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**Environmental sustainability
certifications in the
Fashion Industry**

Supervisor

Ch. Prof. Anna Cabigiosu

Graduand

Anna Marchi

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Introduction

The concepts “fashion industry” and “sustainability”, when juxtaposed, are often considered an oxymoron: fashion has a short-term connotation associated to the seasonality of collections; on the other hand, sustainability is linked to an intergenerational equality in access to natural resources, which assumes long-term perspectives.

It is common knowledge that fashion industry is one of the most polluting industries in the world, being second only to the oil industry. It is also known that, in a historical period in which more and more consumers try to adopt purchasing behaviors aimed at having as positive an impact as possible, companies must adapt their business model to meet a growing demand for environmental sustainability.

This dissertation has been inspired by some questions that I ask myself several times, when seeing words such as “conscious” or “green” or “committed” on fast fashion products labels, usually on a green background. What does “conscious” or “committed” mean? How can this commitment be proved? Is there a framework assessing the degree of sustainability of a brand? How can I be sure that what I am buying is truly sustainable? The lack of trust towards the aforementioned claims derives from the increasingly common greenwashing phenomenon that we, as consumers, are used to, which consists in the improper use of environmental claims with reference to a company’s sustainability practices.

On the contrary, when browsing the websites of sustainable fashion brands, I come across sustainable certifications such as GOTS, BCI, Fairtrade and others. These certifications are used by the apparel companies to ensure a real sustainable commitment towards the workers and/or the environment: a third-party evaluation assessing the respect of binding standards is the way in which new sustainable brands are hindering greenwashing and offering guarantees to consumers.

Turunen and Halme explain that third-party certifications are a sustainability communication method which ensures that sustainable procedures have been performed at the product level. For this reason, they represent a reliable and trustworthy mean of communication towards demanding final consumers (Turunen *et al.*, 2021). At the same time, certifications act as an innovation driver for companies who adopt them, therefore resulting in performance improvements as well (Iannone *et al.*, 2019).

Whilst certifications' importance has been commonly recognized, on the other hand, several standards and certifications have been developed: they generally focus on diverse issues but, sometimes, they overlap each other. This chaotic context generates a major drawback: consumers and companies have many difficulties in making sense out of what has been defined as "a plethora of standards" (Hansen, 2013 and Changing Market Foundation, 2018).

Starting from these personal findings and the literature evidences, and thanks to my Supervisor's guidance, it has been possible to define this dissertation's scope.

The first part of the work provides a snapshot of the *status quo* with regard to environmental sustainability certifications in the fashion industry. As a matter of fact, certifications represent an objective tool for communicating a company's commitment to the implementation of environmental sustainability strategies.

To my knowledge, a general framework defining the environmental certifications and their requirements does not exist, therefore this dissertation aims to describe and to compare the most spread environmental certifications, with a particular focus on those related to materials. The decision to specifically analyze this certificates' niche is based on the fact that the production and processing of raw materials is one of the most polluting phases of the textile and clothing production process.

The goal is to provide a background which can be useful for companies aiming to approach the certifications' adoption path.

The second part of the research takes into consideration the environmental sustainability strategies pursued by the main incumbent conglomerates operating in the luxury segment. The objective is to understand whether and which material certifications are adopted to ensure sustainable sourcing and full traceability, as a proxy of how these companies are moving towards the sustainability frontier, beyond mere declarations. The choice of investigating incumbent companies derives from the fact that the nature of sustainable actions required of firms, which have been operating for decades according to a non-sustainable business model, is certainly more challenging than that of younger companies founded with sustainability in their DNA.

A consistency check is carried out between the sustainability missions declared in the annual reports and the typologies of certifications required by the groups to the supply chains - where indicated - in order to respond to such missions.

The entire research has been performed using secondary data. To the best of my knowledge, there is no existing literature referring to these exact topics to rely on, hence conclusions are drawn using a deductive and descriptive approach.

This thesis is therefore structured in three chapters.

Chapter 1 describes the fashion industry and its supply chain, in order to identify and to understand the different environmental impacts occurring along its numerous stages. Moreover, a literature review on sustainability in the fashion industry has been provided.

Chapter 2 is dedicated to environmental certifications in the fashion industry. First of all, a preliminary research has been carried out on the certificates referred to materials on the ground of their diffusion; thereafter, these have been described in order to capture their objectives and requirements. Finally, the certifications have been compared with the aim of drawing a ranking, which can be useful for companies wishing to steer a business choice in such a complex landscape.

Arising from Chapter 2 certifications' analysis, Chapter 3 reports a coherency check, aimed at verifying the consistency between the objectives and statements presented in the annual reports of incumbent companies in fashion luxury in terms of environmental sustainability, and the actions taken to pursue these targets. In particular, given the nature of the research, it is meant, by actions taken, an evaluation of whether or not sustainability certifications are required for materials and, if so, of which type.

Chapter 1 - The fashion industry

1.1 Introduction

The fashion industry is one of the largest industries in the world: it is worth USD 1.3 trillion and accounts for 300 million employees along the value chain (EMF, 2017).

According to Maslow's hierarchy of needs, it responds to the basic physiological need of protection and to the top self-actualization one, since fashion is a way of expressing yourself and being perceived from others through cloths and accessories.

Over the last two decades, the fashion industry witnessed a rapid expansion due to two main reasons. On the one hand, the rise of the fast fashion model determined a sky-rocketing increase in production volumes (Khurana *et al.*, 2015). This approach, characterized by a fast-response and standardized mass-production (Fletcher, 2010), is also responsible for the increasing criticisms towards the clothing industry as a whole, because of the high volumes and the depletion of natural resources. On the other hand, the increase in population and the economic development phenomena occurred in emerging countries, led to a demand increase that is destined to continue (Khurana *et al.*, 2015). In fact, according to Global Fashion Agenda's and Boston Consulting Group's estimates, there could be an increment to 102 million tons in the apparel consumption, meaning +63% with respect to the 62 million tons in 2017 at the time of the estimate (GFA & BCG, 2017). Likewise, over the period 1975-2018, there had been an increase from 5.9 kg to 13 kg in the global per-capita textile production per year (Niinimäki *et al.*, 2020).

1.2 The fashion industry's impacts

1.2.1 Environmental Impact

The fashion industry, besides having a remarkable role in the global economy, is also one of the industries having the largest environmental repercussions: in terms of generated pollution, it is second only to oil industry (Rinaldi, 2019). The impact can be declined on two dimensions:

a) Resource depletion;

b) Environmental pollution.

a) Resource depletion

The production of raw materials, primarily cotton, and the processing of materials account for an enormous consumption and waste of water.

To crop 1 Kg of cotton, necessary to create a pair of jeans, 8500 liters of water are employed (Desore *et al.*, 2017). The amount of water required by the production of a basic cotton t-shirt is about 2700 liters, equal to what a person drinks over 2.5 years (WWF, 2013).

It is estimated that, on average, the processing of 1 kg of textile requires between 100 and 150 liters of water. Considering that nearly 28 billion kilograms are dyed over one year, the amount of water employed is more or less equal to the amount needed to fill up 2 million of Olympic sized swimming pools (Maxwell *et al.*, 2015). Fashion industry is therefore one of the most water-intensive industries, in the historical moment in which water crisis is set to be one of the top ten global risks according to the World Economic Forum (WEF, 2020).

There are severe impacts on land too: soil degradation and infertility are caused by the extensive use of pesticides and chemicals for raw material production - once again mainly employed in cotton growing. Another key issue is the large-scale deforestation of rainforests, which occurs for the purpose of planting the trees required to produce cellulosic-made fibers like viscose or modal.

b) Environmental pollution

The widespread use of hazardous chemicals in the fashion industry, especially for cotton production and for the processing and dyeing of textiles, is unfortunately well-known. It is assessed that cotton production is responsible for 23 percent of the global insecticide's usage (McKinsey and BOF, 2021); additionally, more than 35% of chemicals from textile treatments are released in the environment (Thiry, 2011), usually dumped from factories into the nearby rivers, resulting in a worrying water pollution that damages the life of millions of people living nearby and of the aquatic species.

Water is not only polluted by chemicals, but also by microfibers every time a synthetic garment is washed. According to a study based on experimental tests, on average a synthetic jacket releases 1.8 mg of microfibers at every washing; "These microfibers then travel to local wastewater treatment plant, where up to 40% of them can enter into rivers, lakes, and oceans (depending on local wastewater treatment conditions)" (Hartline *et al.*, 2016).

The level of greenhouse gases emissions is another pollution-related red flag: the amount generated by the fashion industry is extremely high. In 2018, it was 4 percent of the total emissions at global level, equal to the combined emissions of three developed countries like the United Kingdom, Germany and France (McKinsey and GFA, 2020).

Last but not least, there is a serious issue concerning waste generation that has become increasingly relevant with the rise of fast fashion. The business model is based on high volumes of items which are produced to last for a very short time, before being thrown away in landfills. It is estimated that 17.5 cubic meters of textile products, which is equal to one garbage truck, are incinerated or disposed of in landfills every single second (BOF and McKinsey, 2022).

1.2.2 Social Impact

This industry is often mentioned for the negative and heavy social impacts as well, especially since the Rana Plaza building collapse. The tragic event happened in 2013 and caused more than one thousand deaths: it shed light on the severe working conditions of many garment workers. “High cost and time pressures are often imposed on all parts of the supply chain, leading to workers suffering poor working conditions with long hours and low pay, with evidence, in some instances, of modern slavery and child labour” (UNECE, 2018).

Due to globalization and the rise of the fast fashion industry, more and more companies moved their production sites in locations where labor cost was less expensive. Social issues emerge when the minimum wage is so low that is half or less of the living wage. Moreover, due to the strict timing imposed by the fast fashion system, workers are forced to work 14-16 hours per day, 7 days a week, in unhealthy and unsafe conditions. In addition, in the majority of the producing countries, the governments do not allow unions, therefore garment workers do not have the possibility to fight for and defend their rights collectively (Charpail, 2017).

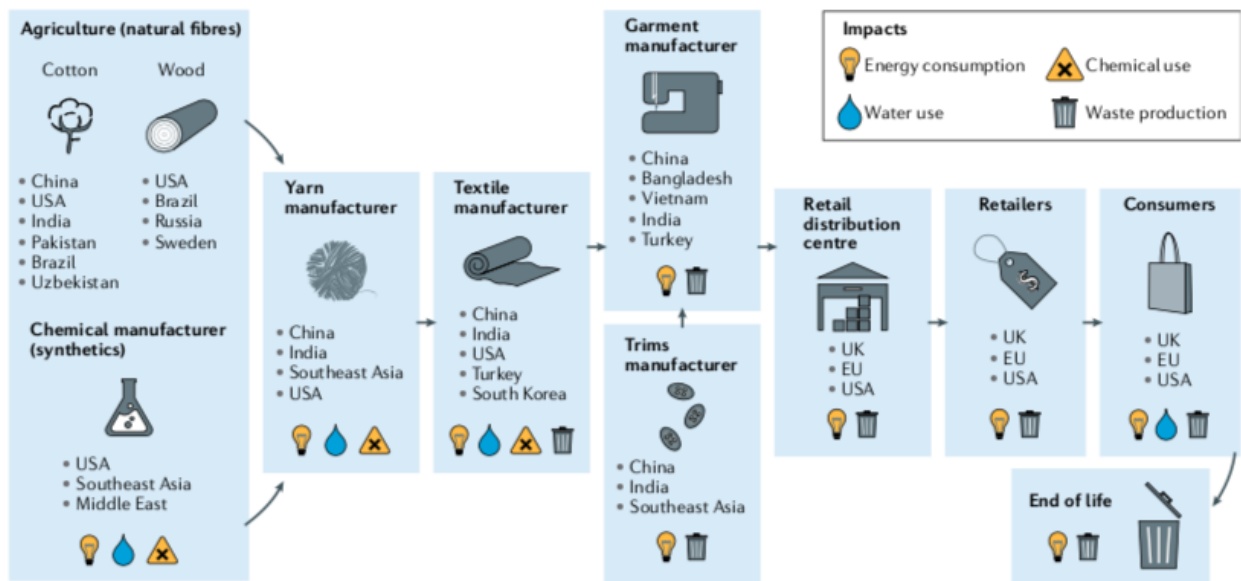
Given the poverty conditions of the countries in which textile productions sites are located, it is common to assist to child labor conditions as well. As a matter of fact, the industry does not require high-skilled workers, therefore children are sent to work in textile factories to contribute to the family finances (Charpail, 2017).

1.3 Textile supply chain

The apparel industry consists of several manufacturing processes which take place in different countries, therefore generating a very long, complex and dispersed supply chain.

Figure 1 illustrates which areas and countries are mainly involved at each stage, besides their impact.

Figure 1: Garment-manufacturing supply chain

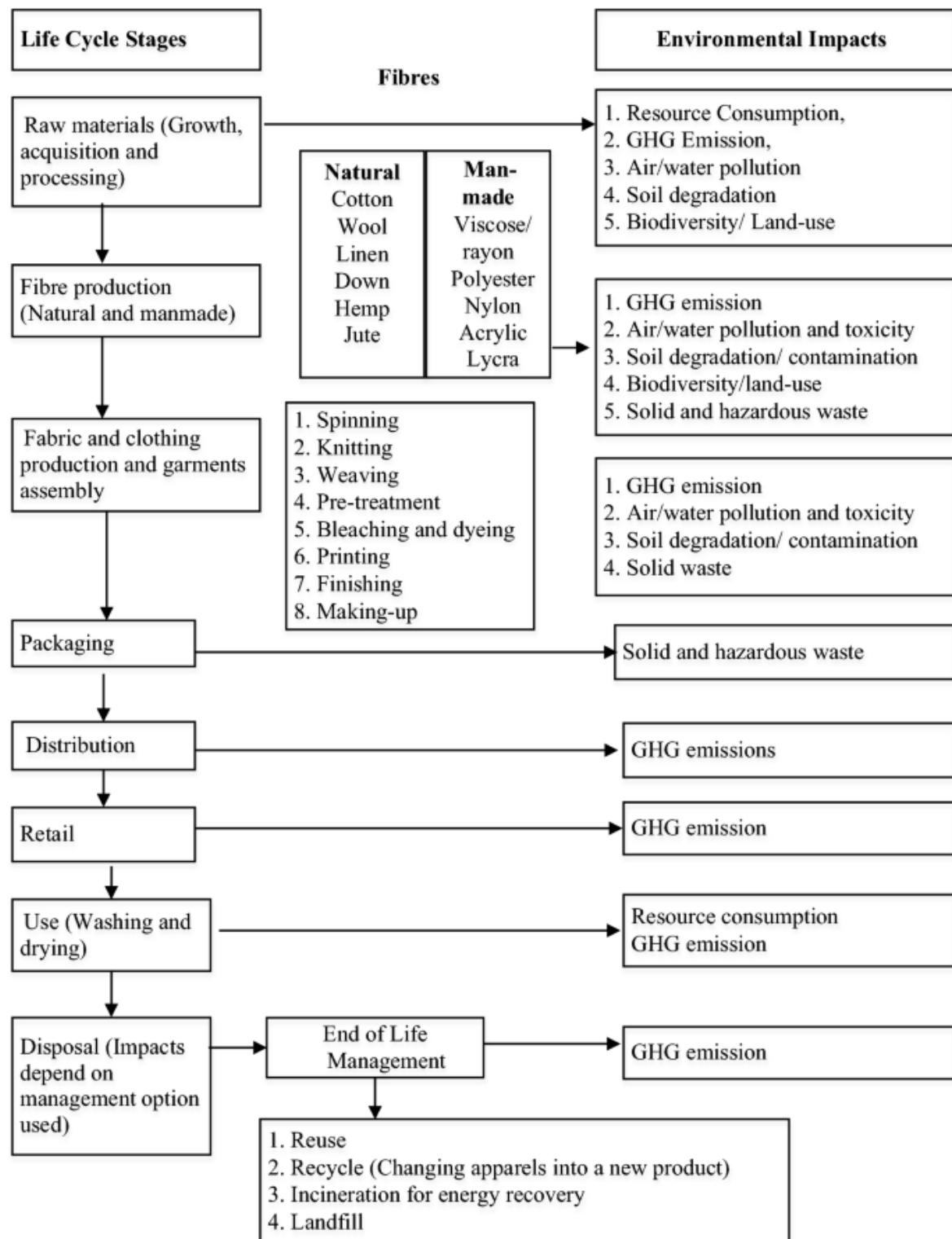


Source: The environmental price of fast fashion (Niinimäki *et al.*, 2020)

The geographic unbalance between the production phases, which occur mainly in China and South-East Asia, and the retail and consumption ones, which involve developed regions such as Europe and North America, is quite evident.

Each process, from fiber production to garments end of life, heavily contributes to the industry's environmental impacts. The following paragraphs provide a description of each step and of its impacts, which can be summarized by Figure 2:

Figure 2: Impact contribution of different stages of textile life cycle



Source: Environmental impact of apparel supply chain and textile products (Moazzem et.al, 2021)

Fiber production

The very first phase is the raw material production. Different types of fibers can be employed to realize clothing yarns and they can be of natural origin or man-made.

Natural fibers, such as cotton, wool, hemp, linen, down and jute, derive from cultivation or farming. On the other hand, artificial fibers can be of natural origin, like viscose or modal, or synthetic like nylon and polyester, which derive from crude oil production (Moazzem *et al.*, 2021).

Evidently, the most energy-consuming types of fibers are the synthetic ones, as it has been scientifically demonstrated, but natural fibers have their own serious environmental impact as well. Cotton, in fact, is extremely water-consuming and is the most polluting natural fiber because of the extensive use of chemical agents. Other types of production, for example wool or viscose, are respectively responsible for soil degradation and deforestation.

Textile production

Textile production starts with spinning, which can be followed by weaving or knitting, two fabric engineering technologies.

