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An Environmental Approach to Sustainable Fashion

Un enfoque ambiental de la moda sostenible

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AN ENVIRONMENTAL APPROACH TO SUSTAINABLE FASHION - UN ENFOQUE AMBIENTAL DE LA MODA SOSTENIBLE

Laura Thommen

Abstract:

Fashion is an industry which has a significant impact on the three pillars of sustainability: social, environmental and economical. This master's thesis investigates the environmental aspect in particular because the sector negatively influences the healthy state of our waters, land, atmosphere and biodiversity, and too little is done to change that. Firstly, the facts on how the fashion industry affects the environment are presented. Then, the data of a survey conducted amongst consumers is analysed. Next, a best practice section describes how five fashion brands (Ecoalf, Gayaskin, MUD Jeans, People Tree and Stella McCartney) tackle the problem and minimize their environmental footprint. Finally, both research topics are discussed and cross-analysed to highlight the keys for a fashion brand to be operational, respect the environment and meet consumer's expectations at the same time. They all confirm the hypothesis of this thesis which claims that, in order to tackle its impact on the environment, the fashion industry should carefully choose the materials used, take a more circular approach and better communicate to aim for radical transparency.

Key words: *Sustainable fashion, environmental impact, sustainable material mix, circularity, consumer's expectations, transparency, environmental tools, communication*

Resumen:

La moda es una industria que impacta significativamente los tres pilares de la sostenibilidad: social, ambiental y económico. Este trabajo de fin de máster investiga en particular el aspecto ambiental porque el sector influye negativamente sobre nuestras aguas, tierras, atmósfera y

biodiversidad, y se hace muy poco para cambiarlo. En primer lugar, se presentan los hechos sobre cómo la industria de la moda afecta al medio ambiente. Luego, se analizan los datos de una encuesta realizada entre los consumidores. A continuación, una sección de mejoras prácticas describe cómo cinco marcas de moda (Ecoalf, Gayaskin, MUD Jeans, People Tree y Stella McCartney) abordan el problema y minimizan su huella ambiental. Por último, se analizan ambas investigaciones exponiendo las claves para que una marca de moda sea operativa y que al mismo tiempo respete el medio ambiente y responda a las expectativas de los consumidores. Todas ellas confirman la hipótesis de este trabajo, según el cual, para hacer frente a su impacto en el medio ambiente, la industria de la moda debe elegir cuidadosamente los materiales utilizados, adoptar un modelo más circular y comunicar mejor para aspirar a una transparencia radical.

Palabras Claves: *Moda sostenible, impacto ambiental, mix de materiales sostenibles, circularidad, expectativas del consumidor, transparencia, herramientas ambientales, comunicación*

Sobre la autora: *Ha estudiado Gestión Internacional de la Hostelería (International Hospitality Management) en Lausana, Suiza.*

Después varias experiencias en el sector del turismo y de los eventos, he trabajado durante un año y medio en la industria del lujo como coordinadora de relaciones públicas. La empresa para la que trabajaba, opera en el sector de la moda, la relojería/joyería y los productos de belleza. Parte de mi trabajo consistía en mantenerme informada sobre las últimas innovaciones en materia de moda y fue entonces cuando empecé a querer aprender más sobre la moda sostenible y el impacto medioambiental de esta importante industria.

El tema me apasiona y siempre estoy encantada de hablar de eso. Mi correo de contacto: laura.thommen@ehl.ch.

1. Introduction

1.1 Rationale

The following project aims to apply the Corporate Social Responsibility (CSR) and Sustainability knowledge gained during my master's degree at Conscious Management Institute to the fashion industry, which is particularly familiar to me as I worked for a luxury fashion brand for almost two years. During this time, I had the opportunity to learn a lot about smaller

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Key Quotes / Frases clave:

- **Traceability demand and distrust / Demanda de trazabilidad y desconfianza:**
  "In an international survey of fashion consumers (284 responses, mostly from Europe), 83 per cent wanted garments to be more traceable, yet only 11 per cent trusted brands' environmental communication, revealing a credibility gap linked to greenwashing." — Thommen (2020), *Conscious Management Journal*, 1(1).
  «En una encuesta internacional a consumidores de moda (284 respuestas, mayoritariamente europeas), el 83 % deseaba prendas más trazables, pero solo el 11 % confiaba en la comunicación ambiental de las marcas, lo que evidencia una brecha de credibilidad asociada al greenwashing.»

- **Moderate willingness to pay / Disposición a pagar moderada:**
  "Consumers' willingness to pay a premium for eco-friendly fashion is genuine but limited: the vast majority of respondents would pay up to 10 per cent more, and 20 per cent up to 50 per cent more, for an environmentally friendly garment." — Thommen (2020), *Conscious Management Journal*, 1(1).
  «La disposición de los consumidores a pagar más por moda ecológica es real pero acotada: la gran mayoría de los encuestados pagaría hasta un 10 % más, y un 20 % hasta un 50 % más, por una prenda respetuosa con el medio ambiente.»

- **Materials, circularity and transparency / Materiales, circularidad y transparencia:**
  "Cross-analysis of the survey and of five benchmark brands (Ecoalf, Gayaskin, MUD Jeans, People Tree and Stella McCartney) suggests that fashion can curb its environmental impact through a sustainable material mix, a circular approach and communication aimed at radical transparency." — Thommen (2020), *Conscious Management Journal*, 1(1).
  «El análisis cruzado de la encuesta y de cinco marcas de referencia (Ecoalf, Gayaskin, MUD Jeans, People Tree y Stella McCartney) sugiere que la moda puede reducir su impacto ambiental con un mix de materiales sostenibles, circularidad y una comunicación de transparencia radical.»

sustainable labels, textile innovations and sustainable fashion initiatives; this was extremely inspiring because it meant that things were finally changing in the industry.

