Master Thesis

The Closed Loop Supply Chain of the Clothing Industry

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'The clue to the fashion industry's closed loop challenge is in the name. It's counter-intuitive for fashion to turn around and say, 'you should keep your clothes for a bit longer.' But ultimately, the fashion industry is going to have to bite the bullet and start re-using clothes' (Rowe, 2013)

Acknowledgements

At the time I am writing this, I am sitting in the Westergasfabriek in Amsterdam at the Kingpinsshow, just returned from a Seminar *'Sustainable Cotton – What it is and what it is not'*. Kingpinsshow is a worldwide denim exhibition, held during the Amsterdam Denim Days.

A more than inspiring location that is a good mirror of how the past months have been for me. A whole new world that looked enormous in the beginning, but turned out to be quite small; a lot of new information; a fast changing, international world; an enormous amount of learning moments; people that are friendly, willing to share their knowledge and collaborate, and above all: really dynamic and interesting. All together: an amazing environment to get to know and to be part of.

I would like to thank Martin Havik, Sandeep Chawla and Olivier Teepe from REMO for their cooperation and time to explain, teach, guide, and help me with my thesis project. Secondly, Erwin van der Laan, my reader, for his feedback and help to keep me focused, and Paolo Letizia, my co-reader, for his time and feedback as well. Thirdly, and absolutely one of the most valuable sources as I otherwise would not have been able to gather all information: all people that were willing to share their information and views on closed loop supply chain management of the clothing industry with me.

Last and absolutely not least – my parents. I would like to thank them for the support during my entire bachelor and master studies in Rotterdam as well as abroad. They gave me plentiful opportunities to explore myself throughout the years, and always supported me.

Thank you all!

K.R. Knape

Rotterdam, 15th of June 2014

Executive summary

Current environmental issues led, among others, to the growing importance of the reuse of scarce raw materials. In the clothing industry, there are major strides to make. The need for Closed Loop Supply Chain Management (CLSCM) of the clothing industry is huge. CLSCM of the clothing industry can have a considerable, versatile contribution to the environment according to the research done. The savings resulting from reusing raw materials and designing products in a different way have positive consequence for the people living on the planet. The cost savings and new opportunities are more difficult to capture at this point in time, as investments are needed first before CLSCM will yield profit.

So, it is a perfect endeavor – an enormous challenge but with great potential and seen as a necessary development. However, there is still an attitude-behavior gap in the sustainable clothing market. The most important factor for this dilemma is the fact that the information provided is insufficient, or not reaching the consumer. This implies that despite the emerging attention for sustainable products, consumers still lack knowledge about this specific market.

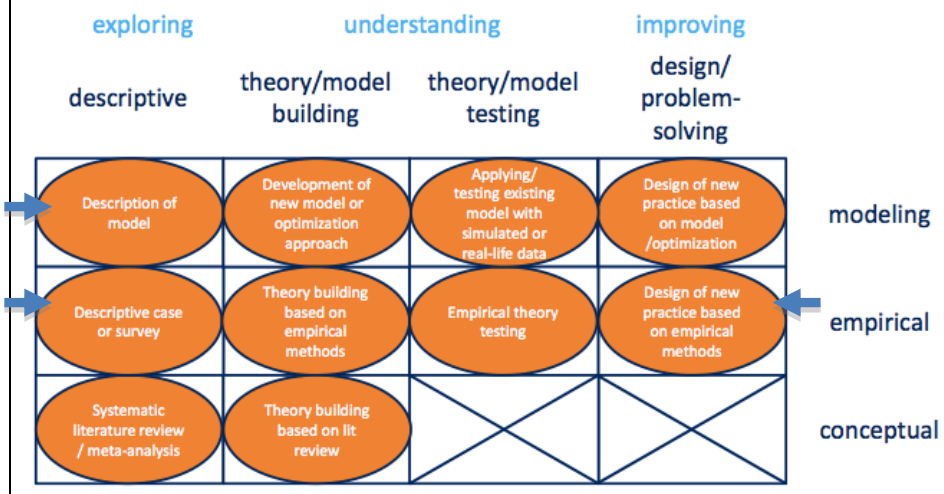
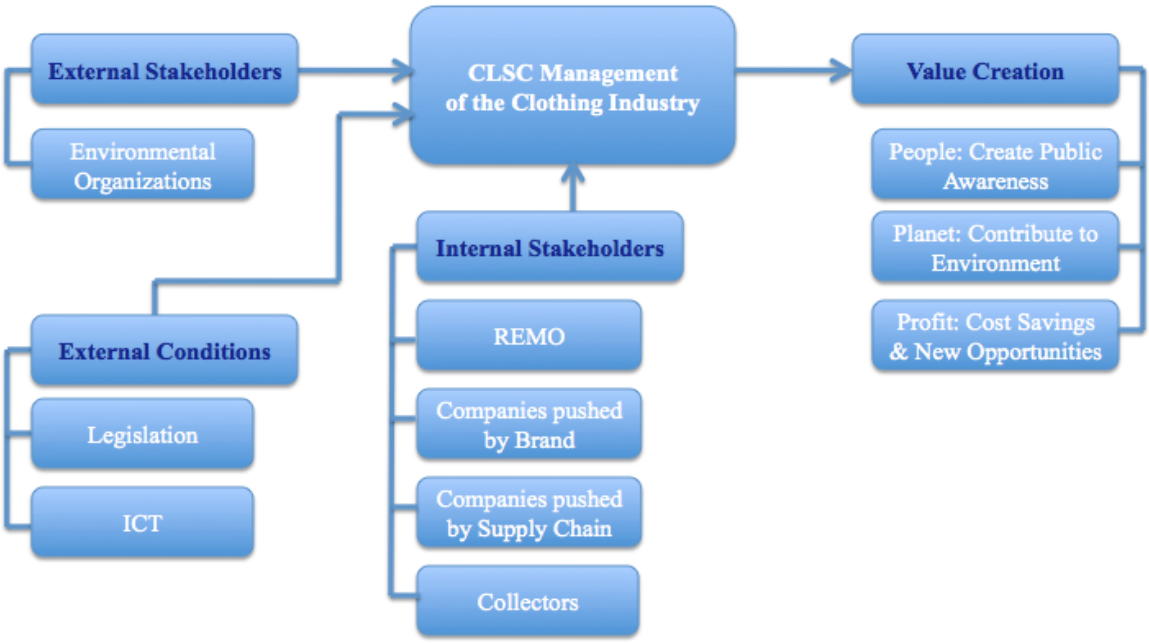
Transparency and traceability are required to increase the awareness of the entire chain. This can only be established by means of collective stimulation and collaboration of all stakeholders. 'Being transparent is vital for almost all companies, and transparency is about trust' (Kingpins, 2014). The REMO System can be the solution. The objective of REMO is to protect the planet by reducing waste and saving natural resources in the textile industry by offering a track and trace system enabling companies to close the loop by means of a simple, but dependable quality label for the businesses in the supply chain. This quality label gives the assurance of a REMO certification, what means that all information about every kilo of material handled is sent into the Cloud. The process is now transparent and the product traceable. A KEY, an information carrier, attached to the garment visualizes this information, which is adding a lot of value to the stakeholders. By using the REMO System in the CLSC, clothing brands will be able to contribute to a sustainable environment; create new business opportunities; and public awareness for the necessity of clothing recycling. However, for providers of these technologies, cost is still a barrier. The overall cost could be decreased when the REMO System would be implemented in the entire closed loop supply chain of the clothing industry.

More initiatives are required from the entire branch, and alignment of sustainability goals between all stakeholders will help to speed up the process, as a change of the industry will be a summation of (numerous small) steps. The government needs to inspire people. Companies need to change routines and recognize that sustainable production starts with selecting sustainable suppliers - and the fact that they could bring over an innovative message by using recycled content in their products. Consumers need to take more responsibility for their buying behavior, as with every purchase they could leave a footprint behind for a sustainable future.

By means of participatory observation including semi-structured interviews and online research the current CLSC of the clothing industry was mapped, and opportunities for improvement identified.

Summary Form with details of the Project

Research Theme	Closed Loop Supply Chain (CLSC)
Research Topic	CLSCM of the Clothing industry
General research objective	Mapping the status of CLSCM of the clothing industry, and come up with improvements for this CLSCM. With these improvements, clothing brands will be able to create public awareness for the necessity of clothing recycling; contribute to the environment; and create value
Type of Research	Practice-oriented Starting point: problem in practice Main audience: practitioners, in particular the principal REMO, and companies operating in the clothing industry Implications: 20% for theory, 80% for practice Approach: problem-solving / evaluate and design Internship-based
Specific research objectives	Map the current status of the following parts of the CLSC of the clothing industry. Besides, describe what the motivators of the different parties are to work with the REMO System – why it would help their business, and thus how the different steps in the CLSC can be influenced in order to keep the circle in motion: *Product returns management* - Product acquisition - Reverse logistics - Test, sort, grade and disposition *Remanufacturing* - Unraveling process - Spinning process - Weaving process - Confection process: Ensure attachment of the REMO labels on/in the final product *Remarketing* - Sales: marketing of the recycled material *The effects of the intervention* - Whether public awareness for the necessity of clothing recycling will really increase or not (people) - The contribution to the environment: amount of water saved, CO2 emission reduction, and energy reduction (planet) - Cost savings & new opportunities (profit)

Specific type of research	Exploratory – *Descriptive* (provide a rich description of the current (CL)SC of the clothing industry), based on empirical research (descriptive case – description of current SC of the clothing industry – more insides by means of participant observation incl. interviews – internship). Improving: *Design solving* based on empirical data (design of CLSC of the clothing industry based on empirical methods) 
Research Strategy	Analysation of the current proces/situation: participatory observation (internship), including semi-structured interviews with people involved in the current SC of the clothing industry, and the companies required to close this SC ([potential] users of the REMO System), in combination with online research
Instances	One N (case study)
Conceptual model	

Object of study	REMO and its (potential) partners by means of participant observation, and the respondents (sample) of the semi-structured interviews
Research question	'What is the current status of CLSCM of the clothing industry and what are opportunities for improvement?' *Descriptive and prescriptive question*
Sub-questions	*CLSC Management of the Clothing industry* 1. *How great is the need for sustainable clothing, in other words a CLSC of the clothing industry?* 2. *Which stakeholders are indispensable to close the SC of the clothing industry, and what is and should be their role in the management of the CLSC?* 3. *What are the major risks of, and opportunities for CLSCM of the clothing industry?* 4. *There is a risk that one of the 'stages' breaks the chain. How can REMO prevent this, and therefore make itself indispensible?* *Internal stakeholders* 5. *Have companies been thinking about track and trace systems before, and are there comparable track and trace systems already in use?* 6. *What are the drivers for companies to close the loop and become transparent?* *Value Creation* 7. *How are people becoming aware of the need for sustainable clothing?* 8. *What will be the contribution to the environment of CLSCM?* 9. *How high are the savings from implementation of CLSCM?*
Importance of the Research	There is a gap on practical information, the current status, of CLSCM of the clothing industry. With the identification of potential bottlenecks of, and opportunities for CLSCM of the clothing industry, brands will be able to create public awareness for the necessity of clothing recycling; contribute to the environment; and will safe costs and create new opportunities. The REMO System can serve as an example within the sustainable (clothing) industry

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1. Introduction

1.1 Introduction

1989 - the Aral Sea is the fourth largest freshwater lake in the world (Landen Consulting, 2011).
2008 - the Aral Sea is almost entirely dried up: only 10 percent of its former size is left, the other 90 percent turned into a salt desert (Merchant, 2010).
Projects intended to boost cotton production, as regulation was needed due to the arid climate, diverted the rivers that fed the lake. Results are: degradation; desiccation; salinization; severely deteriorated quality of soil due to the use of pesticides; destruction of the homes of hundreds of bird and fish species (World Wildlife Fund, 2014)*; and the increased health problems of the people living around the lake can be a result of this as well* (UNEP, 2008). *All together, the lake is near total destruction, and the consequences are enormous.*

2009 - Lake Balkash. The lake receded by up to two meters in the past five years due to the cotton cultivation (Forestier-Walker, 2009). *The region's second largest lake may quietly die because of reduced inflow. This lake is slowly becoming Aral Sea number two.*

Are the Indus Delta in Pakistan (Harvey, 2014), the Murray Darling River in Australia, and the Rio Grande in United States and Mexico (WWF, 2014) *number three, four and five impacted by the shortage of water due to the cotton cultivation? And which large-scale ecosystem will be next?*

Today, cotton is the most important natural fiber used in the textile industries worldwide, amounting to 40 percent of the textile production (Water Footprint, 2014). The consumption of a cotton product is connected to a chain of impacts on the water resources in the countries where cotton is grown and processed - mainly dry regions. These impacts of cotton production on the environment are easily visible and have different faces: effects of water depletion, and effects on water quality.
Global consumption of cotton products requires 256 billion m3 of water per year, out of which about 42 percent is blue[1] water, 39 percent green[2] water and 19 percent grey[3] water (Water

[1] The volume of freshwater that evaporated from the global blue water resources - surface water and ground water
[2] The volume of water evaporated from the global green water resources - rainwater stored in the soil as soil moisture
[3] The volume of freshwater required to mix pollutants and maintain water quality according to agreed water quality standards (GRACE Communications Foundation 2014)

Footprint, 2014). The water footprint of 1 kilo of cotton is about 10,000 liter (GRACE Communications Foundation, 2014) to 20,000 liter (World Wildlife Fund, 2014) – different sources, different amounts mentioned.

The enormous environmental issues led, among others, to the establishment of REMO - Recycle-Movement (REMO, 2012). After years of experience in the fabric and clothing industry, Martin Havik managed with a professional team to unite knowledge, creativity, innovation and passion in a project aimed to (REMO - Vision):

- Protect the planet by reducing waste and saving natural resources in the textile industry;
- Enhance skills and raise output in highly qualified industrial districts;
- Promote cultural exchanges among countries having similar skills for mutual growth;
- Work towards sustainability through a concrete project based on social, environmental and economic objectives.

Cotton consumers have little incentive to take responsibility for the impacts on, inter alia, remote water systems due to the general lack of proper water pricing mechanisms, or other ways of transmitting production information (Water Footprint, 2014). However, just counting gallons is not enough, because consumers also value where the used water came from (Bradley G. Ridoutta, 2010). It could have been rainwater – which is abundant and otherwise not used by people, or it could have been scarce reservoir water – what is also used for drinking, hygiene and other consumer needs. The current definition of the water footprint does not address these discrepancies:

'The water footprint of a product is an empirical indicator of when, where, and how much water is consumed, measured over the whole supply chain of the product. The water footprint is a multidimensional indicator, showing volumes but also making explicit the type of water use, and the location and timing of water use' (Water Footprint, 2014)

However, it can be said that it is highly important to take the original location of the water into account in evaluating the environmental impact of its use in product manufacturing, and secondly, also the type of 'water use'. 'Water use' often fails to adequately describe what happens to water – it can have two forms: consumption or withdrawal. Water withdrawal is defined as 'water diverted or withdrawn from a surface water or groundwater source' (Grace, Communications

Foundation, 2014). Consumptive water use is defined as 'water use that permanently withdraws water from its source: water that is no longer available because it has evaporated, been transpired by plants, incorporated into products or crops, consumed by people or livestock, or otherwise removed from the immediate water environment' (GRACE Communications Foundation, 2014). So, the water does not always 'disappear', it will get back in the ecosystem when it is water withdrawal, but the problem is that it will be in a different form; it is contaminated; or it will not be back in time at the source it is taken from. Regarding the last point, irrigation: 'it is critical that farmers protect their agricultural water source to minimize the potential for contamination. As with any groundwater removal, users of irrigation water need to be careful in not pumping groundwater out of an aquifer faster than it is being recharged' (Centers for Disease Control and Prevention, 2009).

However, as there is not enough known about global water cycles, and without an agreed-upon standard, the environmental impact cannot accurately be measured in this way. Therefore reporting water footprints simply as volumes is currently the best and easiest for consumers and businesses to understand (Kenward, 2010). Besides, this footprint helps to understand that water is involved in many parts of our lives that may not be realized, as for a lot of people the usage is hidden from sight (GRACE Communications Foundation, 2014).

Next to water, textile production is using a lot of energy as well. The reuse of 1 ton of cotton clothing only uses 2.6 percent of the energy required to manufacture those from virgin materials, and the reuse of 1 ton of polyester garments only uses 1.8 percent of the energy required for manufacturing from virgin materials (Watson, 2007). Although this figure is known, (more) awareness from the consumers is required.

During an official meeting called 'Duurzame Dinsdag' in September 2013, Secretary of State Mansveld gave a very inspiring speech, focused on textile as well (Secretary of State Mansveld, 2013). *'Awareness is needed. The government needs to inspire people, companies to change routines. The old word-of-mouth advertising – through social media now – is chief, as it leads to the effect where people convince and follow each other.*

Economic growth is not separate from green, sustainable growth. Sustainability also offers tremendous opportunities for our economy. It can enhance the competitiveness of enterprises and allows for innovation. Practice proves that this works. A concrete example is textile. We now collect about 30 percent, which has doubled in a few years. But, there are a lot of different bins for recycling textile. Often with different instructions and regulations - creating confusion. Many

people think that only clothing without holes and cracks are allowed. But old sweaters; socks with holes; torn pants: it is all more than welcome. The various textile parties sat together and this year there will be a clear, uniform designation on the textile bins.
Altogether. The urgency is clear. But that is not all.'

REMO can contribute to this problem: making people aware of the urgency of sustainable production by means of the REMO System. The REMO System has the aim of (REMO, 2013):

- Ensuring the traceability of raw materials (transparency) along the whole production chain, thus adding value to the end product;
- Recovering a considerable volume of garments that would otherwise be destined for the rubbish heap;
- Adding to the social, environmental and economic values of textile production through a simple but dependable quality label;
- Supporting projects that raise awareness and help grow the culture of recycling. Examples are education and knowledge dissemination on recycling at fashion and design institutes; collaboration with the 'style' industry; training with educational paths (schools and universities); creating and raising awareness to change the public opinion (through shows, culture, events, publicity, congresses and institutions).

The computerized track and trace system provides the consumer and the reseller with reliable and transparent information about:

- The percentage of product that is recycled;
- The origin of the product;
- How much water, energy and CO2 has been saved using recycled raw materials.

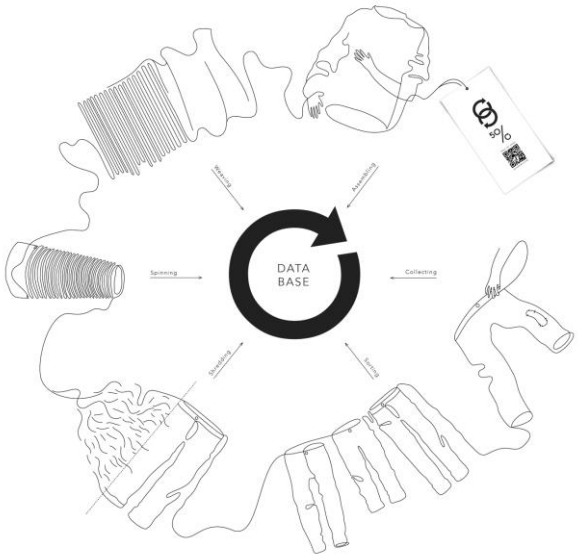

Figure 1 REMO - Input Database (REMO, 2013)

The REMO System has been introduced in the districts of Prato, Italy[4], and Almere[5] with the aims of raising the output of recycled products and creating jobs. The idea is to spread use of the REMO System to the whole world. Brands are interested.

Next to these companies pushed by brand (operating in the confection stage of the supply chain), other important internal stakeholders that are decisive for the CLSM management are the companies pushed by supply chain: the collecting-, sorting-, unravel-, spinning- and weaving stations. Relational efficiency and trust between REMO, the initiator, and the internal stakeholders is essential.

The external stakeholders that affect the CLSCM of the clothing industry have to be mentioned here as well. The way the CLSC can be managed is limited to the current ICT (the track and trace software); legislation has to be taken into account, as companies have to comply with certain rules and regulations; and environmental organizations (governmental and non-governmental) can exert pressure on the way the CLSC will be organized as well.

[4] Historically, Prato's economy has been based on the textile industry (Comune di Prato, 2014)
[5] See 'Almere Principles' of the Economic Development Board Almere (EDBA, 2011)

So, the idea is there. The indispensible parties are present. Now the question is which company dares to be the first to implement the REMO System, and what are opportunities for improvement of the Closed Loop Supply Chain Management of the clothing industry?

1.2 Research Objective

Problem statement

Modern environmental management prescribes sustainability in manufacturing with a focus on waste prevention or reduction, and responsible care of the earth's natural resources (Kumar, 2008). Companies and entire industries participate in the reuse of natural resources - recycling, but entirely closing the loop is not yet the case. The REMO System enables companies, industries to close the loop by means of a simple, but dependable quality label for companies in the supply chain. This quality label ensures that the company is REMO certified, what means that they put all information about every kilo of material they handle into the cloud. A KEY[6] makes this information visible, what is of great value to the customer. Companies in the supply chain certified plus a market for the certified recycled material and the supply chain is closed. Constantly checking and reinventing the wheel is not needed anymore - it will become a self-regulated system. By using the REMO System in the CLSC, clothing brands will be able to contribute to the environment; save a lot of money; and create public awareness for the necessity of clothing recycling.

My *research question* is formulated as follows:

'What is the current status of CLSCM of the clothing industry and what are opportunities for improvement?'

[6] This was originally a QR-Code, but as ICT is developing rapidly – REMO refers to it as a 'KEY' – displaying the valuable information in whatever form possible and prefered by the customer

1.3 Conceptual model of the research

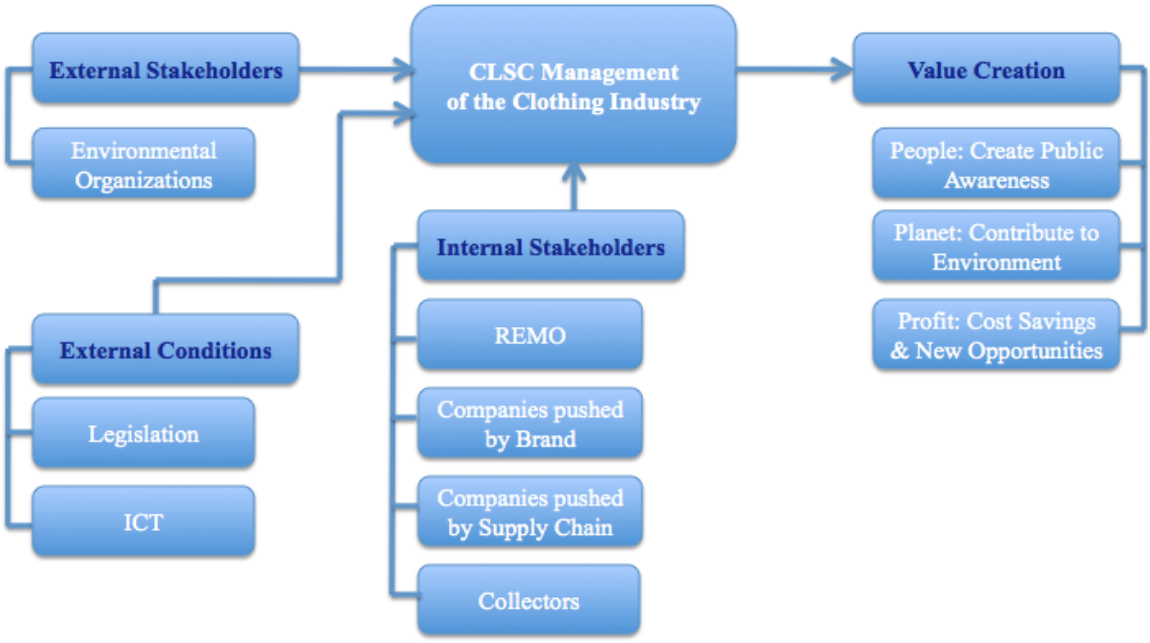

Figure 2 Conceptual Model of the Research

As discussed, external stakeholders are affecting the CLSCM possibilities; external conditions should be looked at as well as they are influencing the management; and the internal stakeholders are the enablers of the CLSCM.

More external stakeholders could be include of course, but this research was limited to one, as this is the most important one found during the early stages of the research. The second reason is that there is a preference to go into depth about all blocks mentioned, and there is not enough time to address a whole list including certification companies, NGO's etc.

With regard to the external conditions the same holds, although this is a bit easier to justify. Legislation is pressuring companies to be engaged in sustainability, CLSCM, and this CLSCM is dependent on the current ICT status. Again, other conditions could be mentioned as well, but this research was restricted to the ones thought of directly and confirmed by early research.

The internal stakeholders of CLSCM all have their own influence on managing the CLSC. Without collectors, there would not be an established acquisition process and thus nothing to 'restart', or in better words: continue, the chain. Companies in the supply chain are working with the recycled clothes and create new products from it: and thus are indispensible as well. With these two internal stakeholders new yarn and cloth can be manufactured, but then something needs to be done with it to get it on the market again. This brings us to the brands. Brands have the final responsibility to make products with recycled content and make this attractive for

consumers. In other words: adjustment of the production process and promotion by means of marketing campaigns. Then the last internal stakeholder: REMO. REMO can speed up the process by connecting all other internal stakeholders. Secondly, REMO makes closing the loop even more interesting for brands and consumers due to co-branding; which will lead to global awareness of REMO and thus recycling. To close off with the fact that the REMO guarantee system is supervised by an external party it will be more reliable than when companies would control it themselves.

The closed loop supply chain management of the clothing industry should result in the last three boxes, the key performance indicators. First People – Public awareness, the second P: Planet – Contribution to the environment: the amount of water saved; CO2 emission reduction; and energy reduction. Then the last P, Profit – cost savings by the companies that are part of the CLSC of the clothing industry by implementation of CLSCM, and new business opportunities that will arise from CLSCM.

All variables of the conceptual model are discussed in the Literature review, the next chapter.

1.4 Overview of Report

The structure of this report is as follows. In the second chapter, literature about the main concepts within the research is discussed. Chapter three will then describe the chosen research method, the data collection and the data analysis. Chapter four will discuss the results, findings of the research – to conclude with the last chapter with conclusions and recommendations for future research

2. Literature Review

'In a complex world, isolated knowledge has no value; the value of your contribution increases if you relate it to the existing knowledge' (Blumberg B, 2005)

This chapter details the literature review – the state-of-art of relevant theoretical knowledge regarding this study. Important topics dealt with in this research paper are elaborated on. The first paragraph goes into depth about *circular economy* – including the three P's of sustainability; the second paragraph discusses the *clothing industry*, with a focus on the *sustainable clothing industry* and the *responsibilities and motivations* from organizations in the clothing industry for sustainable manufacturing. The third paragraph delves into the topic of *Closed Loop Supply Chain Design, CLSC Management, and frameworks including discussion the different stages of the CLSC*. The fourth paragraph specifies *the external stakeholders*, to conclude with the *risks of and opportunities for CLSCM of the clothing industry* in paragraph five.
The chapter will be conclude with a summary of the information found, the positioning of the research, and a review the conceptual model. The structure of the conceptual model will be maintained.

2.1 Circular Economy, 3 P's of Sustainability

There are signs that the coming decades will require productivity gains and quality improvements at a new order of magnitude, in contrast to the well known linear model (Ellen MacArthur Foundation, 2013). Given the expected number of the human world population in 2024 to be 8 billion people (WorldOmeters, 2014), with an even higher increase in the proportion of the global middle class (Pezzini, 2012)[7], and a higher life expectancy (National Institute on Aging, 2011), the consumption and material intensity will rise accordingly.

A conventional perception of economic systems is that they are linear. When the connection between resource use and waste residuals is made, the linear system is converted to a circular system (Bilitewski, 2012) - see Appendix 1. Circular economy is a concept that is transforming traditional patterns of economic growth and production: it follows the pattern of ecological circulation and is based on the recycling of material resources.

[7] From 1.8 billion in 2009 to 3.2 billion by 2020 and 4.9 billion by 2030

In all industries people can observe changes are taking place, and feel the need to change their way of working and thinking. The circular economy's development pattern of 'resources-products-recycled resources' is becoming more and more well known, important, and inevitable. Quality instead of quantity is emphasized in order to solve the contradiction of limited resources and increased consuming desire of human being, and to make use of natural resources rationally to achieve the sustainable development.

The corresponding material flow (MF) pattern of 'resources-products-recycled resources', is a closed feedback circulatory process including 'resources-production-materials flow-consumption-recycled resources' in which the 'whole process control' is emphasized, and every chain involved is paying considerations to the retrieving and reuse of junk (Chen, 2009). This MF pattern will contribute to the improvement of economic efficiency and ecological environment, and can be an effective method to develop the circular economy; to implement the idea of scientific development; and to accomplish the sustainable development (Chen, 2009).

To summarize, different factors are triggering the trend towards a circular economy. Not only a shortage - resulting in higher costs and price volatility - of raw materials; a consumer that is becoming more sustainable in their thinking and buying; and rules and regulations of the government are pushing entire industries towards a circular system. Perhaps one of the chief drivers is opportunistic behavior: companies want go gain a financial and a publicity benefit (Tomesen & Martens, Intermediair, 2013).
Rules and regulations will be discussed in more detail in paragraph 2.4.2. Coming back to raw materials, accessibility to raw materials is not only dependent on physical availability (EY, 2014). Geopolitical and economic forces can also create scarcity, even when technically speaking this is not (yet) in place.