Spinning is the phase in which the fiber is transformed in yarn thanks to a twisting technique; yarn is then converted into fabric through weaving (by interlacing warp and weft threads) or knitting (by interlacing the yarn in continuous loops). All these phases are energy-consuming since, at industrial levels, they are handled with specific machineries. In particular, the spinning stage necessitates of different degrees of energy consumption, depending on the yarn that must be produced. Concerning the typology of fabric production, knitting methodology is relatively less energy-demanding than weaving (Moazzem *et al.*, 2021).

The textile can then undergo different steps in order to acquire the final required characteristics. “Textile wet treatments include washing, boiling, bleaching, dyeing and finishing. Before dyeing, fabric is pre-treated to remove wax and any residue. A bleaching process may be required depending on textile colour/shade to be produced. Caustic liquor or acidic liquor is used during washing and boiling. Acidic liquor is used to remove alkali metal compounds and caustic liquor is used to remove waxes and grease from raw fabric. Reactive dyes and disperse dyes are used to dye cotton and polyester, respectively. Suitable dyestuffs are used to dye blend fabrics. Fabrics may be finished chemically using softener, antistatic, enzyme, piling resistant or crease-

resistant according to requirements. Around 2000 types of chemicals may be used during textile processing, especially during textile wet processing. The release of toxic substances from these chemicals into the environment through evaporation, process waste, dissolving in water causes toxicological impact on the environment.” (Moazzem *et al.*, 2021).

From these words, it emerges how much the fabric processing is impactful both on the environment and on the workers who breath and touch such dangerous chemicals.

Thereafter, finished textiles must be transformed into garments: cutting, sewing and trims application are other energy-demanding steps which concur to the elaboration of the final product.

Product Use

Lastly, the finalized garment must be packaged and transported to retailers, causing GHG emissions, before being used by the final consumer.

The environmental impact of the usage stage depends on the consumer’s habits in terms of garment’s care: high-temperature washings and detergents containing chemicals have more severe impacts on the environment than cold-water washings and ecological detergents (Moazzem *et al.*, 2021).

End of life management

With the fast fashion system’s rise, garments have become more and more disposable: it is estimated that, in one year time frame, half of fast fashion items are disposed of (EMF, 2017). Most of the garments thrown away are incinerated or end up in landfills. According to Niinimäki, in the USA, the quantity of textiles in landfills increased of 40 percent in a 10-years period (2009-2019) and every year, in the USA and in the UK, a person throws away an average of 30 kg of textiles (Niinimäki *et al.*, 2020). Disposal in landfills is the worst option from an environmental point of view because of the decomposition process, which can require more than 200 years for synthetic fibers. As a matter of fact, during the process, the items release in the ground toxic chemicals and dyestuff, which pollute the soil and the groundwater; moreover, methane greenhouse gases are generated (Brown, 2021). Even though the incineration system has the benefit of getting heat and energy of a controlled burning system, the process still generates emissions and causes the dispersion of ashes (Moazzem *et al.*, 2021).

According to the Ellen MacArthur Foundation, only 13% of clothing is recycled, usually in lower-value applications, whereas only 1% of clothing material is recycled to produce new clothing material (EMF, 2017).

The role of fast fashion in enhancing and accelerating environmental issues is clear, but it is argued that its mass-market reach could be exploited to convey sustainable practices and messages (Neumann *et al.*, 2020).

1.4 Sustainability in the fashion industry

The concept of sustainable fashion firstly emerged during the 1960s, when the industry's impact on the environment came to the attention of consumers, who started to ask for more sustainable practices (Jung and Jin, 2014). After the fast-fashion model became prevalent, the environmental and social issues arose with even higher relevance, since the hazardous effects generated even more evident proof. Consumers are therefore addressing their environmental concerns, not only on organic food consumption choices, but on fashion purchases as well (Ritch, 2015).

Nowadays, the interest towards sustainability is constantly increasing, in such a way that it is possible to talk about sustainability “megatrends” (Mittelstaedt *et al.*, 2014). Consumers are changing their purchasing behaviors towards green products and, on the other hand, companies and organizations are using buzzwords like “eco”, “green”, “environmentally friendly” and “sustainability” in their advertising communications (Chen and Chang, 2013; Henninger, 2015). The improper use of environmental claims regarding a company's sustainable practices, when not supported by real evidence, is called “greenwashing”, a phenomenon which frequently occurred during the past years and which undermined customers' trust towards green marketing (Chen and Chang, 2013).

According to Neumann, sustainable fashion is referred to as “green, ethical or eco fashion, with all terms used synonymously” (Neumann *et al.*, 2021). Neumann also reports a definition for sustainable fashion as “(apparel) that incorporates fair trade principles with sweatshop-free labour conditions; that does not harm the environment or workers by using biodegradable and organic cotton, and designed for a longer lifetime use; that is produced in an ethical production system, perhaps even locally, which causes little or no environmental impact and makes use of

eco-labelled or recycled materials” (Neumann *et al.*, 2021; Joergens, 2006; Kang and Hustvedt, 2014; Shen *et al.*, 2013).

Sustainable fashion is often referred to as an oxymoron (Clark, 2008), especially considering the fact that fashion has a short-term property associated to the seasonality of collections, whereas sustainability is connected with long-term perspectives (Henninger, 2015).

Neumann specifies that, according to scholars, different terms are used when referring to diverse aspects of sustainability: “ethical” is linked to social topics such as fair and safe working conditions and fair trade, whilst “ecological” or “green” fashion is related to environmental aspects (Neumann, 2021). The latter, Henninger adds, involves the use of raw materials organically or environmentally-friendly cultivated, certifications and a traceable supply chain (Henninger *et al.*, 2016).

Companies are therefore called to seriously commit to sustainability, not only upon consumers’ requests but by NGO as well, who often force them to take a stand by using their names in shame campaigns (Khurana *et al.*, 2015). Khurana and Ricchetti also provide a reflection upon how sustainability is considered from a financial point of view: on the one hand, given the externalities caused by fashion companies, they should be accounted for the unpaid costs of resource depletion, so a cost should be paid. On the reverse, sustainability could be seen as an innovation and value driver able to generate a competitive advantage, therefore having a financial positive impact (Khurana *et al.*, 2015). The State of Fashion 2022 report, six years later, asserts that developing an environmental sustainability strategy is more a prerequisite to stay competitive than a differentiating element. The pandemic situation, states the report, has enhanced people’s attention around the topic: it would boost the consumer’s mindset to adhere to the sustainability agenda more than ever - “The pandemic will bring values around sustainability into sharp focus, intensifying discussions and further polarizing views around materialism, over-consumptions and irresponsible business practices” (BOF & Mc Kinsey, 2021).

Very long and spread supply chains represent the major difficulty for enterprises aiming at tackling and improving the *status quo*, in view of the fact that exercising control over their partners is definitely challenging (Islam *et al.*, 2020). As the first part of the supply chain is concerned, companies can address the environmental issue by sourcing raw materials that are grown responsibly, or that are regenerative and recycled or recyclable (BOF and McKinsey, 2021). Another intervention area is the processing stage, where pollution and emissions could be reduced thanks to innovative technologies.

Besides the improvement of cultivation and production stages, there are business models focusing on the after-consumption phase. For example, upcycling is a business model based on the use of discarded material to realize new goods of “[...] equal or higher perceived value, utility, and/or quality than the original product” (Todeschini *et al.*, 2017). The major benefit of this paradigm is that no original raw material is needed, therefore no resources are required; additionally, something that would have been disposed of causing waste is still useful, so its lifespan is extended.

Recycling is another strategy which helps to reduce environmental impact, even though the process of transforming a product and its components into something different is an energy-consuming process. For this reason, it is less preferred than reuse strategies, which do not require transformations. Other business models contributing to the abatement of environmental effects are those who target consumer behavior. In order to favor a reduction of new items sold, second-hand and rental shops and platforms became widespread.

The fashion business, as it has been described, besides having a major role in the world’s economy, is also one of the most polluting industries. Its impact is becoming ever more apparent to consumers, who are asking companies for a change of pace.

From the companies’ point of view, taking a stand with green claims is no longer enough: concrete commitments and demonstrable actions must follow. In this context, sustainability certifications can provide actual evidence that certain standards have been achieved.

Chapter 2 - Environmental certifications in the fashion industry

2.1 Introduction

In recent years, consumers are progressively adopting a more responsible behavior and companies, on the other side, are aware that sustainability is key for their competitiveness (Ciasullo *et al.*, 2017).

According to Turunen and Halme, sustainability communication towards consumers can be of two predominant types: third-party verified labels or free-form sustainability declarations (Turunen *et al.*, 2021). The same authors explain that third-party sustainability certifications ensure that sustainability practices have been performed at the product level, therefore they convey a sense of reliability and trustworthiness. On the contrary, free-form communication reports general claims about sustainable initiatives and commitments which are not immediately verifiable and comparative. If certifications engage the rational side of consumers, environmental claims involve the emotional one (Turunen *et al.*, 2021).

A certification is a formal document assessing a status or a level of achievement, with reference to pre-determined standards. In the environmental context, a material, process or product can be certified against the standard's guidelines concerning environmental conditions.

A PEFC research reveals that 4 out of 5 respondents want brands to use certifications labels on products to communicate their sustainability efforts, because they act as a proxy for real commitment (PEFC/GfK Global Consumer Survey, 2014).

From the standpoint of companies, environmental certifications lead to performance improvements and act as drivers for innovation (Iannone *et al.*, 2019).

Integrating certifications on product labels is “[...] a competitive edge, as it quickly communicates to consumer its values” said Ana Andjelic, a retail strategy executive, as reported by Forbes (Moore, 2019). In the same article, certifications are defined as “a seal of approval”, a proof of commitment for more sustainable and responsible practices.

Certifications can be of three types, according to ISO classification (Koszevska, 2021):

- Type I is a voluntary ecolabel, based on multiple-criteria and assessed by third-party bodies;

- Type II consists of manufacturer's self-declarations, with no independent supervisory mechanism;
- Type III is a third-party verified declaration based on quantified environmental reports.

Most of environmentally sustainable certifications are of type I, such as GOTS, EU Ecolabel and Nordic Swan (Koszevska, 2021).

Sustainability in the fashion industry is quite a complex phenomenon, which involves both environmental and societal aspects in many different stages of a long and dispersed supply chain. To respond to the numerous sustainability challenges, many labels have been developed, generating "a plethora of standards, certification systems and labels" (Hansen *et al.*, 2013), more than 100 in the textile industry (Ecolabel Index, 2018). They are focused on diverse issues but, in some cases, overlap each other; moreover, no certification can address any environmental or social sustainability concern (Turunen *et al.*, 2021). This status brings along a major drawback: it is extremely difficult for consumers and companies to make sense of them (Changing Markets Foundation, 2018)

This dissertation aims to provide a snapshot of the status quo with regard to environmental sustainability certifications and standards in the fashion industry, with a particular focus on materials. The decision to specifically analyze those related to materials is based on the fact that the production and processing of raw materials is one of the most polluting phases of the textile and clothing production process.

First of all, a preliminary research has been carried out on the environmental sustainability certifications referred to materials on the ground of their diffusion; thereafter, these have been described in order to capture their objectives and requirements. Finally, the certifications have been compared with the aim of drawing a ranking, which could be useful for companies that wish to steer a business choice in such a complex landscape.

2.2 Certifications research methodology

To understand which are the most employed sustainability certifications in the fashion/textile/apparel industry, three databases have been scouted: Business Source Ultimate, Business of Fashion, and Pambianco News. In order to verify if the papers, articles and reports contained relevant information, I read the abstracts and looked for the word “certification” inside the texts.

In the following section, the procedure will be described in detail according to the related database.

2.2.1 Business Source Ultimate

Date: 30/10/2021 - Query 1

Choose database: all databases

Keywords: fashion AND certification AND sustainability

Select a field: All text

Number of results: 10349 results

To narrow the research area, the following filters have been applied:

- Years: 2001-2021 → 10264 results
- NAICS/industry (alphabetical order) → 746 results

Selected:

- all other clothing stores
- all other miscellaneous store retailers (except beer and wine-making supplies stores)
- all other miscellaneous store retailers (except tobacco stores)
- all other miscellaneous textile product mills
- broadwoven fabric mills
- clothing and clothing accessories merchant wholesalers
- cut and sew apparel contractors

- family clothing stores
 - marketing consulting services
 - other apparel knitting mills
 - other clothing stores
 - other farm product raw material merchant wholesalers
 - packaging and labeling services
 - process, physical distribution, and logistics consulting services
 - regulation, licensing, and inspection of miscellaneous commercial sectors
- Subject → 188 results

Selected:

- sustainability
- textiles
- fashion
- clothing & dress
- sustainable fashion
- denim
- green products
- developing countries
- textile industry
- clothing industry
- marketing
- social responsibility
- textile fibers
- supply chains
- cotton trade
- economic conditions of farmers

- product life cycle
- united states
- yarn
- cotton farmers
- hemp
- retail industry
- standards
- value chains
- clothes closets
- industrial procurement
- new product development
- polyester fibers
- supply chain management
- t-shirts
- advertising & children
- business models
- business revenue
- business size
- business valuation
- certification
- clothing & dress -- environmental aspects
- clothing stores
- consultants
- consulting firms
- consumer protection
- consumers

- consumption (economics)
- corporate sustainability
- corporations
- dealers (retail trade)
- entrepreneurship
- environmental aspects
- environmental protection -- united states
- fashion designers
- fibers
- forest landowners
- fur trade
- globalization
- government agencies
- rules & practice
- united states -- politics & government
- united states -- politics & government -- 2009-2017

In case of duplicates, the database automatically keeps one element.

Date: 01/11/2021 - Query 2

Choose database: all databases

Keywords: fashion sustainability AND certification

Select a field: All text

Number of results: 357 results

Years: 2006-2021

To narrow the research area, the following filters have been applied:

- NAICS/industry (alphabetical order) → 120 results

Selected:

- all other clothing stores
- all other consumer goods rental
- all other miscellaneous general merchandise stores
- all other miscellaneous textile product mills
- all other textile product mills
- artificial and synthetic fibers and filaments manufacturing
- broadwoven fabric mills
- clothing and clothing accessories merchant wholesalers
- consumer lending
- cotton farming
- crop harvesting, primarily by machine
- cut and sew apparel contractors
- family clothing stores
- fiber, yarn, and thread mills
- footwear merchant wholesalers
- independent actors, comedians and performers
- knit fabric mills
- marketing consulting services
- materials recovery facilities
- men's and boys' clothing and furnishings merchant wholesalers
- men's and boys' cut and sew apparel manufacturing
- men's clothing stores
- narrow fabric mills and schiffli machine embroidery

- other apparel knitting mills
 - other clothing stores
 - other farm product raw material merchant wholesalers
 - recyclable material merchant wholesalers
 - women's and girls' cut and sew clothing manufacturing
 - women's, children's, and infants' clothing and accessories merchant wholesalers
 - women's, girls', and infants' cut and sew apparel manufacturing
- Subject → 77 results

Select all, except:

- architectural design
- bed sheets
- bedding
- city dwellers
- electronics recycling
- luxury housing
- music festivals
- organic foods
- outdoor recreation
- peas
- sustainable buildings

Date: 01/11/2021 - Query 3

Choose database: all databases

Keywords: apparel industry AND certification AND sustainability

Select a field: All text

Number of results: 1124 results

To narrow the research area, the following filters have been applied:

- Years: 2001-2021 → 1113 results
- NAICS/industry (alphabetical order) → 292 results

Selected:

- all other clothing stores
- all other consumer goods rental
- all other miscellaneous store retailers (except beer and wine-making supplies stores)
- all other miscellaneous store retailers (except tobacco stores)
- all other miscellaneous textile product mills
- broadwoven fabric mills
- clothing and clothing accessories merchant wholesalers
- cotton farming
- crop harvesting, primarily by machine
- cut and sew apparel contractors
- family clothing stores
- footwear and leather goods repair
- footwear manufacturing
- footwear merchant wholesalers
- marketing consulting services
- other apparel knitting mills

- other clothing stores
 - other farm product raw material merchant wholesalers
 - process, physical distribution, and logistics consulting services
- Subject (alphabetical order) → results: 132

Select all, except:

- attitudes
- conferences & conventions
- decorative arts
- erbium
- executives
- fire investigation
- government agencies
- government policy on industrial safety
- industrial policies
- industrial surveys
- medicine information services
- seafood
- sewage purification

Date: 06/11/2021 - Query 4

Choose database: all databases

Keywords: apparel industry AND certification

Select a field: All text

Number of results: 2726 results

To narrow the research area, the following filters have been applied:

- Years: 2001-2021 → 2600 results
- NAICS/industry (alphabetical order) → 586 results

Select:

- all other miscellaneous store retailers (except beer and wine-making supplies stores)
 - all other miscellaneous store retailers (except tobacco stores)
 - all other miscellaneous textile product mills
 - broadwoven fabric mills
 - clothing and clothing accessories merchant wholesalers
 - cut and sew apparel contractors
 - family clothing stores
 - fiber, yarn, and thread mills
 - narrow fabric mills and schiffli machine embroidery
 - other apparel knitting mills
 - other clothing stores
-
- Subject: → 202 results

Select all, except:

- nonfiction
- decorative arts
- executives
- footwear industry
- least squares
- pyramids
- seafood

- sewage perception
- Academic journals → 61 results

The four queries frequently reported the same articles and/or papers, therefore only one element has been kept.

Out of the 267 analyzed reports, 120 contain information about sustainability certifications in the fashion industry and 147 do not.

In order to proceed with the count of the certifications' mentions, the following revisions were performed:

1. Harmonization of certification names (since some certifications are called in different ways):
 - Oko-tex → Oeko-Tex
 - Svanen → Nordic Swan
 - Eu flower → Eu Eco-Label
 - eco-cert → ECOCERT
 - ZQue/ ZQ certified merino → ZQ
 - Gold level Material Health → C2C
2. Given that Oeko-Text Standard 100 is the most mentioned certification by Oeko-Tex, only this one will be analysed in detail.
3. All the OE versions have been grouped.