This paper will focus on the environmental aspect of fashion, as the industry is one of the biggest polluters in terms of CO2 emissions, water contamination and chemicals use (Fashion Revolution, 2020). First, the theoretical framework gives an overview of the fashion industry, what sustainable fashion means and the different environmental impacts. Second, the research part includes a survey to better understand the consumers' view and highlights five innovative fashion brands who are trying to minimize their environmental footprint. Third, the research findings attempt to present sustainable environmental solutions that take into consideration consumers expectations. Finally, the conclusion gives some final recommendations as well as prospective for future research.

As sustainable fashion is a broad topic, the social aspect will be discussed briefly in the first part but will not be central to this paper. Human capital in the fashion industry is however an extremely important subject not to be overlooked. Numerous studies, documentaries, organizations and NGOs are dedicated to improving the working conditions and empowering the employees of the textile industry (just to name a few: Fashion Revolution, Fair Wear Foundation and Ethical Fashion Initiative).

All the research conducted and analysed does not take into consideration the current Covid-19 crisis as it is still too soon to properly measure the effects on the fashion industry and the consequences it will have in the longer run.

At first, the scope of this paper was intended to be European, but it was quickly changed to worldwide. The reason for this change is that we live in a globalized world where the biggest players of the industry operate on all continents; it therefore made more sense to take a global approach.

Since our world is changing so fast and the fashion industry with it, the majority of sources used for this project are from 2010 and on, in order to be as accurate as possible.

1.2 Hypothesis of the research

This paper attempts to show that the fashion industry can tackle its impact on the environment by adopting a sustainable material mix, taking a more circular approach and improving its communication.

As it will be explained in the second part of this paper, most of the fashion industry's negative impacts on the environment are linked to the textiles and materials used. In fact, the cultivation of natural fibres, the fabrication of chemical or synthetic fibres and the post-consumer life of garments all have huge consequences on the soils, the water and the atmosphere. However, there are multiple circular options nowadays to reuse existing materials or alternative models challenging the *status quo* so that the industry does not need to continuously create new and virgin materials.

1.3 Objectives of the research

Through the research conducted in this project, the goal is to achieve the following objectives:

- Understand why the current state of the fashion industry is not sustainable in the long run.
- Highlight the importance of using sustainable materials in order to stop damaging the environment at such a fast pace.
- Understand the customer's point of view and what they expect from fashion brands.
- Focus on the solutions rather than the problems to show that yes, it is possible to operate, be profitable and respect the environment at the same time.
- Show that communication, transparency and traceability are crucial issues for fashion brands to work on.

1.4 Methodology

In order to validate the hypothesis proposed above, the methodology is a combination of qualitative and quantitative research.

Through qualitative research, the theoretical framework will give an overview of the global industry, of sustainable fashion and list all the environmental aspects linked to fashion in order to highlight that most problems come from the textiles used and the current linear models. The data is mainly secondary, but also primary as the fashion editor of a Swiss daily newspaper and a UN representative for ethical fashion were interviewed over the phone for their experience and insight into sustainable fashion. For confidentiality reasons, they both preferred to remain anonymous.

The survey conducted amongst consumers around the globe is quantitative research with valuable primary data which, combined to secondary research, helps shape the biggest

consumer trends and understand customers' expectations in terms of fashion. The part discussing the best practices through the five companies selected is composed of qualitative research. It includes mainly secondary data recovered from the websites of the different brands, along with primary data as emails were exchanged with one brand to get more information.

All the data collected will allow to confirm the hypothesis and present some environmentally sustainable solutions for the fashion industry thanks to cross analysis.

2. Theoretical framework and state of play

2.1 Overview of the global fashion sector

For the sake of this paper, the term fashion will include the textile, clothing, leather and footwear industries which are also commonly called TCLF by the International Labour Organization (2019). Beyond being functional, fashion can also be defined as a way for people to express their style and personality (WWF Switzerland, 2017). From a different perspective, fashion is also linked to our consumerist society and the attraction individuals have to own new things (Viñas, 2019). In order to have an appropriate overview of the fashion industry, the first part determines the different segments and the biggest players of the sector. Second, fashion will be analysed from the perspective of our globalized world. Then, we will dive into the consumption of TCLF worldwide to finally describe the current linear model of the industry and its supply chain.

2.1.1 Structure of the sector

According to Global Fashion Agenda (2018), fashion brands both online and offline can be segmented by price, into six categories.

- Discount: the cheapest price on the market. For example: Primark and C&A
- Lower mid-price: low price, affordable products. For example: Zara and H&M
- Mid-market: average price. For example: Nike and Levi's
- Premium: above average market price. For example: Ralph Lauren and IKKS.
- Affordable luxury: higher price. For example: Michael Kors and Hugo Boss.
- Luxury: highest price on the market. For example: Chanel and Gucci.

Second-hand shops (physical and online) also play an important role in the fashion spectrum.

As predicted by McKinsey's State of Fashion report 2019, second-hand online platforms such as Vestiaire Collective or Vinted are seeing their number of users increase considerably. They allow people to sell items they are not wearing anymore and to buy items at a more affordable price than if they were new.