'*It is a counterpoint to people thinking that environmental practices are detrimental to the firm. Green practices make a company more attractive because so many employees want to work for a company that is green. However, it is more than just wanting to work there — it is working more*' Delmas[8] said.

[8] Delmas is an environmental economist at UCLA's Institute of the Environment and Sustainability and the UCLA Anderson School of Management

An enormous advantage that more and more businesses are experiencing, are new (profit) opportunities that this circular way of thinking is creating: new customer segments next to the existing business; increased innovation and market leadership; longer supplier retention due to long term contracts and relationships; and lower customer attraction and retention costs (EY, 2014). Besides, a study found that employees at 'green companies'[9] are on average sixteen times more productive than workers in companies with no green initiatives (Mielach, 2012). The researchers suggest that the boost in productivity can be related to employees seeing green companies as a sign of a positive work environment, and that green companies often encourage positive relationships between workers in a cooperative environment (Speer, 2014). In this way, employees are more motivated and next to that, it is found that on average they receive more training than employees in conventional companies. Another fact that could be a factor for the high productivity is that green companies are a draw for investors as well, because of links to cost-efficient – and effective management practices (Mielach, 2012).

Perhaps one of the most important aspects to mention for the clothing industry specific is that intangibles are drivers for circular thinking as well. Examples of intangible values driving circular thinking (EY, 2014) are Competition on talent; Employee engagement; Company values and philosophy; and most important for a lot of clothing brands is Brand Value.

However, the new circular way of thinking gives rise to some complexities as well. What kind of capital-investments are required to set up the new way of doing business? What changes are needed in the accounting-system, as options as leasing instead of owning are now more and more common? How do companies arrange the return flow? And how are companies dealing with other complexities? All questions that need to be answered per industry specific.

A well-know concept is the triple bottom-line, the three P's, of sustainability. By adopting this concept in business practices, growing global markets and developing industries in today's society can achieve protection of: People, Planet and Profit (IECG-WIE, 2012).

- **People**: all individuals should be treated fairly. No group is harmed, exploited, or unequally burdened by business pursuits, and sustainable companies will never neglect the power of people – internal or external (Langdon, 2010). In other words, 'stakeholder engagement' – an area where marketers often excel through their closeness to one group

[9] Companies that follow eco-friendly practices

in particular: consumers. Consumer insights will be more important than ever: ever-greater dialogue and collaboration with consumers in terms of product and service innovation is vital for marketers (Joseph, 2010).

- **Planet**: questions arise as 'are we using our resources efficiently?' 'Are we taking more from the earth than we ever intend to give back?' (Langdon, 2010). The earth's natural resources (including the ecology, plants, or wildlife species) should not be impacted adversely. The implications for marketers are wide-ranging and far-reaching – what brings '*greenwashing*' up (Joseph, 2010). As defined by the Oxford English Dictionary: 'disinformation disseminated by an organization so as to present an environmentally responsible public image' (Oxford Dictionaries, 2014). Evidence that an organization is greenwashing often comes from pointing out the spending differences: when significantly more money or time has been spent *advertising* being 'green', than is actually *spent* on environmentally sound practices (Rai Technology University Campus, 2012).
- **Profit**: The big question when it comes to corporate social responsibility (CSR) is whether being good is actually good for business (Joseph, 2010). However, fiscal or economic successes are not limited or unattainable by the pursuit of the other two values (IECG-WIE, 2012) – the benefits will be different for each organization and are long-term. But, 'what is the business case for not participating in CSR?' – CSR is central to effective management of organizations, and there is no doubt that a brand can successfully differentiate itself from competitors through embracing the principles and practice of CSR (Joseph, 2010). But again, it must be said that companies who add value through CSR are the exception – many utilize it in an ad-hoc rather than strategic manner.

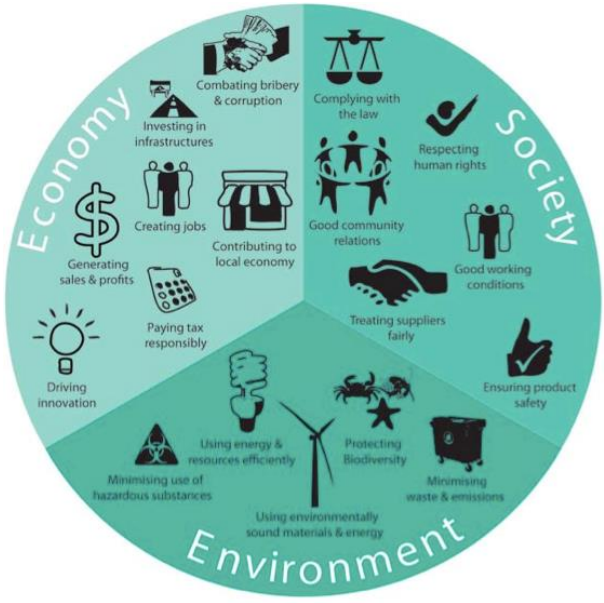

Figure 3 Three-dimensional aspects of sustainable manufacturing (OECD, 2011)

The way these three P's will be measured in this research is as follows. For profit the plans and the targets of companies will be discussed. For planet a lot of different KPI's can be brought up, but the KPI's most relevant here, for the REMO System, are: reduce the CO2 emissions; reduce the chemical usage; reduce the energy usage; and reduce the amount of resources used: raw materials and water. 'People' is a bit more difficult to measure, as the results for people are mostly indirect. One can reason that in the long term the positive effects for the planet are positive effects for people as well: less pollution; better products; and job creation. One can argue that people working in for example cotton plantations will lose their jobs, but on the other hand – the collection, sorting and unravelling will create jobs. However, this is something that is not possible to measure. One example of a direct impact for people is the improvement of the product offering: this will lead to higher customer satisfaction.

2.2 Clothing Industry

Textile industry, Clothing industry, Garment industry, Fashion industry, Apparel industry…

What is it this research will be focusing on and what are, if there are any, the big differences between these industries?

The textile industry is a major industry. It encompasses not only the companies involved in making fibers into threat, but also those who make the thread into cloth, and those who dye, bleach and finish the cloth. All together, all companies busy with the design, manufacturing,

distribution, marketing, retailing, advertising, and promotion of textile. For the time being the focus will be limited to clothes, garments only, and not on footwear and other artifacts made of textile, like carpentry, sheets, towels etc.

So then it should be fashion or apparel industry? Observers used to distinguish between the fashion industry and the apparel industry as 'high fashion' versus 'mass fashion' – but the boundaries between these two had blurred (John S. Major, 2014). However, this is not the focus either, as it encompasses more than just clothes: also accessories, shoes, etc. – what is not (yet) the case.

So, industry names are used intertwined. The definition of the *clothing industry* used in this research is: *'all companies involved in the design, manufacturing, distribution, marketing, retailing, advertising, and promotion of clothing'*.

2.2.1 Sustainable Clothing Industry

'For durables, the benefits of reuse have been widely demonstrated. For consumer goods— such as food and beverages or apparel and their packaging—which are short-lived and often transformed during use, the economic benefits of a circular design are more complex in origin and harder to assess' (Ellen MacArthur Foundation, 2013)

The exact environmental impact of textiles varies significantly depending on the type of fiber the garment is made from. However, generally speaking, the environmental impact includes (Retail Forum for Sustainability, 2013):

- In the production stage, including pre-treatment chemicals, dyes, and finishes: water use, toxicity, hazardous waste and effluent;
- With the production of fiber crops (e.g. cotton): significant water use, toxicity from fertilizer, pesticide and herbicide use, energy use and GHG emissions associated with fertilizer generation and irrigation systems;
- Processing fossil fuels into synthetic fibers (e.g. polyester or nylon) leads to: energy use, resource depletion and GHG emissions;
- The washing (water heating and detergents) and dying of textiles leads to: energy use, greenhouse gas (GHG) emissions, nutrients releases (leading to eutrophication) and ecotoxicity.

At the moment only a really small percentage - around 20 percent (LeBlanc, 2014) - of clothing is recovered, mostly through decomposition and partly through reuse. Recovering a higher percentage is a huge opportunity, but companies face significant hurdles, as the collection systems are not efficient yet. However, these challenges can be met - there are examples of circular business models that do so.

For clothing specifically, there are profitable circular opportunities to reuse end-of-life clothing: they can be worn again, they can be cascaded down to other industries to make insulation or stuffing, or they can be recycled into yarn to make fabrics that save virgin fibers (Ellen MacArthur Foundation, 2013). Another clothing segment that is expanding is 'clothing-for-hire', 'lease clothing' (Mud Jeans, 2014) (Lease a Jeans, 2014).

2.2.2 Responsibilities and motivations from organizations in the clothing industry

The main objective of any enterprise is to create maximum profit. However, driven by governmental regulations, customer perspectives, and responsible producers, environmental thinking becomes more and more important (Bloemhof, 2005) - and 'waste' could be seen as an opportunity to create a higher profit (Flapper, 2005). But again, not all organizations realize that reuse and re-cycling can contribute to their profit (Boulding, 2003). According to several studies, organizations will have other objectives in mind than direct profit maximization once business continuity is in a 'healthy' state.

The concept of Corporate Social Responsibility (CSR) will be discussed here. Although there is evidence of different perceptions of what this should mean from a number of different societies across the world, the following definition will be used in this research:

'Corporate Social Responsibility is the continuing commitment by business to behave ethically and contribute to economic development, while improving the quality of life of the workforce and their families as well as of the local community and society at large' (Holme, 2000)

There is a growing pressure from all types of initiatives to motivate business sustainability. Environmental groups, consumer organizations and own stakeholders are pressuring to take the environment into account – these groups will be dealt with in paragraph 2.4.

Carroll came up with a four-stage model – see figure 5. This pyramid starts with the basic building block notion: economic performance. Secondly, business is expected to obey the law because the law is society's codification of acceptable and unacceptable behavior. The third stage

is the business's responsibility to be ethical: do what is right, just, and fair, and avoid or minimize harm to stakeholders. The last stage is the philanthropic one: business is expected to contribute financial and human resources to the community and to improve the quality of life.

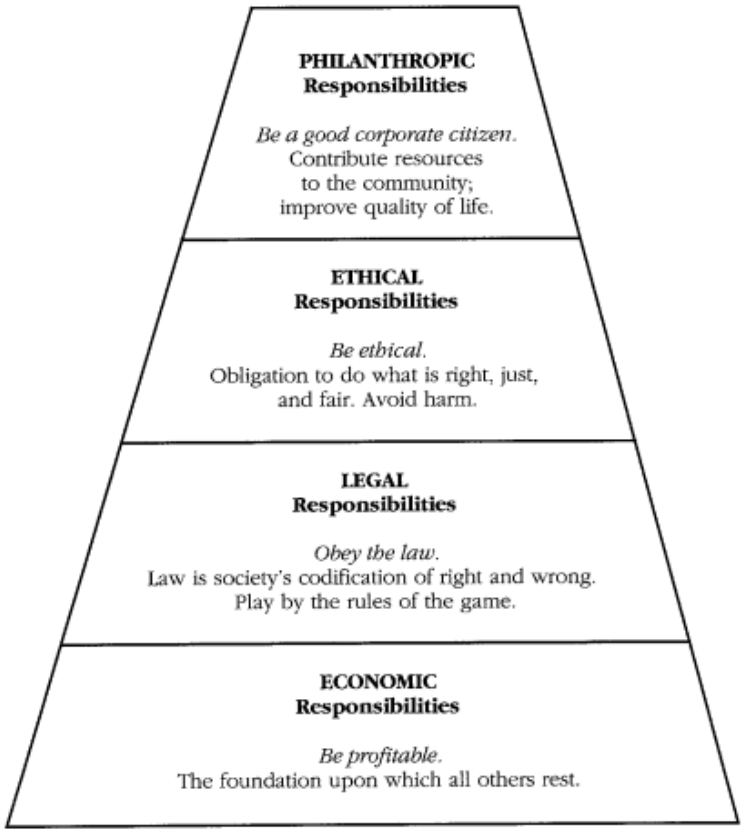

Figure 4 The Pyramid of Social Responsibility (Carroll, 1991)

2.3 Closed Loop Supply Chain Design

This paragraph has a clear connection with paragraph 2.1. As you can imagine: the circular economy changes our supply chain principle. Companies are focusing, and have to focus on the value-regained principle, instead of the 'old' value-delivered principle: recovery reverses one-way production, what can be obtained by CLSC-models (Bloemhof, 2005). Before going into detail about this change, more information will be given about supply chain design in general.

Stock and Lambert (James R. Stock, 2001) found that the majority of supply chains are not designed but rather developed over time. At the time of negotiation of the initial structural arrangement, many organizations are not familiar with all supply chain alternatives. Then, when their 'initial supply chain' has been established, unanticipated changes in the environment, like changes in governmental regulations, product lines, and perhaps most important and fluctuating: the changing end-consumer needs - may make it necessary to reconsider the entire supply chain.

What is really important to take into consideration in this reconsideration stage is alignment of the designed supply chain strategy with the overall corporate strategy. It is an enormous pitfall when the supply chain strategy is developed in isolation from the rest of the business (Wallingford, 2011). There are no good and no bad supply chains: companies attempting to build the most efficient supply chain, regardless of whether their market strategy is to compete on price, is not successful at all. Basing your supply chain on theoretical frameworks may result in a competitive advantage that generates growth in sales and profits (Fisher, 1997).

The supply chain should be *structured* to optimize the strategic goals of the company specific, and the strategy and alignment process should be *refreshed* continuously (Wallingford, 2011).

2.3.1 Closed Loop Supply Chain Management, Cradle to Cradle

'The purpose of the Cradle to Cradle (C2C) design is to restore continuous cycles of biological as well as technical nutrients with long term positive effects on profitability, the environment and human health' (EPEA, 2014)

The objective of the concept Cradle to Cradle (C2C) is production without waste, and is thus focused on the design of products. Circular economy (see paragraph 2.1) is a more elaborated version of the C2C thinking (Tomesen & Schuurman, 2013). The C2C model is opposed to the Cradle to Grave (C2G) model, around which most of the current operations are organized. By reviewing the current method of production, and using clean materials that fit the biological or technical cycles, it is possible to make products that will not produce waste during production and/or after the product its lifetime - waste is eliminated out of the design process. Products will either be biological reused as a nutrient, or technically re- or up- cycled as a resource for a new product (Lie, 2010). 'Be good, not less bad' embodies exactly what the C2C concept is trying to achieve (Braungart, 2002).

'CLSC Management focuses on collecting products from downstream members and reusing them to create additional values' (Huang, 2013)

CLSCM plays a crucial role in the implementation of the C2C model, but CLSCM can also exist without C2C. On small scale it is being done (Closing the Loop, 2013); magazines are writing about it, and are organizing meetings on this subject (People Planet Profit, 2013); and roadmaps are created (Green Blue, 2012) – however, although people are busy with, thinking of, and doing something with CLSC Management, (in most cases) it is not communicated and implemented

industry wide (except for greenwashing). Companies engage in recycling, but current ways of recycling do not solve the Cradle to Grave problem because the end products still end their life as waste. Practices of downcycling are only slowing down the process of depletion of natural resources and come with their own problems like quality issues as material quality decreases with recycling. This loss of value is a result of a lack of the reusability of materials; and secondly, a lack of adequate systems to retrieve them and reintegrate them in the forward logistics (Braungart, 2002). When there would be adequate systems to retrieve valuable products, the second bottleneck mentioned could be eliminated: and that is exactly where CLSC Management comes in. Regarding the first point, with a renewed way of making, and, more important, designing products and materials, the lack of reusability of materials can be removed (Ypma, 2010). As you can see, really closing the loop is something different than 'just' recycling.

CLSC progress (was) low since these CLSC's are (were) rarely considered as value-creating systems – however, the interest is growing because of the potential profitability (V. Daniel R. Guide Jr., 2013). This results in growing demand, and thus growing importance of research on CLSC's. Next to this, CLSCM is contributing to an environmental, profitable, and sustainable business strategy (David B. Grant, 2010) – all hot topics at this time. In other words, the importance of CLSC's is widely recognized in literature and in practice. Research on CLSC's is challenging, and researchers in this field should not be reluctant to change. As stated in the article by (R. Samahie, 2013), there is a lack of interdisciplinary, and trans-disciplinary approaches to the development and evaluation of CLSC systems. The benefits of these collaborations have been proven, but are counterbalanced by costs (monetary and non-monetary) about which there is not that much known (Dale A., 2000). See the figure below for examples of value creation through CLSCM.

Sourcing Value *- Cheaper Sourcing* *- Market Extension*	***Environmental Value*** *- Market Leader through Proactive Compliance* *- Green Image*
Customer Value *- Customer Loyalty* *- Customer Satisfaction*	***Informational Value*** *- Product Design Improvements* *- Supply Chain Process improvements*

Figure 5 CLSC Value Creation (adjusted from Koppius, 2011)

Customer satisfaction is the difference between a customer's perception of the experience and the customer's expectation of the product (Berry, 1991). Once customers are satisfied with the product, and continue to be satisfied, they will become loyal in the long-term.

2.3.2 Closed Loop Supply Chain Frameworks

By looking at the closed loop supply chain of the clothing industry, three clear processes can be distinguished: acquisition – product returns management; reprocessing – remanufacturing; and reselling – remarketing of the 'new' products. Important to mention here, is that this research does not include reconditioning (PLE) in the second stage: the focus is on recycling only, and therefore reconditioning, reuse of clothing is excluded.

Next to these processes, the connecting factors between the SC stages mentioned are decisive for good functioning of the CLSC as well: transparency and clear communication between all stakeholders. 'Product acquisition is a major driver of success, and creating effective remarketing channels is another major driver' (Guide & Wassenhove, 2005) - therefore the focus of this research will be on these stages (the 'first' and 'last') of the CLSC. Besides, the remanufacturing stage has already been set up (on a small scale), and therefore able to run.

Product returns management
- Product acquisition
- Reverse logistics
- Test, sort, grade and disposition
Remanufacturing
- Unraveling process
- Spinning process
- Weaving process
- Confection process: Ensure attachment of the REMO labels on/in the final product
Remarketing
- Sales: marketing of the recycled material

Figure 6 Processes Closed Loop Supply Chain Management

Before starting with in-depth analysis of all stages, the impact of quality on value creation will be discussed. As you can see in the figure below, in all processes of the CLSC - quality is decisive on how the further process will develop and how valuable the entire CLSC is. First of all, the using process. When the product no longer meets customer needs, the return service will meet the customer needs at that time. So the recycle process is set in motion. Then secondly, from the acquisition process to the recovery process: the real quality of the product is checked and this will answer the question whether (parts of) the product can be recycled yes or no. After the recovery process has taken place, the quality of the remanufacturing and thus the new end product is decisive on how the redistribution process works. Once redistributed, the user, the consumer, decides whether the product really fulfills his or her need, and thus buys the product again – and the circle is closed.

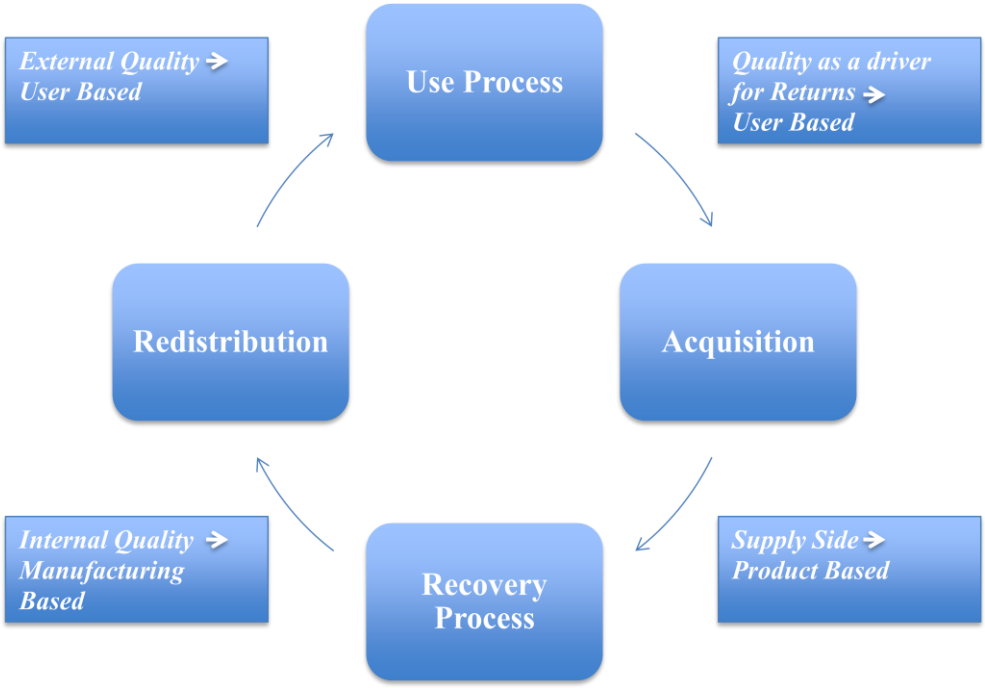

Figure 7 The impact of Quality on Value Creation (adjusted from Laan, 2013)

2.3.2.1 Product Returns Management

Product returns management is a cross-functional process that spans both the marketing and the operations activities within a firm. In order to most successfully manage a supply chain that creates higher levels of customer value, extensive functional integration of the demand processes of marketing/sales activities and the supply processes of operations is required (Mollenkopf,

2010). At the strategic level, an organization must develop policies, processes and structures to handle the reverse flow of product, information and finances. At the operational level, the returns management process involves the physical flow of product, information and finances (Rogers, Lambert, Croxton, & Garcia-Dastugue, 2002).

Managing this marketing – operations interface (M-OI) is acknowledged, but still remains problematic due to their differing roles, orientations and reward systems within the organization (Mollenkopf, 2010).

Within an organization, activities related to returns management include:

- *Return authorizations*: the decision to accept (a certain volume and quality of) product returns for a customer has implications for operations personnel, who manage:
- *Reverse logistics*: physically transporting the product back to the company or to another destination. The volume and quality of products authorized or return will impact staffing needs at the company's distribution centers or factories (Guide Jr., 2006);
- *Gate-keeping*: the ability to limit the amount or types of returns. Some products are more costly to return and process than they are worth – marketing may pre-arrange with customers the amount or conditions within which promotional products may be returned. Understanding of operational costs, so that marketing and operations can jointly determine which products should (not) enter the reverse flow is required for effective gate-keeping;
- *Avoidance of returns*. Improve product quality; conformance to legislative mandates; more responsive productions and delivery systems to improve inventory balance and placement in the market; or aligned deliveries to meet the timing of demand – all things in which operations plays a crucial role;
- *Product recovery, disposition and process*: often labor-intensive activities that require high levels of product knowledge and expertise, as well as joint cross-functional decision-making. Disposition may be constrained by factors such as geographic separation of production and sales; wide geographic dispersion of markets; policy conflicts between production and sales; or an inability to distinguish between the cause(s) of returns (Rogers, Lambert, Croxton, & Garcia-Dastugue, 2002);
- *Crediting*: the ability and speed of issuing credit to a customer is important to marketing/sales personnel, but often controlled by the operations personnel and their ability to process returns in a timely manner.

These activities exemplify the many facets of the M-OI within the returns management process (Mollenkopf, 2010).

Reverse Logistics

The part of product returns management where focus will on - as it is one of the main difficulties most companies encounter when making steps towards sustainable production or closing the loop - is the reverse logistics (RL) process. Other terms used synonymously are Aftermarket Logistics, Retrogistics, or Aftermarket Supply Chain.

> *'The process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value (reuse or recycle) or proper disposal'* (Hawks, 2006)

Most of the time RL is neither well understood nor well managed. Companies should be aware of, and understand the critical importance of perceptions – from purchaser's as well as the seller's point of view; what is quite often not the case. Other reasons to mention for this problem primarily relate to the inability to fully understand the strategic value of warranties and the requirements for the appropriate infrastructure to manage, and, in fact, optimize warranty and post warranty support service (Blumberg, 2004).

In the product life cycle (PLC), at first there are the stages of the forward logistics, 'getting the product to the market': new product development; material management; and manufacturing and distribution – see the figure below. All activity associated with a product/service after the point of sale, are RL. The ultimate goal is to optimize or make more efficient aftermarket activity, thus saving money and environmental resources.

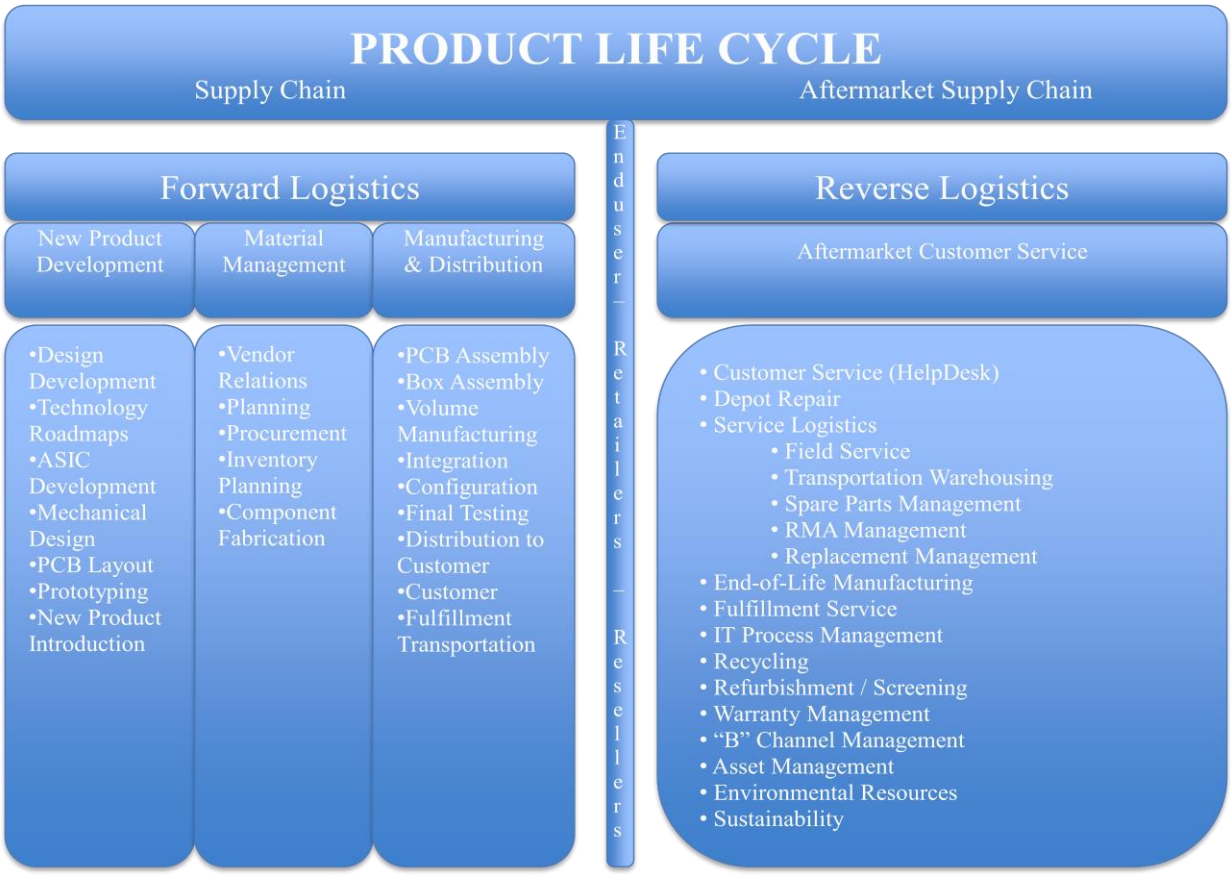

Figure 8 Product Life Cycle – Reverse Logistics (adjusted from Reverse Logistics Association, 2014)

In order to characterize RL, the topic will be analyzed from four essential viewpoints: why, what, how and who – see figure 9. These four basic characteristics are interrelated and their combination determines to a large extent the type of issues arising from the resulting reverse logistics system (Marisa P. de Brito, 2003):

- The *What* here is most easy to answer: all different types of textile that can be reused;
- The *Why* is also clear but the why reasons are more easy to establish for the receiver (receiving), than for the sender (returning). Not all senders are convinced yet, and more awareness, and thus marketing is required to get the customer convinced to return all clothes;
- *Who* is a trickier question to answer, as not all information about textile collectors was present yet. But what is clear is that the consumer is the party who has to start the RL-process and therefore communication from the brands is highly important.
- *How* is the main question of the RL process: as reverse logistics of the entire clothing industry is not established yet.