2.2.2 Business of Fashion

Date: 09/11/2021

Website's search bar

Keyword: certification

Number of results: 118 results

Out of the 118 analyzed articles, only 24 contain information about sustainability certifications in the fashion industry and 94 do not.

2.2.3 Pambianco News

Date: 11/11/2021

Website's search bar

Keywords: "certificazione AND fashion"

Number of results: 47 results

Out of the 47 analyzed articles, only 21 contain information about sustainability certifications in the fashion industry and 26 do not.

2.3 Certifications selection

Research focus

The objective of this dissertation is to analyze the existing certifications regarding materials and materials' processing. For this reason, certifications concerning workers conditions (e.g., Fairtrade), packaging/labelling (e.g., FSC), or company's certifications (e.g., SA 8000 or ISO 14000 etc.) will not be studied and will be excluded from the research selection process.

Selection Method

The methodology employed in the certifications' selection for this analysis is based on the recurrence of the certificates in academic articles, reports and articles related to the fashion industry and to sustainability certifications.

After having listed the certifications in descending order of mentions, two different selection approaches have been applied, due to the different frequency rate of results in the three scouted databases:

- Business Source Ultimate: selection of the top 10 certifications in order of frequency;
- Business of Fashion and Pambianco News: selection of the certifications that appear in more than one article.

The detailed display of results and selection process will follow.

Business Source Ultimate

Top 10 certifications in order of frequency: in case of *ex equo*, both certifications are considered.

The selected items are highlighted in bold.

Table 1: Selection of certifications from BSU

CONSIDERING THE REPORTS CONTAINING INFO, HOW OFTEN IS THE CERTIFICATION MENTIONED?	
CERTIFICATION	FREQUENCY
GOTS	31
Oeko-Tex	28
SA 8000	15
C2C	13
Fairtrade	12
ISO 14001	12
B Corp	11
GRS	11
BCI	9
Bluesign	7
FSC	7
OE	7
CmiA	6
EU Eco-Label	5
Nordic Swan Ecolabel	5
RWS	5
ISO 14000	4
USDA	4
ECOCERT	3
FurMark	3
ISO 9000	3
OCS	3
RDS	3
Econyl	2
EMAS	2
Fairtrade Certified Cotton	2
ISO-TYPE	2
Organic Certification	2
ROC	2
TDS	2
ZQ	2
AIAB	1
Authentico	1
Bureau Veritas	1
Carbon Neutral TUVSUD	1
Certified Humane	1
Certified Organic	1
Certified Vegan	1
EU Organic Standard	1
FACTS	1
FFL	1
FLO	1
Free2Work	1
Good Environmental Choice	1
GRI	1
Intertek	1
ISO 5001	1
ISO 9001	1
IVN	1
LWG	1
Non Pest Management	1
Safer Chemicals	1
SFI	1
Shop For Change	1
STeP	1
WelFur	1
Workers Rights Consortium	1
Zero To Landfill	1

Source: personal elaboration

Business of Fashion

Due to the fact that the number of articles containing information is quite limited, the selection includes only the certifications which appear in the articles more than once.

The selected items are highlighted in bold.

Table 2: Selection of certifications from BoF

CONSIDERING THE REPORTS CONTAINING INFO, HOW OFTEN IS THE CERTIFICATION MENTIONED?	
CERTIFICATION	FREQUENCY
B Corp	9
Fairtrade	5
GOTS	5
BCI	2
Bluesign	2
SA 8000	2
ZQ	2
C2C	1
Common Thread Fabric	1
LEED	1
Lenzing	1
PEFC	1
Waste2Wear	1
WRAP	1

Source: personal elaboration

Pambianco News

Due to the fact that the number of articles containing information is quite limited, the selection includes only the certifications which appear in the articles more than once.

The selected items are highlighted in bold.

Table 3: Selection of certifications from Pambianco News

CONSIDERING THE REPORTS CONTAINING INFO, HOW OFTEN IS THE CERTIFICATION MENTIONED?	
CERTIFICATION	FREQUENCY
B Corp	5
Oeko-Tex	4
SA 8000	4
FSC	3
GOTS	3
ISO 14001	3
GRS	2
ZDHC	2
BCI	1
Bluesign	1
C2C	1
Emas	1
EU Eco-Label	1
Fairtrade	1
ISO 9001	1
ITF	1
LWG	1
PEF	1
Tfashion	1
Tüv Rheinland	1
UNI 11427	1

Source: personal elaboration

As previously stated, the methodology for the certifications' selection is based on the recurrence of the certificates in academic articles, reports and articles related to the fashion industry and to sustainability certifications.

Since the research question focuses on the early stage of the product life cycle, thus materials and material processing, non-relevant certifications have been excluded.

In conclusion, the following thirteen certifications will be analyzed in detail:

- GOTS
- Oeko-Tex
- C2C
- GRS
- BCI
- Bluesign
- OE (now called OCS)
- CmiA
- EU Eco-Label
- Nordic Swan Ecolabel
- RWS
- ZQ
- ZDHC

2.4 Certifications description

The following section will provide a description of the selected certifications, with a particular focus on the object and on the chain of custody of the standards. The chain of custody is the set of activities designed to track data and information and to protect the identity of a product, from the production stages, including raw materials, to the final stage of selling to the consumer.

The main source of information is the official website.

2.4.1 GOTS - Global Organic Textile Standard

Figure 3: GOTS logo



Source: Global Standard website, 2021

According to the previously described certifications research, the Global Organic Content Standard (GOTS) is the most mentioned certification among academic papers and business articles related to the sustainability topic in the fashion industry.

The official website provides detailed information about the standard, starting from its aim, which is the following:

“[...] to define world-wide recognised requirements that ensure the certified organic status of textiles, from the harvesting of the raw fibre, through environmentally and socially responsible manufacturing up to labelling in order to provide credible assurance to the end consumer. Textile processors and manufacturers are thus enabled to export their organic fabrics and garments with one certification accepted in all major markets.” (GOTS, 2021).

Therefore, the certification is focused on natural fibers of organic origin and their treatment during the production process, in order to define standards for a category of raw materials that

has a reduced environmental impact and preserves the health of consumers as opposed to conventional raw materials. The categories that can achieve the GOTS certification are textile products, manufactural activities and chemical products for the textile industry.

The GOTS was established with the objective of representing a world-wide framework, which could standardize different standards and be globally recognized and accepted when trading goods. This goal has been accomplished, thanks to the fact that different stakeholders have been and constantly are consulted in a process of continuous evolution and improvement of the certificate.

Moreover, the credibility of the standard is ensured by the fact that the certification is issued by independent auditors who regularly inspect each process on-site, expelling those companies who are not compliant and imposing penalties on those who improperly use the GOTS logo.

The standard is one of the most binding, since it includes only compulsory requirements. It is applied to items containing at least 70% of certified organic fibers and it encompasses the whole supply chain, from processing to trading. The raw material cultivation is not directly assessed by GOTS, but only materials certified and approved in the IFOAM Family of Standards are considered organic.

The GOTS website defines organic fibers as “[...] *natural fibres grown without the use of synthetic pesticides, insecticides, or herbicides and GMOs (Genetic Modified Organisms) according to the principles of organic agriculture.*”

The guidelines regarding the usage of the GOTS label identify two types of grades:

- “Organic” product, made with a minimum of 95% organic fibers;
- “Made with organic material” product, made with a minimum of 70% organic fibers.

In addition to the clear objective of environmental sustainability, the certification aims to watch over other critical aspects in the supply chain of the fashion industry. In fact, it protects workers’ labor conditions and prohibits the use of chemical agents that are harmful to the health of employees and end-users. Thus, on the one hand, companies that obtain GOTS certification are able to provide tangible proof of their commitment to environmental and social sustainability objectives without falling into greenwashing; on the other hand, consumers who wish to make conscious purchasing choices can be certain that GOTS articles meet rigorous and constantly audited criteria.

The website lists the key requirements that must be met in order to achieve the certification:

Environmental

- “Separation from conventional fibre products and identification of organic fibre products”
- “Use of GOTS approved colourants and auxiliaries in wet-processing only”
- “Processing units must demonstrate environment management, including wastewater treatment”
- “Technical quality parameters for colour fastness and shrinkage for finished goods required”
- “Restrictions on accessories”
- “Restrictions on additional fibre materials”
- “Environmentally hazardous substances prohibited in chemical inputs”
- “Evaluation of toxicity and biodegradability for chemical inputs”

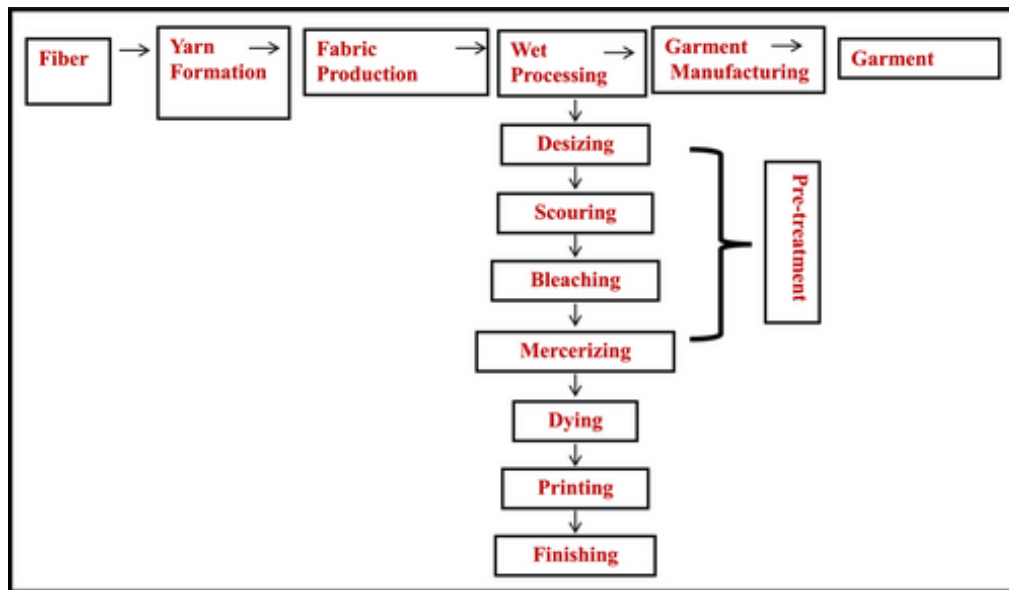
Social

- “Employment is freely chosen”
- “Freedom of association and collective bargaining”
- “Child labour shall not be used”
- “No discrimination is practiced”
- “Occupational health and safety (OHS)”
- “No harassment and violence”
- “Remuneration and assessment of living wage gap”
- “Working time”
- “No precarious employment is provided”
- “Migrant workers”

While meeting social criteria is required at all stages of the certification process, compliance with the environmental criteria may differ according to the stage of the production process.

The following diagram shows the different stages of textile production (Figure 4):

Figure 4: A flow diagram for diverse stages involved in textile production operations



Source: (Madhav, 2018)

The certification process begins with the textile fibers processing, when the raw material is cleaned and prepared for the following steps. For example, this phase is called ginning when referring to cotton: it consists on the removal of seeds and debris. From this moment on, the organic fibers must be carefully separated from the conventional ones to avoid contamination. Since both materials appear identical, workers' training plus clear and accurate separation systems are imperative.

The following step is spinning, where fibers are transformed into yarns. The separation from conventional fibers must be ensured. Moreover, synthetic fibers are prohibited.

The yarn is then converted into fabric in the so-called weaving and knitting process. Usually, yarns of different fabrics are put together to confer particular characteristics to the fabric such as strength or elasticity. Therefore, as in the previous steps, the minimum quantity of 70% organic fibers must be guaranteed. Another element of inspection is the use of natural sizing agents, preferred to synthetic ones. Moreover, machine oils have to be heavy metal-free in case of contact with the organic materials.

One of the most delicate phases is wet-processing, which includes textile pre-treatments (desizing, scouring, bleaching, mercerizing), coloration (dying and printing) and finishing. This stage confers to the textile the final features that will characterize it, both in aesthetical and practical terms (Madhav, 2018). Chemical inputs, for example dyestuffs, inks, enzymes and

other auxiliaries, must be GOTS approved and not be listed amongst the banned substances. In this phase, water plays a prominent role: it is used as a solvent for dyestuffs and chemicals substances, it transfers these agents to the fabric and it is employed for washing and rinsing (Raja *et al.*, 2019). The wastewater treatment must comply with the most stringent environmental criteria between GOTS parameters and local regulation. The requirements include “[...] *pH, temperature, total organic content, biological oxygen demand, chemical oxygen demand, colour removal, etc.*” (GOTS website, 2021)

The following stage is manufacturing: the result is the final item, so the operation includes cutting, assembling, sewing, ironing, etc. Also, different accessories can be added to assemble the final product, therefore they must comply with the Restricted Substances List or be Oeko-Tex Standard 100 certified.

The last stage of the process, trading, is GOTS certified as well, in order to guarantee the customer that the whole supply chain fulfills stringent criteria. Business to business companies must be certified if their turnover from GOTS certified products exceeds € 20.000 per year, otherwise they just need to be registered with an Approved Certifier. On the other hand, retailers have no need to get the certification, but they have the possibility if they wish so. In this way, they can display on the product’s label their license number as well.

2.4.2 Oeko-Tex Standard 100

Figure 5: Oeko-tex Standard 100 logo



Source: Oeko-Tex website, 2021

Oeko-Tex is an organization which brings together 17 independent institutes from Europe and Japan with the aim of developing testing procedures and constantly updating threshold limits for the use of harmful substances in the textile and leather sectors.

Six types of labels have been developed over the years:

- STANDARD 100 and LEATHER STANDARD certify textile and leather products that do not contain substances harmful to human health and the environment;
- MADE IN GREEN combines the purpose of the previous certifications with the evaluation of the production process, which must be ecologically and socially sustainable;
- STeP certifies textile and leather production activities that implement ecologically and socially sustainable practices;
- DETOX TO ZERO, referring to Greenpeace's DETOX campaign, is a tool for analysis and monitoring of chemical management and wastewater quality for companies in the textile and leather sector.
- ECO PASSPORT is a document which identifies chemicals, dyes and auxiliaries used in the textile and leather industry that do not have negative impacts on the environment and human health.

According to the certification research carried out for this dissertation, STANDARD 100 is the most common certificate, therefore the analysis will be focused on it.

The STANDARD 100 by Oeko-Tex ensures that every product carrying the label is tested against the presence of harmful substances in each of its components, therefore guaranteeing to the final user that the product is safe.

The assessments tests are carried out with a modular system at every level of the production process: raw material, semi-finished products, finished products including accessories (e.g., zippers, buttons, decorations, stitching, prints, coating, etc) are subjected to tests before the certification is released.

The evaluation tests are carried out by Oeko-Tex partner institutes, who then release the certification, which will be valid for 1 year.

The tests are based on criteria that are updated annually to include the latest available scientific evidence. The criteria aim at regulating the testing of harmful substances, which are:

- prohibited and legally overseen (azo dyes, carcinogenic dyes, nickel, formaldehyde, etc)
- not yet regulated by law.

Therefore, the tests require to meet more stringent criteria than those provided for by national reference standards, while ensuring a global application.

Restrictions on substance use vary depending on the type of product use. Four product classes have been defined:

- Product Class 1: Children's products;
- Product Class 2: Products in direct contact with the skin (e.g., underwear, shirts, mattresses, etc);
- Product Class 3: Products with limited skin contact (e.g., jackets, etc).
- Product Class 4: Fabrics and products for the textile furnishing.

The limit value is proportional to the type of product and its exposure to the skin. For product Class 1, the most stringent values are provided.

2.4.3 C2C - Cradle To Cradle

Figure 6: C2C logo



Source: Cradle To Cradle website, 2021

The Cradle To Cradle Products Innovation Institute is a no profit organization aimed at guiding businesses towards designing and manufacturing practices that can have a positive impact on people and on the planet. For this reason, the products and the materials employed should be safe, circular and responsibly made.

As the name suggests, the Cradle To Cradle philosophy is opposed to the “cradle to grave” one, which is at the basis of most business models. In fact, the product lifecycle design we are used to is “take - make - use - waste”, with a huge amount of resources employed. To counteract resource scarcity, the cradle-to-cradle design model acts on a responsible design phase of the product, so that the product, once its use comes to an end, can be disassembled and its components can be reused (MasterVision Products, 2019).

As reported in the official document “CRADLE TO CRADLE CERTIFIED® VERSION4.0 Product Standard”, the certification standard “Cradle to Cradle Certified Product Standard” is based on the book “Cradle to Cradle: Remaking the Way We Make Things”, written in 2002 by William McDonough and Michael Braungart, where the authors outline five categories for sustainable performance that are still used as the five pillars of the C2C certification. They are:

- Material Health: it denotes the safety of the material for human beings and the environment, with a specific reference to the use of harmful chemicals;
- Product Circularity: the design stage must involve circular economy principles, therefore the product must be laid out in a regenerative way, prefiguring its next use possibilities;
- Clean Air & Climate Protection: the use of renewable energy sources is highly encouraged, to reduce greenhouse gases emissions and to improve the air quality;

- Water & Soil Stewardship: since they are shared resources, they must be preserved for actual and future living entities.
- Social Fairness: businesses must commit to ensure fair working conditions and to protect human rights.

Even though the five principles have been unaltered over time, the specific certification's requirements to accomplish them evolved according to the industry's and world's changings. For example, the fourth version of the certification criteria emphasizes the actions which must be urgently taken to fight the climate change issue.

There are four certification levels, which indicate the effort degree in pursuing sustainable practices: Bronze, Silver, Gold and Platinum. For each level, there are different requirements to be fulfilled in all the five categories previously described. To get the specific level certification, the product must comply with all the pertaining requirements; in addition there are conditions to be met at a general level, at the packaging level (if applicable) and about animal welfare.