New models of fashion rental have also emerged over the last decade and been a huge success (McKinsey, 2020), allowing customers to rent a dress for a special occasion or even a couple of basic items for a month.

2.1.2 Fashion in a globalized world

For centuries and until the early 1950s, fashion was produced locally, on a relatively small-scale, following a made-to-order model and mainly for wealthy clients. Then, during the 1950s and the 1960s, the consumer society gained importance and fashion started to be mass-produced (and consumed) but still locally (Fashion Revolution, 2020). In the 1970s, legislations on the import of textiles to the United States and minimum environmental requirements in Europe, led the majority of textile producers to relocate their factories to Asia and Africa, where labour and environmental laws were more advantageous (Fashion Revolution, 2020; Muñoz-Valera, 2020). Additionally, in the 1970s fashion photography and advertising gained popularity which gave more visibility to the brands presenting their collections on catwalks. It allowed fashion retailers to copy these looks and produce them as cheaply and as quickly as possible in Asia or Africa, in order to have them on the racks fast and at a lower price. This is how the business model we call *fast fashion* today was born. In the 1980s and 1990s, the model sped in what became referred to as the "democratisation of fashion". During the 2000s, the production pace continuously increased along with the number of collections per year, pressuring manufacturers and suppliers in the developing countries to produce always cheaper and faster, no matter the social and environmental costs. By the mid-2000s, most players of the fashion industry shifted in that direction and relocated their production in Asia and Africa (Fashion Revolution, 2020). Today fashion has become one of the most globalised industries, with the biggest suppliers being Bangladesh, China, India, Turkey, Pakistan and Vietnam (WWF Switzerland, 2017).

The economic impact of the fashion industry worldwide is colossal, with an annual growth of 5.5 per cent over the last decade and an estimated worth of $ 2.4 trillion (McKinsey, 2017). Furthermore, the TCLF sectors generate 7 per cent of global goods exports (Loimil, 2018). Before the Covid-19 crisis, McKinsey (2020) expected the industry to continue growing at 3 to 4 per cent in 2020 but in May they reviewed their estimations to predict a 27-30 per cent contraction in revenues for the current year.

The fashion industry is also an important employer throughout the world. Even though statistics are not extremely precise, the International Labour Organization estimated in 2015 that garment manufacturing employs more than 60 million workers worldwide (40 million of them live in Asia alone), from which 80 per cent are women (Fashion Revolution, 2020). If the entire value chain is looked at, estimates say the fashion industry employs over 300 million workers in the world (Loimil, 2018).

2.1.3 Fashion consumption worldwide

As explained previously, fast fashion has become the most consumed form of fashion in the 21st century worldwide. Between 2000 and 2014, clothing production doubled and for the first time the number of garments produced exceeded 100 billion in 2014, meaning nearly 14 items for every single human being on this planet.

During the same period of time, the global consumption of clothes has increased by 60 per cent annually. The main reasons are the production costs that are always lower due to the pressure placed on suppliers, the accelerated pace of new collections (on average a new one every two weeks at Zara for example) and the slow rise in prices, compared to other consumer goods (McKinsey, 2016). This increased consumption leads to an average of 5 kg of clothes bought per person per year in the world, while the figure reaches 16 kg for Europe and the USA. Fashion consumption is expected to grow even further, rising from 62 million tons in 2015 to 102 million tons in 2030 (WWF Switzerland, 2017). This huge escalation can be explained by the fact that 80 per cent of the population in emerging economies (currently buying less than 5 kg clothes per year) is expected to reach the Western-world level of consumption by 2030 (McKinsey, 2016).

Fast fashion and overconsumption have led people to own more clothes than they can actually wear, and cheap clothes are seen as almost disposable: the majority of items get discarded after only seven or eight wears. Additionally, estimates suggest that an average consumer keeps its clothes for half as long as 15 years ago. (McKinsey, 2016; Fernández, 2018).

2.1.4 Fashion's linear model

As seen above, fashion's model was originally made-to-order. With the boom of fast fashion however, the industry has shifted to a linear *produce – use – dispose* model, where brands first produce huge quantities of clothing and then encourage consumers to buy them. Since the quality has decreased over time because cheaper materials are used, the items do not last as long anymore, and the consumer is regularly tempted to buy new items.

In order to better analyse the environmental impacts, it is important to understand the supply chain of the general fashion industry. To do so, it is crucial to consider the extended supply chain, as it can be seen in *Figure 1*, which includes in addition to the production and distribution phases, the consumer use and the end-of-life phases. As it will be explained in *Section 2.3* of this paper, a significant part of the environmental damage is caused in the post-consumer period. Moreover, as the extended supply chain includes all the stages of the product life cycle, it corresponds perfectly to the Life Cycle Assessment analysis which will be described in more detail in *Section 4* (Reuter & Zetterlund, 2018).