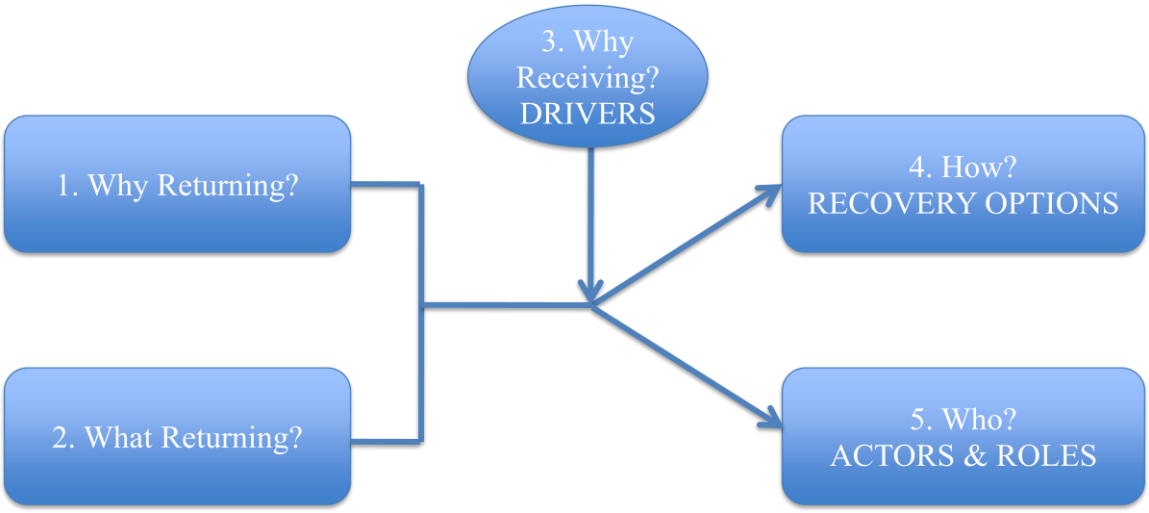

Figure 9 Why, What, How, and Who: basic interrelations (adjusted from Moritz Fleischmann, 2004)

There are different flows in this stream of material: commercial returns, repair/warranty returns, end-of-use returns, end-of-life returns and leasing returns. The main focus of the CLSC of the clothing industry is mostly on end-of-use returns and end-of-life returns. But it can also be clothes that have not been sold and thus are taken out of the collection – 'never-worn, brand new clothing', and cutting waste from manufacturers.

Regarding the Who it should be mentioned that in practice the recovered products do not always return to the original manufacturer. Important for the CLSC is that all resources are reused again: from a RL into a FL.

As you can see a lot of different questions need to be answered before an optimal RL network, and thus a successful CLSC, can be established.

2.3.2.2 Remanufacturing

REMO already has established relations with a couple of (Dutch and Italian) companies within this part of the CLSC of the clothing industry. The unravellers; spinners; and weavers have their machines, people and knowledge ready - and are familiar with, and are taking part in remanufacturing recycled clothing.

The confection process, in which the REMO labels are attached on/in the final product, is more challenging.

2.3.2.3 Remarketing

Parasuraman et al. came up with ten determinants of service (product offering) quality.

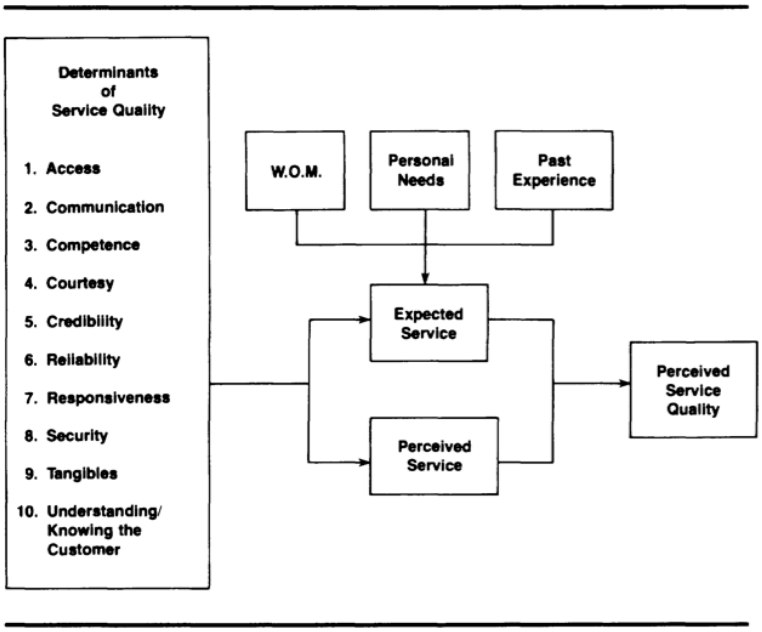

Figure 10 Determinants of Service Quality (A. Parasuraman, 1985)

As you can see, the perceived service quality is the result of the consumer's comparison of the expected service and the perceived service. The relative importance of the determinants in molding consumer expectations may differ from their relative importance with respect to consumer perceptions of the delivered service. Besides, comparison of expected and perceived service is not unlike evaluating goods. For the sourcing process of brands - for new material, the following dimensions are applicable: *Access*: availability of remanufactured parts; *Communication*: perceived quality of the remanufactured parts; and *Reliability*: actual quality of the remanufactured parts. That is the remarketing focused on. The way the brands remarket their final products – with the REMO label and thus recycled material – is something already seen in the clothing industry. Brands are more than interested to market their products to the end-consumer as 'green'; 'sustainable'; and 'environmental friendly' – and the number of consumers interested is growing.

But how do these brands know the quality of the fabric? Darby and Karni (Karni, 1973) distinguish three types of qualities associated with a particular purchase:

- Search qualities: known before purchase;
- Experience qualities: known costless only after purchase;
- Credence qualities: expensive to judge even after purchase.

And only two of the ten quality determinants (tangibles and credibility) can be known in advance of purchase: making the number of search properties restricted. So, what is really important in the remarketing of recycled clothing is transparency in the information provision: in that way, more service determinants will turn from experience or credence qualities into search qualities, what is positive. Especially regarding the credence qualities, which are most difficult and expensive to measure right now. Let me give an example: the savings (in all its forms) from clothing recycling. Some of the companies know these figures, but it is not communicated to the consumer, and therefore not yet a search quality. This is what the REMO System does by providing transparency throughout the whole system: highly important, especially in the beginning, to give this 'new' product the right image when launching it.

2.4 External Stakeholders and External Conditions

Stakeholders are all persons, organizations and agencies involved in, or influencing the CLSCM of the clothing industry. It is important to identify stakeholders and be aware of their objectives. In the next chapter the internal stakeholders will be described, in this paragraph, external stakeholders and external conditions that should be taken into account will be discussed. Not all external stakeholders and external conditions that affect the CLSCM of the clothing industry will be discussed of course - the three with the greatest impact were selected.

2.4.1 Environmental Organizations

There are a lot of (inter) governmental and non-governmental organizations that can exert pressure on the way companies handle. An example is a research from Greenpeace, from which a report was brought out: 'A Fashionable Lie' (Greenpeace, 2014). In this report, and on their website (Greenpeace, 2014), they mention a few brands specific that are producing 'toxic fashion': clothes containing hazardous chemicals that affect everyone. These brands would hide an 'unfashionable truth', in other words – Greenpeace asks for transparency of supply chains. Secondly, with the 'Detox Catwalk', eighteen companies committed to eliminate all discharge of hazardous chemicals from it supply chain and products by 2020 (Greenpeace, 2013). Every year Greenpeace brings out a document with details of the progress made by each of the eighteen detox committed companies towards meeting their commitment. Companies are classified as 'leaders' or 'greenwashers' (Greenpeace, 2013).

Companies do not have to do something with this, it is not legislation, but they know that if they do not do something about (damaging) facts that came out, they will not survive.

Another example is the Better Cotton Initiative (BCI) (Better Cotton , 2014). The BCI is a not-for-profit organization stewarding the global standards for Better Cotton, and bringing together cotton's complex supply chain, from the farmers to the retailers. BCI exists to make global cotton production better for the people who produce it, better for the environment it grows in, and better for the sector's future, by developing Better Cotton as a sustainable mainstream commodity (Better Cotton , 2014). BCI already has a lot of members, among them are big brands like Adidas, Ikea, Inditex, Levi Strauss & Co, Nike, Tommy Hilfiger, and Walmart.

The same holds for this initiative: companies do not have to become member of this organization – but if they are in the end the only organization who is not a member, they will be eclipsed by companies that are member and can show their customers they care about the environment.

There are numerous other examples to mention – but it is assumed that the message is clear: environmental organizations can exert pressure in the same way legislation is doing, perhaps it is even more important to respond to these pressures, because if they do not – customers will hear it.

2.4.2 Legislation

Businesses alone cannot encourage consumers from intention to action. In many instances, the government and the civil sector need to be heavily involved to achieve long-lasting changes in consumer behavior (Oppenheim, 2008). With new rules and regulations, governments try to improve sustainability, visibility and traceability – leading to more and more circular concepts.

At the level of the European Community, the need to protect the Community's environment; to create common standards; to protect consumers; and to enable free circulation of goods between Member States, has been recognized (European Commission, 2013). This lead to REACH (EC 1907/2006): the new European Community Regulation on Registration, Evaluation, Authorization and Restriction of Chemicals. The main aims of this regulation are to ensure a high level of protection of human health and the environment from the risks that can be posed by chemicals (European Agency for Safety and Health at Work, 2014); the promotion of alternative test methods; the free circulation of substances on the internal market; and enhancing competitiveness and innovation (European Comission, 2013). A really good thing is that REACH makes industries responsible for assessing and managing the risks posed by chemicals and providing appropriate safety information to their users – and not only the chemical industry, other industries such as electronics, toys, textiles and tires, etc, are all affected by REACH (Reach, 2012).

Other pieces of legislation include the Biocidal Product Regulation (BPR, Regulation (EU) 528/2012), which establishes the regulatory framework for the placing on the market available on the market and the use of biocidal products, which are used to protect humans, animals, materials, or articles against harmful organisms like pests or bacteria, by the action of the active substances contained in the biocidal product (European Chemicals Agency, 2014). The Waste Framework Directive (2008/98/EC) specifically refers to textiles. Besides defining the waste hierarchy – see figure 11 – the directive calls for end of waste specific criteria to be developed.

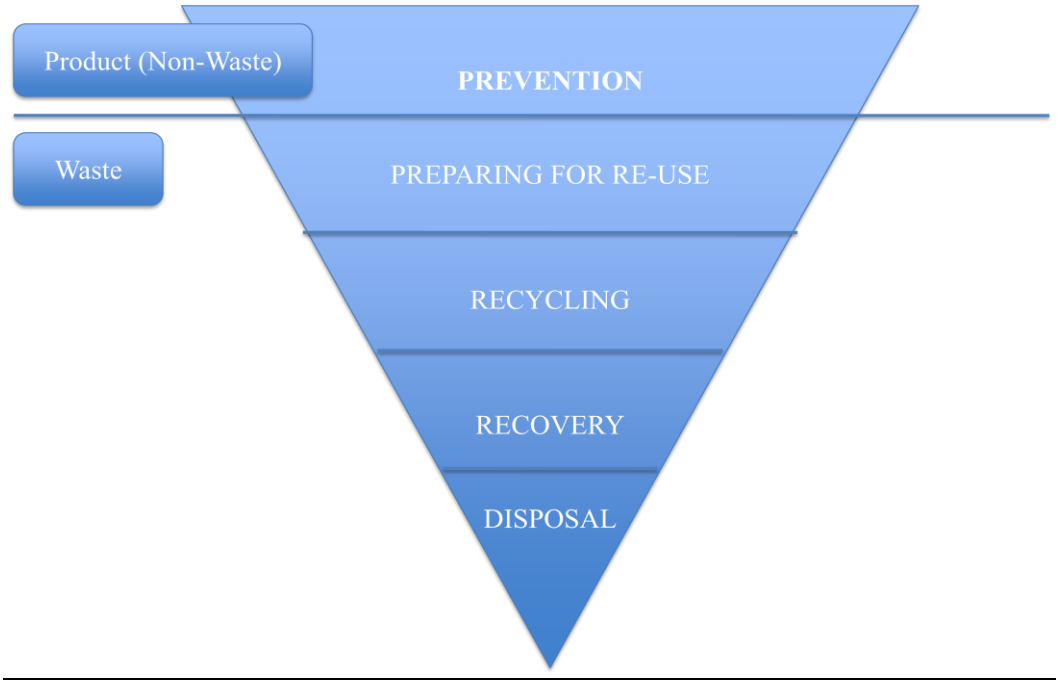

Figure 11 The Waste Hierarchy (adjusted from European Commission, 2014)

Voluntary environmental labeling schemes exist as well: ISO 14024 'Type I' EU Eco-label – which communicates 'better environmental performance with the same quality' (Eco SME's, 2014); the Nordic Swan – where the applicant agrees to follow a certain criteria set (including environmental, quality and health arguments) outlined by the Nordic Eco-labeling in cooperation with stakeholders (Nordic Ecolabel, 2014); and the Blue Angel – where the applicant is producing a product that is environmentally friendlier than others serving the same use (Ecolabel Index, 2014).

Other standards address environmental and social criteria along the supply chain e.g. Global Organic Textile Standard (GOTS): the worldwide leading textile processing standard for organic fibers - including ecological and social criteria - backed up by independent certification of the entire textile supply chain. The aim of the standard is to define world-wide recognized requirements that ensure organic status of textiles, from harvesting of the raw materials, to

environmentally and socially responsible manufacturing, to labeling in order to provide a credible assurance to the end consumer (Global Standard, 2014).

From all this information it can be concluded that participation in CLSCM (integration of the REMO System) will help companies to comply with regulations and beyond, as in this way the produced products will fit to the standard of sustainable purchases by the (Dutch) government (Rijksoverheid, 2014).

2.4.3 ICT

Information and communication technology (ICT) has a supporting role in this complex process. The opportunities for improvements for the CLSCM can be numerous but they have to be realizable, and therefore the capabilities of the current ICT should be taken into account. (Kokkinaki A. R., 2003) identified that ICT systems for RL have attempted to address three themes:

- Product data – data regarding the condition and configuration of the return;
- Process facilitation – supporting operations of reverse logistics;
- Redistribution to the market – attempting to consolidate the fragmented market places: how to redistribute the recovered material back to the market.

Most important is that the supplying firm, REMO, its system should work 24/7. A failure in the system would lead to wrong or incomplete information, and thus a wrong or incomplete KEY (product data), which cannot be sold and thus are useless.

The REMO label system has to be hundred percent secure and reliable.

2.5 Risks of and opportunities for CLSCM of the Clothing industry

As the goal of this research is not to reinvent the wheel, it is important to study the known risks and opportunities to successful closed-loop supply chain management.

Risks

As recovery consists of a lot of uncertain data: time, quantity and quality, this makes systems and predictions unreliable. A study by Geyer and Jackson defined three common bottlenecks or risks in closed-loop supply chains – see figure 12.

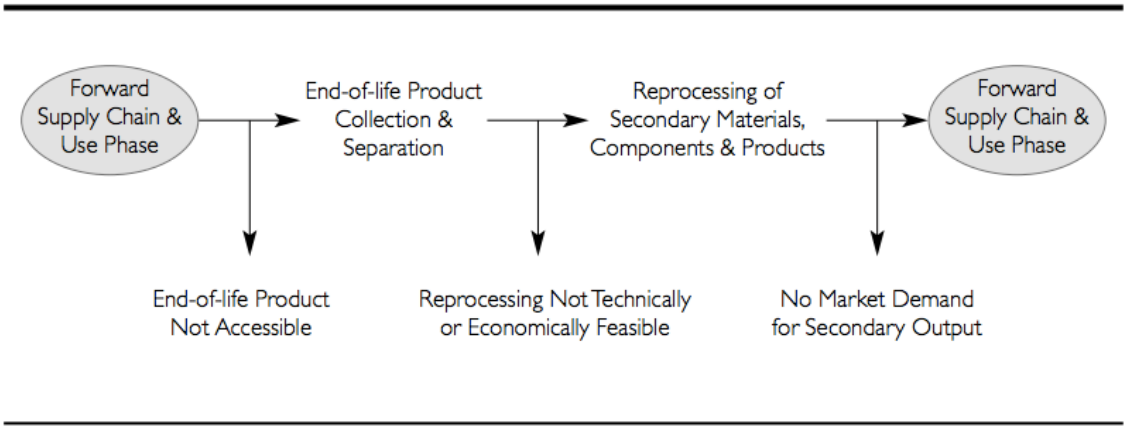

Figure 12 Three Types of Constraints in Supply Loops (Geyer, 2004)

These risks should be evaluated first, before any attempt is made to set up a CLSC. Investing in historical data about the product could mitigate uncertain data, but more importantly: data from stakeholders of this specific CLSC. In this way more information regarding the accessibility of the end-of-life product could be gained; whether the reprocessing is technically/economically feasible - and regarding the last bottleneck: the (potentially) interested sector could be addressed - to get an estimation of the demand.

Another important bottleneck worth mentioning is collaboration. To effectively and successfully manage a CLSC, collaboration and perseverance is required – something that has failed in a lot of cases so far. Even though some studies showed that alliances between organizations are risky (Games - Casseres, 2000) and not always successful. Money, time and energy are required to first evaluate whether an alliance is a good investment, and thereafter to set up a qualitative and healthy management to organize and lead an organization, alliance, towards success (Berendsen, 2012). Nevertheless, organizations do not discourage this way of doing business. An important motivation is that an organization can share costs, and all imaginable risks with the collaborative partner (Alter, 1993). Besides, knowledge can be gained by joining forces. Of course, all this comes at the cost of sharing profit – but synergy should create a higher profit than when the companies would work separately (Strategic Alliances, 2005).

Opportunities

Regarding opportunities, the most important warnings mentioned in literature are unbalanced equations (Geyer, 2004): where the economical aspects will win in respect to the environmental aspects, or vice-versa. That is not the win-win situation businesses should strive for.

Another opportunity is to be ahead of possible legislation. That is what REMO is doing: investing in a sustainable approach which is not yet obligatory, but as they are prepared for what is coming, they can have an advantage here.

And of course, be ahead of competition. With well-established relationships, cases to show what they already achieved, and a reputation of taking responsibility for their activities – a better market value might be the result.

2.6 Summary and Positioning of the Research

As stated by (Souza, 2013), and as seen throughout this chapter, research on the comprehensive design of products and respective CLSC's for recycling is more than welcome, 'particularly on documenting acquisition and collection costs, remanufacturing costs, and the overall market for remanufactured products (including prices, warranties, and channels)' (Souza, 2013). Bsides, given the contemporaneity of the subject, this research can make a lot of valuable information visible to the entire clothing industry.

As seen in the previous sections, the literature has tackled fundamental issues related to this research, however, the exact research questions in this paper has not been addressed before. Literature is focused on describing of current methods for recovery (RL and CLSCM), instead of implementing them in practice. Previous literature can roughly be divided into two streams: papers dealing with CLSCM on company level, and papers with CLSCM on inter-organizational level. Then within these streams literature on specific cases was found – which are more or less telling 'success stories', and regarding the whole industry only literature on company level was found, not on inter-organizational level – what makes these cases (more) generalizable to other industries as well. As a lot of articles are already discussed in this paragraph, the focus will be on four articles and it will be explained why they have been put in a certain box.

It can be said that a lot of papers are dealing with the circular economy, including the need to change our behavior. Regarding this 'our' the article by R. Morana and co-authors (Morana & Seuring, 2011) will be addressed. These researchers came up with a three level framework for Closed-Loop Supply Chain Management linking societal, chain and actor level. In other words, an analytical framework for CLSCM, placing it within the political or societal environment, while linking it to related supply chain partners, and single actor activities. Two dimensions formed this framework. First of all, *integrated chain management* - a concept mainly developed against

national political initiatives: 'Integrated Chain Management is the management of material flows by stakeholders [to be] the goal-orientated, responsible, integrated, and efficient manipulation of material flows. Set targets derived from the ecological and economic realm, under consideration of social aspects. Goals are set on the level of the single firm, within the supply chain of actors, or on the public policy level' (Commission of the German Bundestag, 1994). So, three actions levels are distinguished. Yet, most sustainable SCM stays at the company and actor level, instead of the governmental (acting on behalf of society) and at the secondary stakeholder – level (the consumers and non-governmental organizations). Closed-loop supply chain management incorporates the levels: linking legislation to environmental improvements, as the individual actor level would not be appropriate. Then the next step level is the actor level, where the *transaction costs* should be emphasized, as it limits the framework to a single actor and process in the overall CLSC: without this important step of returns, the overall idea of closing the material cycle would disappear.

The second dimension by which the framework was formed is the division between theoretical basis (incorporates related developments in inter-organizational management concepts), and the analytical basis (allow detailed assessment of a certain CLSC on all three action levels).

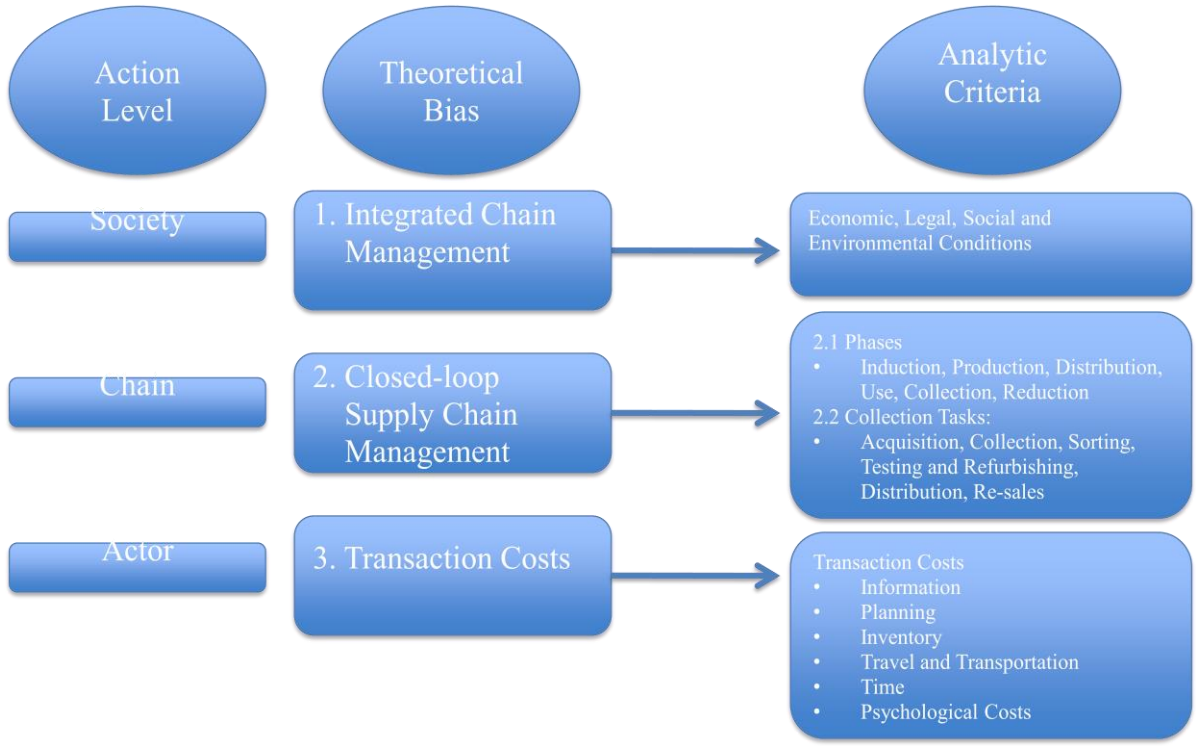

Figure 13 Analytical Framework for the management of closed-loop supply chain (adjusted from Morana & Seuring, 2011)

The contribution of this framework links the societal level of an industrial ecology or closed loop economy to the supply chain, the single actors and their respective activities. It allows analysis of a certain case or application toward these levels, which would yield insight on the overall feasibility of operating a related closed-loop supply chain. The article by Smit and co-authors (Smit, Driessen, & Glasbergen, 2009) put forward a similar framework, but within a quite different setting.

Ruth Carrasco-Gallego and his co-authors (Carrasco-Gallego, 2009) also recognized that empirical research on reusable articles management is quite scarce. Knowledge on reuse CLSC's is fragmented and scattered, and only considers some particular situations in which reuse is involved - such as some types of packaging. The paper contributes to scientific literature by identifying the main management issues that companies must face when dealing with reuse CLSC. The case study indicates that reusable articles involve management difficulties that do not arise in supply chains utilizing single-use articles. But on the other hand, reusable articles contribute to natural resources preservation by reducing the amount of waste generated, and when well managed, provide cost reductions.

The last article mentioned in the table has an industry perspective – but not the intern-organizational level searched for. The paper presented a framework encompassing service, remanufacturing and other reverse flows in integrated closed-loop supply chains. A supply chain and operations strategy can be formed by means of foundation. The approach is not limited to certain types of supply chains, but is focused on the company-level only.

The main contribution of the current research is to model the interaction between the literature (including frameworks) and real-life necessities, by means of a real-life worked out example: the analysis of the influence of different actors on CLSCM. The three levels as found in figure 13 have been elaborated on, but as said by the authors, their integration and interactions would require further analysis, both within the particular setting of recycling networks and CLSC's, but also beyond such issues – in other words, analysis of more cases was the recommendation. That is where this research comes in. There is an explicit case of an entire industry, not a focus on one single company: the focus is on all parties affecting and involved in the CLSC, in which the integration and interactions of the three levels can be analyzed.

	Specific Cases	Whole industry, (more) generalizable
Literature – On Company level	R. Carrasco-Gallego; E. Ponce-Cueto; R. Dekker, A Framework for closed-loop supply chains of reusable articles, Econometric Institute, Report EI 2009-21	Wikner, J.; Tang, O., A structural framework for closed-loop supply chains, The International Journal of Logistics Management, 2008, Vol. 19 No. 3, pp. 344-366
Literature - On Inter-organizational level	Smit, A.A.H; Driessen, P.P.J.; Glasbergen, P. Conversion to organic dairy production in the Netherlands: Opportunities and constraints. Rural Sociol. 2009, 74, 383-411 Morana, R.; Seuring, S., A three level framework for Closed-Loop Supply Chain Management – Linking society, Chain and Actor level. Sustainability Journal. 2011, 3, 678-691	**Current study**

Table 1 Selection of representative Papers dealing with CLSCM

3. Research Methodology

This chapter discusses the research methodology. The first paragraph details the research approach that is be used. The second paragraph states the method of data collection, to conclude with the data analysis method in the last paragraph.

3.1 Research Approach

A distinction is being made between theory-oriented and practice-oriented research.

Theory-oriented research has its findings based on existing theories and with a goal to prove or disprove a hypothesized truth: identification of a core set of principles within a topic and showing how they are related in some way to the subject. The objective therefore is to contribute to theory development.

The goal of practice-oriented research is to utilize research knowledge to enhance the development and implementation of practice and policy. Practice-oriented case study information can be readily applied or adapted to fit their particular settings (Marshall, 2010). The primary goal of case study research is to generate knowledge of the particular rather than the general. The objective therefore is to contribute to the knowledge of one or more specified practitioners responsible for a specific real time situation (Marshall, 2010). However, in the field of Supply Chain Management, practice-oriented research could also include 'business problem solving' which relies on the design-oriented research paradigm (A. Georges, 2003).

In design-oriented research, the production of new knowledge and the questioning of any initial problem descriptions and other kinds of limitations to the freedom of design should be seen as characterizing elements (Fallman, 2003). The proposed intervention is typically focused on a new or improved business process. That is exactly the research objective of this paper: to answer the main research question:

'What is the current status of CLSCM of the clothing industry and what are opportunities for improvement?'

With its sub-questions:

CLSC Management of the Clothing industry

1. *How great is the need for sustainable clothing, in other words a CLSC of the clothing industry?*
2. *Which stakeholders are indispensable to close the SC of the clothing industry, and what is and should be their role in the management of the CLSC?*
3. *What are the major risks of and opportunities for CLSCM of the clothing industry?*
4. *There is a risk that one of the 'stages' breaks the chain. How can REMO prevent this, and therefore make itself indispensible?*

Internal stakeholders

5. *Have companies been thinking about track and trace systems before, and are there comparable track and trace systems already in use?*
6. *What are the drivers for companies to close the loop and become transparent?*

Value Creation

7. *How are people becoming aware of the need for sustainable clothing?*
8. *What will be the contribution to the environment of CLSCM?*
9. *How high are the savings from implementation of CLSCM?*

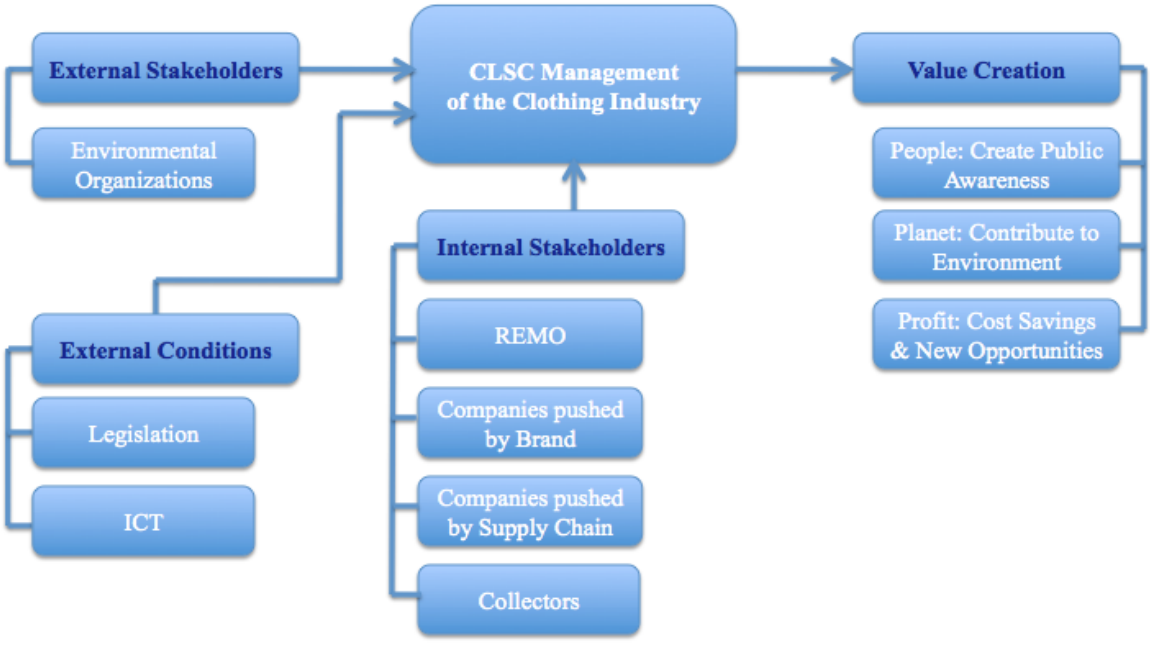

Figure 14 Conceptual Model of the Research

As you see, all questions can be brought back to one of the stages and/or blocks of the conceptual model. The external stakeholders mentioned in the model are discussed in the literature review. The same goes for the choice of KPI's of the CLSCM of the clothing industry, but the results

from further research and the interviews will be discussed in the results chapter. The internal stakeholders will be discussed in brief in the following paragraph, and more details will be described in the results chapter.