When upgrading from one level to the following one, all the requirements of the previous level must be maintained.

The certification is valid for two years, after which further inspections will be carried out to reconfirm the certification.

The Cradle To Cradle Products Innovation Institute makes available also the Material Health Certificate: it is focused only on the first pillar regarding materials' safety and use of chemicals. It follows the Cradle to Cradle Certified Product Standard related to the topic, so it represents a solid guarantee for manufacturers and consumers.

2.4.4 GRS - Global Recycle Standard

Figure 7: GRS logo



Source: Textile Exchange website, 2021

The Global Recycle Standard (GRS) is an international standard which sets the requirements to certify the sustainable production of textiles and products made with recycled materials.

The voluntary standard is promoted by Textile Exchange, together with the Recycled Content Standard (RCS), in order to enhance the usage of recycled materials to contrast the extensive resource consumption. The GRS goes beyond the RCS, because it addresses also social and environmental requirements, and adopts the ZDHC's list of Manufacturing Restricted Substances. Therefore the standard's aim is not only to assess products composed of recycled materials, but also to guarantee that the item's production process is responsible for the least possible harm.

According to the Preferred Fiber and Materials Market Report (Textile Exchange, 2021), the number of sites which obtained the GRS certification more than doubled in one year, from 6.755 in 2019 to 14.367 in 2020.

The GRS objectives stated in the Textile Exchange Guide to the standards are the following:

- "Alignment of definitions across multiple applications."
- "Track and trace Recycled input materials."
- "Provide customers (both brands and consumers) with a tool to make informed decisions."
- "Reduce harmful impact of production to people and the environment."
- "Provide assurance that materials in the final product are actually Recycled and processed more sustainably."
- "Drive innovation in addressing quality issues in the use of Recycled materials."

The GRS certification can be attained only if all the stages in the supply chain, from production to trade, are audited by a third-party certification body, whilst ensuring the chain of custody. Material collection and concentration are the only phases subject to self-declaration and not directly certified.

The standard is applied to the products which contain a minimum percentage of 20% of recycled content, as defined by the ISO 14021.

The final product sold to the consumer must contain at least 50% of recycled content to be labelled with the GRS logo.

The standard accepts both pre- and post-consumer materials: on the one hand, the content has never reached the end-user because it is waste generated by manufacturing processes; on the other hand, post-consumer content derives from the collection of what is tossed by users in recycling bins and sorted by recycling facilities (Taha, 2016).

2.4.5 BCI - Better Cotton Initiative

Figure 8: BCI logo



Source: BCI website, 2021

The Better Cotton Initiative (BCI) is a multi-stakeholder program focused on the production of cotton in a sustainable way, both from an environmental and social point of view.

It was born out of a series of round-table discussions around cotton growing conducted by WWF in 2005, joined and supported by several organizations such as adidas, Gap, H&M, Interchurch Organisation for Development Cooperation (ICCO), International Federation of Agricultural Producers (IFAP), International Finance Corporation, IKEA, Organic Exchange, Oxfam and Pesticides Action Network (PAN) UK (BCI, 2021).

The Standard preparation phase required three years, and, in 2010, it started to be implemented in countries with very different environmental and social characteristics: Brazil, Pakistan, India, West and Central Africa. During the following years, the initiative kept evolving and diffusing amongst numerous countries: nowadays, Better Cotton is grown in 25 countries, more than 2.4 million of farmers are licensed, and 23% of world-wide cotton production is Better Cotton (BCI, 2021).

BCI's main focus is to counteract the most significant negative effects of the cotton industry. From an environmental perspective, the biggest impacts stem from pesticide and fertilizers usage, water consumption and contamination, soil erosion and degradation (WWF Cotton Industry, 2021). From a social perspective, on the other hand, this industry has always been characterized by indecent labor practices, including the economic and physical exploitation of workers, and exposure to chemicals.

To achieve these goals, the BCI trains cotton farmers, smallholders and large-scale workers in order to provide them the best practices in terms of soil and water management and, at the same time, improving social welfare conditions.

The farmers can get their cotton certified to the BCI Standard by following the Better Cotton Principles and Criteria, which is based on seven principles (BCI, 2021).

1) Crop protection

Farmers must adopt an “Integrated Pest Management” approach, based on pest control and on a limited usage of pesticides. The use of chemical pesticides is discouraged but not prohibited, except for those listed in the Stockholm Convention on Persistent Organic Pollutants (POPs) and in the annexes of the Montreal Protocol on Substances that Deplete the Ozone Layer. The use of pesticides, due to their potential health hazards, is reserved to healthy, properly instructed individuals. In addition, workers must wear protective devices and, once used, pesticides must be properly disposed of.

2) Water

Freshwater management is a fundamental asset in an industry that consumes tons of water and pollutes it with agrochemicals. The Water Stewardship criterion aims at developing environmentally, socially and economically sustainable practices, which the document defines as follows “*Environmental sustainability is met by using fresh water within sustainable limits – ensuring that ecosystem and subsistence uses of water are met at the river basin or aquifer scale, for example. Social sustainability is met through allocating water equitably between uses and users, both locally and globally. Economic sustainability is met through maximising water productivity, i.e. by reducing the quantity of water consumed, or the pollution created, per unit of production.*”

3) Soil health

A proper soil management can ensure better outputs, reduce pests and soil degradation. The BCI soil Plan is based on an analysis of the soil type, on a maintenance and enhancement of the soil structure and fertility and on nutrition cycles. One of the pursued strategies is to cultivate the ground less frequently and to use cover crops, plants able to nurture and protect the land in between cotton sowings.

4) Biodiversity

Biodiversity loss can be enhanced by improper land management practices, with negative effects on the crops as well. To preserve and enhance natural habitats, BCI licensed farmers must identify and map the animal and vegetal species and the micro-organisms, restore ruined areas, apply the Integrated Pest Management approach and prevent soil erosion.

5) Fiber quality

The quality of cotton fiber is a particularly important characteristic for growers, as higher quality is positively correlated with greater market demand and value. Quality is defined by how clean the cotton is, in terms of weeds and impurities. The rationale rests on the next stage of spinning, which is quicker and more efficient if the fiber is cleaned and robust. The cotton should also not be too wet nor too dry: on the one hand there is the risk of damage caused by bacteria, on the other hand there is an increase in the risk of fires.

Since cotton quality and storage is a farmer's responsibility, BCI promotes best practices to ensure an optimal output. However, there is no minimum score to achieve in the quality levels for certification.

6) Decent work

Besides environmental issues, working conditions are often a sensitive topic when referring to cotton cultivation. BCI aims at training farmers in order to acknowledge and stop child labour episodes and to guarantee equal access to job opportunities, as to fight discrimination in employment.

Moreover, farmers adhering to BCI must ensure safe, healthy and protected working conditions, besides fair wages. Freedom of unions must also be guaranteed to ensure workers the right to collective bargaining.

7) Management system

In order to secure that the criteria and the principles set by the standard are properly met, Better Cotton requires farmers to adopt a common management system. This is also helpful to track areas of improvements.

BCI cannot ensure a full traceability of the cotton from farmers to final garments, because its chain of custody is based on the so-called “mass balance system”. The official website provides the following explanation of the system: “Mass balance is a volume-tracking system that allows Better Cotton to be substituted or mixed with conventional cotton by traders or spinners along the supply chain while ensuring that the amount of Better Cotton sold never exceeds the amount of Better Cotton purchased.” and “Every 1kg of Better Cotton lint from the gin is assigned one Better Cotton Claim Unit (BCCU). As the cotton moves along the supply chain (beyond the gin) and is made into different products, these BCCUs are also passed along to represent the

volume of Better Cotton sourced. BCCUs do not have to stay connected to the original Better Cotton sourced from Better Cotton Farmers.”

This system is alternative to the product segregation model, which requires that organic cotton is carefully and evidently separated from conventional cotton as other certifications like GOTS do. It is easier to implement, and therefore more accessible.

Nevertheless, BCI is now working on the implementation of a full-traceable system to ensure the possibility to track the businesses who worked on a garment along the entire supply chain.

2.4.6 Bluesign

Figure 9: Bluesign logo



Source: Bluesign System website, 2021

Bluesign certification, part of the Bluesign System, is developed by Bluesign Technologies AG, a company founded in 2000 in Switzerland.

The organization's aim, at the beginning of the new millennium, was to make the textile industry safer and less pollutant: this strategy, which is still at the basis of the program, is considered to be the only one possible for businesses to be competitive in the long run.

The Bluesign approach is holistic and it targets the following objectives:

- ensure the highest degree of product safety for consumers through restrictions on the use of hazardous chemicals;
- use resources (chemical materials, water and energy) in a responsible and efficient manner;
- limit the human health and environmental impacts of textile manufacturing processes.

To carry the Bluesign PRODUCT label, the product must have all its components certified as Bluesign APPROVED and it must originate from a brand which is a Bluesign SYSTEM PARTNER.

The certification process starts from the very beginning, with the application of the Input Stream Management. On-site assessments are carried out to evaluate if the stringent criteria related to the use of chemicals on textiles and accessories are respected. In particular, substances listed in the BSBL (Bluesign SYSTEM BLACK LIMITS) must be banned from the articles and the usage thresholds defined by the BSSL (Bluesign SYSTEM SUBSTANCES LIST) must be

respected. Another relevant document that has to be taken into consideration is the RSL (RESTRICTED SUBSTANCES LIST), where indications about testing methods of chemicals restricted by law are provided. All these documents are updated on a yearly basis to ensure that there is compliance with the latest scientific knowledge.

The exclusion of harmful substances from the initial steps of the process can guarantee that the final product will be the safest, given that the strictest criteria have been fulfilled.

The scope of Bluesign is to provide proof that the product or the specific component has been made with the lowest ecological footprint and while respecting social standards along the entire supply chain. For this reason, on-site assessments and consulting services will be focused on:

- increasing resource productivity and optimizing its consumption
- minimizing the use of energy
- reducing carbon dioxide and toxic gases emissions
- reducing water contamination
- ensuring healthy conditions and social welfare to the workers involved in the processes

Bluesign relies on third-party auditors to ensure transparent, comprehensive and independent evaluations.

Some of the Bluesign SYSTEM partners are: Blanche, Eileen Fisher, Kathmandu, Patagonia, prAna, The North Face, Toad&Co, VAUDE.

2.4.7 OCS - Organic Content Standard

Figure 10: OCS logos



Source: Textile Exchange website, 2021

The Organic Content Standard (OCS) is a certification promoted by Textile Exchange which ensures that the content of natural fibers, both of animal and plant origin, comes from organic farming. In addition, it provides chain of custody verification: organic material is tracked throughout the production chain, right up to the final business-to-business transaction. The certification is similar to GOTS, promoted by Textile Exchange as well, but differs from it in that the following areas are not subject to certification:

- Animal welfare conditions;
- Material safety (e.g., in terms of chemicals used);
- Environmental performance;
- Economic and social well-being of the people working in the supply chain.

The OCS certification is subject to audits by third-party certification bodies, which recur on an annual basis and can be applied only to products which contain a minimum of 5% organically grown fiber.

The OCS certified product can carry two types of labels:

- OCS Blended, if the organically grown material percentage is between 5% and 94% (the residual component can be any material);
- OCS 100, if the organically grown material percentage exceeds 95% (the residual component can be a certified or non-certified material, but it must be different from the OCS-certified one).

As for the GOTS certification, OCS does not certify the cultivation step: the certification process starts from the first processor.

The organic material to be handled must be certified at the farm level according to one or more of the following standards:

- USDA National Organic Program (NOP);
- Regulation (EC) 834/2007 & EU 2018/848;
- Any standard allowed by the IFOAM Family of Standards.

In case of cotton, OGM tests will be conducted. If the raw material is wool, only wool from non-mulesed sheep will be accepted.

The chain of custody is ensured by the following practices, to be followed at every stage:

- Proper and unequivocal identification of the certified organic material;
- Segregation of the organic material from the conventional one to elude contamination;
- Detailed and accurate record system to satisfy volume reconciliation, whose objective is “to ensure that certified output volume does not exceed available certified input (from transaction certificates) after factoring in production losses.” (OCS User Manual, 2021).

The certification’s goal is to encourage organic agriculture production, since it is more sustainable than conventional agriculture. According to the data reported in the “Quick Guide to the OCS”, available on Textile Exchange official website, the number of certified farms grew by 47% in 2019, overturning the previous years’ growth rate which ranged between 6% and 16%.

2.4.8 CmiA - Cotton made in Africa

Figure 11: CmiA logo



Source: CmiA website, 2021

Cotton made in Africa (CmiA) is a certification promoted by the Aid by Trade Foundation which was founded in 2005 with a specific aim: cotton production in Africa must be environmentally and socially sustainable.

The standard certifies the cultivation and ginnery stages, so there is no monitoring of the whole supply chain through to the finished product.

As of April 2021, after 15 years of activity, 30% of the cotton produced in Africa was CmiA certified, with a farmer base of around 1 million units.

The certification process is structured in two steps: first, the eligibility conditions for the program must be met; once admitted, companies must assess their sustainability performance according to criteria defined by CmiA. The results of the measurements are evaluated using a traffic light system: green indicates that, for that activity, there is already a sufficient degree of sustainability, which is likely to last over time. In the case of orange or red results, an improvement strategy will be defined. The second phase does not require all criteria to be met: the minimum percentage of green plus yellow light must be 50%, but it is crucial that there is strong evidence of improvement in the weakest areas.

Criteria verification is done through independent certification authorities, namely AfriCert and EcoCert, on a regular basis.

The certificate is valid for two years, during which auditing checks are carried out, first in the ginnery and then, the following year, on the cultivation.

The list of criteria for exclusion from the program is provided below and can be accessed on the official Cotton made in Africa website at the following link <https://cottonmadeinafrica.org/en/principles-and-criteria/>.

“Exclusion Criteria: What Cotton made in Africa Cannot Accept”

- “At least 95 percent of the cultivation contracts entered into by cotton companies verified by Cotton made in Africa must be with smallholder farmers, i.e., farmers cultivating no more than 20 hectares of cotton fields. In practice, a large majority of farmers contracted with only have between one and three hectares of cotton fields.”
- “Smallholder farmers are required to practise exclusively rain-fed agriculture, meaning they do not water or irrigate their fields.”
- “Clearing primary forests is prohibited, as is encroachment into officially protected areas.”
- “Exploitative child labour (as laid down in ILO Conventions 138 and 182), human trafficking (pursuant to the UN’s Palermo Protocol), and forced labour (as laid down in ILO Conventions 29 and 105) are also prohibited.”
- “Freedom of assembly and of membership in organisations that represent smallholder farmers or ginnery workers must be guaranteed. The right to collective negotiation (as laid down in ILO Conventions 87 and 98) is also guaranteed.”
- “The usage of genetically modified seeds is precluded.”
- “Pesticides regulated by the Rotterdam or Stockholm conventions or classified by the WHO as extremely or highly hazardous (classes Ia and Ib) must not be used. A list of prohibited pesticides can be found here.”
- “Pregnant, lactating, sick, under-age, and uneducated or inexperienced people are prohibited from working with pesticides.”
- “Also prohibited are pesticides that are permitted under national regulations but do not conform to international standards and that are not labelled in at least one national language.”
- “Men and women must receive equal pay for equal work (in accordance with ILO Convention 100.1).”

- “Discrimination at the workplace is prohibited (in accordance with ILO Convention 111).”
- “According to OECD guidelines for multinational enterprises, business dealings must conform to national or international law.”

Since most of the criteria for the program's admission are related to the observation of ILO conventions, it can be inferred that the social sustainability aspect is more relevant than the environmental one.

At the same link, Sustainability Criteria related to the traffic-light evaluation system can be found.

“The following supplementary criteria are applied to promote sustainable cotton production:”

- “Maintaining Soil Fertility and Conserving Water: Environmentally friendly agricultural methods such as crop rotation conserve soil and groundwater and prevent soil depletion.”
- “Deliberate Pesticide Use: Regular training keeps cotton farmers informed of the potential dangers of pesticides. They are taught to wear protective clothing when applying pesticides, to use suitable equipment, and to store containers where they are not accessible to children.”
- “Controlled and Reduced Pesticide Use: In accordance with the economic threshold principle, cotton farmers learn to use pesticides only after a certain level of pest infestation has been reached.”
- “Pre-Financing Through Cotton Companies: Cotton companies provide advances to smallholder farmers with whom they have contracts, so they can purchase certain operating supplies such as seed material or pesticides. The farmers are informed of the costs of these operating supplies before signing contracts.”
- “Cotton farmers are paid reliably and on time, and they are guaranteed representation in negotiations for cotton prices, allowing them to influence how the prices are set.”
- “The classification of cotton quality is transparent, as is the price paid for the raw material.”

“The following criteria apply to ginneries:”

- “Permanent and seasonal employees receive written employment contracts.”

- “Working hours are regulated, and overtime is paid in full and in accordance with national law (cf. ILO Convention 1).”
- “Monthly salaries are reliably paid out on time and meet or exceed the national minimum wage (cf. ILO Conventions 26 and 131).”
- “Health and safety measures, such as wearing dust masks, are observed by all employees (cf. ILO Convention 155).”
- “An environmental management plan is in place to reduce undesirable effects on the environment.”

In summary, the certification aims to support African cotton smallholders, granting them access to a global market with stable market conditions. In doing so, it requires farms to meet requirements that guarantee the health and financial well-being of the people involved, and to take action to protect the environment (e.g., the soil, water, biodiversity, etc.).

2.4.9 EU Ecolabel

Figure 12: EU Ecolabel logo



Source: European Commission website, 2021

The EU Ecolabel was developed in 1992 by the European Commission and is ruled by the Regulation N. 66/2010 of the European Parliament and Council. The purpose of the label is to ensure environmentally sustainable products and services at every stage of the product or service life cycle. The aim is to identify the top performers in terms of sustainability for the product category in question.