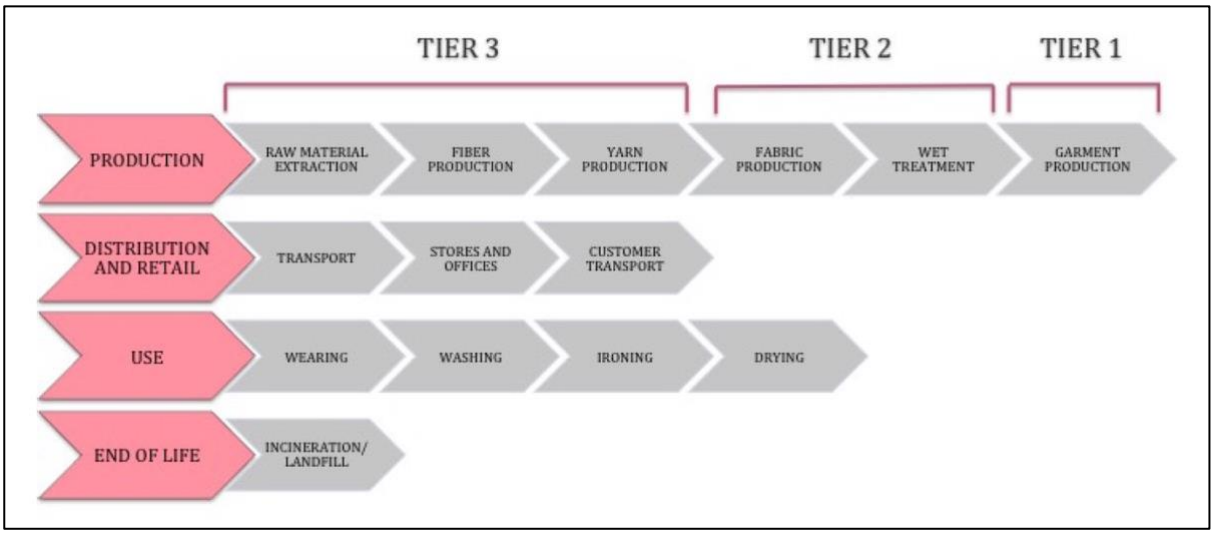

Figure 1 – *Fashion industry extended supply chain (Reuter & Zetterlund, 2018)*

According to Reuter & Zetterlung (2018) the tiers represent segments during the production process, where Tier 1 is the phase in which the fashion company has the most influence whereas in Tier 3 the company has only very little control.

During the production phases in tier 3, the natural materials are grown (such as cotton) and oil or gas is extracted for the chemical/synthetic materials. Then, the fibres and yarn are created, and the recycled fibres are reprocessed at these two stages.

Moving on to tier 2, the fabrics are produced by spinning, weaving, knitting, polymerization or extrusion. The wet treatment allows the fabrics to be bleached, dyed, printed and tanned.

Finally, in tier 3 the fabrics are cut, sewed and assembled to become a garment.

The other phases are pretty straight-forward and will not be further described, except the end-of-life one. In *Figure 1*, if the garment is disposed it is indeed incinerated, but it can also be reused (second-hand), recycled to become new fabrics or downcycled to be used for thermal insulation for example. However, only a very small proportion of end-of-life items end up reused or recycled (WWF Switzerland, 2017).

2.2 Sustainability in the fashion industry

2.2.1 Defining sustainability and sustainable fashion

The term "sustainable development" appeared for the first time in 1987 in the Brundtland Report, also known as *Our Common Future*, published by the World Commission on Environment and Development (WCED): "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". In 1992, chaperoned by the United Nations, 175 countries signed the Rio Declaration on Environment and Development that intended to guide countries towards future sustainable development with 27 principles (González, 2013; Rodríguez Cánovas & Martín-Caro, 2019). Since then, sustainability has been defined more in details and worked on to become an operational concept. According to González (2013), "The concept of sustainability is based on the premise that people and their communities are made up of social systems, economic and environmental issues that are in constant interaction. A harmony or balance must be kept if the communities want to keep working for the benefit of its inhabitants, now and in the future."

How does the concept apply to fashion? First of all, sustainable fashion considers the economic, social and environmental aspects equally (Fernández Matilla, 2017). Obviously selling fashion items needs to be profitable for the company, but not at any cost (poor working conditions, "modern slavery", damaging the environment, etc.). According to Patricia Larios (2019), sustainable fashion is also an ongoing process of improvement all along the life cycle of the product. In today's fashion world, sustainability is not a "nice-have" anymore but a "must-have". It should be included in all the steps, from design to fabrics production, from transport to selling point and from the product-use to the recycling of the fabrics. The *slow fashion* movement is inspired by the previous definitions and just like the *slow food* movement favours quality over quantity. Slow fashion wants to avoid the overexploitation of natural and human resources by reducing production and decreasing consumption through extended garment life (Fernández Matilla, 2017).

However, the meaning of sustainable fashion today is hard to simplify and define as it clearly lacks standardization. The sustainability issues are so broad (it can relate to basically

anything from LED light bulbs in a store to integrated sustainable strategies), that consumers have a hard time to get a clear picture of the essence of sustainable fashion (McKinsey, 2019). As sustainability is a predominant trend nowadays, many brands define themselves as such but who can properly assert that they really are? One key is transparency, which Fashion Revolution (2020) defines as "the public disclosure of credible, comprehensive and comparable data and information about fashion's supply chains, business practices and the impact of these practices on workers, communities and the environment". The great value of transparency will be extensively discussed in *Section 4.1*.

2.2.2 Fashion and the SDGs

The Sustainable Development Goals (SDGs), along with the Agenda 2030 were launched by the United Nations in 2015. The 17 interconnected goals address the global challenges our world is facing today and focus on the three aspects of sustainability defined previously; economic, social and environmental (Reuter & Zetterlung, 2018). The aim of the following tab is to give a few examples of economic, social and environmental (ESE) impacts fashion has on the SDGs, to illustrate that the industry is linked to all of them. The list of impacts in non-exhaustive.