To show that this research is of high quality, the reader will be presented with information about the current SC of the clothing industry, and the advantages of a CLSC and the management thereof. By providing the reader with this comparison, the reader will be convinced that the advantages of an optimized closed loop supply chain are numerous.

3.2 Data Collection

There is a lot of information in the world: within companies, within the heads of people, but not all (not a lot of) this valuable information is written down on paper.

Participatory observation including semi-structured interviews and online research to dig deeper into the information found, is the data collection method chosen as seen during the literature review that information found by this research method was most in line with the results hoping to find. Besides, given the contemporaneity of the subject (not that much research is done yet), and the given time constraint, this method should be optimal.

Observation is 'the systematic description of events, behaviors and artifacts in the social setting chosen for study' (C. Marshall, 1989), it enables the researcher to describe existing situations using the five senses, providing a 'written photograph' of the situation under study (Erlandson, 1993). Participant observation is the process of active looking, natural conversations, informal interviewing, writing detailed field notes (DeWalt K. M., 2002). Nonverbal expression of feelings, determine who interacts with whom - grasp how participants communicate and do business with each other: and check how much time is spent on various activities - and in that way see where the bottlenecks are (Schmuck, 1997). Besides, events that informants may be unable or unwilling to share as this would be impolitic, impolite, or insensitive, can be checked by means of observation (Eberle, 2005). What of course can be a downfall here is to stay objective, nonjudgmental, as you are involved in the day-to-day situation. There are different levels of involvement in participant observation. The type of participant observation of this research is active participation: 'the researcher becomes a member of the group by fully embracing skills and customs for the sake of complete comprehension' (DeWalt K. M., 1998). Howell described four stages of participant observation (Howell, 1972). The first two stages take a lot of time, but taking enough time is crucial in order to succeed in the last two stages.

1. Establishing the rapport	Get to know the members, visit the scene before study. It is important to be accepted in the community in order to obtain quality data
2. In the field	Connect, or show a connection with the population in order to be accepted as a member of the community. This sets the stage for how well the researcher blends in with the field and the quality of observable events he or she experiences
3. Recording observations and data	- Field notes - Interviews - Reflexivity journals: record personal thoughts and feelings about the subject of study. Researchers must be aware of these biases and enter the study with no misconceptions about not bringing in any subjectivities into the data collection process
4. Analyzing data	Thematic analysis: organizing data according to recurrent themes found in the qualitative data collection methods and narrative analysis: categorizing information gathered, finding common themes, and constructing a coherent story from the data

Figure 15 Howell's Stages of Participant Observation (adjusted from Howell, 1972)

It is important to be aware of the fact that the recorded observations are never going to be a full description of the case; that is simply infeasible. Secondly, this way of information gathering and analysis of collected data is inevitably influenced by the researcher's worldview: personal belief of what is relevant and important to collect, and the way he or she interprets and evaluates the data found. One final remark, as for every form of research: the researcher must ensure the ethical boundaries are never crossed (University of Minnesota's Center for Bioethics, 2003).

The advantage of semi-structured interviews is that it combines a pre-determined set of open questions – and thus providing uniformity over the interviews – with the opportunity for the interviewer to explore particular themes or responses further. It thus does not limit respondents to a set of pre-determined questions and/or answers – resulting in a good understanding of how

certain things work for their company and how they should be changed (Evaluation Toolbox, 2010). Another advantage is that this form of interviewing allows respondents to discuss and raise issues that might not have been considered before. One disadvantage of this form of data collection is that it can be time consuming to collect the data; and that the interviewer should be very vigilant not to suggest answers. Next to that, semi-structured interviews are harder to analyze and prone to bias in the analysis. Therefore it is highly important to have a good data collection and management process in order to store, retrieve and analyze (coding) the data (Evaluation Toolbox, 2010). This will be done by means of a spreadsheet. The interviews were transcribed and coded right after the interview.

3.3 Data Analysis

As much relevant data on sustainability, and environmental friendly products; projects; and companies in the clothing industry – and thus potentially suitable for the CLSCM of the clothing industry – as possible was looked up. This data was clearly structured throughout the paragraphs in the literature review, and the information found was also used to make certain assumptions. Useful information that will be collected during the participatory observation including interviews will be transcribed and coded. However, specific labels for coding were not defined, as the preference was to use the exact citations of the interviewees given that that is really valuable information. The answers will be combined and it will be checked what themes came up most, and all this - including all other qualitative information gathered - will be used during the process of describing the opportunities for improvement of the CLSCM of the clothing industry.

As discussed in the literature review and as seen in the conceptual model, it is known how the three KPI's in which this CLSCM of the clothing industry is expected to result want to measured.

Validity

Validity involves the issue of whether that what was measured was intended to be measured. It is achieved when 'results can be considered to meaningfully capture the ideas contained in the corresponding concept' (Dul, 2008). The researcher will work in close cooperation with REMO - the initiator of the CLSCM of the clothing industry - in order to align incentives and objectives. This warrants the validity of this research.

External validity is the establishment of the domain to which a study's findings can be generalized (Dul, 2008). Relevant theory was used to give direction and to provide focus on the variables relevant for this research. The opportunities for improvement of the CLSCM of the

clothing industry will be applicable for the textile industry as a whole, and eventually for the management of other CLSC's as well.

Reliability

Reliability is an estimate of the precision of the score obtained by a measurement. Reliability is achieved when the results are free from researcher, situation and instrument bias (Dul, 2008) - in other words: an estimate of the precision of the collected data. This research applied triangulation in the data collection stage in order to increase reliability. Triangulation combines multiple observations and insights, and is achieved by combining interviews together with participatory observation and analysis of textual information (Guion, 2013). Semi-structured interviews will help understand cultural elements once the observation is done. The combination of different data sources will provide an overall view of CLSCM that is as accurate as possible.

4. Results, Findings

The semi-structured interview-questions have been derived from the literature review (see Appendix 2). The literature review provides a solid basis for the issues relating to the CLSCM of the clothing industry. The purpose of the interviews is to come up with more insights, motives, attitudes and ideas of different persons and thus viewpoints regarding the CLSCM of the clothing industry. The interviewees were selected based on the company they are working for and thus in which part of the supply chain they are involved. The endeavor was to get into contact with the sustainability manager or managing director – however, this was not always possible. Besides, it must be said that it was quite hard to come into contact with collectors and companies in the supply chain. There was contact with one person working at a company in the SC (at (Pontetorto, 2014)), but as she had really limited time she was not able to answer all questions. Therefore those answers were not included, as otherwise the dataset would have been incomplete. During the research it was learned that valuable information could be obtained from consultants, freelancers, who have a lot of knowledge and experience in this business as well. For this reason some consultants were interviewed as well – not the initial plan but turned out to be really interesting. One final remark regarding the selection of the interviewees is that it was tried to have a balance between male and female interviewees, to reduce the influence of the chance of women being more likely than men to be interested in and to work for a sustainable world than men (Stevens, 2010).

The interviews were semi-structured, and most questions open ended, therefore the interviewees had enough space to express themselves. The semi structured interviews lasted in general between 45 and 150 minutes.

As the current limitation is that there are almost no practical suggestions of what should be incorporated to manage the closed-loop supply chain in the most efficient way - these interviews, in combination with the participant observation information and online research, provide information on whether what was said in the literature review can be confirmed by means of real-life examples, or not. Of course it is extremely difficult to map the entire closed loop supply chain, and to identify all challenges that may arise when implementing, improving CLSCM of the clothing industry in the time given, but it was tried to come up with the most comprehensive version as possible.

First the background of the interviewees will be discussed in brief. Thereafter the structure of the conceptual model will be maintained: the outcomes of the interviews, standpoints and opinions of the interviewees regarding the CLSCM of the clothing industry in combination with the literature found (sub-questions 1-4 of the interview); to continue with the internal stakeholders (sub-questions 5-6 of the interview); to conclude with the value creation part (sub-questions 7-9 of the interview).

In this chapter only the answers on questions that really contribute to the research question (and sub-questions) will be displayed in tables, as otherwise it would have become even more extensive than it already is – the complete dataset can be found in Appendix 3.

4.1 Interviewees

In Appendix 4 you find a table with information about the 12 interviewees and their ID's. The ID's have four capitals and are created as follows: the first letter is the first letter of their first name, the second letter is the first letter of their last name, the third letter says M or F for male or female, and the fourth, the last letter states for what kind of company they work:

- B for working with a brand (6 interviewees);
- C fir working with a collector (1 interviewee);
- E for external parties (4 interviewees); or
- U for companies in the up-cycling business (1 interviewee).

4.1.1 B

Peter Korver is the managing director of Hi-Tec (Hi-Tec, 2014). He used to work for a lot of different brands: Nike, PUMA, Brunotti and so on. Hi-Tec is a global sports company that designs, develops, manufactures and sells a range of performance footwear. They do sell apparel and accessories as well, but that is not their main business. However, as he has a lot of knowledge about the clothing industry given his former jobs, an interview with him was more than valuable.

AA preferred to stay anonymous, but is an experienced man who established a company manufacturing clothes in the high-end segment. They are entirely focused on sustainable garment production, giving old clothing many new lives. He thus has a lot of knowledge about sustainable production.

Norbert Mutsaerts is the founder and director of Noppies, a company producing maternity-, baby- and kids clothing for over twenty years now. Norbert therefore has a lot of experience in and knowledge about the clothing industry as well.

Anne Hermans is the first international management trainee of Tommy Hilfiger. Tommy Hilfiger is a large apparel and retail company offering high-end consumer products including men's, women's and children's apparel, sportswear, denim, and a range of licensed products. She started as an intern a year ago, but as she is young and has received a lot of information due to her positions she is well aware.

Maaike Kokke is working at the Corporate Responsibility division of G-Star and is responsible for communications and sustainable materials. She worked for G-Star for over six years now, and has almost eight years of experience in the CSR branch. REMO has been in touch with the sustainability department of G-Star for a couple of months already.

A couple of these brands are mentioned again in paragraph 4.3.2.

4.1.2 C

Simon Smedinga is operational director at Leger des Heils ReShare. A lot of information about this organization was gathered before the start of this research already. ReShare has been in contact with REMO for a couple of years already, due to the relationship the founder of REMO has with this organization.

More information about collectors is given in paragraph 4.3.4.

4.1.3 E

Ellen Sillekens is a freelancer, and as a freelancer, consultant and trainer she promotes the sustainability of textiles, fashion and design. She is doing research on how sustainable the clothing and textile is at this moment, and she is interviewing leading sustainable Dutch Textile companies. Besides, she organizes expert meetings on relevant subjects in the textile branch on various network forums.

Constanza Brachi is a consultant with a major focus on sustainability, CSR. She works at Process Factory, a company based in Prato, Italy. Process factory has many years of practical experience in organizational development and she helps to solve problems that apply to clients' organizations by giving advice for solutions that will work within the client's specific operating environment

(Process Factory, 2014). Process Factory is familiar with the REMO System and is more than enthusiastic about it.

Dion Vijgeboom worked at G-Star for years as Manager Purchase and Planner Jeans, and started his own company a few months ago. He now is an independent advisor in the supply chain of the denim industry. Given his experience in the clothing – specifically jeans – industry, he contributed a lot of interesting information.

Wanda de Wit is a freelancer supporting creative designers and schools/universities in the Netherlands and in Italy with organizing events in the clothing industry. She has done some work for REMO as well: she made the first website; organized lectures in collaboration with the mayors of Almere and Prato; and organized a trip of a couple of students from AMFI to Prato.

4.1.4 U

Mireille Geijsen founded I-Did together with her partner Michiel Dekkers. I-Did is the redesign party for established brands in the Netherlands. The I-Did 'slow fashion movement' wants, in collaboration with Dutch fashion labels, to show that the value of clothes is (can be) permanent. By redesigning the surplus from the fashion industry such as scrap, overstock and waste into beautiful products in their CSR ('MVO') workshop. Thus, a large percentage of this surplus can be processed in a creative and innovative way in the collections of fashion labels, as a new redesign item (I-Did, 2014). They are thus engaged in up-cycling, not in recycling. After talking to both of them for over two hours it can be said that their experience and their focus on a more sustainable clothing industry made their contribution really valuable.

4.2 Part 1 – Closed Loop Supply Chain Management of the Clothing industry

Circular Economy, Sustainable Clothing Industry

Sustainable clothing is gaining increasing attention, and there are two categories of stores offering sustainable clothing:

- Well-known fast fashion retailers (like H&M, C&A)
- 'Small' retailers which mostly only offer sustainable clothing (like Mud Jeans and Honest By)

It is quite hard for the second group to compete with the fast fashion retailers, as the demand for cheap garments is still present in consumers' minds. However, as said before: the consumers' mind is changing, especially when retailers know how to influence sustainable buying behavior.

In the table below you see the responses of the interviewees about whether sustainable clothing is fashionable.

Question 1. Sustainable clothing is fashionable. Do you agree or not?		
Response	**X Neutral P Positive N Negative**	**Interviewee Code**
No - gets a new impulse every now and then	X	ES - FE
Depends on the position of your brand - can be cool but depends	X	PK - MB
Absolutely	P	MG - FU
Difficult - depends on the brand	X	AA - MB
Agree	P	CB - FE
Agree	P	DV - ME
Yes - you can make it fashionable	P	WW - FE
Yes - absolutely	P	VV - FB
Yes	P	NM - MB
It is in a certain degree, but the price is really a bottleneck; makes them less interested in the end	X	AH - FB
This is the future, and not a trend that will blow over	P	MK - FB
Yes	P	SS - MC

You can see that most interviewees agreed that sustainable fashion is or can be fashionable. This result was a bit more positive than expected: although a lot of companies are busy with sustainable production, it is still in its infancy. Therefore it is good to see that most interviewees believe that it can be fashionable and thus interesting.

As researched by Beukema (Beukema, 2013), the problem of sustainable clothing is that it most of the time does not meet all three sustainability criteria: that it is fashionable, ethical for workers, and taking environmental issues into account. For these issues the whole supply chain is

responsible: not just one stakeholder. However, the interviewees of this research agreed that it is largely dependent on the brand: on its position, on how the products are designed and marketed, and of course the price - Beukema came up with four consumer motives towards buying sustainable clothing as well: harmony, fairness, compassion, and environmentalism. Only the brands are in direct contact with the consumers and thus can influence this.

Conclusion Q1: Although dependent on the brand, sustainable clothing can be fashionable

However, on the question whether consumers are interested in buying products made of recycled material[10] the opinions differed: a few are convinced; some say that it is only the conscious consumer who is interested and willing to pay a higher price for this (thus high-end products); and others say that consumers would be interested if they would be aware of the scarcity of raw materials: so again, transparency.

Conclusion Q4: Not all consumers are interested in products made of recycled material yet – transparency and awareness creation are needed to increase the number of conscious consumers

The answer on the second question was more in line with the expectations: all interviewees agreed (in a certain degree) that a sustainable clothing industry is a necessary development. Although feasible, they also point to the fact that it will take a lot of time and effort to get there.

Question 2. What is your view regarding a sustainable clothing industry?	
Response	**Interviewee Code**
Important	ES - FE
Happening a lot already, but afraid they will be stereotyped as alternatives/idealists. But this is changing	PK - MB
Feasible	MG - FU
Development of recycled fibers is a hard and costly process. Takes a lot of time, but feasible	AA - MB
Key to success and competitiveness for the clothing industry	CB - FE
Necessary development. Both Push (by government) and Pull (by consumers)	DV - ME

[10] Question 4. Do you think your customers are interested in buying your product made of recycled material?

It is developing, but it is not always visible - and not priority for all companies	WW - FE
A must	VV - FB
Currently a bad image w.r.t. sustainability and would do well to improve and communicating about this	NM - MB
As long as the demand is not sustainable, the supply will not be sustainable either	AH - FB
We see CSR as a self-evident part of the our strategy and vision - be progressive is really important	MK - FB
Long way to go but in the end it is a necessity	SS - MC

Conclusion Q2: A sustainable clothing industry is a necessary development

So how could we get there? The entire process should be taken into account, all different stages and these parties need to cooperate with each other and share information. Transparency (fair production) and awareness of the consumer are key. Investments, price, technique, and regulations are mentioned to be determinative for the speed.

Question 3. What do you think needs to change in order to make this industry sustainable?	
Response	**Interviewee Code**
Look at entire process	ES - FE
Most important is the back side of the supply chain: the acquisition process has to be affordable	PK - MB
The awareness of the consumer	MG - FU
Better cooperation between the weavers and the confection companies	AA - MB
Reduce/remove chemical substance that could harm people and planet. More attention to fair treatment	CB - FE
Transparency, innovation and scale. Speed depends on variables included - in particular: price, technique, regulations	DV - ME
Largest bottleneck I see is the finances. More cooperation between the companies is needed	WW - FE
Transparency is needed	VV - FB
Awareness first, then check what should be changed / improved	NM - MB

Reducing carbon footprint, become entirely fair-trade and invest in the safety and education of the employees	AH - FB
All parties should take their responsibility	MK - FB
Price/quality ratio should be competitive with the less sustainable industry	SS - MC

Conclusion Q3: Commitment and involvement of all stakeholders is required in order to make the clothing industry sustainable – the speed of this development is dependent on various factors

In any case, more has to be done with the 'old', worn-out clothing [11] - most interviewees agreed that too much garments are thrown away, and there are good opportunities to do more with it. Stimulation of the collection and reuse by retailers are nice examples.

Conclusion Q5: Not enough is done with worn clothing right now, although there are nice and interesting opportunities to do more with this

Performance Measurement regarding Sustainability in own Company

As most (large) companies nowadays have sustainability on their agenda, it is not that remarkable to see that all interviewees are working at a company in which sustainability is an important concern to which at least some, and in other companies a lot, attention is given. What companies are currently doing in the field of sustainability[12] may vary between them and over time: from giving advice; to developing recycled products; to up-cycling; to an entire focus on sustainability and innovation in the production process; to 'producing responsible and fair, to keep the wishes of the current and future generations in mind' (NM-MB).

Conclusion Q6: Sustainability is on the agenda of most companies – but the term sustainability has not one clear definition and can therefore be widely interpret / associated with varying initiatives

[11] Question 5. What, in your opinion, is currently done with worn clothing - what are (your) customers doing with 'old' garments?

[12] Question 6. What is your company currently doing in the field of sustainability?

Conclusion Q7[13]: Sustainability has not been integrated in the ethos of all companies from the beginning onwards, some just started with it, and some just started communicating about it

Due to this broad definition, companies have different goals with regard to sustainability:

Question 8. What is important for you to see changed over time? What is the goal of your company with regard to sustainability?	
Response	**Interviewee Code**
A lot of changes already. Innovative projects with smart and more 'healthy' use of materials	ES - FE
For our company, not really (yet), but you have to move with 'the rest' - and thus keep an eye on it	PK - MB
Revaluation of raw materials	MG - FU
Increasing percentage of recycled material in our products	AA - MB
Acceptance of integration of sustainability in business strategies	CB - FE
Willingness to provide openness. Improve the denim industry SC through innovation, automation, sustainability, integration	DV - ME
Create awareness, in a lot of different industries	WW - FE
Suppliers and producers/designers to start revising their own way of working	VV - FB
Achieve the maximum possible without jeopardizing the survival of the company in the economic sense	NM - MB
Neutral footprint and making employees in developing countries autonomous	AH - FB
A lot of different subtargets: a.o. increasing the percentage of sustainable fibers, decrease use of chemicals	MK - FB
Subsidies for initiatives for recycling of raw materials. Right now the innovation costs; investments are too high	SS - MC

However, you can see that revaluation of raw materials; increase the percentage of recycled content in products; acceptance of the whole sustainability idea in business strategies; creating awareness and willingness to provide transparency were concepts mentioned most frequently.

[13] Question 7. If yes - has sustainability always been integrated in your ethos, have you been working on it for years already, or are you exploring sustainable production?

This is not a surprising finding. 'Whatever goal a company has, it has to be valuable and realistic in the given timeframe' (NM-MB).

Conclusion Q8: Different companies have different perspectives, ideas, and thus goals regarding sustainability

Conclusion Q9[14]: The number of colleagues involved in the sustainability goal is of course also highly dependent on the activities and the size of the company

On the question how companies are trying to achieve this[15] it was expected that they would have totally different opinions as well – as companies with different operations, sizes, and missions/visions were interviewed. That turned out to be the case: from creating awareness of the value of clothing through education and promotions; to water-savings initiatives; to collaboration with manufacturers. The last one is quite comprehensive for all (again): collaboration is essential.

Conclusion Q10: The ways to achieve sustainability goals are also highly dependent on the activities and the size of the company

The answers on question 12[16] were different than expected. It was more or less assumed that companies would like to work together with certain companies in order to achieve sustainability goals – as there are a lot of certification companies, initiatives etc. and once one big player starts with a certain certification, it was expected that other (smaller) players were more or less forced to follow that. But this was not the case. Interviewees mentioned that they like to work together with whatever party sharing the same sustainability-goal; some mentioned REMO; some just said they will achieve this by their own strength.

Conclusion Q11[17] and 12: There are no specific parties that all companies really have to work with in order to achieve sustainability goals. Collaboration with stakeholders in the supply chain is key in order to make (numerous small) steps together

[14] Question 9. Which colleagues (within your company) are involved in the sustainability 'goal' of your company?

[15] Question 10. How are you trying to achieve this?

[16] Question 12. With which parties, companies, would you like to work together to bring this goal to a higher level?

[17] Question 11. With who do you have to work together in order to achieve your goals?

How companies measure whether they achieved their sustainability goals[18] was a more difficult question to answer, as most companies do not really have specific measurement methods for that (yet). This is in line with the information found in the literature.

Conclusion Q13: Companies do not have established measurement methods and tools for sustainability yet

Labels

Although these questions do not contribute to answering the research questions directly, they were included in the interview to get more background information and to check how 'difficult' it is for companies already with all labels currently on the market.

Conclusion Q14[19] and 15[20]: There are no specific textile labels must-have's, or nice-to-haves (yet)

Objectives for Closing the Loop

Question 16[21] was also included to get more background information about the company of the interviewees, and is valuable for the interpretation of the answers on the next questions.

Conclusion Q16: N.A.

The answers of the interviewees about what their thought is regarding closing the loop of the entire clothing industry more ore less all had the same message, and is in line with the answers on the question 2:

Question 17. What is your thought about closing the loop of the entire clothing industry?	
Response	**Interviewee Code**
Necessity	ES - FE

[18] Question 13. How do you measure whether you achieved your goals?

[19] Question 14. Are there certain textile labels you cannot do without (must have), but which are a pain in the neck – and there are no alternatives for? (for example GRS)

[20] Question 15. Which labels would you like to have (want-to-haves)? (for example Green Shape)

[21] Question 16. How is your supply chain organized?

I think the return process, the acquisition process is really difficult	PK - MB
Good	MG - FU
Good and feasible But keep segmentation of 'the ideal' in mind - where your focus will be (in the first place)	AA - MB
Necessity	CB - FE
Technically a huge challenge: therefore more than interesting. Stop extracting more raw materials than we can replenish	DV - ME
Not on the 'short term'. But should be supported as it is a really difficult process: different cultures, countries, ways of organizing	WW - FE
High need	VV - FB
It is the future, and has potential	NM - MB
A nice endeavor but these techniques are still in their infancy	AH - FB
Interesting next step in our product innovation process	MK - FB
Necessity but a long way to go	SS - MC

Conclusion Q17: Closing the loop of the entire clothing industry is a perfect endeavor - a huge challenge with potential and a necessity

Question 18. How great is the need for a CLSC in the clothing industry?	
Response	**Interviewee Code**
Huge	ES - FE
Huge	PK - MB
Huge	MG - FU
No interested consumers as long as clothing can be sold for the low prices as they are right now - all dependent on price!	AA - MB
Huge	CB - FE
From social point of view: large. Consumption and thus the use of natural fibers is disproportionate; no longer justified	DV - ME
Huge: we cannot maintain the current way of living	WW - FE
Really high	VV - FB

When commonplace: more important	NM - MB
Small, but this can change when the attitude of the whole attitude wrt sustainable clothing changes	AH - FB
Huge - the clothing industry is generating a lot of waste	MK - FB
Huge	SS - MC

Conclusion Q18: The need for a CLSC in the clothing industry is huge, although some changes are required before this can be established

Question 19[22] was also included to get more background information about how involved and informed the interviewees are in the sustainability business.

Conclusion Q19: n/a

As expected, there is not one specific stakeholder that is indispensable to close the SC of the clothing industry. Interviewees mentioned that all stakeholders need to be involved as awareness need to be created first (so it can be said that the change of mindset of the consumer is most urgent: 'they need to become aware of the damage cheap fashion causes' (NM – MB)), for which cooperation between all stakeholders is essential. Of course, dependent on the business the interviewee is in, they all mentioned one or two parties, but in the end they all agreed that it is the cooperation that is of utmost importance to increase the awareness and thus close the loop.

Question 20. Which stakeholders are indispensable to close the SC of the clothing industry, and what is and should be their role in the management of the CLSC?	
Response	**Interviewee Code**
All important	ES - FE
n/a	PK - MB
Awareness, and stop the fast fashion	MG - FU
Government - have a lot of initiatives, but takes too long and could do more. Industry can be more creative: new BM's	AA - MB
Brands and unravelling companies	CB - FE

[22] Question 16. How is your supply chain organized?

Cotton and oil industry, governments, brands, spinners and weavers	DV - ME
All parties, that is why it is so difficult	WW - FE
Large fashion organizations with market power. But smaller companies play an important role and can sustain this process	VV - FB
Consumer. Should be willing to pay more - prices are way too low compared to the damage cheap fashion causes	NM - MB
Consumer and manufacturers	AH - FB
Suppliers, Brands, Consumers	MK - FB
Collaboration is essential	SS - MC

Conclusion Q20: Cooperation between all stakeholders is key to close the loop, and the mindset, awareness, of the consumer is essential to 'restart' the loop

A nice example of collaboration between stakeholders is the 'Green Deal Textielinzameling' with the main objective to decrease the amount of textile in the residual waste with 50 percent, in other words 4.2 kilo per inhabitant per year in 2015 with 2011 as the base year (Green Deal, 2011).

To continue with the importance of collaboration, the question of what is seen as the most important step of the CLSC to make it a success comes up. Again, because the interviewees are working in different parts of the SC, the answers on the question were diverse – what was not different than expected.

Question 21. What, in your opinion, is the most important step of the CLSC, to make this a success?	
Response	**Interviewee Code**
Involve all parties in the chain	ES - FE
Acquisition and remarketing/creating awareness	PK - MB
Remarketing: awareness of the consumer	MG - FU
There has to be an added value for EVERY party in the chain, when one is missing, CLSCM will fail	AA - MB
Remarketing and Remanufacturing	CB - FE
Remanufacturing - using materials that can be recycled	DV - ME

Subsidies of the government for all companies would be good	WW - FE
Get all parties aligned, involved	VV - FB
Awareness and legislation - should be on global level	NM - MB
Remanufacturing - when the quality is not good enough, there is no future	AH - FB
A good system for the collection - make it 'normal' and thus easy to hand in your clothes	MK - FB
Again - collaboration is essential	SS - MC

An interesting statement was the one from WW-FE. When all companies would receive subsidies to invest in a more sustainable way of doing business, this movement could take place faster and more equal, as some parties need to invest more and than others.

Conclusion Q21: There is not one evident step of the CLSC of the clothing industry that can be designated as the most important one make it a success

Question 22. Do you feel a pressure for closing the loop?	
Response	**Interviewee Code**
I do not want to feel pressure, involve everyone to make it feasible	ES - FE
Of course, like everyone - in the end	PK - MB
Sure. We would like to be an example for other companies	MG - FU
Our business was born out of idealism. But everything needs time	AA - MB
Too little experience, but I think awareness is too little	CB - FE
Yes - social pressure for the next generations	DV - ME
Philanthropic	WW - FE
We are all responsible for the world: more idealistic / philanthropic	VV - FB
No - not acutely	NM - MB
Not really a pressure – it is purely a positive stimulus	AH - FB
Yes - it is an interesting next step in our product innovation process	MK - FB
Part of our mission	SS - MC

As you can see, most interviewees do not feel a pressure by the current or future legal responsibilities, environmental organizations or whatsoever. This is also because they do not want to feel a pressure, but that they would like to serve as an example for other companies, industries, what can be translated to a social, philanthropic pressure. These answers were not really in line with what was expected, as the expectation was that current or future legal responsibilities, and/or environmental organization would have a large (larger) impact on companies than they seem to have.