The standard can be applied to different product categories, including textiles; for this reason, sustainability criteria are defined and tailored specifically for the different types of products, focusing, for each of them, especially on the most polluting phases.

For all the product and service categories that can be certified, each phase of the life cycle is evaluated by third-party auditors: the sourcing of raw materials, their processing, the packaging of the finished product, the transportation, and finally the use and disposal or recycling of the product.

The effort required to companies wishing to achieve the certification, is to design products that have a minimized environmental impact not only at the beginning of their life cycle, but also at the end, with a circular economy viewpoint.

In order to ensure that the latest innovations in terms of raw materials, production processes and resource consumption are properly considered, the criteria are updated every four years.

The certification validity, instead, can be of three up to five years, according to the product category's degree of innovation.

The standard does not cover aspects of animal protection (e.g., animal testing is not prohibited) and social responsibility.

2.4.10 Nordic Swan Ecolabel

Figure 13: Nordic Swan Ecolabel logo



Source: Nordic Ecolabel website, 2022

The Nordic Swan Ecolabel was established at the end of the 80s, precisely in 1989, by the Nordic Council of Ministers of Denmark, Finland, Iceland and Sweden in order to provide, on the one hand, companies with a tool to pursue more sustainable practices and, on the other hand, consumers with a label characterizing environmentally sustainable products.

The requirements are constantly updated and tightened over time, and this commitment determined the international diffusion of the schemes beyond the Nordic borders and a consequent increasing demand.

The certification guarantees that a product fulfills stringent sustainability requirements from the raw material to the final assembly phase: in this way, the consumer knows that there had been an attempt to reduce the environmental impact of the product.

The Nordic Swan Ecolabel covers 59 product groups, ranging from home and household services, garden, hygiene and beauty, to office products and clothing.

Focusing on textiles, leather and skin, the standard deals with:

- reduced environmental impact
- restriction on chemical products usage
- social welfare

- circular economy

The criteria reported in the lasted version of the document, valid from March 1st 2022 “Criteria for textiles, hides, skins and leather 5.0” available on the Nordic Swan Ecolabel official website are the following:

Textiles’ requirements:

- “Made from fibres, that are either organic, recycled or based on renewable resources complying with specific environmental requirements.”
- “Meets strict environmental and health requirements for chemicals used in textile production - this is important for wastewater, the people who produce the textiles and those who wear them.”
- “Made without the addition of substances that can cause cancer, toxic to reproduction and can damage genetic material, as well as bans on substances on the EU's list of substances suspected of being endocrine disruptors, halogenated flame retardants, fluorinated substances and antibacterial additives incl. nanoparticles.”
- “Produced with water and energy efficient technology, which saves water and reduces CO₂ emissions.”
- “Quality tested to enable a long lifetime.”
- “Only contain metal parts - e.g., zippers and buttons - that meet strict requirements for heavy metals, and plastic parts are without phthalates.”
- “Is produced under proper working conditions, where UN’s International Labour Organizations (ILO) conventions on workers’ rights has been complied with.”
- “Unsold textiles must not be sent for incineration or dumped in landfill. This motivates to avoid overproduction.”

Hide/skin and leather requirements:

- “Are produced by residuals or by-products or skins from free-living, nonendangered species.”
- “Made without the addition of substances that can cause cancer, are toxic to reproduction or can damage genetic material. Substances on the EU's list of substances suspected of being endocrine disruptors are banned, as are halogenated flame retardants, fluorinated substances, and antibacterial additives, including nanoparticles.”

- “Meets strict environmental and health requirements for chemicals in the tanning process, but also for dyes, coatings, solvents, and biocides.”
- “Are tested free of chromium VI, which can be allergenic.”
- “Meets strict requirements for wastewater treatment from tanneries.”
- “Only contain metal parts - e.g., zippers and buttons - that meet strict requirements for heavy metals, and plastic parts are without phthalates.”
- “Quality tested to enable a long lifetime.”
- “Is produced under proper working conditions, where UN’s International Labour Organizations (ILO) conventions on workers’ rights has been complied with.”
- “Unsold skin and leather must not be sent for incineration or dumped in landfill. This motivates to avoid overproduction.”

2.4.11 RWS - Responsible Wool Standard

Figure 14: RWS logo



Source: Textile Exchange, 2022

The Responsible Wool Standard (RWS) is a voluntary standard provided by Textile Exchange which ensures cruelty free wool production.

The standard's goal is to assure that the most used animal-based material, wool, comes from farms which guarantee animal welfare, progressive land management practices and social welfare.

Therefore, the standard has a double aim: to preserve animals' welfare and the environment they graze on, and to enhance social sustainability. The certification does not prohibit the use of chemical products.

Farms who require this certification must follow stringent criteria in order to guarantee that sheeps have been treated with no harm and with respect to the Five Freedoms. These are globally recognized standards which safeguard animal welfare and involve: Good Nutrition; Good Environment; Good Health; Appropriate Behavior and Positive Mental Experiences. (FAWC, 1993).

The standard prohibits the mulesing practice, which consists on the removal of skin in the perianal zone and/or the tail asportation to prevent infections and fly strikes. This procedure is accomplished by using shears or by applying liquid nitrogen, without anesthesia, thus causing great pain to the animal.

In a second step, farmers best practices are also evaluated according to responsible land management methods: soil health, biodiversity and native species protection are elements which must be preserved through regenerative procedures.

Last but not least, social welfare is the third element to be guaranteed to get the certification, meaning safe and healthy working conditions.

The RWS ensures the material chain of custody, from farms to the final product. For this reason, all steps of the production process are endorsed according to the Content Claim Standard requirements, in order to guarantee the certified wool tracking.

To carry the RWS logo, a product must be composed of 100% certified wool.

As previously stated, the standards are set by Textile Exchange. The development process involved several stakeholders such as farmers, specialists in animal welfare and land management, fashion brands and retailers, resulting in a holistic view on the matter.

Textile Exchange released the Responsible Mohair Standard (RMS) in March 2020 and the Responsible Alpaca Standard (RAS) in April 2021. These two new certifications are based on the RWS criteria, aiming at protecting, respectively, goats and alpacas.

Some of the companies adopting RWS are: Kering, H&M, Marks & Spencer, Patagonia, Eileen Fisher, and Knowledge Cotton Apparel.

2.4.12 ZQ Merino Wool

Figure 15: ZQ Merino logo



Source: ZQ website, 2022

ZQ wool certification was developed by The New Zealand Merino Company Ltd in 2007, resulting as the first wool certification scheme which requires farmers and growers to fulfill stringent farming requirements around animal welfare, environmental and social sustainability and complete traceability.

The standard's goal is to provide top-class wool to the consumers; merino wool is the best type of fiber, because of its softness and durability and due to its temperature regulating characteristics. As a consequence, the certification geographic perimeter is mainly focused on New Zealand, but also Australian and South African farms can be certified.

The on-farm certification process for ZQ farms is audited by third-party accreditation bodies, namely AsureQuality and Control Union. The certified wool cannot be found in the auction market but is bought directly from The New Zealand Merino Company Ltd. This choice represents a warranty for growers because they will be fairly paid according to the standard principles; moreover, the direct partnership with brands and retailers represents a product quality assurance.

The ZQ Grower Standard is the reference for farmers who want to start the certification journey with ZQ. The requirements are rooted in the following five key categories.

Animal Welfare and Health

The most important component of the certification is definitely animal welfare. To achieve it, the following conditions must be audited:

- respect for the five freedoms of the animals (Freedom from thirst or hunger; Freedom from pain or distress; Freedom from injury or disease; Freedom from discomfort or inadequate shelter; Freedom to display normal patterns of behavior);
- no mulesing;
- no international transport of live animals;
- continuous improvement of nutritional, grazing, health and pest prevention and management conditions.

Animal welfare is ensured during the shearing as well: the process is planned in advance in order to be as fast as possible to minimize the sheep's stress. Additionally, the tool used is machine shear to ensure a precise and quick job. The wool is never cut too close to the skin, but a proper covering is left to keep warm the animals. Finally, the shearing usually happens once a year, between August and November: the early spring season is the most adequate time of the year because sheep can be more comfortable during summer months and be ready for winter with a new woolly coat.

Environmental Sustainability

Respect for soil and water is of utmost importance to animals and livestock farmers of present as well as future generations. For this reason, growers must develop a Land Environmental Plan that outlines their commitment to preserve biodiversity.

Quality Fibre

The wool's quality is measured not only in terms of its softness and smoothness, but above all on the basis of the fiber's diameter and its strength. To meet ZQ criteria, the fiber must not have weak points that are prone to breaking, but must have a fine, uniform diameter. Quality wool is proof of the animal's well-being. Finally, to assure buyers that the product meets the agreed-upon characteristics, the wool is hand-picked by experts.

Traceable to source

The fact that the wool is directly sold to the partner brand reduces the chain of steps between the raw material and the finished product. This is fundamental to ensure the buyer that its specific requests and specifications are met. Complete security is guaranteed by a precise tracking system which allows the wool to be traced back to the farmers.

Social Responsibility

The standard sets requirements in order to protect human rights too: healthy and safe working conditions and financial security and fair wages are an essential component of an ethical output.

ZQ and RWS

ZQ and Textile Exchange worked together to develop the RWS standard. The cooperation between the two institutions was natural, considering the deep experience in the field obtained by ZQ in ten years, and the Textile Exchange's objective to provide a tool of guarantee for wool production with the RWS certification.

The common principles, namely animal welfare, respect for the environment and a strong sense of social responsibility, resulted in a clear and binding checklist of requirements needed to obtain the RWS certification.

Due to the proximity and overlap between the two certification schemes, from April 2021 ZQ-certified farmers will also automatically receive the RWS certification.

Some of the brand partners are: Allbirds, Cathrine Hammel, Eileen Fisher, Fjallraven, Hugo Boss, Icebreaker, Loro Piana, Maggie Marilyn, Rembrandt, The Fabric Store, Thee Bags Full.

2.4.13 ZDHC - Zero Discharge of Hazardous Chemicals

Figure 16: ZDHC logo



Source: ZDHC website, 2022

ZDHC stands for Zero Discharge of Hazardous Chemicals and is an international multi-stakeholder program with more than 160 contributors, overseen by the ZDHC Foundation.

The program came about as a result of Greenpeace's 2011 Detox campaign. On that occasion, several studies have brought to light the problem of water pollution of rivers and oceans caused by the release of chemicals by manufacturing companies in the textile, leather and footwear industries (Greenpeace, 2021).

Greenpeace's campaign challenged the industry to drastically reverse its course, with 2020 being set as the year by which to eliminate the use of hazardous substances from the supply chain. Brands and retailers demonstrated their commitment by creating the ZDHC program, through which they set out a concrete plan for implementation.

The program aims to eliminate or replace the use of hazardous chemicals, to ensure transparency of processes and the substances used, and to develop and promote the best practices on the topic.

The approach, as described on the ZDHC website, is a holistic one, which involves all the players in the supply chain: in fact, every supplier of a signatory brand must fulfill the ZDHC requirements; moreover, the approach takes into consideration the inputs, the production process, and the output.

The first step is to not introduce harmful substances, as defined by the Manufacturing Restricted Substance List (MRSL). This list is updated on a regular basis to ensure a constant alignment between available and employable resources.

The management of chemicals in manufacturing processes is of extreme importance, so the Chemical Management System (CMS) document was outlined. It consists of two sections, one more general to serve as a framework, the other more technical to help harmonize the different entities in the supply chain.

The last step concerns the evaluation of the outputs, in particular quality tests are carried out on wastewater and sludge. The Wastewater Guideline document defines the concentration limits that must be respected in order to ensure water quality and test methods. A programmatic document has also been developed for the evaluation of emissions into the atmosphere, as to reduce the environmental impact on this front as well.

Thus, the principles of the ZDHC program can be summarized as follows:

- elimination or removal of hazardous chemicals;
- development of transparent processes for assessing and quantifying the risks involved;
- development of effective tools, best practices and trainings to improve chemicals management;
- constant update and improvement of the guidelines through a multi-stakeholder collaboration;
- continuous monitoring and improvement at factory levels through internal audits.

Three conformance levels are defined, as reported on the official website (<https://www.roadmaptozero.com/input>):

- Level 1: “A third-party review of documentation or analytical test report are required to decide conformance to ZDHC MRSL.”
- Level 2: “A review of the chemical supplier's product stewardship practices is carried out by a third-party certifier.”
- Level 3: “Requires all the elements of MRSL Conformance Level 2 and a site visit to chemical supplier to evaluate product stewardship.”

The level of compliance improves as the degree of control by designated authorities increases, up to an on-site assessment. Compared to five years ago, when the first level of compliance was based on self-declaration, more control is being applied (Changing Markets Foundation, 2018).

It is therefore clear that ZDHC is not a certification *per se*, but it provides the best standard for the elimination of harmful chemicals. Other certifications use the ZDHC guidelines as the gold standard for managing substances that are harmful to humans and the environment.

Some of the signatory brands are: Asos, Adidas, Benetton, Burberry, C&A, Decathlon, Esprit, F&F, Fast Retailing, G-Star Raw, Gap Inc, H&M, Hugo Boss, Inditex, JCPenney, Kering, Kmart, LVMH, Levis Strauss & Co, Li-Ning, Marks & Spencer, Mango, Nike, New Balance, Next, OTB, Primark, Puma, River Island, Stone Island, Tendam, Tchibo, Teddy Group, VS&Co.

2.5 Certifications recap and evaluation

For the purpose of summarizing and comparing in a more immediate way the analyzed certifications, the following table has been drawn up (Table 3 - Certification's evaluation chart).

It includes the name of the certification, the certification institution and the main target. The next six items (environment protection, animal welfare, chemical management, social welfare, chain of custody and circularity) represent the objectives of the certifications in a more precise way. Each objective certified by a certification is marked with an “X”.

The second step is trying to assign a score to each certification in order to rank them. The two most important characteristics are environment protection and chain of custody. The former is of interest because of the dissertation’s purpose; the latter is particularly meaningful due to the fact that it guarantees that the standards are met and complied with along the entire value chain, and not limited to few stages.

The elaboration of this score is therefore based on the following question: which certification might be of interest to a company wishing to undertake a corporate sustainability journey, based on the transparency provided by the certification in the supply chain and the goals it meets?

The score is calculated assigning value 1 each time one target is accomplished by the certification, and, on the other way round, 0 if a target is not met. The final score is determined by the simple sum of the points for each certification.

Table 4: Certification evaluation chart

CERTIFICATION NAME	INSTITUTION	MAIN OBJECT	ENVIRONMENT PROTECTION	ANIMAL WELFARE	CHEMICALS MANAGEMENT	SOCIAL WELFARE	CIRCULARITY	CHAIN OF CUSTODY	SCORE
GOTS	Global Standard	Organic materials	X		X	X		X	4
OEKO-TEX	Oeko-Tex Service	Chemicals	X		X			X	3
C2C	C2C Products Innovation	Circularity	X		X	X	X		4
GRS	Textile Exchange	Circularity	X		X	X	X	X	5
BCI	Better Cotton Initiative	Cotton	X			X			2
BLUESIGN	Bluesign Technologies	Chemicals	X		X	X		X	4
OCS	Textile Exchange	Organic materials	X					X	2
CMIA	Aid by Trade Foundation	Cotton	X			X			2
EU ECO-LABEL	European Commission	Sustainability and circularity	X				X		2
NORDIC SWAN ECOLABEL	Nordic Ecolabelling	Sustainability and circularity	X		X	X	X		4
RWS	Textile Exchange	Wool	X	X		X		X	4
ZQ	The New Zealand Merino Company	Wool	X	X		X		X	4
ZDHC	ZDHC Foundation	Chemicals	X		X			X	3

Source: personal elaboration

According to the abovementioned calculation method, the final ranking is the following:

Table 5: Certifications ranking

CERTIFICATION NAME	SCORE
GRS	5
GOTS	4
C2C	4
BLUESIGN	4
NORDIC SWAN ECOLABEL	4
RWS	4
ZQ	4
ZDHC	3
OEKO-TEX	3
BCI	2
CMIA	2
EU ECO-LABEL	2
OCS	2

Source: personal elaboration.

When evaluating the most mentioned sustainability certifications focused on raw materials and material processing, Global Recycle Standard is the most complete certification in terms of sustainability’s objective, with a score of 5 out of 6.

GOTS, C2C, Bluesign, Nordic Swan Ecolabel, RWS and ZQ certifications are ranked second with the same score of 4 points out of 6.

ZDHC and Oeko-Tex follow with 3 points whilst BCI, CmiA and EU Eco-Label and OCS scored 2 points out of 6.

Comments

A certification like GRS, able to meet a large number of objectives, certainly appears to be more complete. The economic effort to get it would be compensated by a certification able to prove the company's choice for sustainability on several grounds: not only from an environmental point of view, but also by guaranteeing social welfare to the employees or safety to both workers and final consumers, thanks to the management of chemical products.

On the other hand, if not carefully supported by stringent criteria and frequent and independent control mechanisms, too comprehensive certifications would be liable to have the undesirable and reverse effect of greenwashing, contributing to tarnish an already opaque context.

For this reason, a company might select one (or more) specific certifications focusing on well-defined issues, according to their business and sustainability's purpose.

In particular, the ranking obtained by this analysis could be useful to assess, once the main objective has been defined, which certification fulfilling that objective is the most complete, controlling for the other targets. To provide a clearer explanation, examples will follow.

- Main objective: **organic materials** → **GOTS** certification is definitely preferred to OCS.
- Main objective: **chemicals management** → **Bluesign** certification is preferred to ZDHC and Oeko-Tex.
- Main objective: **circularity** → **GRS** certification is preferred to C2C, Nordic Swan Ecolabel and EU Eco-Label.
- Main objective: **cotton** → **BCI** and **CmiA** are equally evaluated.
- Main objective: **wool** → **RWS** and **ZQ** are equally evaluated.

