 2008-2018 and to see how the legislations support circular economy. Second focus is to understand the role of charitable organizations has in the post-consumer textile waste management and their experiences and insights on the topic.

Participant consent

The interviews will be recorded, and interviewer will take notes during the interviews. Interviews and recordings will remain confidential and only to be used and analysed by the researcher. The identity of interviewees will remain anonymous, and no views will directly be linked to interviewee in the thesis. The name of interviewees company may be known in the thesis unless asked otherwise. The interviews are to gather information for the thesis and only used to contribute to it.

The consent of the interviews can be withdrawn at any time. Furthermore, if there is a particular question(s) that are wished not to be answered, the interviewees do not need to answer it.

Interview questions

Opening

- A short description of your company's operations and role in the field of post-consumer textile management?
- What are the biggest goals and aims in your operations?

Circular Economy

- Is circular economy implemented in your operations? If so, how?
- Are there any desired changes you would like to see or how do you consider that circular economy could be further implemented in the context of post-consumer textile waste management in Finland?

Waste Act

- Do you consider the legislations have an important role?
- Do the textile waste legislations have any impact for you?

Demand and supply in Finland

- What have been the trends in the recent years that you have noticed?
- How do you consider the capacity in Finland for handling post-consumer textiles currently?

Export of textile and clothing

- How do you experience the export of textiles and clothing in Finland?
- Do you have particular partners outside of Finland with whom you work when exporting?

Future

- What trends and changes you foresee for the coming years in the field?

- Any changes or legislations you would like to see?
- What do you consider being the main issues holding back progress?

Closing

- Anything you would like to add that was not covered?
- Do you have anyone else in mind that could be interviewed for this topic?