SDGs	Examples of ESE impacts in the fashion industry
SDG 1 **No poverty**	- No fair salary for all textile workers - Child and forced labour still exist in the earlier stages of production
SDG 2 **Zero hunger**	- Loss of biodiversity due to monocultures (cotton for example) - Ecotoxic effects on the land used to grow food
SDG 3 **Good health and well-being**	- Health and safety on the workplace to be improved - Not enough social benefits for workers
SDG 4 **Quality education**	- Respect for individuals' rights - The industry could encourage technological development so that more children have access to education
SDG 5 **Gender equality**	- Not all workers have the same working conditions - All female workers do not have secure living conditions due to too low wages
SDG 6	- Loss of biodiversity in waters due to the release of chemicals

Clean water and sanitation	- Communities living near textile factories see their health impacted because of the contamination of their waters
SDG 7 Affordable and clean energy	- The production of TCLF is very demanding in energies such as oil and coal, which directly contribute to climate change - All these emissions also contribute to the acidification of oceans
SDG 8 Decent work and economic growth	- The fashion industry is a huge contributor to the economy in the textile countries - However, workers should have fair working conditions which include amongst others the freedom of association and decent working hours
SDG 9 Industry, innovation and infrastructure	- The industry has a tremendous potential to innovate, engage communities and contribute to technological development of countries
SDG 10 Reduce inequalities	- A living wage could change the life of millions of workers, lifting them out of poverty - Child and forced labour should be completely abolished
SDG 11 Sustainable cities and communities	- Fashion can contribute to pass on the culture heritage - A living wage would give workers from the TCLF industries the possibility to consider sustainable options in their daily life - The industry should work on diminishing its ecotoxic effects as it impacts the cities close to the factories or the culture of fabrics
SDG 12 Responsible consumption and production	- Transparency is key to responsible consumption - Consumers should feel responsible for the end-of-life of their fashion items - TCLF items should be produced more social- and eco-responsibly
SDG 13 Climate change	- Fashion has a direct impact on climate change, particularly in terms of CO2 emissions
SDG 14 Life below water	- The use of fashion items made of synthetic/chemical fibres releases micro-plastics in the oceans, affecting life below water - The release of chemicals in the waters kills all sorts of life below it
SDG 15 Life on land	- The use of pesticides in cultures of raw material such as cotton deteriorates the land and the biodiversity nearby

SDG 16 **Peace, justice and strong institutions**	- Everyone deserves decent working conditions - Fashion brands should publicly commit to sustainability and prove it through transparency and traceability - Institutions have to set higher standards in terms of sustainability
SDG 17 **Partnerships for the goals**	- Alliances between the bigger fashion players commonly working towards a more sustainable future on the industry - Social responsibility should be promoted all along the value chain - Good and transparent suppliers' relationships are key to ensure sustainability in the industry

Table 1 – *Adapted from Reuter & Zetterlung (2018) and Baptist World Aid Australia (2019)*

In 2017, the United Nations published *Guidelines for Providing Product Sustainability Information* which is a report providing "global guidance on making effective environmental, social and economic claims to empower and enable consumer choice" to professionals. The SDG 12 (Responsible consumption and production) sets the common ground for the fundamental and aspirational principles of the guidelines. They can easily be applied to the fashion industry and would partly clarify the consumer's confusion around sustainability discussed previously.

2.2.3 Alliances and governance

In the last decade, several alliances in the industry have been created in order to build a more sustainable future. International organizations have also published various guidelines to help fashion brands into better practices and some regulations as well as laws are being put into place. This section provides an overview of what has been done internationally during the last decade.

To start with the alliances, the bigger players of the industry have launched many coalitions and initiatives on their own. The Sustainable Apparel Coalition (SAC) for instance, was created in 2010 by Patagonia and Walmart because they wanted a tool to measure the environmental impact of their products. This is how the HIGG Index was born, which is a standard measurement allowing fashion companies to understand their sustainable impact as well as reduce risks and inefficiencies (Loimil, 2019). Another example is the non-profit organization Global Fashion Agenda (GFA), which aims to "mobilize and guide the fashion industry to take bold and urgent action on sustainability". Since 2009, GFA has also organized the Copenhagen Fashion Summit, a global event gathering all of fashion's stakeholders to work

on feasible and innovative solutions to implement environmental and social sustainability. Moreover, the GFA publishes in-depth analysis and reports on the state of the industry (Global Fashion Agenda, n.d.). During the 2019 UN Environment Assembly, the UN Alliance for Sustainable Fashion initiative was created to "coordinate action in the fashion sector" in order to achieve the SDGs (UN Alliance for Sustainable Fashion, n.d.). The UN representative interviewed explained that one of the objectives of the Alliance is to assist the cooperation between international organizations and TCLF professionals, so that all the information concerning fashion and sustainability can be found in one place. Additionally, as part of the Alliance, the UN are currently developing an application that will contain all the product information to allow full traceability and transparency of fashion items.

At the COP24 in 2018 in Poland, the UN Climate Change launched the Fashion Industry Charter for Climate Action (UNFCCC) which includes a set of targets to achieve net-zero emissions by 2050. It is built on the Science-Based Targets Initiatives methodologies and includes for example a 30 per cent reduction of GHG emissions by 2030 and a decarbonisation pathway for the industry. The charter is not legally binding but the 108 signatories along with the 31 supporting organizations have committed themselves to reach the target through Working Groups (UNFCCC, n.d.). In 2019 on the occasion of the G7 summit, 20 per cent of the global fashion industry (by volume of products) signed the Fashion Pact, which is a set of targets to achieve by 2050: "The Fashion Pact is based on the collective ambition of CEOs to commit to sustainability targets that are needed to bend the curve on climate, biodiversity and fight against the pollution of our oceans." The pact is once again not legally binding but includes concrete joint initiatives to improve the collaboration between the companies and all the stakeholders of the fashion industry (Fashion Pact, 2019).