One of the main criticisms to the certifications' system is that several certifications' schemes and standards exist, covering different targets but, sometimes, overlapping each other (Turunen *et al.*, 2021). This is unquestionable, as clearly shown by Table 1: for example, with regard to circularity, GRS and C2C certifications share the environmental protection, the chemicals management, the social welfare and the circularity targets. Nevertheless, they differ for the most fundamental aspects, chain of custody, with GRS being the only one able to ensure it.

One possible solution to such a chaotic framework could be to simplify it, by integrating those standards targeting the same kind of issues in order to reach the most comprehensive scheme.

Companies would benefit from a simpler context to steer their decisions; at the same time, they would be prevented to choose the least ambitious certification, a drawback of having many choice options (Changing Markets Foundation, 2018).

To conclude, this analysis confirms the multifaceted context in which companies find themselves to operate in. The abovementioned certifications evaluation chart and the certifications ranking aim to be a supportive tool for companies which strive to pursue an environmental sustainability strategy.

Chapter 3 - Environmental sustainability statements: a coherency check

The second research question, arising from the certifications' analysis previously outlined, aims at verifying the consistency between the objectives and statements presented in the annual reports of incumbent companies in terms of environmental sustainability, and the actions taken to pursue these targets. In particular, given the nature of the research, it is meant, by actions taken, an evaluation of whether or not sustainability certifications are required for materials and, if so, of which type.

The analysis was conducted considering the main incumbent groups or brands operating in the luxury clothing market. The choice of investigating incumbent companies derives from the fact that the nature of sustainable actions required of firms, which have been operating for decades according to a non-sustainable business model, is certainly more challenging than that of younger companies founded with sustainability in their DNA.

Delving into whether and which material certifications are adopted to ensure sustainable sourcing and full traceability, helps to understand how these companies are moving towards the sustainability frontier, beyond mere declarations.

The choice of the luxury segment, on the other hand, is dictated not only by personal interest, but also by the fact that companies in this sector play a strong leadership role in relation to the entire industry.

The groups and independent brands which have been analyzed are: LVMH, Kering, Chanel, PVH Corp and Hermès. The selection includes the top 5 most selling companies, according to Deloitte's ranking of luxury fashion companies based on FY 2020 sales in the Global Powers of Luxury Goods 2021 report (Deloitte, 2021).

3.1 Methodology

To pursue the research objective, the following steps have been undertaken:

- at first, a deep browsing of the corporate websites of the selected groups or independent brands has been performed;

- then the annual reports, statements, documents dealing with environmental sustainability have been selected;
- on the ground of the information provided by the document, the definition of the environmental sustainability strategy declared at group or company level has been reported, especially focusing on raw material sources and supply chain transparency;
- in light of the sustainability strategy definition, a research of specific information concerning certifications has been carried out (using research tools with keywords like “certification”, “certify”, “certified” or certification names - both acronyms and extended versions);
- Finally, an evaluation of the consistency between the environmental sustainability statements and the type of required certification, based on the certification analysis, has been provided.

In order to have a broader vision, also Chief Sustainability Officers’ or Presidents’ interviews have been taken into consideration in the initial steps. Nevertheless, the research did not provide statements specifically addressing the materials’ certifications.

3.2 Coherency check

3.2.1 LVMH

According to Deloitte, LVMH is the top luxury brand by sales during the Fiscal Year 2020. In 2021, the French group generated €64,2 billion revenues. The Group is composed of 75 different brands, called Maisons, rooted in six sectors: Wines and Spirits, Fashion and Leather Goods, Perfumes and Cosmetics, Watches and Jewelry, Selective retailing and Other activities. The Fashion and Leather Goods division counts 14 brands: Berluti, Celine, Christian Dior, Emilio Pucci, FENDI, Givenchy, Kenzo, Loewe, Loro Piana, Louis Vuitton, Marc Jacobs, Moynat, Patou and RIMOWA.

The corporate website reports the Group’s commitments, among which Social and Environmental Responsibility is defined as a priority since the founding. Environmental sustainability is outlined as mandatory and as a source of competitive advantage: “[...] It is imperative because the long-term success of LVMH Maisons depends directly on preserving

and respecting the natural resources they use to make their products. At the same time, this policy drives competitiveness, because taking environmental factors into account in our production processes makes them more reliable and sharpens our leadership.” (LVMH, Social and Environmental Responsibility, 2022).

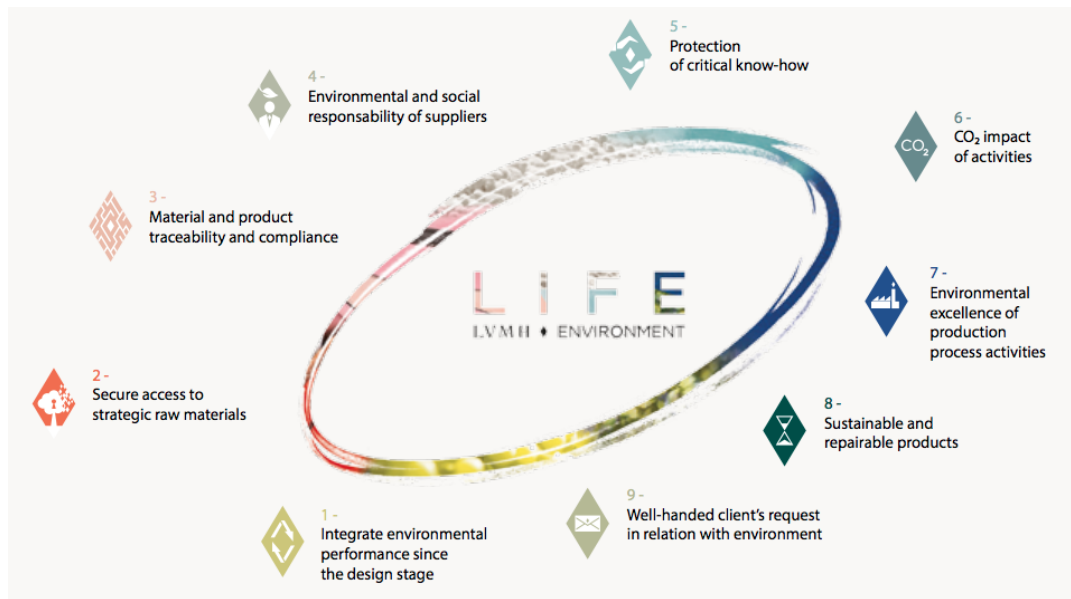
These words are proved by the fact that, back in 1992, the Group established a division exclusively dedicated to the Environment and that the first environmental report, referred to 2000, was published in 2001.

Bernard Arnault, LVMH’s Chairman and Chief Executive Officer, in the LVMH Environmental Report 2017 message declared that “As the world leader in luxury, it is the duty of LVMH to be exemplary. Our Maisons make use of rare and precious natural raw materials in the formulation of their products. We have no option other than to seek to preserve these resources which constitute our common heritage. With regard to the environment, just as in our products, we strive for excellence.” (LVMH Environmental Report 2017).

In the same report, the environmental strategy is described as rooted around five goals: “[...] achieving a high level of environmental performance, creating a collective commitment, optimizing the management of environmental risks including the environmental aspect in product design, and becoming involved and taking action outside the Group.”. To further boost these objectives onto a measurable and long-term structure, the LIFE (LVMH Initiatives For the Environment) program was created in 2012. It is based on the following nine environmental challenges:

- 1) Integrate environmental performance since the design stage;
- 2) Secure access to strategic raw materials;
- 3) Material and product traceability and compliance;
- 4) Environmental and social responsibility of suppliers;
- 5) Protection of critical know-how;
- 6) CO₂ Impact of activities;
- 7) Environmental excellence of production process activities;
- 8) Sustainable and repairable products;
- 9) Well-handed client’s request in relation to the environment

Figure 17: The dynamics of the Life program



Source: LVMH Environmental Report 2017

Starting from this group-shared structure, each Maison is required to include the brand's most critical aspects in its strategy and to develop action plans and monitoring tools in order to keep track of the annual developments.

In 2016, the LIFE Program has been further improved into the LIFE 2020 version: to boost initiatives and results, objectives have been set at a group level around four strategic areas: product, supply chain, climate change and sites. In particular:

- 1) Improvement of all products' performance, is supported by an internal software able to estimate packaging and products' CO₂ impact and environmental performance.
- 2) Ensure that the highest standards are applied in the raw material sourcing process along the entire supply chain, and that the substances used to manufacture the products are traced and compliant. The objective, set at the group level, is that 70% of the raw material procurement must follow the highest standards by 2020, in order to raise the ratio to 100% by 2025.
- 3) CO₂ emission reduction by 25% between 2013 and 2020, by improving the store's energy efficiency, responsible for 80% of the total energy consumption.
- 4) Improve by at least 10% the environmental indicators at sites and stores level, for example by reducing the water or energy consumption or by decreasing the waste generation.

Given the purpose of this research, the attention will be focused on the second objective, concerning supply chain standards and traceability. On the sustainability report, it is possible to find the following statements, which provide the group's point of view around the theme:

“The Group pays considerable attention to the traceability and compliance of the materials and substances used to manufacture its products. It develops responsible purchasing processes and sets up environmentally-friendly supply chains, working closely with its suppliers and subcontractors.”

and again

“Certification is one of the main drivers used to develop responsible procurement by the LVMH Group's Maisons. It guarantees that the materials and substances included in the composition of their items are produced according to the highest environmental standards.”

The identified certifications across the sustainability reports are:

- LWG - Leather Working Group, for leather products: this certification is not part of the research selection;
- BCI - Better Cotton Initiative, for organic cotton.
- RWS - Responsible Wool Standard is encouraged to protect animal welfare, with particular focus on the mulesing practice ban.

BCI, as explained in Chapter 2, is a certification whose chain of custody is based on the “mass balance” system, therefore there is no complete traceability from the raw material to the finished product, nevertheless it ensures an easier and wider implementation.

RWS, on the other hand, guarantees the full traceability, therefore it represents a fully credible certification.

In the Environmental Sustainability Report 2019, it is stated that the Group, with the aim of pursuing the LIFE 2020 objectives, had increasingly tightened the standards to ensure sustainable sourcing and traceability. This statement is confirmed by the fact that the GOTS certification has been introduced, in conjunction with the already mentioned BCI. Unlike the latter, GOTS' chain of custody is based on the segregation model, therefore the materials' traceability can be fully guaranteed.

The 2020 objective of 70% GOTS and BCI certified cotton was not achieved on time: the percentage of certified cotton procurement has been 51%.

The 2019 report also informs about the groups' participation in the ZDHC foundation:

“In 2019, LVMH also joined the Zero Discharge of Hazardous Chemicals (ZDHC) foundation, which seeks to promote best practice and the use of safer chemicals at textiles and leather manufacturing facilities”.

Overall, it is possible to assert that the Group has a clear view of the necessary steps to pursue a verifiable and traceable supply chain: it relies on some of the most diffused certifications and, over time, tightened the standard selection in order to guarantee even more control. On the other hand, the full implementation of this approach is still not close enough to reach satisfying results.

A new version of LIFE, called LIFE 360, has been released in April 2021. Focusing on traceability and biodiversity protection, the objective is to reach 100% traceability systems integrated in the whole Group strategic supply chain by 2030 and 100% of strategic raw materials certified to the highest standards by 2026. Probably, such an ambitious target could help boosting the activities towards an increase in the higher level standards' adoption.

3.2.2 Kering

Kering is a global luxury group created in 1963 by François Pinault. It holds renowned brands operating in fashion, leather goods, jewelry and watches: Gucci, Saint Laurent, Bottega Veneta, Balenciaga, Alexander McQueen, Brioni, Boucheron, Pomellato, Dodo, Qeelin, Ulysse Nardin, Girard-Perregaux, and Kering Eyewear.

According to the timeline provided by the corporate website, the Group's sustainability strategy began in 1996, when the social and environmental commitments were defined in the Code of Ethics. A few years later, in 2003, the Group also established a Sustainability Team and developed a digital tool to monitor the performance.

The sustainability strategy is defined by the “Kering's 2025 Sustainability Strategy”, an action plan shared in 2017 aiming at reducing the environmental footprint by 40% and at ensuring people's welfare, rooted around three pillars: Care, Collaborate and Create.

Care is the pillar dealing with environmental sustainability, and for this reason will be analyzed in depth in the following paragraphs. The objective is to reduce the environmental impact and

preserving natural resources through the use of innovative practices and tools and by applying strict standards.

Collaborate is focused on social sustainability: the Group aspires to be acclaimed “as an exemplary employer”, protecting employees’ rights, diversity and talents.

The last pillar, create, aims to make Kering a change leader for the entire industry: innovative practices are and will be shared for common knowledge, following an open source model.

After three years of plan implementation, Kering published the “Progress report 2017-2020” to inform stakeholders on its results. The Chief Sustainability Officer Marie-Claire Daveu commented “While our progress report reflects the very encouraging achievements Kering has made, there is still significant work to do to reach our near-term sustainability ambitions and go far beyond in the coming years.”

Concerning the research topic, focused on materials and supply chain traceability, the most relevant information will be reported:

- “In January 2018, Kering developed and open-sourced our “Standards for Raw Materials and Manufacturing Processes” covering best practices across environmental protection, social welfare, traceability, chemical use and animal welfare. The Group has already achieved 68% alignment.”
- “Kering achieved 100% responsible gold purchase for our Jewelry and Watches and is on track to reach 100% sustainable sourcing for other key raw materials by 2025.”
- “Kering attained 88% traceability for our key raw materials, against a goal to reach 100% by 2025.”
- “In May 2019, Kering created the first animal welfare standards for luxury and fashion to improve industry practices and catalyze collaboration.”
- “100% traceability is our end-goal to ensure Kering’s high standards around environmental protection, social welfare, chemical use and animal welfare are adhered to.”

Even though the traceability goal is extremely clear, there is no mention in the Progress Report to environmental standards or certifications to be pursued at group-level. The only reference is to Balenciaga’s employment of GOTS certification for organic cotton and GRS for recycled polyester in its newest collection.

Nevertheless, the reference to certifications can be found in two of the abovementioned documents: the “Kering Standards for Raw Materials and Manufacturing Processes” and the

“Kering Animal Welfare Standards”. Only the former will be analyzed, since the latter presents the same guidelines when wool is concerned, and since the other types of materials are out of this dissertation’s scope.

The Group’s vision on certifications and standards clearly emerges from the first introductory lines to the “Kering Standards for Raw Materials and Manufacturing Processes” document:

“Outlined in detail in this document, the Kering Standards and their accompanying suite of policies set the framework for commitment and action for Kering and our brands. In addition, they provide a way of measuring progress and outcomes on traceability, social welfare, environmental protection, animal welfare and chemical use. This document is intended to give clarity and help operationalize Kering’s overall long-term commitment to sustainability. The principles that underpin the Kering Standards are integrity, circularity and the application of the precautionary principles. By design, the Kering Standards are specific and requirement based. Thus, as a reflection of our commitment, Kering will assess all new suppliers for adherence to our sustainability standards and work with current suppliers who have challenges in meeting certain Kering Standards, from 2017 onward.”

The standards set by Kering have the purpose to holistically track the entire supply chain, from cultivation or farming to finishing. Suppliers are selected according to the minimum requirements that must be respected in order to be aligned with Kering goals, but must work over time to be able to provide certified materials.

The document is divided by material, therefore this review will follow the same structure. For each material, the mentioned certifications will be reported.

Leather and hides: LWG, ICEC, CSCB, Textile Exchange Sustainable Leather.

Fur: WelFur, Profur, Saga Furs, Copenhagen Fur, Granges Can Rafael.

Cashmere: RWS, ZQ Merino Wool, GOTS.

Cotton: GOTS, OCS, GRS (not recommended: CmiA and BCI).

Paper and Wood: FSC.

Plastic: compliance to the MRSL - Manufacturing Restricted Substances List (which meets the ZDHC standards).

Down: RDS/TDS.

Focusing on those certifications which are part of the previous analysis, it turns out that, except for OCS, the Group uses the most recommended standards: GOTS, GRS, RWS, ZQ and ZDHC.

A specific mention to what is reported about cotton sourcing can be useful to understand Kering commitments:

“Kering brands are encouraged to use as much certified organic cotton (fibre certification) as possible in their products because studies done by Kering have shown that organic cotton has up to 80% less environmental impact than conventional cotton. [...]. Suppliers should work to source materials containing organic cotton, whether at fibre stage through IFOAM family of standards or ideally beyond during processing through GOTS certification, and proactively offer them to the brands when possible.”

“Suppliers should source GOTS certified organic cotton throughout the textile supply chain. When this is not possible, a combination of GOTS certified and Organic Content Standard (OCS) certified organic cotton is acceptable (i.e. products can have GOTS certification through to yarn or fabric and OCS certification for all other processes such as dyeing, finishing, etc.) through to final product. This will ensure the integrity of the organic cotton at each level of the supply chain.”

“Certified recycled cotton is another acceptable certification. For recycled cotton, the GRS Certification is preferred and recycled cotton should have clear, verifiable traceability for integrity within the supply chain and verification of compliance to Kering’s chemical standards [...].

Other certified cotton, such as Cotton made in Africa (CMiA) and Better Cotton Initiative (BCI), are not preferred choices compared to the above-mentioned certifications unless evidence of sustainability can be provided (e.g. evidence-based reports that the certification is an improvement over conventional cotton in terms of environmental impact). Additionally, as stated above, Kering does not support genetically engineered (GE) or modified (GMO) fibre and/ or food for the livestock that provide raw materials for its brands’ products and packaging in keeping with the precautionary principle, with respect to its environmental and social impacts. As BCI cotton allows GMO seeds, this is not a preferred certification for suppliers.”