And this resulted in the answers on question 23[23]: almost all interviewees feel responsible to make this step, the only interviewee who was a bit more reluctant was NM-FB: 'We feel responsible to be busy with it and grab opportunities when they arise' – so this is perhaps just somewhat more realistic instead of only idealistic.

Conclusion Q22&23: No real pressure is felt to close the loop except for a social, philanthropic pressure – people feel responsible

Risks (Bottlenecks) of CLSCM of the Clothing Industry

Coming back to the risks mentioned in paragraph 2.5 - the timing, quantity and quality of the clothing could be predicted quite reliably when the chain would be transparent – and this transparency could be achieved through collaboration by means of alliances between stakeholders in the CLSC through which synergy is created. When good established relationships would not be present, there is a big chance that one of the parties in the supply chain would lack commitment and that the circle will be broken somewhere: a huge risk in supply chain management, and an even bigger threat in closed loop supply chain management.

1. The first type of constraint in Supply Loops is *no market demand*. It is known from literature that there is demand, however, the extent of this demand is not that clear: ⇨ From the information obtained from the interviews it can be said that there indeed is demand, but that this demand is very small: the mass market is not ready yet. The image of clothes with recycled content is still that it has a 'poor quality', is 'dirty', and 'less valuable':

[23] Question 23. Do you feel responsible to make this step?

Question 24. Recycled materials are being used already, but the information about the composition is most of the time not made visible to customers because it was not known or they just did not do that. Why do you think companies are not proud of using recycled materials (so far), and sharing this information?	
Response	**Interviewee Code**
There is demand already, but the market is not ready yet	ES - FE
Image it has, has to change, and brands now see it as a necessity instead of something to be proud of	PK - MB
No demand yet, no added value	MG - FU
The consumer 'does not mind' at the moment, so why would you 'sell' this information then?	AA - MB
Most people relate recycled clothes with poor quality	CB - FE
No demand and regulations did not allow it (recycled cotton was not allowed in some countries)	DV - ME
No capacity for marketing + take it more or less for granted: not aware of that they could bring over an innovative message	WW - FE
We are sharing this information and they are interested	VV - FB
Dont know, may be because consumers see recycled as less valuable	NM - MB
There is, was, no demand yet	AH - FB
No idea	MK - FB
Knowledge, skills and experience not present, and again the price/quality ratio	SS - MC

These answers did not surprise me; when the mass market would be interested already, recycled content in garments would have been more well-known and used by now. This brings us to remarketing, 'telling a story': this should change the mindset of the consumers.

Conclusion Q24: The interest in recycling is growing, and companies need to become aware of the fact that they could bring over an innovative message by using recycled content in their products

2. Secondly, it is already known that *reprocessing the clothing* is technically feasible, and regarding the economic feasibility of producing clothing with recycled content more information was obtained through the interviews.

   ➡ On the question what the interviewees see as the largest risks (bottlenecks) in the CLSCM of the clothing industry, the following answers were given:

Question 25. What do you see as the largest risks (bottlenecks) of, and in a sustainable clothing industry, the CLSCM of the clothing industry?	
Response	**Interviewee Code**
Acquisition: too much transportation will not solve the problem – therefore: up-cycling would be great.	ES - FE
Remarketing, to make it attractive for a large customer group	PK - MB
Marketing: creating Customer Awareness	MG - FU
Price	AA - MB
Quality of clothes and toxic substances.	CB - FE
Money and technique	DV - ME
Everyone working in unison is difficult as everyone has its own interests	WW - FE
We can all make a change in our own way - but now we all have to do it	VV - FB
Price	NM - MB
Decreasing quality of the clothes, style problems	AH - FB
Content of elastane fibers in garments; buttons, zippers, rivers make recycling hard; collection; chemicals.	MK - FB
Risk: price/quality ratio	SS - MC

As you can see, interviewees indeed mention price as a bottleneck. A lot of money is needed to solve all (potential) bottlenecks: to invest in a more sustainable way of production and consumption. Besides, the consumer should be willing to pay a higher price, as subsidies - when present - cannot cover the entire investment of course. Especially for the smaller labels price is a huge challenge.

One other thing with regard to reprocessing (see next question): several interviewees mentioned the quality of the clothes; and the number of cycles that a material can be

reused as a risk as well - this is something that has to be learned from practical experience. The last thing that should be mentioned is that we indeed should be cautious with too much transportation (ES-FE) – as this would not solve the problem either. Localize the chain again instead of spreading it out over the whole world would be best if you would focus on transportation, but of course this is not as easily done as said.

Conclusion Q25: The price of sustainable clothing, clothing with recycled content, is seen as a large and overarching bottleneck

3. *End-of-life product not accessible* was the last risk mentioned by Geyer (Geyer, 2004). This can become easier when collectors are connected to the CLSC as well.

   ⇨ Although it must be said that the inclusion of this step in the SC is something that has a lower priority than all other parties in the SC, as the collectors are already doing this, and their business will only become larger as they will be able to sell more (for a higher price). Besides, the statement made by AA-MB is really interesting.

Question 26. What, in your opinion, risks exist in recovery of clothing?	
Response	**Interviewee Code**
Is it feasible for small labels as well, as it is costly? Can they use recycling systems of bigger brands?	ES - FE
Again, Acquisition	PK - MB
I do not really see a risk (yet)	MG - FU
At the time recycled material will become scarce, we will find a solution: all creative people in this sustainable industry	AA - MB
Limited access to the products, Limited market demand for the output	CB - FE
No danger, perhaps only in the number of cycles that a material can be reused	DV - ME
I do not have enough knowledge about this, but I do not think people see a danger in recovery	WW - FE
No - not yet at least	VV - FB
Decrease of the quality	NM - MB
Limited feasibility of reprocessing	AH - FB
Quality and the pass on of chemicals from recycled fibers into new garment	MK - FB

The availability of monostreams	SS - MC

Conclusion Q26: There are no real high risks in the recovery of clothing identified

Opportunities for CLSCM of the Clothing Industry

An advantage of fibers is that it does not have a short-life cycle, and thus no high obsolescence risk (Guide & Wassenhove, 2005). If course the interviewees mentioned opportunities as well[24]: improvement of the image and competitiveness (CB-FE); the technique and consumer pressure (DV-ME); 'improvement of the quality and decrease the price so that it will be as interesting as virgin materials' (SS-MC); footprint (NM-MB); make recycled material an important raw material for the clothing industry (MK-FB). The statement made by AA-MB and which encompasses all is that all interviewees agreed that: 'in the end, it is better for everyone to do more with 'waste' – it is an enormous opportunity'.

4.3 Part 2 - Internal Stakeholders

Both social developments (regulation and consumer awareness) and technical developments (ICT, RFID) enable the concept of CLSCM. Sustainability implies innovations in SCM as in order to fulfill sustainability requirements, the product must be tracked and traced in all stages of the supply chain (Bloemhof, 2005).

'Traceability is a tremendously impactful tool for advancing sustainability objectives. Global collaboration, driven by multi-stakeholder collaborative schemes, is the key to success in traceability' (UNGC BSR , 2014)

4.3.1 Initiator of the CLSCM - The REMO System

The REMO System provides exact information about an item's origin and past established through a powerful track and trace system providing transparency in a complex production chain (REMO, 2014). In the beginning, there should be a pull strategy: focus on brands, consumers. Not on the supply chain (Chawla, 2014). The supply chain will follow when the brands are asking for it, in other words: they will push it into the supply chain. Besides, not all brands and retailers have established relationships with each supplier in their supply chain and thus can request this information right away (Historic Futures Ltd, 2013). The only reason for companies pushed by

[24] Question 26 – Appendix 6

supply chain to become member is when the REMO System adds value. For companies pushed by brand, *Clothing brands B2C*, the REMO System' service includes:

1. By format of delivery
    - Physical: cardboard tag / stitched on cloth label (separate in / on garment or as part of brand's own label) / printed-on-garment (electronic ink) / co-creating a new original bespoke medium for messaging
    - Technological: alternative ways of unlocking the information on the REMO Key within a secure and branded environment: online landing page, through an app, augmented reality
2. By content of delivery (web and mobile-focused)
    - A simple well-designed table
    - Bespoke stories told through still images and words, moving GIFs, and/or animation
    - Bespoke stories told through audio-visual and interactive experiences

For companies pushed by brand, *Clothing brands B2B*, the content of delivery is the same, but the physical format of delivery is perhaps not required for (all) B2B – work-wear for example – what can save costs for B2B customers.

For *companies pushed by supply chain* – adherence to the disciplinary REMO System can obtain the following advantages:

1. The guarantee of suitability to the recycling production system
2. The possibilities to supply brand products that help increase the amount of recycled products
3. The online presence of recycled products to offer to the market

This is done by means of:

4. Assessment of the production chain
    - Base intake: ability to handle and report recycled material
    - Full assessment: base intake + verification of labor and environmental practices
    - On site assessment: full assessment + a physical audit

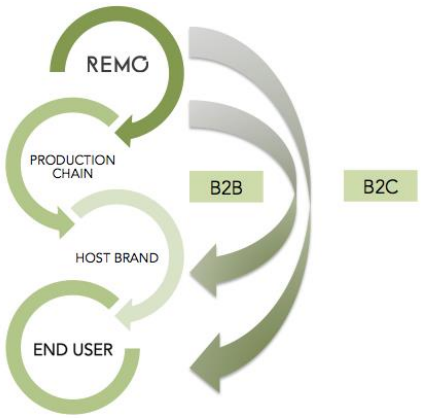

Figure 16 End Users REMO System (REMO, 2014)

This exact product offering has not been offered before, and is currently not offered by another organization. However, the Sustainable Apparel Coalition (SAC) has been thinking and writing about QR codes on garments. The SAC was established in 2010, and now they have an expanded membership of retail companies, apparel and shoe manufacturers, fashion houses, non-profits, and the EPA (Environmental Protection Agency), that seeks to reduce the environmental and social impacts of the clothing industry (by improved sustainability strategies and tools to measure and evaluate sustainability performance) across the globe (Kaye, 2011). The chief tool is the Higg Index, what is an indicator based apparel and footwear industry self-assessment tool for assessing environmental and social sustainability throughout the supply chain.

Now this coalition asked itself the same question as REMO does: 'How is it possible to connect people to the wealth of environmental and social data that is now available in a way that changes their purchasing habits?' (Confino, 2014). Part of the members of the coalition is already convinced by the QR code, as they see this as an opportunity to give the consumers all information required to make a sustainable choice and go for the companies that are responsible. But not all members are convinced - they say there is no point in sharing this information, 'unless it becomes part of people's decision-making process, and so far other efforts of this kind have not lived up to their promise' (Confino, 2014).

Honest By

The best example of the closed loop supply chain management, the traceability, the REMO System is aiming at is Honest By (Honest By, 2014). Honest By is a web-shop established by a designer – Bruno Pieters, who works together with international designers who are invited by him to create a 'green' item, look or collection exclusively for the Honest By store. They give their 'secret' away by communicating all information regarding a garments production process:

something not a lot of businesses will do (nowadays), as their mission is to offer their customers the opportunity shop in a completely conscious way by offering products that have the smallest impact on the environment and human health as possible. By doing this, Honest By wants to shed light on the questions: where is it made and by whom. Bruno Pieters believes that 'fashion is a celebration of beauty and that the story behind that celebration can be equally beautiful' (Honest By, 2014).

Comparable Track and Trace Systems

Made by is a European not-for-profit organization with a mission to improve environmental and social conditions in the fashion industry (Made-By, 2014). Making sustainable fashion common practice is their mission. With the Scorecard System they measure, benchmarks and track a brand's progress year-on-year: in a way that is transparent. These scorecards can be used to develop business plans, which improve their social and environmental footprint. It is therefore a logical step that they came up with the idea of a track and trace system as well: to make the fashion industry even more transparent. After email contact with the company that had a partnership with Made-By for several years: Historic Futures, and a conversation with a REMO colleague who talked to Made-By before, the reasons why that track and trace system did not work out could be deciphered.

The company offered their 'String' technology (Historic Futures Ltd, 2013), which collected the data from each participant in the extended supply chain for specific batches of Made-By co-branded goods. String provided an API to allow the Made-By website to look this information up when a consumer visited their website and entered the batch code found on the garment label. However, as of 31 December 2012 their track and trace is no longer available, brands are either managing the system themselves, or they are implementing an alternative traceability system. As mentioned by Made-By it was only because it was no 'priority for them anymore': they wanted to become self-funding, and therefore had to find profitable services: therefore they now are more focused on consulting and score carding.

But this was of course not the only reason why such a valuable system was no longer available. Historic Futures had more information. First of all, it was a shared ownership, the technical party Historic Futures also had the responsibility of selling the system – what was not working out as that is not their specialty and they did not have enough people to service it: for the implementation as well the sales. Other important reasons were that it was too costly; too difficult

to implement and to use; and there was a lack of awareness of customer 'need' within the value-chain.

Important lessons learnt that should be taken into account when developing and improving the REMO System. Historic Futures has since then withdrawn their String service from the textiles industry - but are now working on the development of a new improved version based on everything they have learned over the last 10 years. Of course they are not willing to share all information, but to keep an eye on this player is really important.

The majority of the interviewees said they have been thinking about a track and trace system before[25], as it is highly important in CLSCM: 'transparency is everything' (AA-MB), 'it is essential and the only tool that the consumer will use and trust in his/her search for information and origin' (DV-ME). However, most of them not really in concrete terms.

Conclusion Q28: Most companies have been thinking about a track and trace system before but most of them not in concrete terms

The interest of the parties in the supply chain for the REMO System is (therefore) predominantly really high.

Question 27. What do you think about the REMO System?	
Response	**Interviewee Code**
Really good system, hope you can connect REMO to all chain partners. However, creating awareness will be difficult	ES - FE
Interesting, but again be aware of the alternative/idealist image recycling (still) has	PK - MB
More than interesting	MG - FU
Really interesting	AA - MB
We are REMO partner	CB - FE
Excellent - would be even nicer if the track and trace would be there for the entire product: including virgin material	DV - ME
Really interesting, could have a snowball effect once yo have convinced one party	WW - FE

[25] Question 28. Track and trace systems are highly important in CLSCM, have you been thinking about using this before?

Can be an excellent tool towards a sustainable future, have a strong impact if more companies would agree to adopt it	VV - FB
Sounds promising	NM - MB
Absolutely useful in the future	AH - FB
Good initiative	MK - FB
Interesting	SS - MC

Interviewees are positive about the REMO System and would be interested to work with it[26] – in a greater or lesser extent. But again, awareness creation is seen as a huge challenge: thus not only for the consumers but also for all chain partners.

Conclusion Q27 and Q31: Companies are highly interested in working with the REMO System, although awareness creation is seen as a huge challenge

On the question whether the companies, the interviewees, would be willing (and whether it is an option) to be transparent in their supply chain[27] the answers were primarily positive. This was a bit more positive than the expected answers. But there were some different opinions as well: 'it is difficult in the clothing industry: companies want to be transparent but hide when it starts to get difficult. Collective stimulation would help' (ES-FE), and 'it is good when you really know everything, however – this is really difficult in the clothing industry' (NM-MB). Another interesting remark was that 'everyone wants to be transparent in the end, but it is the question what is commercially needed and what is feasible' (PK-MB).

Conclusion Q29: Companies strive for transparency but collective stimulation and collaboration are essential to achieve this

So then the question comes up what is seen as the largest added value of being transparent.

26 Question 31. So, would you be interested to work with the REMO System?

27 Question 29. Are you willing (is it an option) to be transparent in your supply chain?

Question 30. What do you see as the largest added value of being transparent?	
Response	**Interviewee Code**
Insight to production, raw materials and price structure	ES - FE
The consumer has right to transparency. But there is a boundary as well: traceability in detail raises the question: how credible are you, and besides is it feasible regarding costs? This balance is interesting	PK - MB
Communicating this valuable information to the consumer	MG - FU
Worn to reborn. That is beautiful. You can really see the savings and the recycled material.	AA - MB
See all information of the SC, the composition and the environmental savings.	CB - FE
Automatically doing the best in all facets of business	DV - ME
For the production this is most valuable, and for the consumer a positive message.	WW - FE
Ensuring that every component in every product we sell has the smallest impact on our health and the environment	VV - FB
Being fair and the fact that you have nothing to hide	NM - MB
Knowledge is power	AH - FB
Nothing to hide: informing your consumers even better	MK - FB
Understanding all your processes	SS - MC

The statement of PK-MB is really interesting; finding an optimal balance between credibility and costs is key.

Conclusion Q30: Transparency is really valuable in order to attract and retain consumers as well as for companies themselves as they then have all information required to identify their strengths and weaknesses

The last two questions of this paragraph[28] were included to get more background information about the integration of the REMO System in companies. However, most interviewees did not have enough information yet to answer these questions.

Conclusion Q32&33: n/a

4.3.2 Companies pushed by Brand

Consumer attitudes about the materials and ingredients in products they buy are rapidly changing, shifting toward products that are ethically or sustainably sourced - and clothing is no different' (Strategic Sourceror, 2013)

Companies pushed by brand are the companies that might be interested in the REMO System and might want to produce REMO certified clothing. REMO certified clothing went though the supply chain in which companies operate that are REMO certified and thus have send information about every stage specific into the cloud. As they use recycled materials, this attracts (a certain type of) consumers that care about the environment. But this consumer group needs to become bigger. We simply cannot sustain current lifestyles. 'Our current system is malfunctioning; a finite system of take-make-waste that has led us to live in, not only an economical crisis, but an ecological and cultural crisis as well' (Ogtrop, 2014) 'If we can not get the consumer involved, we will always be behind the curve' (Drummond, 2013). Changing consumer behavior is seen as a long-term (marketing) strategy that is creating the company's preferred future operating environment. It is no longer an extension of CSR and it can help to create long-term success. But the question is: how can the consumer be persuaded to act more responsibly?

A number of companies are using knowledge of behavior change to 'nudge' consumers into action. Unilever has defined five levers for sustainable living (Unilever, 2014). It benefits from insights into behavioral change including practical 'nudges' such as the use of social proof[29]; choice editing[30]; framing[31] and prompts[32]. To change behavior you need to change what

[28] Question 32. Do you see complying with the REMO System as an extra hurdle, or as an enormous extra value? Question 33. What would help you to integrate the REMO System in your company?

[29] If other people like me to do it, it is likely that I will

[30] E.g. have people opt out rather than opt in

[31] How you frame the marketing message based on a knowledge of what will motivate them to act

people think, feel, believe and do, not simply what they know. Whatever it is called – social marketing, consumer behavior change or sustainable behavior change; it is the next big thing (Drummond, 2013).

For businesses there are numerous other reasons to 'green' their company (Climate Change & Environmental Services, LLC , 2011). First of all, new products can give you a competitive sales edge through which you will sell more. Secondly, you can raise employee morale: a lot of firms with 'green' programs have reported that many employees developed a new devotion to work and the company. Another reason is fast-tracking future projects: green programs can be used as the moral high ground to negotiate for a project that some may dispute. Improving efficiency: reduced fuel and electricity on the one hand, but growing operations on the other hand leads to better operational efficiency and thus improved profit margins throughout the companies business. By evaluating climate change risks you make sure that you are prepared. Company valuation is another really advantageous reason. A recent study shows that companies that emit lower quantities of GHG's have a higher value, based on stock price, than those that emit more carbon: they would be more efficient, effective and business savvy. Last but certainly not least is the fact that companies can improve their reputation by operating green. 'Being more sustainable seems to improve the reputation of a company and could increase profit' (Price Waterhouse Coopers, 2008) (Koedijk, 2006). Here the REMO System can add value as well.
Building trust and credibility in the relationship with brands by means of collaboration and information sharing which increases the transparency and openness in business processes is really important for the supplying firm – REMO, as otherwise the SC will not have a market to sell it to. In the long run, it would be great if the brands would organize their return flow: the first stage of the CLSC. For now, garments from the collectors, sorting stations, are used and delivered to the unravel companies.

Although product ranges, materials, dying techniques, water use, logistics, and so on differ substantially per brand and garment – which makes it challenging to compare them and draw conclusions regarding sustainability – a couple of brands willing to cooperate in this research, and a couple of brands about which a lot of information regarding their sustainability strategy could be found on the internet (large companies leading in sustainability) were selected.

[32] Reminders of how to act at the point of relevance in space and time; much like the use of the green man for crossing the road

C&A

'C&A has understood from the start that sustainable apparel requires a sustainable supply chain and that the amount of water consumed and polluted, the water footprint of the supply chain, must be reduced to sustainable limits' (Ruth Mathews, Executive Director, Water Footprint Network (C&A, 2013))

C&A and the Water Footprint Network announced a partnership to improve water sustainability of textile supply chain in august 2013. Mandatory guidelines are being developed: instruments and trainings for partners, cotton farmers and factory workers. Besides, C&A plans to work with other stakeholders and draw up possible solutions for pressing environmental issues, in order to achieve an overall improvement of water conditions worldwide (C&A, 2013).
And this is just one example of an initiative from C&A to protect the environment, take their corporate responsibility seriously – something they are doing for twenty years already. A lot of other targets were set in their C.R. report.

C&A also confirms that in recent years the management of the supply chain for textiles has become more challenging. Suppliers often appoint producers who, in turn, may employ the services of subcontractors. This may result in long transportation routes not only for the individual components of each garment, but also for the finished product. Before the owner of a garment can actually wear it, it has already covered many thousands of miles (C&A, 2012). Besides, C&A is a trading company. They do not manufacture goods themselves: they either purchases them ready for sale or arrange for them to be produced according to their designs or their own specific requirements.

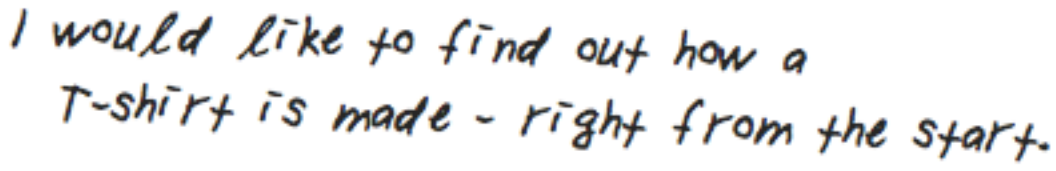

Figure 17 From 'We Care, Acting Sustainably' Report C&A (C&A, 2012)

C&A sees this as something highly valuable, as they aim to communicate openly, honestly and transparently with its customers, staff and other stakeholders. But, as stated in their C.R. report: much work still needs to be done in terms of increasing the transparency necessary in the early parts of their supply chains – it is an enormous challenge. That is why they are now collaborating with REMO.

G-Star Raw

In contrast to for example Kuyichi, G-Star Raw – commonly called G-Star – did not start their company with the idea of producing sustainable fashion. G-Star was established in 1989 producing urban clothing (G-Star, 2014), and in 1996 they introduced their famous raw denim jeans: unwashed, untreated, directly from the factory. G-Star nowadays has over 6,500 selling points worldwide.

However, G-Star Raw acknowledges that only when they are creating products with minimal environmental impact they will be able to persist as a successful company. They look into sustainable solutions and carefully consider the materials used for their products. They know that they can make a big move towards minimizing the environmental impact by looking for materials that contribute to a more sustainable future – all without compromising on quality, comfort and design. G-Star Raw aims to gradually increase the use of sustainable materials in their collection. In Appendix 5a you can find the materials considered sustainable by G-Star Raw, based on the Made-By environmental benchmark for fibers – which you can find in Appendix 5b. Ten percent of the 2012 collection of G-Star Raw is made of organic cotton. Other figures of G-Star Raw can be found on their Made-By Scorecard – see Appendix 6.

As sustainable, innovative materials are less widely available than conventional ones, they often require more complex production processes and longer lead times. Fitting them into the supply chain is therefore also for G-Star Raw a challenge that is taken on in close cooperation with their suppliers. REMO can help them with this process.

H&M

Although there was no interview with an employee, a lot of information can be found online about H&M. Using ‘conscious’ materials – Better Cotton, Organic Cotton, Recycled Cotton, and Lenzing Tencel – is key to achieve their target of sourcing all cotton from more sustainable sources by 2020. This commitment to better raw material sources plays out in the requests to suppliers, as H&M is not directly involved in the purchase of raw materials. Without certification, a ‘conscious’ material will not be used. BCI is also part of their strategy to transition to more sustainable cotton – H&M invests for example in farmer training to assist in the transition from trail to implementation phase. ‘H&M would like to see traceability schemes including BCI develop in scale, and recognizes a need for better technology to support them’ (UNGC BSR , 2014). Next to the cotton, H&M has seven commitments regarding sustainability, which should

help them to create a better fashion future (H&M, 2014).

Kuyichi

At the time of establishment in 2001, they were the first conscious fashion brand. 'How is the garment made and by who?', those two questions are highly important for the business of Kuyichi (Kuyichi, 2014). Sustainability all starts with being conscious is what they say. Being conscious is all about development, collaborate, and thinking forward. Since 2001, they have been at the forefront of innovations in sustainable denim and fashion-wear – constantly working to clean up their production process and increase its use of sustainable materials. Today, Kuyichi has more than 120 selling points in the Netherlands, and is available in more than 200 stores across Europe as well as in Indonesia, and a number of other countries (Made-By, 2014).

Kuyichi is already doing a lot to become more and more sustainable: using recycled cotton and PET bottles in their collections; using organic cotton; recycle denim; working with natural (indigo) dyeing techniques; using water, energy, and chemical saving production techniques throughout the supply chain; working together with other companies involved in the creation of their product on advanced water recycling and cleaning processes; recycle waste fabrics from the denim mills as well as the stitching lines; using recycled vegetable tanned leather patches, recycled polyester labels and trims made of recycled metals ('Zamak' (Encyclo, 2014)[33]) – aged and finished with natural processes and dyes; and using recycled paper hag tags and recycled material for packaging. It can be concluded that they are doing a lot on sustainability already – visible on their Made-By Scorecard[34] (see Appendix 7). They are interested in the REMO because precise information per garment can be given – in addition to the overall information of their business. Secondly, they are using a lot of organic materials, but the REMO System can contribute to help to close the loop: use more recycled materials. To briefly go into *organic cotton* versus conventional cotton crops: the main point is that it is grown without pesticides, herbicides and chemical fertilizers (Everman, 2009), but it is questionable whether it is truly the better choice because of the following. First of all, higher transportation cost as the organic farmers are for example not as common in the US as in Peru, Turkey and Africa. Secondly, all cotton is dyed – and as there is no labeling system for products made with low-impact dyes, all manufacturing facilities can just say that their organic cotton is dyes using

[33] Zamak is a family of alloys with a base metal of zinc and alloying elements of aluminium, magnesium and copper
[34] This Scorecard is published each year and shows the social and environmental progress of companies – verified by Made-By

sustainable means, even if it is not. Last but not least: cost. Organic cotton is 10 to 45 percent more expensive than conventional cotton products (Everman, 2009). So, although organic cotton production is not using chemicals; less water; and no genetically modified (GMO) seeds, there is no clear winner.

Nike

'The 'age of abundance' is over. Conspicuous consumption, wanton waste of natural resources, cheap energy – those days are long gone. In this new world, resources are scarce, and sustainability is a business imperative' (Nike, 2010/2011)

Nike came up with some EPM's (environmentally preferred materials, in three classes: 'good', 'better', and 'best') in their sustainability report as well. Organic cotton and recycled polyester are the two materials important to mention with respect to the manufacturing of clothing. However, they acknowledge that more research is required before the 'better' and 'best' EPM's can be brought to market. Through innovations in these materials, Nike aims to create disruptive change in the industry and set new benchmarks for sustainability and performance.

But they state that as contract factories typically source materials directly from material vendors, they do not have direct insight into volume of materials purchased or everything that happens to materials before they become final products. This is the case for a lot of brands, and makes the ability to be transparent more difficult. Nevertheless, Nike made the commitment to greater traceability and transparency. So a lot of efforts are undertaken already. Nike made several of their scoring tools available to the industry (through the SAC), in an effort to improve the sustainability of materials beyond their value chain. With a long-term vision to have a widely adopted industry means of rating and reducing the environmental impact of products, they know they have to work together to make this goal feasible.

Noppies

Noppies strives to perform all production processes in an economically socially and environmentally friendly correct and sustainable manner. 'When we speak of sustainable, we mean a type of management that keeps in mind the wishes and needs not just of the current generation, but also our future generations' (Noppies, 2014). Noppies takes, as much as possible, available precautions to keep dangerous chemical substances out of the process of manufacturing their clothing. They adopted amongst others the BSCI standard by the Foreign Trade Association

(FTA); and their production resources are deployed as efficiently as possible to limit refuse and resources going to waste. Besides, they took several policy measures to reduce carbon emissions such as energy efficiency measures in terms of lightning and started with organic cotton for one of their collections – although it is not clear what percentage of the total volume this represents.

But, Noppies is not communicating concrete about the policies for environment, carbon emissions or labor conditions in low-wages countries, therefore they received the lowest possible sustainability score from Rank a Brand (Rank a Brand, 2014).