During the last ten years, many international events on green and sustainable fashion have been created, gaining more and more importance. Just to name a few, an *IMPACT sustainable fashion show* is organized in Paris every year, in Amsterdam a *Green Fashion Fair* takes place twice a year and Berlin has been welcoming the *Ethical Fashion Show* yearly since 2010. Even during the four famous fashion weeks (New York, London, Milan and Paris) twice a year, sustainability has become an important part of the fashion shows with, for instance, recycled and/or recyclable decors (Muñoz-Valera, 2020).

Regarding guidelines, the OECD published in 2018 their Due Diligence Guidance for Responsible Supply Chains in the Garment and Footwear Sector. It aims to help industry professionals "avoid and address the potential negative impacts of their activities and supply chains" and is not legally binding (OECD, 2018). The document includes due diligence recommendations, risk assessment as well as recommended actions to take. *Figure 2* shows

the sector's risks (Human rights & labor, environmental and integrity) identified by the OECD in the report.

Human rights & labour risks	Environmental risks	Integrity risks
Child labour Discrimination Forced labour Occupational health and safety (e.g. worker related injury and ill health) Violations of the right of workers to establish or join a trade union and to bargain collectively Non-compliance with minimum wage laws Wages do not meet basic needs of workers and their families	Hazardous chemicals Water consumption Water pollution Greenhouse Gas (GHG) emissions	Bribery and corruption

Figure 2 – *Sector risks in the garment and footwear sector, not limited to the above (OECD, 2018)*

In Italy, the National Chamber for Italian Fashion published in 2012 a *Manifesto of sustainability for Italian fashion* in order to build a more sustainable industry in the country, which includes ten points with concrete actions as well as the laws or international standards linked to it. Additionally, the Chamber also has a set of extensive guidelines on their website that provides all the useful information a fashion company needs to become more sustainable or for a new company to be created on sustainable pillars (National Chamber for Italian Fashion, 2012). As the UN representative mentioned during our phone call, it can be difficult for fashion companies to have a clear understanding of all the existing guidelines, regulations and laws. Therefore, the Italian Fashion Chamber disclosing clearly all the information is a good start and could inspire Fashion Chambers in other countries, such as France.

As mentioned above, the UN published in 2017 their *Guidelines for Providing Product Sustainability Information* that explains the fundamental criteria on which sustainability claim should be made, along with different certifications and accreditations that can be used.

To conclude, all these pacts and guidelines are mainly soft law and therefore not legally binding for the signatories. It is undeniably a good start because it shows the industry acknowledges its social and environmental impact, but who is measuring if the targets are really being reached? Considering the urgency of the situation, soft law might not be enough anymore to push fashion stakeholders to act in-depth and on the long term.

2.2.4 Consumers

When it comes to sustainable fashion but also consumption in general, consumers need to be aware of the indirect impact their purchase has on the environment and the communities around the world. In that regard, various studies show that a real shift in consumer awareness is occurring because roughly 35 per cent of them say they consider social and environmental impact when buying clothes (Fashion Revolution, 2018). Additionally, a majority of people think fashion brands need to reduce their long-term impacts on the world by addressing global poverty, climate change, environmental protection and gender inequalities. The number of online searches for "sustainable fashion" has tripled between 2016 and 2019 (Fashion Revolution, 2018). As explained previously, according to Rodríguez Cánovas and Martín-Caro (2019) the concept of sustainability is not always clear to consumers which could be one of the reasons why they are always demanding more transparency. 89 per cent of citizens polled by the Global Fashion Agenda (2018) want companies to disclose more information on sustainability and according to Fashion Revolution (2018), a large majority of consumers think brands should disclose the list of their suppliers and where their materials are sourced from. A rise in public interest in transparency has been observed by 90 per cent of fashion corporates (Fashion Revolution, 2018). Therefore, as suggested by Muñoz-Valera (2020), radical transparency can be a proper added value for a fashion company because it responds to consumers' expectations. To conclude, consumers have become extremely powerful with the rise of internet and social media. They can now share their experience, the good and the bad, in a few seconds and it has a tremendous influence on other consumers (Aguilera Moyano and Baños González 2017). This is why, consumers can have a significant role in the shift of the fashion industry towards more sustainable practices. By buying fashion, consumers have a shared responsibility on what is happening all along the extended supply chain and they have much more power than they think because they can pressure companies for more transparency and proper change (WWF Switzerland, 2017).

2.3 Environmental impact of the fashion industry

As Loimil (2019) defines it, the circular economy and the optimization of natural resources are the pillars of environmental sustainability. It is linked, amongst others, with waste reduction, contamination decrease and a better energy use. The fashion industry has a tremendous impact on the environment but is still way too opaque about it. The Fashion Revolution Transparency Index (2020) found that only 4 per cent of the world's 250 largest fashion brands and retailers publish the amount of textile waste they generate in their annual

report. Moreover, only 36 per cent of them disclose progress on achieving sustainable material targets and 24 per cent publish time-bound commitments to eliminate hazardous chemicals. 31 per cent of these fashion brands publish annual water footprint in their company's own facilities and 4 per cent publish annual water footprint at raw material level. Fashion puts a tremendous amount of pressure on our natural resources and seeing that not even one in three brands publishes this type of information - meaning that the other two thirds are doing what they want out of sight - is scandalous considering the urgency of the climate crisis. The aforementioned environmental impacts of fashion have been classified into five categories: waste, chemicals, water, carbon emissions and materials.