From these statements, it clearly emerges that Kering seriously works to guarantee full traceability, relying on certifications that are able to provide such certainty: for this reason,

GOTS is preferred to BCI and CmiA. This action goes exactly in the direction of the certification analysis results described in the previous chapter.

3.2.3 Chanel

Chanel is a privately owned company since its foundation in 1909. The French luxury house is positioned as “a world leader in creating, developing, manufacturing and distributing luxury products.” (Chanel Mission 1.5°, 2020), focusing on top level craftsmanship.

The “Report to Society 2018” is the first report containing information about the company’s sustainability strategy. Some statements are reported, in order to understand which is the brand direction around the topic:

“Creation builds and spreads beauty far and wide, and inspires many people all over the world beyond our immediate clientele. We believe we have a responsibility to maintain the conditions that allow creation to thrive, so we give it the potential to be a positive force for change in the world, and to contribute to transforming lives and societies. To make this a reality, CHANEL invests heavily in preserving the sources of creation in the following ways:

- Valuing and securing the extraordinary and rare raw materials that we use in our products, and protecting complex and fragile ecosystems.
- Protecting and developing the incredible skills and traditions of our artisans, whose métiers belong to the cultural heritage of humanity but would probably disappear without our support.
- Supporting relevant new technologies which add value to our products and to the way we produce them.”

“CHANEL’s creation relies on our ability to continue to source natural ingredients and materials of exceptional and unique quality. The extreme care we take in choosing and preserving such extraordinary quality is part of our heritage.”

These sentences induce the reader to think that a traceability strategy has been set up, which is confirmed by the following report’s section about natural raw materials.

Nevertheless, there is no detailed information about traceability standards, certifications or practices concerning fashion. The report just states:

- “Traceability: We try to trace the structure and composition of the supply chain to as close to the material’s origin as is possible.
- Audits: We assess and monitor the actual and potential risks and impacts on the welfare of humans, animals, and natural ecosystems.
- Remediation: We set up programs to remediate local environmental and social impacts wherever possible through long-term cooperation with suppliers and local communities. [...] Where supply chains are highly complex and lacking in traceability, and where recognized sustainability standards do not exist, we try to work in association across sectors, with private, public, and nonprofit parties that are trying to achieve responsible supply chains.” (Report to Society 2018).

In March 2020, Chanel launched the “CHANEL Mission 1.5°” program, which represents a formal commitment to act towards the 2015 Paris Climate Agreement’s goal of limiting the increase in global temperature to a maximum of 1.5 Celsius degrees. The program is based on the following four challenges, as reported by the launch’s press release (Chanel Announces Climate Commitments, 2020):

- 1) “Reducing CHANEL’s carbon footprint across its own operations and its entire supply chain to meet Science Based Target;
- 2) Shifting to 100% renewable electricity on a worldwide basis by 2025;
- 3) Balancing our residual carbon emissions;
- 4) Financing climate change adaptation.”

The direction is clearly focused on reducing the carbon footprint and emissions, therefore there is no reference to fashion sustainability certificates.

Last year, in 2021, the “CHANEL Mission 1.5° Performance Update 2020” was published, aiming at disclosing the results achieved during the one-year activity.

From the introduction, it is possible to read the following statement:

“We are focusing our actions in the decade ahead on the areas where we can make the greatest difference: reducing our impact on climate change; contributing to the restoration and regeneration of nature and biodiversity; supporting more resilience in societies around our value chain.”

Not only cutting emissions, but also protecting and preserving biodiversity is one of the company's targets.

To the purpose of this research, it is of particular interest to proceed the reading: in fact, in the "Cutting Emissions in Chanel's Value Chain", the following words can be found:

"Our scope 3 emissions, which represent the majority of our impacts, arise principally from the raw materials that we source, the distribution of materials and goods, how products are packaged and marketed, and business travel."

"Chanel strives for distinction in the raw materials we use in our creations. We aim to source according to the highest standards of sustainability while delivering the finest quality. Our fashion business, for example, is increasing the use of sustainably sourced and certified materials, notably through support for the Global Organic Textile Standard (GOTS) and the Global Recycled Standard (GRS). GOTS certifies that the materials come from organic farming, with respect for the environment throughout the value chain. GRS guarantees a minimum of 20% recycled fibre composition in the fabrics, along with responsible social and environmental practices. Chanel's progress in this area in 2020 resulted in a quarter of materials of the Cruise Collection 2021/2022 being GOTS and GRS-certified." (CHANEL Mission 1.5° Performance Update 2020, 2021).

For the first time, in 2021, the company publicly declared to have employed certified raw materials for a fashion collection.

From the previous analysis, GRS and GOTS are two of the most valuable certifications for raw materials, first of all because they can ensure full traceability along the entire supply chain. Secondly, GRS, the leading standard for Recycled materials, is assessed to be the most complete certification among the analyzed ones.

In conclusion, the French luxury house has only recently started to make use of certified raw materials in its collections, nevertheless the standards' choice proves to be the best possible for the company's aims.

3.2.4 PVH Corp

The Phillips-Van Heusen Corporation was founded in 1881. It owns five brands: Calvin Klein and Tommy Hilfiger, positioned as high-ended fashion lifestyle brands, and Warners, Olga and True, with underwear as core business.

The PVH Corp sustainability strategy is called Forward Fashion and is developed around three focus directives summarized by some key numbers:

- ZERO, aiming at reducing negative impacts to zero;
- 100%, aiming at increasing the positive impacts to 100%;
- 1M+, is the number of lives that the company aims to improve along the whole supply chain.

The first two focus areas, concerning the environmental strategy, will be analyzed, focusing on the aspects that are relevant to the research question.

The strategy “Reduce negative impacts to Zero” aims at achieving “zero waste, zero carbon emissions and zero hazardous chemicals, and for our products to be circular.”

By 2025, the goal is to eliminate hazardous chemicals, responsible for water pollution during the wet processing stage, and to implement a filter system able to contrast microfiber pollution.

By the same year, the group also aims at making the top 3 best seller products completely circular and supported by a complete traceability of materials.

Likewise, the strategy “Increase positive impacts to 100%” is about the implementation of sustainable practices regarding products, packaging and people employed.

Concerning the environmental targets, ethical sourcing will be extended to all the products and materials: by the end of the decade, all PVH Corp partners must meet the environmental and social standards.

The company also strives for implementing regenerative practices concerning cultivation and raw materials and protecting animals’ wellbeing. By 2025, PVH Corp aims to source only sustainable cotton and viscose, and, by 2030, to reach the same target with polyester.

The abovementioned strategy can be summed up by the following words, reported on the PVH Corp Environmental Policy:

“We are taking steps to manage resources responsibly in the face of increasing resource scarcity. In particular, we aim to reduce our carbon footprint by cutting energy consumption and increasing energy efficiency – both within our business and across our value chain. We are also focused on reducing and phasing out hazardous chemicals, safeguarding water resources, innovating towards more sustainable packaging and sourcing raw materials in a way that respects people, animals and the environment. We address environmental and climate change impacts across our owned and operated facilities, products and packaging and supply chain as referenced below and our efforts, successes and specific targets are included in our annual Corporate Responsibility Report, which is available on our corporate website.”

The company’s sustainability commitments can be also proved by the fact that, on its website, it is possible to find several documents reporting progresses and data, such as the Factory List Disclosure, the 2019 GRI Index & SASB Reference Table, the Materiality Assessment, the Corporate Responsibility Reports since 2014 and Public statements (e.g. on Uzbek Cotton and Textiles on child labor).

On the Corporate Sustainability Report 2018, it is possible to have an overview of the company strategy about the use of raw materials:

“Considering the volumes of various raw material types, as well as business risks and opportunities, we identified priority areas of focus within natural, synthetic and animal based raw material categories. To implement this strategy, we are introducing new resources, tools and trainings to our raw materials and design teams to enable them to incorporate sustainability considerations into their daily activities. Sourcing cotton more sustainably for the environment and farming communities is a particular global focus for us. Cotton represents nearly 70% of our raw material use, so we have a great need and opportunity to invest in sourcing more sustainable cotton. [...] A core component of our global sustainable cotton program is sourcing Better Cotton, which is produced by farmers in a way that is measurably better for the environment and farming communities. Our CR Director at Tommy Hilfiger sits on the Innovation Board at BCI.”

Besides Better Cotton Initiative, there are references also to other two of the previously analyzed certifications: Zero Discharge of Hazardous Chemicals and Responsible Wool Standard.

“We made significant progress in 2018 against our commitment to eliminate hazardous chemicals from our supply chain by utilizing standardized industry tools and evolving our full-cycle approach to responsible chemical management. This is a complex endeavor and requires an understanding of our wet-processing base (i.e., mills and tanneries), chemical performance and compliance at each facility, responsible design decisions, transparency in chemical recipes, and baseline reporting. Key to these efforts was the adoption of the Sustainable Apparel Coalition (“SAC”) Higg Facility Environmental Module (“Higg FEM”) and deeper understanding of the Zero Discharge of Hazardous Chemicals Programme (“ZDHC”) tools.”

“We became members of the Textile Exchange (TE) and we intend to use their Responsible Wool Standard (RWS) wool in our products moving forward in order to support our commitment to this goal. We also have made the decision to remove all mohair products by 2020 due to concerns about its production.”

In the Animal Welfare Policy Statement, it clearly emerges that PVH Corp cares about animals’ wellbeing and, with regard to wool, the group is strictly against the mulesing practice on sheep.

The Corporate Responsibility Report 2019 highlights some improvements compared to the previous year:

- the ZDHC list, which defines the restricted substances, had been shared with the supply chain to foster their compliance, with a particular attention to wet processing partners;
- the introduction of recycled materials, like cotton and polyester;
- almost 50% of cotton is sourced from BCI partners;
- the group keeps requiring the Textile Exchange’s RWS (Responsible Wool Standard) and RDS (Responsible Down Standard).

The 2020 Corporate Responsibility Report provides the most relevant evidences:

“Percentage of raw materials third-party certified to an environmental and/or social sustainability standard, by standard: 34% of our materials are sustainably sourced. For all sustainable materials, PVH Corp requires third party certifications including but not limited to: Better Cotton Initiative, Global Organic Textile Standard, Organic Content Standard, Global Recycled Standard, Recycled Content Standard, Responsible Down Standard, and Responsible Wool Standard.”

“To manage wastewater in a way that will remove hazardous chemicals from the supply chain, we encourage suppliers to go beyond legal requirements, for example, application of the ZDHC Wastewater Guidelines and more advanced wastewater treatment technologies”.

These statements show a more defined commitment to sustainability, certified by third-party standards. Once again, the role of certification proves to be extremely relevant for communication purposes.

In 2021, PVH Corp became also a member of the U.S Textile Protocol, an organization which sets standards for sustainably grown cotton in the USA.

“Joining the Trust Protocol helps us move forward in reaching our sustainability goals and driving continuous improvements in sustainable cotton sourcing for our brands and at scale for the industry” said Marissa Pagnani McGowan, Chief Sustainability Officer at PVH Corp.

3.2.5 Hermès

Hermès is a French luxury company founded by Thierry Hermès, a saddler and harness artisan. At the beginning of the century, Hermès started to produce bags and, during the two World Wars, the first ready-to-wear collections were realized, such as the iconic silk scarfs.

It has always been a family-run company with an exceptional focus on high-quality products and craftsmanship. Moreover, the production process is highly verticalized to guarantee full traceability and 80% of manufactures are localized in France, in spite of the industry's trend to delocalize.

The sustainability strategy, according to the Corporate website, is declined along five directives:

- 1) Sustainability of objects, designed to last over time and to be adaptable;
- 2) Sustainability of employment, to foster know-how capabilities;
- 3) Sustainability of local anchoring, to pursue the revitalization of regional territories;
- 4) Sustainability of partnerships, which must share the company's values to guarantee full compliance to standards and traceability. Additionally, "The group's 2024 objective is to have 100% of the textile and leather sectors certified."
- 5) Sustainability of natural resources, intended both as raw materials for products' production and as resources like water or energy employed along the value chain.

It is also possible to browse the "2020 CSR Extract" from the website, where more information are disclosed about raw materials and traceability. Some extracts will follow.

Raw Materials

"Hermès' approach to sustainable development is based on exceptional raw materials, from renewable natural sources, obtained with a determination to limit their footprint. In addition to actions to control consumption of materials, each métier and production unit is committed to using materials wisely at each stage of their life, reducing waste and promoting recycling."

"The Group's policy is to use only the best quality materials, to optimise their use by adapting production methods, and to work on the recycling or reuse of any production waste. This policy consists of aligning purchases as closely as possible with needs, thereby reducing waste. The artisanal approach is an advantage in this respect, ensuring close proximity between buyers and craftspeople. In order to control the use of all materials, for several years reuse initiatives have

been launched in a circular economy approach, both internally and externally, and Hermès regularly examines different ways to reduce the waste generated by its activities.”

It emerges that the company’s approach is based on high-quality material selection, but also on waste reduction and up-cycling. This is confirmed by the information reported in the Textile section as well.

Textile

“Once the raw materials have been provided (essentially silk, cashmere and cotton), the Textile division takes over all processing tasks: weaving, printing, finishing, fabrication. This unique integrated process makes it possible for us to control the use of materials down to the last thread. All manufacturing units in the division are involved in very active waste and scrap minimisation programmes, as part of the quality initiative that drives the whole sector. This objective of maximising the use of materials is at the heart of the division’s production model. [...] Thanks to precise monitoring of products initially discarded and a strong development dynamic with the métiers, new products have been created in a spirit of “up cycling”.

[...]

Since June 2018, a multidisciplinary team from the Ateliers AS and Siegl production sites and process departments, has been seeking ways to reduce adhesive consumption at the printing sites. Glue is essential to the process since it holds the textile in place during printing. Holding Textile Hermès complies with the regulatory framework for managing this risk, but the solvents contained in these glues have potentially harmful effects on health when they are released into the atmosphere. The Group is continuing to work in three directions to reduce these emissions: streamlining the daily use of these adhesives through procedures and the development of an adhesive application machine, the replacement of current adhesives with adhesive films, and the replacement of current adhesives with ones containing less solvents. Based on initial work, glue consumption decreased by 10% between 2019 and 2020.”

From the *Eco-design* and *Supply chain* sections, it is possible to get a deeper view on the materials selection and management:

“[...] the materials used come from natural, renewable sources, taken while respecting the potential for regeneration of the resource, such as in the case of hides from farmed animals, or

for the main textile materials (silk, cashmere and wool, for example). The House's historical preference for natural fibres avoids the use of non-renewable petroleum chemistry".

"The Group's policy, which has been unchanged for decades, is to apply the highest standards to the sectors in terms of quality, as well as the environment and social issues. This is reflected in the need to better understand its supply chains, to strengthen them to ensure quality and their ethics, to raise their awareness of environmental and social issues, and to develop them to prepare for future growth."

Starting from 2019, Hermès has defined a protocol called "Supply chain brief", which outlines the company's ethics and requirements that must be shared by the supply chain partners. The final target is to make use of raw materials compliant with the strictest standards, or to protect animal welfare and biodiversity and, more in general, to increase transparency.

"Overall, all textile suppliers were approached during 2020 in order to jointly construct responsible supply chains for natural fibres, based on the existing RWS, RDS and OekoTex labels."

"In 2020, work was started with the main cotton suppliers in order to be able to switch all cotton supplies to organic cotton or GOTS for packaging by 2024. These improvements will take place gradually from 2021 on emblematic and widely used elements, namely the herringbone covers and wrapping ribbons, which will significantly reduce the corresponding water consumption."

It is possible to understand from the table below (Figure 18) that, in order to set measurable objectives, certifications are required. This confirms the fact that they represent evidence of solid commitment.

Figure 18: Main commitments for better control of sectors and suppliers

MAIN COMMITMENTS FOR BETTER CONTROL OF SECTORS AND SUPPLIERS	
ANIMAL SECTORS	
Cashmere	Responsible Wool Standard (RWS) certification
Feather/Down	Responsible Down Standard (RDS) certification/PFC (Parent Farm Certified)
Leather	Leather Working Group (LWG) certification of tanneries
	IFCA certification for crocodile farms
Precious leather	LPPS certification for lizard farms
PLANT SECTORS	
Cotton	GOTS certification
Linen	Master of Linen certification
Cellulosic fibres	FSC fibre sources (list of prohibited suppliers)
Wood	FSC and/or PEFC certification
MINERAL SECTORS	
Stones	RJC and/or IRMA certification
Gold/Silver	RJC certification and use of recycled materials

Source: 2020 CSR Extract, Hermès

Nevertheless, it must be underlined that Hermès highly relies on the vertical integration and direct supervision on production and partnerships, as it is reported in the CSR Extract:

“[...] While external certifications are useful, the Group favours closer supervision through direct knowledge of its partners’ practices, which the House’s business model makes possible.”

3.3 Discussion of the results

The objective of this analysis was to understand if the most important fashion luxury groups were communicating an environmentally sustainable strategy, and in which way they were implementing it.

The following table (Table 6) provides a summary view of the previously described study. The group or brand name, the main sustainability claims, the year in which they had been stated and the corresponding certification are reported.