PUMA

'When Puma started with sustainability projects years ago – with the vision to distinguish and to be producing hundred percent neutral – people were thinking this company is totally crazy, but look where they these days' (Korver, 2014)

PUMA initiated a lot of sustainable projects and initiatives. To start with: the product Economic Profit & Loss Account (EP&L). This account evaluates environmental impacts and attaches a tag denominating the price. Their aim is 'to communicate in a transparent, credible, educational way and full of PUMA JOY' (PUMA, 2012). Although PUMA states that they do not expect the customers to absorb the costs of the impacts, the REMO KEY could contain more information and could be made visible in a more interesting way, a way through which the customers will be willing to pay part of these costs or at least acknowledge the need for better use of scarce raw materials. PUMA is convinced that providing information is a powerful assessment tool for comparing the level of sustainability for different products; what is in line with the idea of the REMO System.

With the InCycle collection PUMA took a first step in addressing the environmental footprint of the consumers' disposal, helping them to reduce their personal waste generation: the collection is either biodegradable or recyclable.

Another index PUMA is using is the Sustainability Index (S-Index), a standard serving as an internal benchmark for the development and manufacturing of more sustainable products. It determines the amount of sustainable material PUMA needs to include in order to classify it as a 'more sustainable' product. Besides, this index determines that the product is manufactured in factories with A or B+ audited social and working standards, and besides helps to communicate their products' sustainability features to their customers (PUMA, 2012).

Besides, PUMA has been participating in the Global Reporting Initiative's (GRI) Global Action Network for Transparency in the Supply Chain (GANTSCh) since 2009. To date, over 30 suppliers (more than 50 percent of PUMA's production) are being trained in producing sustainability reports in compliance with GRI guidelines, as PUMA analyzed that the environmental impact caused by PUMA products is attributable to the SC for the largest part.

One of the risk categories PUMA mentions in its business and sustainability report are procurement risks. Applying the principles of sustainable development, the PUMA Safe team was founded years ago to support the optimal integration of environmental protection and social responsibility into PUMA's core business areas and to reconcile these two pillars of sustainable development with economic development (PUMA, 2012).

As you can see, PUMA has a clear Environmental Policy, and clear targets on its Sustainability Scorecard. Environmental performance data from both their own entities and key contract manufacturers worldwide is collected every now and then in order to keep their goal clear: 'become the most desirable and sustainable sport lifestyle company in the world' (PUMA, 2012). However, as stated by (Korver, 2014), Puma is also using a sourcing company – what makes control over this more difficult as an extra party is involved.

Tommy Hilfiger

The Tommy Hilfiger Group has its own sustainability division: the 'Hands-on' division and has a tradition of conducting business in accordance with the highest ethical standards, with uncompromising commitment to responsibility and fairness across all practices. Tommy is leading the industry in progressive corporate citizenship in every territory they produce, buy and sell their products. Integrity of the brand and their product should therefore never be undermined, that is the steadfast assurance they make (Tommy Hilfiger, 2014). Tommy insists that their business partners comply with all applicable environmental laws, rules and regulations at their facilities and in the communities in which they operate, particularly with respect to water, energy, hazardous chemicals, air quality and waste (Tommy Hilfiger, 2014).

Tommy received a quite good sustainability label this year. They are fairly transparent with regard to their carbon emissions (Rank a Brand, 2014). However they still have a long way to go to reduce these emissions, use sustainable materials and cleaner production processes. Tommy started to investigate the possibilities of incorporating sustainable materials in collaboration with

BCI and Made-By, but at this point in time it is not clear if they use any environmentally friendly materials yet. Tommy also committed to the Detox Catwalk (see paragraph 2.4.1), although it must be said that in this process, Tommy belongs to the group of brands categorized as 'laggards' according to Greenpeace. With regard to their policy to minimize environmental pollution of chromium and other harmful substances from leather tanning processes it is known that they are developing methods to minimize the environmental impact of the wet processes, and is identifying goals for the future. Although it was written a few years ago, it can be said that this statement made by a student from AMFI who did a study on the involvement level of Tommy regarding the 21st century sustainable clothing challenge, still holds: 'Tommy should implement transformational change, with the help of clear timeline towards sustainability. Tommy should not start with small measures, but rather with big jumps. Only then sustainability can truly become a part of Tommy Hilfiger DNA and can be integrated within its branding and marketing' (Lukawska, 2011).

Zara

A Greenpeace campaign pressuring the brand to end the use of toxic chemicals in its products had the result that the Inditex group[35] promised to eliminate all discharge of hazardous chemicals from it supply chain and products by 2020 (Environmental Leader, 2013). This is a nice example of what is possible when you have a clear sustainable strategy with clear targets (Inditex, 2011). This also resulted in the fact that Zara entered the Best Global Green Brands of 2013 for the first time (FNA, 2013).

Inditex already collaborates with numerous organizations and institutions in developing its CSR policy. The REMO System could be more than valuable for them as they state that: 'transparency is the guiding principle inspiring Inditex's dealings with all its stakeholders. Building on its transparency pledge, the company participates in the most innovative global reporting initiatives in order to incorporate emerging best practices in reporting to our stakeholders in order to provide them with information that is transparent, accurate, relevant and precise' (Inditex, 2014).

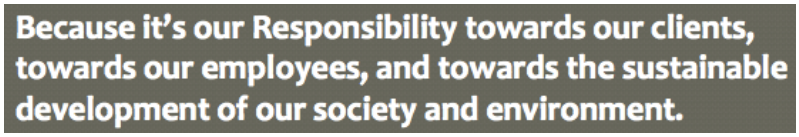

Figure 18 From Report Sustainable Inditex (Inditex, 2011)

35 Inditex Group: Zara, Pull & Bear, Massimo Dutti, Bershka, Stradivarius, Oysho, Zara Home and Uterqüe

Companies pushed by Brand	Sustainability commitments *'Detox Catwalk : Elimination of all discharge of hazardous chemicals from supply chain and products by 2020'*	View on Transparency, Traceability
C&A	Detox Catwalk + Reduce total energy consumption through measures to increase efficiency, improve water sustainability of textile SC, and meet remaining energy needs from renewable resources with low CO2 emissions.	Aim is to communicate openly, honestly and transparently with its customers, staff and other stakeholders.
G-star	Detox Catwalk + Responsible supply chain + sustainable product + sustainable operations + community involvement	Acknowledges that only when they are creating products with minimal environmental impact they will be able to persist as a successful company.
H&M	Detox Catwalk + Provide fashion for conscious customers, choose and reward responsible partners, be ethical, be climate smart, reduce – reuse – recycle, use natural resources responsible, strengthen communities	Would like to see traceability schemes including BCI develop in scale, and recognizes a need for better technology to support them
Kuyichi	Decrease ecological footprint by developing new sustainable concepts, to improve working and living conditions, to ban toxic chemicals and to reduce the waste of natural resources like oil, water and energy.	Quality fashion should be created in a 100% sustainable and responsible way. By being part of a bigger plan that drives the use of progressive sustainable materials, socially responsible production and cleaning up our production processes through collaboration, innovation, inspiration and transparency.
Nike	Detox Catwalk + Create disruptive change in the industry and set new benchmarks for sustainability and performance	Made the commitment to greater traceability and transparency: encourages and supports the transparency and collaboration around issues affecting suppliers.
Noppies	Strives to perform all production processes in an economically socially and environmentally friendly correct and sustainable manner	Is not communicating concrete about the policies for environment, carbon emissions or labor conditions
PUMA	Detox Catwalk + Become the most desirable and sustainable Sport lifestyle company in the World	Providing information, communicate in a transparent way, is a powerful assessment tool for comparing the level of sustainability for different products
Tommy Hilfiger	Detox Catwalk + Developing methods to minimize environmental impact of the wet processes	Fairly transparent with regard to their carbon emissions, but not for the entire process. Working on transparency but seen as really difficult
Zara	Detox Catwalk + Adopting innovative management practices to improve performance and become more efficient and sustainable + adding the sustainability variable to all strategies and operations + focusing and targeting commitment on consumers and team	Transparency is the guiding principle inspiring Inditex's dealings with all its stakeholders

Table 2 Summary Brands regarding Sustainability

4.3.3 Companies pushed by Supply Chain

'As the apparel industry is aware, the length of the supply chain is quite long. Because of the numerous processing steps involved in garment production, often conducted by different suppliers, the major environmental impacts of production usually occur before the Tier 1 (cut and sew) suppliers of brands and retailers. Those in the industry working on environmental sustainability, have concluded that additional focus needs to be placed on lower-tier suppliers to best improve the environmental performance of the textiles and apparel industry'
(Richardson, 2013)

Companies pushed by supply chain are the companies that are part of the closed loop supply chain of the clothing industry that can become member of REMO: the unravel-, spinning- and weaving stations. For becoming a member they pay a *year one – member ship fee*, and thereafter an annual *renewal – membership fee*, and for every kilo they handle and that they want to be REMO certified, they have to send information into the cloud and pay a certain amount to REMO for doing that (0.02 – 0.05 eurocent). In that way, the final stage of the supply chain: the assembling companies will have all information of that specific kilo of material and can attach a KEY to the garment that contains all information. This Key is attached to or sewn into the clothing. The garment can be between approximately 15-25 and 100 percent REMO. 20 percent REMO means 20 percent recycled material, 80 percent new material, and when a garment is 100 percent REMO – it is made of recycled material only.

Italy - Prato

The companies in the supply chain REMO is currently working with are situated in Prato - Italy. The companies are already recycling clothes, but on a really small scale and it is not communicated to the consumer. In other words, the valuable product they are producing is not (fully) utilized. REMO already sent its contract to five companies in Prato: Comistra, Pontetorto, Filpucci, Manteco, Newlife/Saluzzo Yarns. Building trust and credibility in the relationship with current and potential member firms, by means of collaboration and information sharing which increases the transparency and openness in business processes is really important for the supplying firm – REMO, to manage the CLSC in the best way possible.

Italy - Prato is just one small part of the worldwide clothing industry. There are of course numerous other clothing, textile, manufacturing industries in countries like Turkey, UK, Spain, Portugal, North-Africa, US, Germany, and Sweden. However, given the short period of time these

companies and countries in the supply chain of the clothing industry will not be discussed in detail as this does not add that much value to the research.

4.3.4 Collectors

The Netherlands is responsible for approx 240 million kilos of textiles per year. Approximately 160 million kilo *would* be suitable for reuse or recycling (65 percent), but only approximately 70 million kilo of textile is collected for recycling and reuse (30 percent). The rest of this textile disappears in the incinerator or ends as landfill together with residual waste.
Approximately 50 percent of the collected clothing can be worn again, and rotates back in second-hand markets and stores in developing countries. 50 percent is not suitable to be reused (technically or economically) – this is approximately 36 million kilo per year, about 20 percent of this is cotton. As it is too costly to manually sort these materials, they all end up in one or two mixed piles and get shredded. This material is suitable for low quality applications made of mixed materials only (Vereniging Herwinning Textiel, 2013).

External collectors are required to make the closed loop supply chain of the clothing industry a success. Without these (established) organizations picking up and sorting the clothing, it will be way harder, and take longer, to close the loop. REMO is and will collaborate with major collectors to stimulate (REMO, 2012):

1. Volume growth of recycled products;
2. Construction of the production chain for C2C projects;
3. Consumer loyalty through handing back the used product.

Clothing collectors are having a hard time these days. Due to the increased prices for textile, a growing number of municipalities are charging charitable collectors for the placement of containers (Veenstra, 4). Perhaps more remarkable is the fact that people are wearing their clothes longer due to the crises, and the clothes they do get rid of are sold through for example Marktplaats. Another reason is the offering by the clothing stores. Long lasting quality is disappearing. Nowadays consumers favor cheap garments that can be discarded after a couple of washes – and wear something else everyday (Bom, 2012). So, even though in some cities the volume of collected clothes is stable, the clothes have a lower quality (Gabeler, 24).

This trend means a lot to the revenue of the sorters, who are making a loss on the fraction of ‘not wearable’ clothing. As you can see in figure 19, most money is earned by the upper two categories – by extending the product life cycle. But as said, these categories are shrinking and

the percentages of the other categories are increasing. As REMO's business is a (small) percentage of the third category, this development is really interesting.

Figure 19 Value of Second Hand Textiles (adjusted from Hans Markowski, 2013)

Important to mention here is that a functional recycling system depends on consumers that understand the overall concept and how they can help individually. The return process should be convenient and simple for the customers (PUMA, 2012).

Charitable Collectors	Commercial Collectors
Humana	I:CO
Leger des Heils	OVU Recycling
KICI	Boer Groep Holland B.V. (Curitas)
Sam's Kledingactie	Drietex
	Erdotex
	Perfect Logistics Quality BV
	Sita
	Van Gansewinkel

Figure 20 Collectors in the Netherlands (Vereniging Herwinning Textiel, 2014) (Rigter, 2012) (Goeree Overflakkee Nieuws, 2014)

Charitable Collectors

Charitable collectors are really interesting to work with for REMO as their philosophy, to do something for the society, in line with REMO's philosophy. The largest four charitable collectors operating in the Netherlands will be discussed in this section.

Leger Des Heils

REMO already has a contract with Leger Des Heils (LDH), the company that receives at least 600 tons of used defence clothing annually, from the Dutch Ministry of Defence – clothing that was incinerated till the end of 2012. This contract states that LDH will purchase the produced threads from the 10 Tons of recycled clothing they will deliver in Prato, Italy.

The reason why LDH is more than willing to support REMO's efforts is because the reuse of cotton, and thus prevention of incineration, would contribute largely to their custodianship within their mission: to meet human needs without discrimination (Salvation Army, 2014). Besides, LDH acknowledges the importance of providing transparency in the supply chain in order to create public awareness. The REMO System will give this. Scanning the KEY on the end-product label provides the buyer his/her contribution by buying that garment.

ReShare is a part of Leger des Heils and the largest collector in the Netherlands. They collect approximately 23 million kilo of clothing a year (ReShare, 2014) – of which a part is being reused and the rest is brought to sorting stations for which they receive money, money they invest in social projects.

Humana

Humana collects annually approximately 10 million kilo of textiles (Humana, 2014). The collected textiles are retrieved and brought to sorting centers at various locations in the Netherlands, where the fabric is sorted on quality and type. Given their large international network, approximately 85 percent of all collected clothing gets a second life. Humana processes a part of the collected clothes themselves. This is done in centers in Assen, Eindhoven and Utrecht, where people with disabilities or people who have been unemployed for a long time work.

These sorting stations can be very valuable for REMO.

KICI

KICI is the largest independent clothing collecting charity of the Benelux (Belgium, the Netherlands, Luxembourg) – committed to the reuse of textiles and footwear professionally (KICI, 2014). They process more than 10 million kilograms of textiles per year.

KICI is sorting the textiles and footwear based on wearable or non wearable as well. Just like the other two collectors just mentioned, the wearable textiles are brought back in circulation in countries outside Europe or are given to thrift stores, food banks.
The non wearable textiles enter a high tech process of pulping and recycling, generating fibers of which new yarns can be made. In this way products such as jeans, relief blankets or insulation material for housing but even table tops, doors and new collection bins for garments can be made (KICI, 2014).

Collection Method

Markowski, director of KICI is convinced that the current collection method is quite outdated, and not (most) ideal anymore. He discussed with amongst others C&A, the idea of small containers in the shops where a voucher gets out when customers put their old clothes in. Advantages for the retailer are a higher run of customers, new customers and higher sales. And next to that, the usage of raw materials in their own garments – which could be cheaper than new cotton (Bom, 2012). C&A is already doing this, giving their customers a five percent discount on their next purchase (C&A, 2014). H&M is doing the same, and they state they do not earn money from the collection: with the money earned they pay the vouchers, donate to charities, and invest in the innovation of recycling (H&M, 2014). Eventually, H&M wants to create a closed cycle for textile fibers. The company is looking for technical solutions to close the loop. Another example of a specific brand is PUMA. PUMA's Bring Me Back recycling bins in PUMA stores help to reduce the people's personal waste generation by returning their used products (PUMA, 2012). In contrast to H&M and C&A, Puma is not giving vouchers or whatsoever in return. The answer on the question 'what do I get for my contribution?' is simply 'Feeling really, really good about yourself. You're contributing to a healthier environment by properly disposing of your footwear, apparel, and accessories' (PUMA, 2014).

C&A, H&M and PUMA partnered up with I:CO, as they offer a reliable system, and infrastructure as culmination of a process where worn clothes continuously is being processed and made ready for recycling (H&M, 2014).

So, what would be more interesting for these companies than to entirely track and trace their raw materials and reuse these materials in their new collection again?

Textiles for Textiles (T4T) Machine

Markowski from KICI agreed that something had to be done with the clothing not suitable for reuse ending up for example dusters or just burned. He is a great supporter of the new business model for the collected clothing: making new fibers out of it, so that it can be used as a raw material again. Therefore he initiated the development of an automatic sorting machine. The Textiles for Textile machine can be set to select a specific type of fabric due to the optical detection system (NIR technology), which checks the color and fiber – also commonly used mixes of fabrics. So, torn clothes are more than welcome, as the main criterion is not longer the re-wearability (Bom, 2012). New high quality fabrics can be created that can compete with virgin materials (Textiles 4 Textiles, 2014). The machine is currently still in the making, with a prototype in use at Wieland Textiles (WIeland Textiles, 2014).

Sam's Kledingactie

By collecting clothes, Sam's Kledingactie is generating money that is immediately spent to alleviate the distress in developing countries (Sams Kledingactie, 2014). So without giving money directly, people can contribute to emergency relief, rehabilitation and prevention of 'Cordaid People in Need'. In other words, this collector does not (yet) operate in the recycling scene – at least not on large scale.

Commercial Collectors

Even though commercial collectors have a different philosophy than the charitable collectors have, some of them are busy with recycling as well, and perhaps will be needed and willing (in the future) to collaborate and work with the REMO System. The largest two commercial collectors operating in the Netherlands will be discussed in this section.

I:CO (SOEX)

The real international giant in the world of secondhand clothing is the German SOEX with the Swiss subsidiary I:Collect (I:CO) – which are handling over 150 million ton of collected clothes and shoes per year – worldwide (Bom, 2012). I:CO's goal is to have all collected textiles and shoes in a recycling process by 2020.

In every country I:CO collects textiles the following formula applies: 'once 500 tons or more of textiles are collected daily, recycling plants will be built. The more products that are already manufactured in such a way that, at the end of their useful life, they can be broken down into their individual elements and returned to industry as raw material, the greater the drive towards establishing the I:CO concept worldwide – also, and especially, in the world's poorer countries.' I:CO is convinced that preserving the world is the shared duty of consumers, commerce and industry. In other words, a more than interesting party to work with for REMO.

Figure 21 I:CO Philosophy (I:CO, 2014)

De Boer Groep (Curitas)

The clothing that is being collected by De Boer Groep is processed in one of their sorting stations – which are certified by TÜV Rheinland (TÜV Rheinland, 2014) and strive for an as high as possible recycling percentage of the collected clothing. Right now this is approximately 95 percent. De Boer Groep is really serious with complying to the current law and regulations regarding working conditions and the environment: they see it as a prove of a transparent stream of the goods and a careful sorting process of a lot of varying textile articles.

4.4 Part 3 – Value Creation

Guide to Traceability

The United Nations Global Compact created this guide in collaboration with BSR (the Business of a Better World). 'The UNGC is a multi-stakeholder leadership initiative with both a policy platform and a practical framework for companies that are committed tot sustainability and responsible business practices' (UN Global Compact, 2013). With ten universally accepted principles in the areas of human rights, labor, *environment* and anti-corruption they seek to align business operations and strategies and catalyze actions in support of broader UN goals.

UNGC stated that 'traceability is a tremendously impactful tool for advancing sustainability objectives, but it still has a long way to go before it is an integral part of sustainable supply chain management and is used widely by companies' (UNGC BSR , 2014). The reason for this they give as well is that it should be a collaborative effort – something that is difficult to establish. Currently only a very small percentage of commodities are traceable on sustainability attributes.

Nowadays, more information about the origins of products and materials and the conditions under which they were produced and transported along the value chain are demanded from governments, NOG's, suppliers, buyers and consumers. The 'traceability schemes' mentioned in the report refer to 'organizations whose purpose is ensuring the sustainability of raw materials, for whom traceability plays some role'. As these organizations are generally labeling or certification organizations, or industry or commodity roundtables, they are at different levels of advancement in terms of implementing traceability. A higher level is required these days. Given the increase in demand for organic, fair trade and environmentally friendly products and materials, well-functioning traceability systems and new technologies have been, and are being developed to meet stakeholder needs. Examples are the Forest Stewardship Council (FSC), and UTZ certified – both schemes that have engaged with stakeholders along the entire value chain in order to develop credible and robust chain of custody standards and certification for products from the raw material to the final use phase.

As stated in the report, 'the focused purpose of making a specific commodity more sustainable is a powerful and uniting force for the participating companies and stakeholders', and that is what happening to the clothing industry as well. But there are a lot of limitations to achieving full supply chain traceability (UNGC BSR , 2014):

1. Supply chain complexity: engagement and collaboration of all actors along the SC is required. Developments in technology and demands for greater transparency are making this increasingly more manageable, but it is still a complex issue;

2. Availability and scale of certified, traceable products: companies need to push for and support the continued expansion of traceability schemes;

3. Costs for all supply chain actors: alignment around tools helps reduce costs to individual actors. With widespread collaboration there is greater incentive for actors to work together and will lower the overall costs;

4. Further developments in technology are needed to support traceability schemes: verification is needed at all stages, what means that SC actors need to collect and validate data and commit to chain of custody standards. While technology and tools are developing, the pace of these innovations needs to increase significantly – and mastering these technologies for traceability purposes is a challenge. *For providers of these technologies, cost is still proving a difficult and related barrier.*

The writers of this guide conducted a lot of interviews, and came up with really interesting findings. A good example is that the barriers for companies who already have put effort in creating traceability schemes were most of the time due to two key factors:

1. The reluctance of suppliers to share information
2. The fact that there was a particularly opaque section of the SC – such as agents/ distributors not prepared to share sources, or a large number of small producers that are difficult to track.

This resulted in a clear model of best practice in traceability. This model has three distinctive features:

1. One independent, multi-stakeholder *Global collaborative Scheme*. This organization provides guidance and works on commodities to advance traceability
2. *Focus*. The traceability scheme is focused on a limited number of issues, both in terms of the number of commodities and the sustainability attributes that must be traced
3. *Appropriate collaboration along the supply chain*. The supply chain actors along the way are participating in the scheme in a manner appropriate to their position in the supply chain, and are communicating with their immediate business partners

Figure 22 Global Collaborative Scheme (adjusted from UNGC BSR , 2014)

The guide also came up with gaps and opportunities for collaboration by commodity. With regard to cotton they mention relevant actors as the BCI (Better Cotton Initiative), the BCFTP (Beter Cotton Fast Track Programme), OCS (Organic Content Standard), and the GOTS (Global Organic Textile Standard) and mention active organizations like IKEA, H&M, M&S, Nike, Patagonia, Adidas, and Levi Strauss & Co. But they also mention that these initiatives need to 'gain momentum and provide standards applicable to the mass market and share best practice in order to allow for traceability'.

To conclude, this highly important guide acknowledges the urgency of traceability, but also the difficulties that are involved. What became clear from the interviews is that all parties look at it the same way: there has to be a mutual benefit for all parties, because if one party does not see the added value for them specific, the closed loop supply chain will miss a chain and therefore will collapse like a house of cards.

On the question who the initiator of the recovery should be, they had differing opinions:

Question 34. Who, in your opinion, should be the initiator of the recovery?	
Response	**Interviewee Code**
All	ES - FE
Retailer should enforce this. We always use the food industry as an example - there that is the case as well	PK - MB
We focus on the producer/manufacturer	MG - FU
The stores, those people tell the story in the end to the consumer (in person)	AA - MB
Brand and the producer	CB - FE
Producer	DV - ME
The government should have an enormous role. They should propagate their responsibility by means of subsidies	WW - FE
It all starts with yourself - so we should all be thinking about this	VV - FB
Consumer: if they ask for it, it will happen naturally	NM - MB
Consumer (should not be lazy etc.) + Brand (requires a good image to be able to use recycled content)	AH - FB
Cooperation of different companies	MK - FB

The entire branch	SS - MC

Conclusion Q34: There is not one single party that could be designated to be the initiator of clothing recovery – it is the responsibility of the entire industry

So again, awareness amongst all people would help every company, the whole world in the end.

On the question how customers can get triggered to return (all) their clothes – how they become aware of the need for sustainable clothing, it was expected that the interviewees would all point at advertisements, and then you end up with the brands again. This was the case, but the government was mentioned several times as well.

Question 35. How do you think customers can get triggered to return (all) their clothes? How are people becoming aware of the need for sustainable clothing?	
Response	**Interviewee Code**
Not all clothes - some have personal value	ES - FE
Incentives + sustainable products should have a better price. Difficult is that this process starts in countries with expensive labor	PK - MB
Involvement from the government by means of advertisements etc.	MG - FU
Story told by the shop employees again. First look at sorting stations - they should provide an easy accessible solution	AA - MB
Problem is in the people's mentality: returning in exchange for cash or a discount	CB - FE
Especially by making it easy to hand in your clothes (in as many different ways as possible)	DV - ME
Propagating a clear message by the companies as well as the government	WW - FE
More marketing and awareness	VV - FB
If they would be better off financially	NM - MB
Clear communication about misunderstandings + clear about costs of clothes if all unsustainable brands would disappear	AH - FB
Compensation like a discount	MK - FB
Difficult: this is our daily job	SS - MC

Conclusion Q35: Initiatives from brands and the government are seen as the biggest influencers on the behavior of the consumers

So, not one single party can be held responsible to trigger consumers – but most interviewees are convinced that transparency, traceability of products in the supply chain will absolutely contribute to the awareness creation.

Question 36. Do you think awareness amongst people is created through transparency, traceability of products in the supply chain?	
Response	**Interviewee Code**
Absolutely	ES - FE
I think so - all initiatives will help in the end. You can move everything, as long as you want to.	PK - MB
Sure	MG - FU
Yes, this is the cherry on the pie. Then you really have a good story.	AA - MB
Yes	CB - FE
Yes	DV - ME
Yes, by good communication absolutely	WW - FE
Yes	VV - FB
I am afraid that it will have a very limited impact	NM - MB
Not totally sure, insufficient knowledge about it	AH - FB
Yes	MK - FB
Yes can contribute to a certain extent	SS - MC

Only NM-MB is more skeptical. He thinks people are not that interested in it (yet), and he brings up the price-issue again (as discussed earlier).

Conclusion Q36: Transparency, traceability of products in the supply chain could contribute to awareness creation regarding sustainable clothing

A quite logical conclusion after all information found so far.

Returning to the three P's of sustainability:

1. **People**: This is a difficult thing to measure. But it is generally known that in the end, closed loop supply chain management of the clothing industry will be more than important and good for all people in the world. How we live; how long we will live; fewer chemicals are being used; less waste and so on. This should be clear by now.
2. **Planet**: This became clear out of the literature, and it is logical and well known that when producing and consuming in a sustainable way this is the best thing to do for our planet.
3. **Profit**: To measure the exact profit gained from implementation of CLSCM is hard. All parties interviewed could not answer this question[36]. That is not because they did not have the information, but simply because this was not implemented yet, and/or they simply are aware that it will first cost a lot of money and time, investments, before profits will flow out of all these initiatives. In other words, investments are required before they lead to profits for all parties individually. But once the concept is established. The prospects are enormous. Really important to mention here is that it is not the case that when clothing is becoming more expensive that it will be more responsible. Clothing from more expensive brands can be produced in unsafe, environmentally unfriendly factories as well (Textilia, 2014).

Conclusion Q37: n/a

According to the results of the interviews, it can be concluded that there should be a good balance between the 3 P's. This is all in accordance with the existing literature. The equilibrium will not be as balanced as it should from the beginning onwards given the investments required, but in the end this can certainly be achieved.

[36] Question 37. How high are (would be) the savings from implementation of CLSCM in your organization?

5. Conclusions and Recommendations

'What is the current status of CLSCM of the clothing industry and what are opportunities for improvement?'

In the first paragraph a summary of the answers on all sub-questions will be given[37]; paragraph 5.2 will verify the conceptual model; paragraph 5.3 the implications of this study; paragraph 5.4 the limitations of this research; to conclude with the recommendations for future research in paragraph 5.5.

5.1 Conclusion of Findings

CLSCM of the clothing industry is the first category that will be discussed. As expected, the need for a sustainable clothing industry and CLSCM of the clothing industry is huge. It is a perfect endeavor – indeed a huge challenge but with great potential and a necessary development. There is not one single party responsible to close the SC of the clothing industry – commitment and involvement of, and collaboration between all stakeholders is key. This collaboration will only be good when there is an added value for all parties to close the loop - if one of the parties is not interested, and thus not cooperating, the CLSC will collapse like a house of cards: non of them is dispensable. However, as already stated by Beukema (Beukema, 2013): there is an attitude-behavior gap in the sustainable clothing market. Too little information is given to or is reaching the consumer is the most important factor for this gap. This implies that despite the emerging attention for sustainable products, consumers still lack knowledge about sustainable products and clothing in particular. To reduce the gap, more awareness and knowledge among consumers is needed. Another solution to reduce the gap is by increasing the offering of sustainable products and so reducing the offering of unsustainable products. As the second solution is not that easy to establish in the short term, the focus should be on the first solution. So, companies are convinced that sustainable clothing can be fashionable, but not all consumers are interested in products made of recycled material yet. Transparency and awareness creation are needed to increase the number of conscious consumers. The interest in recycling is already growing, now companies need to become aware of the fact that they could bring over an innovative message by using recycled content in their products. However, one of the largest and overarching bottlenecks is the price of

[37] See Appendix 9 for an overview of the conclusions of all questions of the semi-structured interviews

clothing with recycled content. The success of take-back programs remains very much customer dependent. If the consumer does not send a product back to the producer (due to unwillingness to cooperate or a lack of awareness (Ypma, 2010)), and it will cost too much effort and resources to recover the materials, it can become too expensive to retrieve the material.