2.3.1 Waste

According to Fashion Revolution (2020), there are two types of fashion waste along the extended supply chain: pre- and post-consumer.

Pre-consumer waste occurs during the production phase and include end-of-roll waste, textile scraps, samples leftovers, unusable materials or samples with manufacturing defects. It is projected that during this phase, one quarter of the industry's resources are wasted yearly (Fashion Revolution, 2020). WWF Switzerland (2017) estimates that 2.1 billion tons of waste are produced yearly by the industry before selling the items, of which only 20 per cent is recycled. What happens to unsold fashion items of big brands (especially luxury) remains unknown as until now, no investigation has found any evidence. It has however been supposed that for image and intellectual property reasons, unsold stock is landfilled and incinerated (Fashion Revolution, 2020). Explicitly enough, post-consumer waste refers to discarded items after consumers have used them. To give just one of the many vertiginous numbers to illustrate this reality, one garbage truck of textiles is wasted every second (Ellen MacArthur Foundation 2017). As explained previously, our consumption of clothes has tremendously increased over the last 15 years and as a consequence the waste produced as well. In fact, as claimed by the Ellen MacArthur Foundation (2017), after its final use 87 per cent of fashion items end up landfilled or incinerated. It is difficult to measure textile waste on the global scale, but it has been estimated that in Europe we generate 3 million tons annually (Carrera i Gallissà, 2017). The US Environmental Protection Agency found that 5 per cent of all landfill space is occupied by textile (WWF Switzerland, 2017).

The problem is that clothes take a colossal amount of time to decompose in the landfill. A viscose t-shirt takes for example 1 to 6 weeks, a linen top 2 weeks, cotton socks 1 week to 5 months and a wool jumper 1 to 5 years. On the other hand, way more problematic, nylon tights take 30 to 40 years to decompose, lycra sports clothing 20 to 200 years and a polyester dress

more than 200 years (Fashion Revolution, 2019). Additionally, the decomposition of the plastic-based textiles can produce greenhouse gas emissions in the atmosphere and the leak of harmful chemicals which in turn contaminates soil and water (González, 2013). This is why more recycling of materials is needed, but currently only 1 per cent is actually recycled into new clothes (Ellen MacArthur Foundation, 2017). Another small percentage of textile waste is downcycled, meaning that it is recycled into a product of lower value such as building insulation or carpet underlay (Fashion Revolution, 2020). One of the problems with textile recycling is that items composed of blended materials, very often the case today, make the recycling process more expensive and more difficult (Ellen MacArthur Foundation, 2017). WWF Switzerland (2017) also found that the collection of used clothes is not well developed in most countries and for now the recycling process is not very cost-effective and scalable worldwide. It is, however, according to the Ellen MacArthur Foundation (2017) representing a lost opportunity of more than $ 100 billion annually, which is why fashion brands should invest in innovations to scale-up the recycling process.

2.3.2 Chemicals

Many toxic chemicals are used to produce textile, in particular during the processing stage but also to grow natural fibre, which damages water, soil and biodiversity (WWF Switzerland, 2017). The textile industry uses 25 per cent of all the chemicals produced worldwide, representing 43 million tons annually (Ellen MacArthur Foundation, 2017; González Romo et al., 2019). According to the Ellen MacArthur Foundation (2017), there are six key chemicals used to produce textiles.

a) Pesticides

Pesticides are used to prevent crops from being damaged by insects, mould or weeds and are mainly used in cotton farming (Ellen MacArthur Foundation, 2017). 24 per cent of insecticides and 11 per cent of all pesticides sales worldwide are consumed by conventional cotton crops (WWF Switzerland, 2017). Insecticides and fungicides are used as seed treatments which is why before being planted, the majority of cottonseeds are treated with such products. Then, herbicides, nematicides and fungicides are used for soil treatment and finally insecticides, herbicides and fungicides are used on the cotton crop as foliar applications. Pesticides can be applied on the field by aerial spraying (13 per cent of total application), field spraying by hand (52 per cent) and tractor spraying (35 per cent) (FAO, 2015). As reported by the Ellen MacArthur Foundation (2017), many hazardous pesticides banned globally (such as mirex or endosulfan) are still being used in some countries.

b) Solvents

They are broadly used in the dyeing process, to dissolve the dye pigments, but also to extract and treat the cellulose in the production of cellulose-based fibres such as nylon or viscose. Solvents can be extremely dangerous when inhaled or in contact with the skin, leading to severe health issues.

c) Surfactants

Surfactants are used in numerous stages of the production process and have various functions such as emulsifier, foaming agents, detergents, dispersant, softener, wetting agent to enable better absorption into the material, anti-pilling and anti-static agent. The most commonly used surfactants such as alkyl phenol ethoxylates can be problematic to mammals and fish because the chemical deregulates their hormone systems.

d) Dye and pigments

They are used to colour clothes but most of the time dyes are applied in excess and huge quantities end up in the wastewaters, becoming harmful for the environment. Dyes can also contain heavy metals (like lead or cadmium) or decompose into carcinogenic or allergic compounds.

e) Plasticisers

They are used to soften plastic, such as polyvinylchloride (PVC), which is used for screen-printing designs and coating fabrics. Plasticisers are hazardous to hormonal systems and reproductive health, and they can leak out when worn or washed.

f) Water and stain repellent

An important feature for outdoor equipment nowadays is to be water repellent and this can be achieved by injecting the fabric with fluorinated or perfluorinated mixtures. The problem is that these chemicals contain impurities such as perfluorooctanoic and perfluorooctanesulfonic acids that persist in the environment because they bioaccumulate. The impurities are now found in the most remote regions of the world and it has been found that they have hormone-disrupting properties (Ellen MacArthur Foundation, 2017).