Table 6: Coherency check summary

BRAND/GROUP	YEAR	CLAIM	CORRESPONDING CERTIFICATE
LVMH	2018	"Certification is one of the main drivers used to develop responsible procurement by the LVMH Group's Maisons. It guarantees that the materials and substances included in the composition of their items are produced according to the highest environmental standards."	BCI, RWS
	2019	"TIGHTENING OR DEVELOPING NEW STANDARDS LVMH takes measures to continuously improve its responsible sourcing for natural materials."	GOTS
	2019	"In 2019, LVMH also joined the Zero Discharge of Hazardous Chemicals (ZDHC) foundation, which seeks to promote best practice and the use of safer chemicals at textiles and leather manufacturing facilities"	ZDHC
KERING	2018	"[...] the Kering Standards and their accompanying suite of policies set the framework for commitment and action for Kering and our brands. In addition, they provide a way of measuring progress and outcomes on traceability, social welfare, environmental protection, animal welfare and chemical use. This document is intended to give clarity and help operationalize Kering's overall long-term commitment to sustainability."	GOTS, GRS, RWS, ZQ, OCS, ZDHC
CHANEL	2021	"Chanel strives for distinction in the raw materials we use in our creations. We aim to source according to the highest standards of sustainability while delivering the finest quality. Our fashion business, for example, is increasing the use of sustainably sourced and certified materials [...]."	GOTS, GRS
PVH Corp	2018	"Sourcing cotton more sustainably for the environment and farming communities is a particular global focus for us. Cotton represents nearly 70% of our raw material use, so we have a great need and opportunity to invest in sourcing more sustainable cotton."	BCI
	2018	"We made significant progress in 2018 against our commitment to eliminate hazardous chemicals from our supply chain by utilizing standardized industry tools and evolving our full-cycle approach to responsible chemical management."	ZDHC
	2018	"Responsible sourcing of animal-based materials has become an increasingly important issue to our company and stakeholders."	RWS
	2020	"34% of our materials are sustainably sourced. For all sustainable materials, PVH requires third party certifications [...]"	BCI, GOTS, OCS, GRS, RWS, ZDHC
HERMÈS	2020	"The Group's policy, which has been unchanged for decades, is to apply the highest standards to the sectors in terms of quality, as well as the environment and social issues. This is reflected in the need to better understand its supply chains, to strengthen them to ensure quality and their ethics, to raise their awareness of environmental and social issues, and to develop them to prepare for future growth."	RWS, Oeko-Tex, GOTS

Source: personal elaboration

In general, the analyzed groups and independent brands always include traceability and sustainable sourcing of raw materials among other objectives in their strategy.

Nowadays, all of them are requiring their supply chains to provide at least one of the previously analyzed certifications, with GOTS being the common denominator.

Table 7 synthesizes the certifications' adoption path of the analyzed groups and brands in the three-years' time frame 2018-2020; next to each certification, the relative score obtained by the

previous analysis (Chapter 2) has been reported. In this way, it has been possible to compute, for each group/brand, a total certification score per year. It should be recorded that this study considers only the environmental sustainability certifications which have been selected according to the number of mentions in academic papers and trade magazines (see Chapter 2, section 2.3 “Certifications’ selection”). The top 5 fashion luxury groups, in fact, adopt other environmental sustainability certifications (e.g., LWG – Leather Working Group or RDS – Responsible Down Standard) or other types of certifications, such as the ones related to the factories’ performances. Future studies could take these limitations into account and extend the research scope, in order to obtain a more complete view.

Table 7: Analyzed companies’ path towards certifications adoption

GROUP/BRAND	2018		2019		2020	
	CERTIFICATION	SCORE	CERTIFICATION	SCORE	CERTIFICATION	SCORE
LVMH	BCI	2	BCI	2	BCI	2
	RWS	4	RWS	4	RWS	4
			GOTS	4	GOTS	4
			ZDHC	3	ZDHC	3
	<i>Total score</i>	<i>6</i>	<i>Total score</i>	<i>13</i>	<i>Total score</i>	<i>13</i>
KERING	RWS	4	RWS	4	RWS	4
	ZQ	4	ZQ	4	ZQ	4
	GOTS	4	GOTS	4	GOTS	4
	OCS	2	OCS	2	OCS	2
	GRS	5	GRS	5	GRS	5
	ZDHC	3	ZDHC	3	ZDHC	3
<i>Total score</i>	<i>22</i>	<i>Total score</i>	<i>22</i>	<i>Total score</i>	<i>22</i>	
CHANEL					GOTS	4
					GRS	5
<i>Total score</i>	<i>-</i>	<i>Total score</i>	<i>-</i>	<i>Total score</i>	<i>9</i>	
PVH CORP	BCI	2	BCI	2	BCI	2
	ZDHC	3	ZDHC	3	GOTS	4
	RWS	4	RWS	4	OCS	2
					GRS	5
					RWS	4
<i>Total score</i>	<i>9</i>	<i>Total score</i>	<i>9</i>	<i>Total score</i>	<i>20</i>	
HERMÈS					RWS	4
					Oeko-Tex	3
					GOTS	4
	<i>Total score</i>	<i>-</i>	<i>Total score</i>	<i>-</i>	<i>Total score</i>	<i>11</i>

Source: personal elaboration

As Table 7 shows, the timing concerning certifications’ adoption has been different from one company/group to another: LVMH, Kering and PVH Corp have been the first ones to undertake

it in 2018, whereas Hermès and Chanel started to require certifications to their supply chain only in 2020.

In 2018, the total certifications score of LVMH was 6, because only two certifications were required: BCI and RWS. The following year, the group introduced also GOTS and ZDHC, therefore obtaining a score of 13; the score was unaltered in 2020, since no variation occurred.

Kering is the group with the highest total score in the whole three-years' time frame: since 2018, the group required to its supply chain some of the most significant certifications (RWS, ZQ, GOTS, OCS, GRS, ZDHC). Even though no change in the materials' policy has been registered in the considered time period, the group still remains the most committed to the certifications' adoption practice.

On the other hand, Chanel started to require the GOTS and the GRS certifications only in 2020, with a total score of 9.

Similarly, Hermès introduced the first certifications (RWS, Oeko-Tex and GOTS) in the same year, reaching a score of 11 points.

PVH began its certifications' journey in 2018, by requiring the BCI, the RWS and ZDHC certifications. This selection has been kept also in 2019, therefore maintaining a total score of 9; by contrast, in 2020, the group introduced other three certifications: GOTS, OCS and GRS, boosting the score to 20 points.

Kering and PVH Corp appear to be the groups which require the highest number of sustainable certifications to their supply chains: out of a total of six required certifications for each group, RWS, GOTS, GRS, OCS and ZDHC are common. This proves that the groups can sustain their sustainability claims thanks to a strong commitment which is periodically certified by third-party bodies.

Chanel results as the worst performer in this analysis, because of its late and limited adoption of certifications. The encouraging aspect is that the Maison started its sustainability commitment relying on two of the most valuable and complete certifications.

Focusing on cotton, the most polluting among natural materials, it must be underlined that Kering was the first one to require GOTS certification for organic cotton and to disincentive Better Cotton Initiative standard because of its lack of full traceability. On the other hand, LVMH and PVH Corp adopted the BCI standard in 2018, but, starting from 2019 for LVMH and from 2020 for PVH Corp, GOTS has been introduced as well. The different strategy

pursued by the three groups can have pros and cons. Kering set strict requirements for organic cotton since the beginning, thus ensuring transparency to its stakeholders; LVMH and PVH Corp chose to adopt a less stringent standard when developing the certifications journey probably to reach more suppliers, and to introduce the strictest one in a second stage.

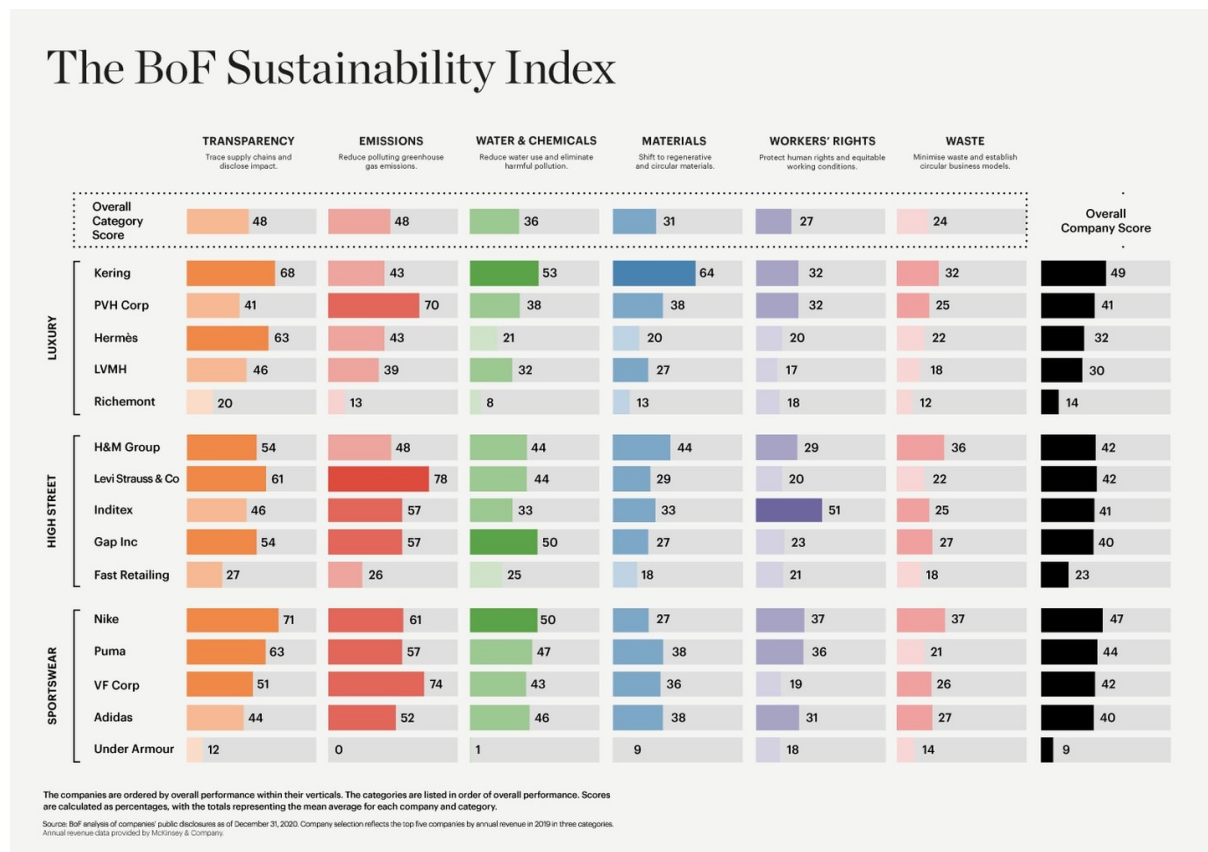
These evaluations about companies' commitment to certifications' adoption can be corroborated, to some extents, by the Business Of Fashion Sustainability Index 2022.

The Index takes into consideration the 15 largest fashion companies, five for each category: luxury, high street and sportswear. For luxury, Kering, PVH Corp, Hermès, LVMH and Richemont are selected. Each company's sustainability performance has been evaluated against six categories: transparency, emissions, water and chemical, materials, workers' rights and waste.

The comparison between this dissertation's analysis and BOF Index can be limited only to Kering, LVMH, PVH Corp and Hermès, since Chanel and Richemont do not appear in both the researches.

The following figure (Figure 19) reports the BOF Sustainability Index results:

Figure 19: The BoF Sustainability Index



Source: The Sustainability Gap, 2021.

Focusing on traceability and material performances of luxury companies, Kering is the best performer in both the categories, with Hermès providing a very high score in transparency as well. This result is proved by the coherency check analysis: Kering’s strict commitment requires high levels of control, therefore ensuring transparency and less impacting materials. In contrast, Hermès’ vertical integration makes easier for the brand to have a full control on its value chain.

It must be taken into consideration, as the BOF report specifies, that transparency evaluation is subject to a company’s spontaneous declarations and data can be very difficult to find.

On the material side, the report states that “Material certified to have better environmental and social impact have hit the mainstream”. This confirms the increasing trend of employing materials’ certifications outlined from the coherency check analysis. With regard to this category, Kering is ranked first out of 15 brands, with a score of 64 out of 100, followed by H&M with a score of 44.

Contrary to expectations, LVMH appears to be more transparent than PVH Corp relating to transparency: PVH Corp's higher number of required certificates could induce to think that the group is also more transparent. Nevertheless, this divergence could be determined by calculation parameters.

Therefore, there is an overlapping in both the analysis which classify Kering and PVH Corp as the top performers, followed by LVMH and, lastly, by Hermès.

3.4 Conclusions

This chapter is built around a coherency check between the environmental statements provided by the most important luxury groups and brands, and their possible certifications' adoption.

It has been demonstrated that Kering is the top performer according to the analysis. In order to implement the sustainability strategy aimed at guaranteeing full traceability concerning environmental protection, the group has been requiring its supply chain six of the most mentioned certificates (according to the results provided by Chapter 2) since 2018. In addition, it should be noted that Kering's certifications selection expresses a real commitment towards traceability: an example above all is the fact that the GOTS certified organic cotton is preferred to BCI or CmiA cotton, given the fact that the last ones do not ensure full traceability.

Generally speaking, there has been an increase, overtime, in the number of certifications' typologies required to the companies' supply chains. This demonstrates that certificates are, on the one hand, a valid guarantee instrument to exert control over dispersed partners and, on the other, a credible tool to communicate real commitment on such topics.

A significant improvement in the certifications' quality has been reported as well: for example, LVMH and PVH began the certification process with BCI for organic cotton, but, in a second step, they introduced also the GOTS certification to fulfill the same scope. Two considerations emerge from this choice: i) the late introduction could be due to the fact that GOTS standards are more stringent and difficult to comply with than BCI ones, therefore the groups might have chosen to start the sustainability process relying on a more basic certification like BCI; ii) the fact that BCI has not been discharged in favor of only GOTS certified cotton could be the result of the groups' aim of sourcing the highest possible percentage of sustainable cotton, without any constraints on relative percentages.

Chanel and Hermès, on the contrary, proved to be the late laggards in the certifications' adoptions process, with reference both to the year of introduction (2020) and to the number of certifications (only two for Chanel and three for Hermès). Nevertheless, the brands chose to adopt some of the most reliable certifications.

Conclusions

This dissertation should be considered an explorative study of the environmental sustainability certifications in the fashion industry, rooted around two main research questions:

- 1) Which are the most diffused certifications concerning environmental sustainability?
How can they be classified?
- 2) How are the most important luxury conglomerates and brands dealing with the environmental sustainability strategy, especially in relation to certifications?

Environmental sustainability certifications represent an objective tool for communicating a company's sustainability program, because third-party bodies assess its commitments in relation to stringent and binding environmental standards.

This dissertation provides a description of the most spread certifications in terms of mentions in academic journals and trade magazines, aimed at capturing their targets and general requirements. Subsequently, a summarizing table has been drawn up for the purpose of comparing the certificates in a more immediate way. From this data elaboration, it has also been possible to assign a score to each certification, with the aim of providing a ranking able to answer the following question: which certification might be of interest to a company wishing to undertake a corporate sustainability journey, based on the transparency provided by the certification in the supply chain and the goals it meets?

From the certifications' description it emerged that, besides the specific target, the most important characteristic for a certificate is its ability to prove that the chain of custody has been maintained along the several production stages: only in this way, the final retailer can be certain that all the required standards have been respected, therefore full sustainability can be ensured to the final consumer.

The analysis' findings confirm the "plethora of standards", as defined in the Changing Market Foundation report in 2018. In fact, there are many different certifications focusing on distinct goals, but, at times, overlapping with one another. This complexity undermines the ability of companies to understand which certifications are the most relevant and prestigious to pursue; at the same time, looking at it from a different - and more negative - perspective, the chaotic condition may enable the least committed companies to achieve less rigorous certifications with

a significantly lower effort, while still providing the same picture of sustainability to an average non-expert consumer.

To simplify this framework, the solution could be to integrate those standards targeting the same kind of issues, in order to define a most comprehensive scheme.

Considering the certifications' ranking of the most mentioned certificates, Global Recycle Standard (GRS) appears to be the most complete certificate, since it targets, in addition to environmental protection, full chain of custody, proper chemicals management, social welfare and circularity.

Nevertheless, as previously stated, since there are many certificates targeting different sustainability aspects, a company could be more interested in the adoption of specific certificates, notwithstanding their general completeness level. Indeed, a company might select one or more specific certifications focusing on well-defined issues, according to its business and sustainability's purpose. For this reason, the ranking obtained by this dissertation could be useful to assess, once the company defines its main objective, which certification fulfilling that goal is the most complete, controlling for the other targets.

The second research question examines the top 5 luxury conglomerates and brands certifications' adoption, according to their environmental statements in the last annual reports.

Investigating whether and which materials certifications are adopted by such companies to ensure sustainable sourcing and full traceability, helps to understand how they are moving towards the sustainability frontier, beyond mere declarations.

According to the study, Kering resulted as the top performer. As a matter of fact, the group has been implementing sustainability strategies aimed at guaranteeing full traceability since 2018, requiring its supply chains to adopt some of the most diffused and stringent certifications.

Broadly speaking, the analysis confirms that certifications represent an objective tool to exert control over long and dispersed supply chains and to communicate sustainability commitments to the final consumers. This is motivated by the fact that there has been an increase in the number of certifications required to the supply chain partners. Moreover, over time, there has been an improvement in the certifications' quality: the analyzed companies are introducing or

favoring the most stringent standards, therefore sustaining their statements with consistent and verifiable evidence.

Limitations and future research

The study takes into consideration only the most mentioned environmental certifications concerning materials. Future research could extend the perimeter to all the existing materials' certifications: this would allow to draw a more complete ranking and to assess which are the most recommended ones for a company wishing to adopt this strategy.

Moreover, the scope could be broadened to examine certificates focused on other phases of the production process as a whole, therefore including, by way of example, those related to factories performances in terms of energy consumptions and emissions, or on packaging and distribution. Starting from this thesis' second research question, another possible research area could be to understand which kinds of certifications are adopted by which kind of companies, in order to define clusters. Different variables could be taken into consideration, such as the companies' segment, the target market, the foundation date, the dimension, etc.

Another interesting analysis to perform, could be focused on the most virtuous companies and investigate if there has been an evolution over time in the typology of adopted certification, and see if there is any correspondence across different segments.

Lastly, owing to the fact that consumers and public opinion are shedding more and more light on workers' protection and welfare, the same analysis could be performed by shifting the certification's object from environmental to social sustainability.

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