More initiatives are required from the entire branch, and alignment of sustainability goals between all stakeholders will help to speed up the process, as a change of the industry will be a summation of (numerous small) steps. Although the need is high, no real pressure is felt by the stakeholders, except for a social, philanthropic pressure as people feel responsible as they agree that we cannot sustain our current way of living – as it not fair to ourselves, neither for the next generations.

'It is increasingly clear that it is not just our own direct actions which we need to focus on in terms of our sustainability strategy, but also matters which occur in the long and complex clothing supply chains which characterize our industry. Much work still needs to be done in terms of increasing the transparency necessary in the early parts of our supply chains' (C&A, 2012).

As confirmed by literature and the interviews, the attitude-behavior gap could be vanished by means of transparency, traceability - a tremendously impactful tool, and a requisite in CLSCM of the clothing industry. While recognizing that all supply chains are different, there are some universal responsibilities that apply across commodities. According to (UNGC BSR , 2014), drivers and benefits of traceability for companies can be grouped in four main themes (and was verified by the answers of the interviewees):

Values and efficiencies	**Stakeholder pressure**	**Regulation**	**Global Alignment**
1. Reducing risk 2. Operational efficiencies and process consistency 3. Securing supply 4. Supplier selection and supplier relationships 5. Reputational benefits	6. Meeting stakeholder demands for more product information 7. Ensuring sustainability claims are true	8. Meeting legal requirements	9. Standardization of expectations, processes and systems 10. Ensuring security of natural resources

Figure 23 Drivers and Benefits of Traceability for companies (adjusted from UNGC BSR , 2014)

All drivers and benefits should be taken into account when thinking of traceability, implementing traceability and evaluating traceability. This brings us to the second part of the conceptual model: the internal stakeholders. Quite a lot of companies have been thinking about a track and trace system before, and there was a comparable track and trace system in use in part of clothing industry. However, this system was not as easy to implement and to work with as the REMO System, and is therefore not in use anymore. So in that sense the REMO System can be seen as a 'new' system. REMO will make itself indispensible by means of transparent and good collaboration and communication about their system and costs. REMO guarantees that all partners who implement the REMO System in their company signed their contract and thus comply with the 'rules' of membership. In other words, REMO is creating a platform of companies that are interested in and willing to work with the REMO System what will help other companies to speed up the introduction of sustainable production in their organization. Transparency is really valuable in order to attract and retain consumers (could contribute to awareness creation regarding sustainable clothing), as well as for companies themselves as they then have all information required to identify their strengths and weaknesses. It is therefore not remarkable that companies strive for transparency, leading to the fact that most of them are highly interested in working with the REMO System. However, they are being realistic and point at the fact that awareness creation is a huge challenge requiring collective stimulation and collaboration. An important final remark is that for providers of these technologies, cost is still proving a difficult and related barrier (UNGC BSR , 2014). This barrier can be overcome when the REMO System would be implemented all together.

'The concept of closed loop supply chains sounds a laudable, if possibly Utopian ideal: a virtuous circle of production from cradle to grave and back to cradle again. However, the reality is proving harder to achieve for the clothing and textile sector' (Rowe, Closed Loop Supply Chains Hard to Achieve, 2013)

However, as said, the supply chain needs to be redesigned in order to make it closed-loop, and it is clear that this is quite a big change. To assist companies in this process, a roadmap for reverse supply chain redesign was created (Guide & Wassenhove, 2005) – see Appendix 6.

With regard to the last part, the value creation – it can be stated that CLSCM of the clothing industry can have a huge, versatile contribution to the environment, and thus to the people living on the planet given the savings resulting from reusing raw materials and designing products in a

different way. The cost savings and new opportunities are more difficult to capture at this point in time, as investments are needed first before CLSCM will yield profit.

As said during a seminar on organic cotton: 'it is not the consumer who will change the chain, we as an industry have to do it' (Kingpins, 2014). The government needs to inspire people; companies need to change routines and recognize that it starts with selecting suppliers; and consumers need to become more responsible for their buying behavior and the message they can leave by that – as with every purchase they make a decision. But, more initiatives are needed from big players in the market. Walmart developed a closed loop fund to encourage more recycling for example.

'Being transparent is vital for almost all companies, and transparency is about trust' (Kingpins, 2014). This trust can only be given when a third party is involved in the labeling, and thus the transparency, because in that way the data will be verified; there is a legitimate governance; it is multi stakeholder in this way; and the data are credible. The REMO System can be the solution [38].

'Shall we wait for another collapse?... It is time to be fair' (Panos Sofianos, 2014).

Opportunities for improvement of the CLSCM of the clothing industry in addition to this paragraph are summarized and can be found in Appendix 10.

[38] At this point in time, there is a test drive of the REMO System: the first installations at two producers in Italy.

5.2 Revision of the Conceptual Model

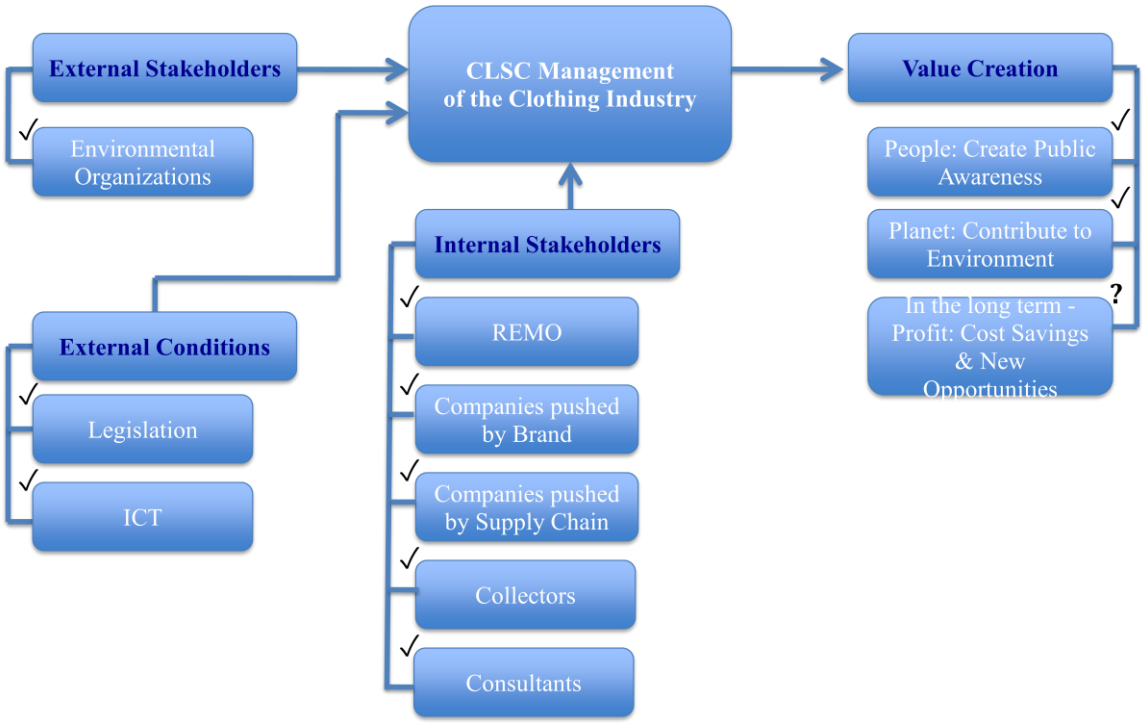

Figure 24 Conceptual Model - Revised after Research

When retaking the conceptual model, its validity can be confirmed after this research – just two minor changes were made. First of all, as discovered in the early stages of the research and through the interviews, it was figured out that consultants, working for and with the internal (and sometimes even external) stakeholders have a lot of knowledge and can exert pressure on organizations as well – therefore this internal stakeholder was included in the conceptual model. Secondly, with regard to the outcomes of CLSCM of the clothing industry, it can be stated that investments will precede cost savings and the identification of new opportunities. In other words, cost savings and new opportunities are expected to be present in the long term, but in the short term it will thus cost money instead of generating profit. Although expected to be present, nothing can be said about this relationship – as there is not enough evidence for that after this research.

With regard to all other relations, it can be stated that they are present. All variables mentioned do have an impact on the CLSCM of the clothing industry. This relationship can be 'positive' or 'negative', as an example: some may argue that the relationship between the external stakeholders and conditions cannot be stipulated as positive, others would say it can: when environmental organizations and legislation were not 'pushing' CLSCM, it would take way longer to establish it, and besides, ICT is innovating continuously and therefore creates new opportunities for CLSCM as well.

5.3 Implications

From an academic view this research aimed at delivering a deeper understanding of the closed loop supply chain of the clothing industry and deliver recommendations for CLSCM of the clothing industry. The combination of different qualitative research techniques contributed in a way that it discovered attitudes, motives and meanings that are not possible to discover with quantitative research. Furthermore, with the rising attention towards sustainability in general, and sustainable clothing in particular in the past years, this research is of great value. Despite a lot of research that has already been done, most research is not focused on implementation of CLSCM, so it is obvious that the academic world needs to broaden this.

To conclude the academic implications, a concept like the REMO System is completely new and therefore never researched before.

From a managerial view, this research is of high value as well. The sustainable clothing industry is emerging – but still acting in a niche market. To ensure growth, more awareness and thus knowledge, transparency throughout the sustainable clothing industry is required. Having more companies connected to the REMO System will broaden the sustainable offering for consumers – making it more easy to buy sustainable clothes (only). The information the REMO System provides makes the entire CLSC visible and therefore gives consumers the opportunity to shop in a completely conscious way.
What should be mentioned regarding societal implications is that the term ‘sustainable fashion’ is really broad. Greenwashing happens a lot, at a very broad spectrum of organizations. It should be unambiguous what sustainable clothing encompasses. Not just one of the P’s of sustainability, but a good balance between the three of them.

5.4 Limitations

Observing and mapping the entire (closed loop) supply chain, and identifying all challenges that may arise when implementing, improving CLSCM of the clothing industry is not feasible - but it was tried to come up with the most comprehensive version as possible.

A limitation of this research is the number of interviews (12 in total): with more interviews the reliability and validity would go up. Secondly, the data collection method and analysis of the collected data was inevitably influenced by the researcher’s worldview: personal belief of what is

relevant and important to collect. Another limitation is that this research was done simultaneously with an internship at a company, which will bias the researcher as well. Although the assumptions made were verified by means of literature and further research, this could be seen as a limitation of this research.

What is good to mention is that although this research was focused on the clothing industry only, the information, results and suggestions found could be valuable for other industries as well.

5.5 Recommendations for Future Research

A recommendation for future research is to extend the research on clothing recycling industries in other countries, compare these countries and check what the differences between the different countries are in applying CLSCM. Secondly, more information about the motives of more brands to engage in CLSCM is more than valuable. In this way the marketing of the CLSCM could be even more optimalized. In extension of the previous recommendation, it is also possible to further analyze complex aspects mentioned, like collaborations between brands, collaborations with collectors, collaboration with companies in the SC, collaborations with different countries and/or profit/non-profit organizations. In this way, more exact approaches for implementation could be recommended. Another recommendation is to do research on the possibilities of ICT in this field, as it could be used even more extensively. Doing research on what are the options to decreasing the price when track and trace systems would be implemented by the whole industry is what would be really valuable.

Last but not least, research on the acquisition process – to make this process even easier, more accessible for the consumer. Examples could be to pick up clothing after people report online that they have bags of clothing ready to be picked up; or use containers at gas stations, big supermarkets, in stores etc.

More factors could be recommended for further research; however, these are the ones most likely to influence the closed loop supply chain of the clothing industry.

‘*There is nothing ordinary about a simple T-shirt’* (NPR, 2013)


EVERY
THREAD
TELLS A STORY


EVERY
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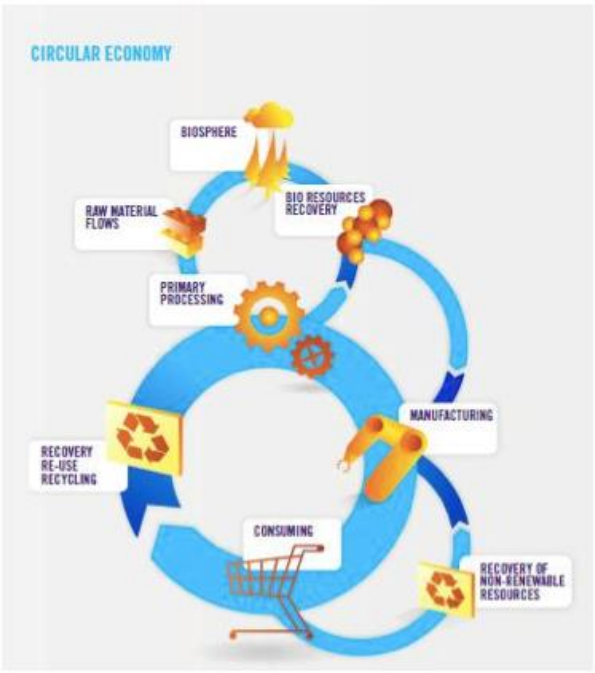
Appendixes

Appendix I Changing Economy from Linear to Circular

(Ellen MacArtur Foundation, 2012)



Appendix 2 Semi Structured Interview

Company

Location

Interviewee

Function

Date

Company Website

Part 1 – Closed Loop Supply Chain Management of the Clothing industry

Circular Economy, Sustainable Clothing Industry

1. Sustainable clothing is fashionable. Do you agree or not?

2. What is your view regarding a sustainable clothing industry?

3. What do you think needs to change in order to make this industry sustainable?

4. Do you think your customers are interested in buying your, or a, product made of recycled material?

5. What, in your opinion, is currently done with worn clothing - what are (your) customers doing with 'old' garments?

Performance Measurement regarding Sustainability in own Company

6. What is your company currently doing in the field of sustainability?

7. If yes - has sustainability always been integrated in your ethos, have you been working on it for years already, or are you exploring sustainable production?

8. What is important for you to see changed over time? What is the goal of your company with regard to sustainability?

9. Which colleagues (within your company) are involved in the sustainability 'goal' of your company?

10. How are you trying to achieve this?

11. With who do you have to work together in order to achieve your goals?

12. With which parties, companies, would you like to work together to bring this goal to a higher level?

13. How do you measure whether you achieved your goals?

Labels

14. Are there certain textile labels you cannot do without (must have), but which are a pain in the neck – and there are no alternatives for? (for example GRS)

15. Which labels would you like to have (want-to-haves)? (for example Green Shape)

Objectives for Closing the Loop

16. How is your supply chain organized?

17. What is your thought about closing the loop of the entire clothing industry?

18. How great is the need for a CLSC in the clothing industry?

19. Do you know whether specific companies are already involved in more less closing the loop?

20. Which stakeholders are indispensable to close the SC of the clothing industry, and what is and should be their role in the management of the CLSC?

21. What, in your opinion, is the most important step of the CLSC, to make this a success? Remarketing, Acquisition, Remanufacturing, something else?

22. Do you feel a pressure for closing the loop? *(Current or future legal responsibilities, environmental organizations, philanthropic responsibility, or (indirect) economic benefit?)*

23. Do you feel responsible to make this step?

Risks of and Opportunities for CLSCM of the Clothing Industry

24. Recycled materials are being used already, but the information about the composition is most of the time not made visible to customers because it was not known or they just did not do that. Why do you think companies are not proud of using recycled materials (so far), and sharing this

information? *(Scared for 'negative' marketing/bad image of recycled material, or was there simply no demand yet?)*

25. What do you see as the largest risks (bottlenecks) and opportunities in a sustainable clothing industry, in the CLSCM of the clothing industry?

26. What, in your opinion, risks exist in recovery of clothing? *(limited access to the products, limited feasibility of reprocessing, limited market demand for the output; recycled clothes)*

Part 2 - Internal stakeholders

As stated in the UNGC BSR Guide to Traceability: 'Traceability is a tremendously impactful tool for advancing sustainability objectives'. Global collaboration, driven by multi-stakeholder collaborative schemes, is the key to success in traceability.

The REMO System – Recycling clothes (and thus integration of CLSCM) is not new, but tracking and tracing where they come from, what they went through, and what savings were made, all of this is new. REMO's innovative track and trace system charts the journey of recycled fibers through the production chain, feeding exact information into the REMO database about a garment's production history. The system reveals exact information about an item's origin and past life, a precise percentage of its recycled content, and the resulting environmental savings on energy, water and CO2. The end result is a garment tag with a measurement of recycled content as well as a call to action to dive deeper into the garment's history.

27. What do you think about the REMO System?

28. Track and trace systems are highly important in CLSCM, have you been thinking about using this before?

29. Are you willing (is it an option) to be transparent in your supply chain?

30. What do you see as the largest added value of being transparent?

31. So, would you be interested to work with the REMO System?

32. Do you see complying with the REMO System as an extra hurdle, or as an enormous extra value?

33. What would help you to integrate the REMO System in your company? (Would it be useful when REMO would come up with a guideline to use to internally communicate/educate/train key stakeholders (customers) in the CLSC?)

Part 3 - Value Creation

People

34. Who, in your opinion, should be the initiator of the recovery? (The Producer/manufacturer, the customer, or a third party?

35. How do you think customers can get triggered to return (all) their clothes? How are people becoming aware of the need for sustainable clothing?

36. Do you think awareness amongst people is created through transparency, traceability of products in the supply chain?

Profit

37. How high are (would be) the savings from implementation of CLSCM in your organization?

Appendix 3 All coded answers on semi-structured interview questions

Question Number	Response	Interviewee Code
1	No - gets a new impulse every now and then	ES - FE
	Depends on the position of your brand - can be cool but depends	PK - MB
	Absolutely	MG - FU
	Difficult - depends on the brand	AA - MB
	Agree	CB - FE
	Agree	DV - ME
	Yes - you can make it fashionable	WW - FE
	Yes - absolutely	VV - FB
	Yes	NM - MB
	It is in a certain degree, but the price is really a bottleneck; makes them less interested in the end	AH - FB
	This is the future, and not a trend that will blow over	MK - FB
	Yes	SS - MC
2	Important	ES - FE
	Happening a lot already, but afraid they will be stereotyped as alternatives/idealists. But this is changing	PK - MB
	Feasible	MG - FU
	Development of recycled fibers is a hard and costly process. Takes a lot of time, but is is feasible	AA - MB
	Key to success and competitiveness for the clothing industry	CB - FE
	Necessary development. Both Push (by government) and Pull (by consumers)	DV - ME
	It is developing, but it is not always visible - and not priority for all companies	WW - FE
	A must	VV - FB
	Currently a bad image wrt sustainability and would do well to improve and communicating about this	NM - MB
	As long as the demand is not sustainable, the supply will not be sustainable either	AH - FB
	We see CSR as a self-evident part of the our strategy and vision - be progressive is really important	MK - FB

	Long way to go but in the end it is a necessity	SS - MC
3	Look at entire process	ES - FE
	Most important is the back side of the supply chain: the acquisition process has to be affordable	PK - MB
	The awareness of the consumer	MG - FU
	Better cooperation between the weavers and the confection companies	AA - MB
	Reduce/remove chemical substance that could harm people and planet. More attention to fair treatment	CB - FE
	Transparency, innovation and scale. Speed depends on variables included - in particular: price, technique, regulations	DV - ME
	Largest bottleneck I see is the finances. More cooperation between the companies is needed	WW - FE
	Transparency is needed	VV - FB
	Awareness first, then check what should be changed / improved	NM - MB
	Reducing carbon footprint, become entirely fair-trade and invest in the safety and education of the employees	AH - FB
	All parties should take their responsibility	MK - FB
	Price/quality ratio should be competitive with the less sustainable industry	SS - MC
4	Only the conscious consumer	ES - FE
	For us it is not a necessity. Certifications are claimed by the buyers (retailers): we push this in the SC	PK - MB
	When they would be aware of the scarcity of raw materials - yes	MG - FU
	Ours are - we produce high-end products; are thus willing to pay for it + are interested. Not the case for all brands	AA - MB
	Not yet in Italy. Customer's mentality has to change first	CB - FE
	Yes	DV - ME
	Yes	WW - FE
	Yes	VV - FB
	You would think that, but research showed other results: especially due to the higher price not all consumers are	NM - MB
	Only when it fits the style of our consumers	AH - FB
	Awareness of consumers is growing: they do are interested in it (and expect it from our brand)	MK - FB
	Yes but at this point in time it is often overrated. Right now it is just a USP for a small consumer group.	SS - MC
5	Retailers are stimulating collection and reuse: by means of advertisement	ES - FE
	There is no return process: predominantly landfill	PK - MB

	Burn it, transportation to developing countries, unravelling or I Did	MG - FU
	Not enough. Should be done (even) more	AA - MB
	A lot is thrown away	CB - FE
	Collected by KICI and Salvation army and the bin	DV - ME
	Thrown away or in collection bins, however people are not aware what happens with those clothes…	WW - FE
	Thrown away, and a small percentage is recycled	VV - FB
	Collected and sent to third world countries	NM - MB
	Given our brand is more expensive + a high quality: mostly not thrown away, only when really worn-out	AH - FB
	Wear our clothes as long as possible, and perhaps resell it on second hand websites as well	MK - FB
	Collected for a small part, too much is still thrown away	SS - MC
6	Giving advice and developing recycled products	ES - FE
	Responding to the requirements of the claims of our customers; slowly more and more	PK - MB
	We redesign, together with labels surplus from the clothing industry: up-cycling	MG - FU
	All our operations are focused on sustainability	AA - MB
	Consulting company: give advice	CB - FE
	Connecting parties in the SC working on sustainable production and searching for methods to make the entire jeans supply chain	DV - ME
	- sustainable and innovative	
	Giving advice to designers, schools, the industry	WW - FE
	We are the first company in the world to share the full cost breakdown of our products	VV - FB
	Produce by the guidelines of BSCI - as we keep the wishes of the current and future generations in mind	NM - MB
	Produce in accordance with the highest ethical standards; producing responsible and fair, and require this from all partners	AH - FB
	Continuously reinventing denim craftsmanship: innovating for the futures includes taking responsibility	MK - FB
	Stimulation of reuse. ISO 14001 and initiatives wrt the usage of raw materials.	SS - MC
7	Always	ES - FE
	For years already	PK - MB
	We are established with sustainability in our minds	MG - FU
	We are established with sustainability in our minds	AA - MB

	We have started to integrate the sustainability policy in our business just two years ago	CB - FE
	I started just 3 months ago	DV - ME
	n/a	WW - FE
	Yes, always: one of the main goals behind our company	VV - FB
	Since approx. 10 years	NM - MB
	For years already	AH - FB
	Till 2006 we did not communicate that much about it, since then (company was growing) a more formal CSR strategy	MK - FB
	Part of our mission	SS - MC
8	A lot of changes already. Innovative projects with smart and more 'healthy' use of materials	ES - FE
	For Hi-tec, not really (yet), but you have to move with 'the rest' - and thus keep an eye on it	PK - MB
	Revaluation of raw materials	MG - FU
	Increasing percentage of recycled material in our products	AA - MB
	Acceptance of integration of sustainability in business strategies	CB - FE
	Willingness to provide openness. Improve the denim industry SC through innovation, automation, sustainability, integration	DV - ME
	Create awareness, in a lot of different industries	WW - FE
	Suppliers and producers/designers to start revising their own way of working	VV - FB
	Achieve the maximum possible without jeopardizing the survival of the company in the economic sense	NM - MB
	Neutral footprint and making employees in developing countries autonomous	AH - FB
	A lot of different sub targets: a.o. Increasing the percentage of sustainable fibers, decrease use of chemicals	MK - FB
	Subsidies for initiatives for recycling of raw materials. Right now the innovation costs; investments are too high	SS - MC
9	n/a	ES - FE
	n/a	PK - MB
	Everybody, all colleagues	MG - FU
	Everybody, all colleagues	AA - MB
	3 out of 8 colleagues	CB - FE
	n/a	DV - ME
	n/a	WW - FE
	All	VV - FB

	Agenda of the management team - so in the end all	NM - MB
	Hands on' division; a special sustainability division	AH - FB
	CR department has 7 people coordinating the work, however: part of our business and thus in the end: all employees	MK - FB
	Relationship Manager	SS - MC
10	n/a	ES - FE
	n/a	PK - MB
	Creating awareness of the value of clothing among consumers	MG - FU
	Collaborating with manufacturer - trying to make small steps together to increase the % of recycled content. Slow moving process	AA - MB
	Promoting/increasing education process	CB - FE
	n/a	DV - ME
	Increasing awareness and knowledge through education and marketing	WW - FE
	We put an accent on the educational element and raise awareness throughout young designers and students	VV - FB
	Next to themes related to fashion production, we try to improve other business processes as well	NM - MB
	Numerous different ways: from double-side printing till reducing water usage in the production process of jeans	AH - FB
	A lot of different targets: but incorporating this in the business strategy and vision. Working with collectors and suppliers	MK - FB
	Small steps together with all parties in the market	SS - MC
11	n/a	ES - FE
	Certification companies	PK - MB
	An unravelling party and larger parties in the fashion industry (labels)	MG - FU
	Our manufacturer	AA - MB
	n/a	CB - FE
	The entire SC	DV - ME
	Really diverse number of companies	WW - FE
	With all our sourcing and manufacturing companies	VV - FB
	Suppliers and colleagues	NM - MB
	That specific division in collaboration with the board and all stakeholders involved	AH - FB
	Our suppliers	MK - FB

	n/a	SS - MC
12	All parties with the goal of development and sharing this	ES - FE
	n/a	PK - MB
	With REMO and its unravelling party, and with big labels	MG - FU
	From our own strength	AA - MB
	n/a	CB - FE
	Cotton suppliers, Fabric manufacturers, confection companies, laundries, brands, and retailers	DV - ME
	n/a	WW - FE
	Already working with a lot of companies, people - but big fashion chains would be great, change would happen faster then	VV - FB
	Not specifically	NM - MB
	Not enough information to answer this question	AH - FB
	We work with a lot of different companies. Our suppliers but also a.o. Solidaridad, Made-By etc.	MK - FB
	Parties with knowledge and relations in the international textile market	SS - MC
13	a.o. LCA	ES - FE
	n/a	PK - MB
	Business: revenue, idealistic: number of labels joining I Did	MG - FU
	n/a	AA - MB
	n/a	CB - FE
	n/a	DV - ME
	n/a	WW - FE
	n/a	VV - FB
	Especially by benchmarking with other companies in our branche (info from Modint) and try to be one step ahead	NM - MB
	Every year this is measured separately	AH - FB
	Made-By scorecard	MK - FB
	n/a	SS - MC
14	n/a	ES - FE
	We have to be compliant; so only when customers are demanding something	PK - MB

	n/a	MG - FU
	REMO was in the first line of our products, and hopefully again soon. Other labels: no - costs too high and too many of them	AA - MB
	n/a	CB - FE
	n/a	DV - ME
	n/a	WW - FE
	n/a	VV - FB
	Not one specifically	NM - MB
	n/a	AH - FB
	No - certificates are a way of getting authorized warranty of a sustainability claim	MK - FB
	n/a	SS - MC
15	n/a	ES - FE
	n/a	PK - MB
	n/a	MG - FU
	REMO	AA - MB
	n/a	CB - FE
	n/a	DV - ME
	n/a	WW - FE
	n/a	VV - FB
	In our branche: FairWear	NM - MB
	n/a	AH - FB
	n/a	MK - FB
	n/a	SS - MC
16	Recycling, smarter chains, it starts with designers and retailers	ES - FE
	Production in the far east, rest all here on location	PK - MB
	Labels deliver their materials and we design and produce the new product	MG - FU
	Confectioner buys at company that has recycled material. Customers receive discount when handing in old clothes: motivating	AA - MB
	n/a	CB - FE
	n/a	DV - ME

	n/a	WW - FE
	Extensive research in sources of the raw materials, then established and upcoming designers make garments with it	VV - FB
	Traditional SC: production in Turkey and Far East, sourcing is outsourced	NM - MB
	Production in Turkey, India, China and material in and from for example Italy (leather)	AH - FB
	Global SC - see our website for more detailed information	MK - FB
	We have a complex SC as we work with a lot of different parties	SS - MC
17	Necessity.	ES - FE
	I think the return process, the acquisition process is really difficult	PK - MB
	Good	MG - FU
	Good and feasible But keep segmentation of 'the ideal' in mind - where your focus will be (in the first place)	AA - MB
	Necessity	CB - FE
	Technically a huge challenge: therefore more than interesting. Stop extracting more raw materials than we can replenish	DV - ME
	Not on the 'short term'. But should be supported as it is a really difficult process: different cultures, countries, ways of organizing	WW - FE
	High need	VV - FB
	It is the future, and has potential	NM - MB
	A nice endeavor but these techniques are still in their infancy	AH - FB
	Interesting next step in our product innovation process	MK - FB
	Necessity but a long way to go	SS - MC
18	Huge	ES - FE
	Huge	PK - MB
	Huge	MG - FU
	No interested consumers as long as clothing can be sold for the low prices as they are right now - all dependent on price!	AA - MB
	Huge	CB - FE
	From social point of view: large. Consumption and thus use of natural fibers is disproportionate; no longer justified	DV - ME
	Huge: we cannot maintain the current way of living	WW - FE
	Really high	VV - FB
	When commonplace: more important	NM - MB

	Small, but this can change when the attitude of the whole attitude wrt sustainable clothing changes	AH - FB
	Huge - the clothing industry is generating a lot of waste	MK - FB
	Huge	SS - MC
19	Patagonia, Honest By	ES - FE
	I hear things from cutting waste, but not really post-consumer	PK - MB
	No parties that close the loop entirely	MG - FU
	Enough initiatives, and of course we are familiar with the industry in Prato	AA - MB
	Intimissimi, Calzedonia, H&M	CB - FE
	Nudie, Nike, Saxion Hogeschool, Sustainable Apparel Coalition	DV - ME
	Enough companies	WW - FE
	We are - we are totally transparent	VV - FB
	I know some of them due to my management function at Modint	NM - MB
	H&M, PUMA, M&S	AH - FB
	Mud Jeans	MK - FB
	REMO	SS - MC
20	All important	ES - FE
	n/a	PK - MB
	Awareness, and stop the fast fashion	MG - FU
	Government - have a lot of initiatives, but takes too long and could do more. Industry can be more creative: new BM's	AA - MB
	Brands and unravelling companies	CB - FE
	Cotton and oil industry, governments, brands, spinners and weavers	DV - ME
	All parties, that is why it is so difficult	WW - FE
	Large fashion organizations with market power. But smaller companies play an important role and can sustain this process	VV - FB
	Consumer. Should be willing to pay more - prices are way too low compared to the damage cheap fashion causes	NM - MB
	Consumer and manufacturers	AH - FB
	Suppliers, Brands, Consumers	MK - FB
	Collaboration is essential	SS - MC

21	Involve all parties in the chain	ES - FE
	acquisition and remarketing/creating awareness	PK - MB
	Remarketing: awareness of the consumer	MG - FU
	There has to be an added value for EVERY party in the chain, when one is missing, CLSCM will fail	AA - MB
	Remarketing and Remanufacturing	CB - FE
	Remanufacturing - using materials that can be recycled	DV - ME
	Subsidies of the government for all companies would be good	WW - FE
	Get all parties aligned, involved	VV - FB
	Awareness and legislation - should be on global level	NM - MB
	Remanufacturing - when the quality is not good enough, there is no future	AH - FB
	A good system for the collection - make it 'normal' and thus easy to hand in your clothes	MK - FB
	Collaboration is essential	SS - MC
22	I do not want to feel pressure, involve everyone to make it feasible	ES - FE
	Of course, like everyone - in the end	PK - MB
	Sure. We would like to be an example for other companies	MG - FU
	Our business was born out of idealism. But everything needs time	AA - MB
	Too little experience, but I think awareness is too little	CB - FE
	Yes - social pressure for the next generations	DV - ME
	Philanthropic	WW - FE
	We are all responsible for the world: more idealistic / philanthropic	VV - FB
	No - not acutely	NM - MB
	No pressure, purely positive stimulus	AH - FB
	Yes - it is an interesting next step in our product innovation process	MK - FB
	Part of our mission	SS - MC
23	Yes	ES - FE
	Yes	PK - MB
	Yes	MG - FU
	Yes	AA - MB

	Yes	CB - FE
	Yes	DV - ME
	n/a	WW - FE
	Yes - we are in an environmental crisis	VV - FB
	We feel responsible to be busy with it and grab opportunities when they arise	NM - MB
	As a large fashion company you need to take your responsibility to innovate and improve; in that sense: Yes	AH - FB
	Yes - innovating for the future also includes taking responsibility for the social and environmental impact of our products	MK - FB
	Yes - we are questioned about this by the management of the company	SS - MC
24	There is demand already, but the market is not ready yet	ES - FE
	Image it has, has to change, and brands now see it as a necessity instead of something to be proud of	PK - MB
	No demand yet, no added value	MG - FU
	The consumer 'does not mind' at the moment, so why would you 'sell' this information then?	AA - MB
	Most people relate recycled clothes with poor quality	CB - FE
	No demand and regulations did not allow it (recycled cotton was not allowed in some countries)	DV - ME
	No capacity for marketing + take it more or less for granted: not aware of that they could bring over an innovative message	WW - FE
	We are sharing this information and they are interested	VV - FB
	Don’t know, may be because consumers see recycled as less valuable	NM - MB
	There is, was, no demand yet	AH - FB
	No idea	MK - FB
	Knowledge, skills and experience not present, and again the price/quality ratio	SS - MC
25	Acquisition: too much transportation will not solve the problem. Up-cycling would be great.	ES - FE
	Remarketing, to make it attractive for a large customer group	PK - MB
	Marketing: creating Customer Awareness	MG - FU
	It is better for everyone in the end. You can do a lot with 'waste'. That is an enormous opportunity	AA - MB
	Quality of clothes and toxic substances. Opportunities: improvement of the image and the competitiveness	CB - FE
	Bottlenecks: money and technique. Opportunities: technique and consumer pressure	DV - ME
	Everyone working in unison is difficult as everyone has its own interests	WW - FE
	We can all make a change in our own way - but now we all have to do it	VV - FB

	Biggest opportunity is footprint. Bottleneck could be the price	NM - MB
	Decreasing quality of the clothes, style problems	AH - FB
	Content of elastane fibers in garments; buttons, zippers, rivers make recycling hard; collection; chemicals.	MK - FB
	Opportunities: decrease of waste and make it important as it is sustainable	
	Risk: Price/quality ratio, opportunity: improve the quality and decrease the price so that it will be as interesting as virgin materials	SS - MC
26	Is it feasible for small labels as well, as it is costly? Can they use recycling systems of bigger brands?	ES - FE
	Again, Acquisition	PK - MB
	I do not really see a risk (yet)	MG - FU
	At the time recycled material will become scarce, we will find a solution. All creative people in this sustainable industry	AA - MB
	Limited access to the products, Limited market demand for the output	CB - FE
	No danger, perhaps only in the number of cycles that a material can be reused	DV - ME
	I do not have enough knowledge about this, but I do not think people see a danger in recovery	WW - FE
	No - not yet at least	VV - FB
	Decrease of the quality	NM - MB
	Limited feasibility of reprocessing	AH - FB
	Quality and the pass on of chemicals from recycled fibers into new garment	MK - FB
	The availability of monostreams	SS - MC
27	Really good system, hope you can connect REMO to all chain partners. However, creating awareness will be difficult	ES - FE
	Interesting, but again be aware of the alternative/idealist image recycling (still) has	PK - MB
	More than interesting	MG - FU
	Really interesting	AA - MB
	We are REMO Partner	CB - FE
	Excellent - would be even nicer if the track-and-trace would be there for the entire product: including virgin material	DV - ME
	Really interesting, could have a snowball effect once yo have convinced one party	WW - FE
	Can be an excellent tool towards a sustainable future, have a strong impact if more companies would agree to adopt it	VV - FB
	Sounds promising	NM - MB
	Absolutely useful in the future	AH - FB

	Good initiative	MK - FB
	Interesting	SS - MC
28	Yes - since 1992	ES - FE
	Not this company - but I know companies who do like Icebreaker	PK - MB
	Thought about it, but not in concrete terms	MG - FU
	Yes, transparency is everything	AA - MB
	Yes	CB - FE
	Yes: essential and the only tool that the consumer will use and trust in his/her search for information and origin	DV - ME
	n/a	WW - FE
	We are doing this	VV - FB
	No	NM - MB
	No - not me but I do not have sufficient information to know whether this also applies to the sustainability division	AH - FB
	Yes	MK - FB
	Sure	SS - MC
29	It is difficult: companies want to but hide when it starts to get difficult. Collective stimulation would help	ES - FE
	Yes, everyone wants to be transparent in the end, it is the question what is commercially needed and what is feasible	PK - MB
	Yes	MG - FU
	Yes, we are quite transparent already - the consumer only does not know the exact/detailed information	AA - MB
	n/a	CB - FE
	n/a	DV - ME
	n/a	WW - FE
	Yes we are doing this already	VV - FB
	Is good when you really know everything. This is really difficult in the clothing industry	NH - MB
	Yes	AH - FB
	Yes	MK - FB
	Yes	SS - MC
30	Insight to production, raw materials and price structure	ES - FE

	The consumer has right to transparency. But there is a boundary as well: traceability in detail raises the question:	PK - MB
	how credible are you, and besides is it feasible regarding costs? This balance is interesting	
	Communicating this valuable information to the consumer	MG - FU
	Worn to reborn. That is beautiful. You can really see the savings and the recycled material.	AA - MB
	See all information of the SC, the composition and the environmental savings.	CB - FE
	Automatically doing the best in all facets of business	DV - ME
	For the production this is most valuable, and for the consumer a positive message.	WW - FE
	Ensuring that every component in every product we sell has the smallest impact on our health and the environment	VV - FB
	Being fair and the fact that you have nothing to hide	NM - MB
	Knowledge is power	AH - FB
	Nothing to hide: informing your consumers even better	MK - FB
	Understanding all your processes	SS - MC
31	Yes: REMO should communicate the conditions and the price clearly	ES - FE
	Not for this company - but it is an interesting concept	PK - MB
	Yes	MG - FU
	Yes	AA - MB
	n/a	CB - FE
	Yes	DV - ME
	n/a	WW - FE
	Yes definitely	VV - FB
	Would be open for it, but I would like to score on different sustainability themes first	NM - MB
	Yes	AH - FB
	Yes	MK - FB
	Yes - already in contact with REMO	SS - MC
32	Not enough information yet - would like to figure that out	ES - FE
	n/a	PK - MB
	Extra value	MG - FU
	No	AA - MB

	n/a	CB - FE
	n/a, but: extra value	DV - ME
	n/a	WW - FE
	No	VV - FB
	Cannot answer this question right now	NM - MB
	Value provided that there is ROI - we are a profitable business	AH - FB
	Most of the requirements are already included in our corporate policy	MK - FB
	Dependent on the use	SS - MC
33	Yes	ES - FE
	n/a	PK - MB
	Yes	MG - FU
	We are already familiar with REMO	AA - MB
	n/a	CB - FE
	n/a	DV - ME
	n/a	WW - FE
	Not needed for our company	VV - FB
	Cannot answer this question right now	NM - MB
	Cannot answer this question right now	AH - FB
	Certification option	MK - FB
	Cannot answer this question right now	SS - MC
34	All	ES - FE
	Retailer should enforce this. We always use the food industry as an example - there that is the case as well	PK - MB
	We focus on the producer/manufacturer	MG - FU
	The stores, those people tell the story in the end to the consumer (in person)	AA - MB
	Brand and the producer	CB - FE
	Producer	DV - ME
	The government should have an enormous role. They should propagate their responsibility by means of subsidies	WW - FE
	It all starts with yourself - so we should all be thinking about this	VV - FB

	Consumer: if they ask for it, it will happen naturally	NM - MB
	Consumer (should not be lazy etc.) + Brand (requires a good image to be able to use recycled content)	AH - FB
	Cooperation of different companies	MK - FB
	The entire branch	SS - MC
35	No not all - some have personal value	ES - FE
	Incentives + sustainable products should have a better price. Difficult is that this process starts in countries with expensive labor	PK - MB
	Involvement from the government by means of advertisements etc.	MG - FU
	Story told by the shop employees again. First look at sorting stations - they should provide an easy accessible solution	AA - MB
	Problem is in the people's mentality: returning in exchange for cash or a discount	CB - FE
	Especially by making it easy to hand in your clothes (in as many different ways as possible)	DV - ME
	Propagating a clear message by the companies as well as the government.	WW - FE
	More marketing and awareness	VV - FB
	If they would be better off financially	NM - MB
	Clear communication about misunderstandings + clear about costs ofc clothes if all unsustainable brands would disappear	AH - FB
	Compensation like a discount	MK - FB
	Difficult: this is our daily job	SS - MC
36	Absolutely	ES - FE
	I think so - all initiatives will help in the end. You can move everything, as long as you want to.	PK - MB
	Sure	MG - FU
	Yes, this is the cherry on the pie. Then you really have a good story.	AA - MB
	Yes	CB - FE
	Yes	DV - ME
	Yes, by good communication absolutely	WW - FE
	Yes	VV - FB
	I am afraid that it will have a very limited impact	NM - MB
	Not totally sure, insufficient knowledge about it	AH - FB
	Yes	MK - FB

	Yes can contribute to a certain extent	SS - MC
37	n/a	ES - FE
	n/a	PK - MB
	n/a	MG - FU
	n/a	AA - MB
	n/a	CB - FE
	n/a	DV - ME
	n/a	WW - FE
	n/a	VV - FB
	no idea	NM - MB
	no idea	AH - FB
	Difficult to estimate	MK - FB
	n/a	SS - MC

Appendix 4 List of interviewees

	Company	Name	Function	Interviewee ID
Company pushed by Brand	Noppies	Norbert Mutsaerts	Director	NM-MB
	Tommy Hilfiger	Anne Hermans	International Management Trainee	AH-FB
	G-star	Maaike Kokke	Corporate Responsibility - Communications & Sustainable Materials	MK-FB
	Honest By	Virginia Visan	Multidisciplinary designer	VV-FB
	Anonymus	Anonymus	Founder and manager	AA-MB
	Hi-Tec	Peter Korver	Managing Director	PK-MB
Collector Netherlands	Leger des Heils, ReShare	Simon Smedinga	Operational Director	SS-MC
Other	Ellen Sillekens Studio	Ellen Sillekens	Freelancer, consultant, trainer	ES-FE
	Process Factory	Constanza Brachi	Consultant	CB-FE
	Figtori	Dion Vijgeboom	Consultant, Advisor	DV-ME
	Wandadewit	Wanda de Wit	Freelancer, consultant	WW-FE
Upcycling	I Did	Mireille Geijsen	Founder and manager	MG-FU

Additional valuable information for the research was gathered by means of small interviews/ conversations by phone; face to face; or email with:				
	REMO	Sandeep Chawla	Manager	
	REMO	Martin Havik	Sales	
	REMO	Olivier Teepe	Software and Marketing	
	Cloudfactory	Jessica Kersten	Marketing	
	Cloudfactory	Maartje Kuijpers	Marketing	
	Van Puijenbroek Textiel	Huub Zegveld	Director	
	Qmilk	Leonie Volsgen	Founder	
	Zetes, Software developer	Managers, Project leader	Diverse – Met through a.o. Software training	
	Jean School	James Veenhoff	Founder	
	Pontetorto	Annemarie Kerckhoffs	Sales & Support Europe	
	Mud Jeans	Bert van Son	Founder	
	C&A	Ingrid Zeegers	Sustainable Business Development Manager	

Appendix 5a Materials considered sustainable by G-Star Raw

(G-Star Raw, 2014)

Recycled Cotton	Organic Cotton	In Conversion Cotton	Organic Flax (Linen)	Conventional Flax (Linen)
Mechanically Recycled Nylon	Mechanically Recycled Polyester	Chemically Recycled Polyester	Recycled Wool	Ramie
Organic Hemp	Conventional Hemp	Tencel® (Lyocell product from Lenzing)	Nettle	PLA

Appendix 5b Made-By Environmental Benchmark for Fibres

(Made-By, 2014)

MADE-BY ENVIRONMENTAL BENCHMARK FOR FIBRES www.made-by.org

CLASS A	CLASS B	CLASS C	CLASS D	CLASS E	UNCLASSIFIED
Mechanically Recycled Nylon	Chemically Recycled Nylon	Conventional Flax (Linen)	Modal® (Lenzing Viscose Product)	Bamboo Viscose	Acetate
Mechanically Recycled Polyester	Chemically Recycled Polyester	Conventional Hemp	Poly-acrylic	Conventional Cotton	Alpaca Wool
Organic Flax (Linen)	CRAiLAR® Flax	PLA	Virgin Polyester	Cuprammonium Rayon	Cashmere Wool
Organic Hemp	In Conversion Cotton	Ramie		Generic Viscose	Leather
Recycled Cotton	Monocel® (Bamboo Lyocell Product)			Rayon	Mohair Wool
Recycled Wool	Organic Cotton			Spandex (Elastane)	Natural Bamboo
	TENCEL® (Lenzing Lyocell Product)			Virgin Nylon	Organic Wool
				Wool	Silk

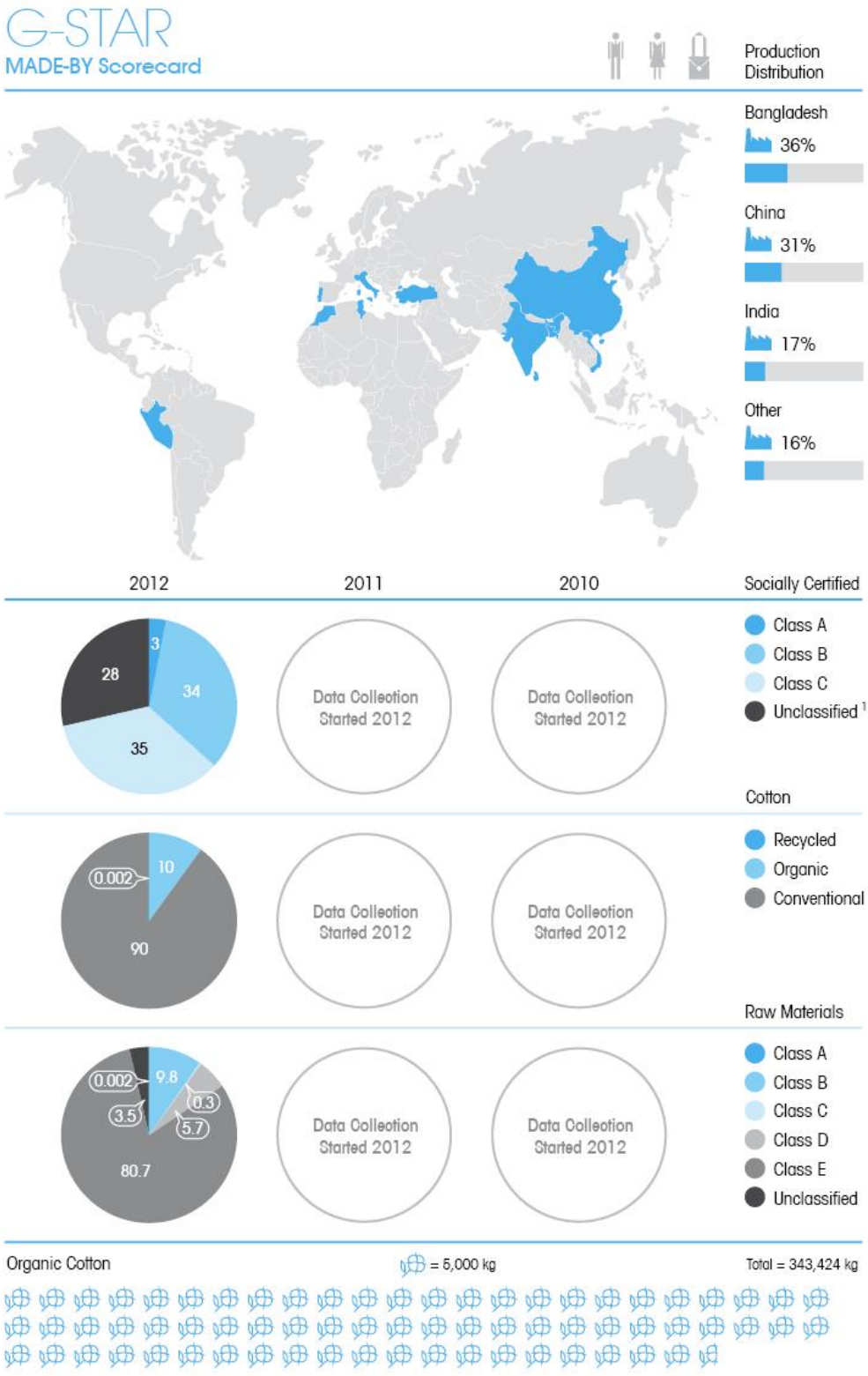
More Sustainable — Less Sustainable

MADE-BY Benchmarks cannot be printed, circulated or copied without the accompanying MADE-BY logo and website.

bwe This Benchmark was made in cooperation with Brown and Wilmanns Environmental, LLC. For further information on this Benchmark see www.made-by.org/benchmarks

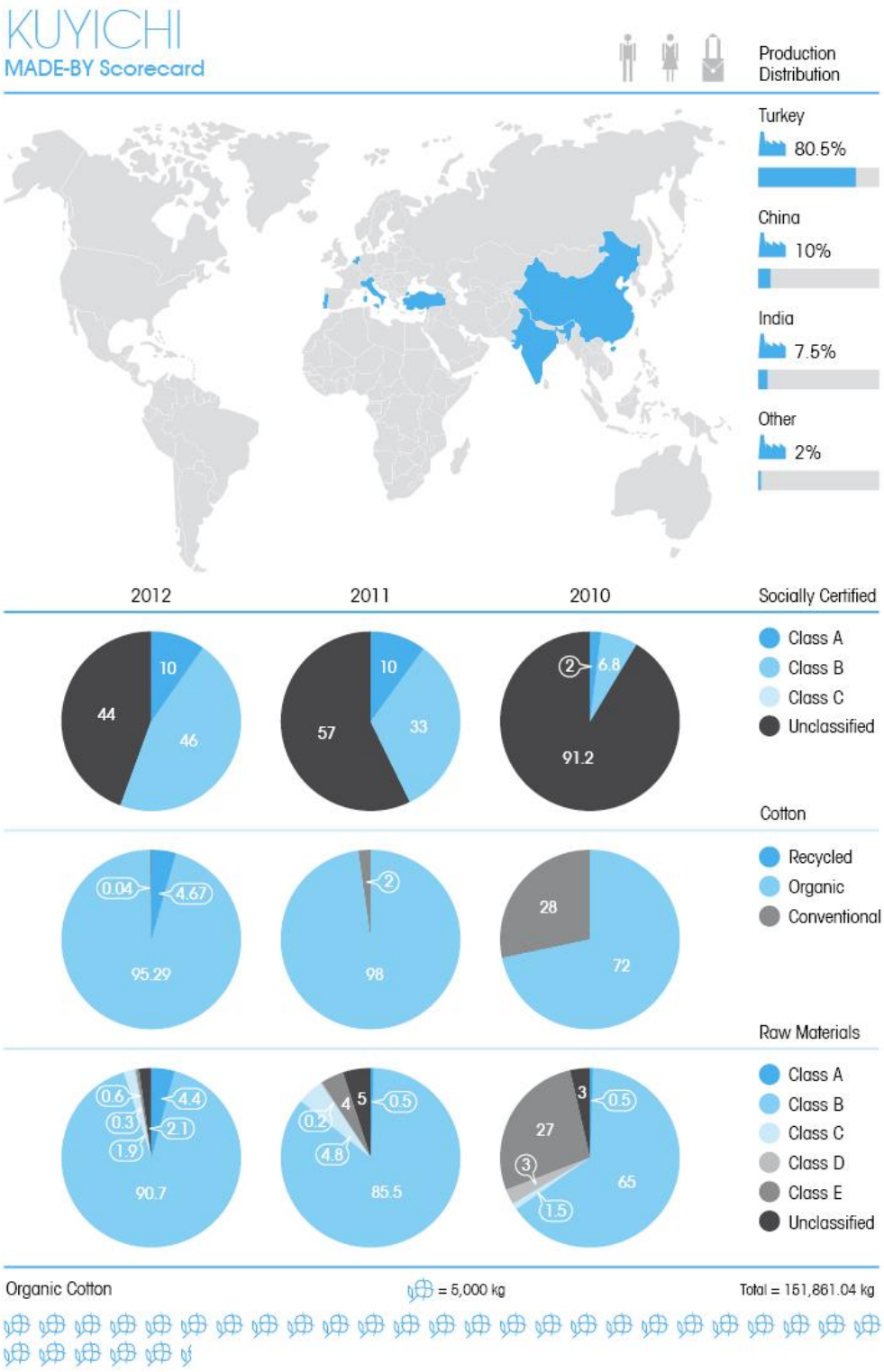
Appendix 6 Made-By Scorecard G-Star

(Made-By, 2014)



Appendix 7 Made-By Scorecard Kuyichi

(Made-By, 2014)



Appendix 8 Roadmap for reverse supply chain redesign

(Guide & Wassenhove, 2005)

1. Treat returns as a value stream, as opposed to a waste stream.

2. Consider the reverse supply chain from end-to-end.

'Any sub-process can become a system bottleneck'.

3. Identify and develop the right performance metrics and track them systematically.

4. Start by constructing simple models based on the right information. ¨Pay particular attention to the economic impact of time.

5. Use the insights obtained from the models to fully understand the economic impact of alternative designs and operational policies.

6. Align the organizational structure and the incentives/reward systems

Appendix 9 Overview conclusions per question of the semi-structured interview

Conclusion Q1: Although dependent on the brand, sustainable clothing can be fashionable

Conclusion Q2: A sustainable clothing industry is a necessary development

Conclusion Q3: Commitment and involvement of all stakeholders is required in order to make the clothing industry sustainable – the speed of this development is dependent on various factors

Conclusion Q4: Not all consumers are interested in products made of recycled material yet – transparency and awareness creation are needed to increase the number of conscious consumers

Conclusion Q5: Not enough is done with worn clothing right now, although there are nice and interesting opportunities to do more with this

Conclusion Q6: Sustainability is on the agenda of most companies – but the term sustainability has not one clear definition and can therefore be widely interpret / associated with varying initiatives

Conclusion Q7: Sustainability has not been integrated in the ethos of all companies from the beginning onwards, some just started with it, and some just started communicating about it

Conclusion Q8: Different companies have different definitions, perspectives, ideas, and thus goals regarding sustainability

Conclusion Q9: The number of colleagues involved in the sustainability goal is of course also highly dependent on the activities and the size of the company

Conclusion Q10: The ways to achieve sustainability goals are also highly dependent on the activities and the size of the company

Conclusion Q11 and 12: There are no specific parties that all companies really have to work with in order to achieve sustainability goals. Collaboration with stakeholders in the supply chain is key in order to make (numerous small) steps together

Conclusion Q13: Companies do not have established measurement methods and tools for sustainability yet

Conclusion Q14 and 15: There are no specific textile labels must-have's, or nice-to-haves (yet)

Conclusion Q16: n/a

Conclusion Q17: Closing the loop of the entire clothing industry is a perfect endeavor - a huge challenge with potential and a necessity

Conclusion Q18: The need for a CLSC in the clothing industry is huge, although some changes are required before this can be established

Conclusion Q19: n/a

Conclusion Q20: Cooperation between all stakeholders is key to close the loop, and the mindset, awareness, of the consumer is essential to 'restart' the loop

Conclusion Q21: There is not one evident step of the CLSC of the clothing industry that can be designated as the most important one make it a success

Conclusion Q22&23: No real pressure is felt to close the loop except for a social, philanthropic pressure – people feel responsible

Conclusion Q24: The interest in recycling is growing, and companies need to become aware of the fact that they could bring over an innovative message by using recycled content in their products

Conclusion Q25: The price of sustainable clothing, clothing with recycled content, is seen as a large and overarching bottleneck

Conclusion Q26: There are no real high risks in the recovery of clothing identified

Conclusion Q27 and Q31: Companies are highly interested in working with the REMO System, although awareness creation is seen as a huge challenge

Conclusion Q29: Companies strive for transparency but collective stimulation and collaboration are essential to achieve this

Conclusion Q30: Transparency is really valuable in order to attract and retain consumers as well as for companies themselves as they then have all information required to identify their strengths and weaknesses

Conclusion Q32&33: n/a

Conclusion Q34: There is not one single party that could be designated to be the initiator of clothing recovery – it is the responsibility of the entire industry

Conclusion Q35: Initiatives from brands and the government are seen as the biggest influencers on the behavior of the consumers

Conclusion Q36: Transparency, traceability of products in the supply chain could contribute to awareness creation regarding sustainable clothing

Conclusion Q37: n/a

Appendix 10 Opportunities for improvement

Opportunities for improvement of the CLSCM of the clothing industry as an addition to paragraph 5.1:

- More involvement from the government (Kingpins, 2014);
- Subsidies from the European Union for all parties in the supply chain, so this investment is paid by the world instead of companies bearing the risk of the investment themselves entirely;
- The industry should form a good platform to discuss possibilities, lessons learned and invest together - continuously talking about this in the industry; create a platform; and explain and emphasize the importance of it to all stakeholders;
- Voluntary producer responsibility measures (Oakdene Hollins, 2009);
- More markets need to be developed for recycled textiles to redress the balance;
- Work with a (one single) company that is responsible for checking behind doors, to guarantee and ensure the transparency;
- Increase the price of 'new' fibers, perhaps a tax for products without recycled content;
- Quality requirements of clothing containing post-consum / recycled content should be reset (Zegveld, 2014);
- Products need to be redesigned to fit the concept. The analysis of cases found in literature show that in most occasions the quality of materials cannot be maintained in the recovery process simply because products are not designed to be recycled;
- More research on the preservation of material quality during re-cycling to make it interesting for a larger company- and consumer group;
- Embedding the aim for implementation of C2C/CLSCM in the company's strategy and mission;
- Invest money in research into the acquisition process, to make it as easy and accessible as possible for consumers.