Chemicals have a terrible impact on the environment, from poisoning life under water, wildlife and livestock, to contaminating drinking water, river systems, groundwater and aquifers, without forgetting the air pollution and the reduction of pollinating insects needed for crop yield (FAO, 2015). This is why Zero Discharge of Hazardous Chemicals (ZDHC), a group of TCLF brands and retailers working together to fight the discharge of hazardous chemicals, has published the Manufacturing Restricted Substance List which bans chemical substances and establishes acceptable concentration limits in the apparel and footwear facilities processing

textile (ZDHC, 2019). The list includes the Azo dyes with cleavable carcinogenic amines, detergents such as alkylphenols/alkylphenol ethoxylates which are toxic to aquatic life or chlorophenol (antibacterial and anti-mould agents) extremely toxic to human (Green Peace, 2018). In Europe, the 2006 REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) regulation legally required TCLF industries to ban or limit the use of the most hazardous chemicals. The problem is that the regulation only applies to European countries and most of our clothes, shoes or leather goods are produced outside the EU, where some of the most toxic chemicals listed by ZDHC and REACH are still being used because there is no legal obligation.

To end on a positive note, it will be explained in the research section of this paper that natural dyeing techniques have been developed, which considerably diminish the damaging effect of chemicals on the environment. Additionally, organic cotton is gaining market share and is being promoted by non-profit-organisations such as the Better Cotton Initiative (the largest cotton sustainability programme worldwide supported by the biggest players of the industry).

2.3.3 Water

Once again, the impact of the fashion industry on water happens all along the value chain.

To start with the water needed during production, fashion is the second most demanding industry in terms of water, just after agriculture. It uses roughly 93 billion cubic metres of water annually, which represents 4 per cent of the global freshwater withdrawal (Ellen MacArthur Foundation, 2017; Rodríguez Cánovas and Martín-Caro, 2019). The fibre that needs the most water is cotton, as according to WWF Switzerland (2017) and Ellen MacArthur Foundation (2017), the production of one kilogram of cotton requires between 4,300 and 20,000 litres of water depending on the climate conditions and how it is grown.

In addition to the water used, fashion is also the second most water polluting sector after the oil industry (Rodríguez Cánovas and Martín-Caro, 2019). Various sources estimate that 20 per cent of all freshwater pollution globally comes from the dyeing and treatment of textile (Ellen MacArthur Foundation, 2017; Fashion Revolution, 2020; WWF Switzerland, 2017). This is, as explained previously, due to the huge quantity of chemicals ending up in wastewaters because dyes are applied in excess. Additionally, the leaching of pesticides and fertilisers used to grow cotton result in water pollution as well (Chapagain, et al., 2005).

Then, happening during both the pre- and the post-consumer phases, a terrible issue is the pollution of water due to microplastics. As defined by Fashion Revolution (2020): “Microfibres are fibres that are shed from clothing during production, consumer use, or end of life, and end up as pollution in the environment. Microfibres from synthetic clothing (such as polyester) are the largest source of primary microplastics polluting our oceans. Microplastics are any plastic particles smaller than 5mm.”. According to WWF Switzerland (2017), 35 per cent of all microplastics found in the ocean come from clothes and textiles, thus making the fashion industry the number one source. The problem is that these microparticles pollute not only the oceans, rivers, groundwaters and the animals living in them or drinking from them, but also the rain and the air (Fashion Revolution, 2020).

Finally, precise numbers have not been measured yet but WWF Switzerland (2017) and the Ellen MacArthur Foundation (2017) both agree on the fact that, as a consumer, washing clothes less often leads to more water saved.

2.3.4 Greenhouse gas (GHG) emissions

The TCLF industries are responsible for 3 per cent of global CO2 emissions, which represent more emissions than all international flights and maritime shipping combined (Fashion Revolution, 2020). Fernández Matilla (2017) states that one third of the emissions occur during the production phase and two thirds during the use of the fashion item, which includes cleaning, drying and ironing. According to Rodríguez Cánovas and Martín-Caro (2019) and WWF Switzerland (2017), CO2 emissions of the fashion industry reach 1.7 billion tons annually, contributing significantly to global warming.

Carrera i Gallissà (2017) found that a pair of jeans emits more than 30 kg equivalent of CO2 during its life: 1.75 kg emitted to produce cotton, 6.5 kg for the weaving part, 3 kg for the manufacturing, 2 kg for the distribution, 18.5 kg during the use and 0.5 kg at the end-of-life. In fact, the GHG emitted during the production phase come mainly from the fossil fuels used by the agriculture machines to grow natural fibres, from the extracted fossil fuels needed to produce synthetic fabrics (such as polyester or nylon) and from the energy used by the TCLF factories. The transport of fibres from the producing land to the fabric production factory, then to the garment producing country to finally reach the points of sale all over the world also contributes to climate change. According to González Romo et al. (2019), the majority of fashion brands have switched to sea and railway to transport the products during the last decade. As very well explained in the documentary *Cargos, la face cachée du fret* (The hidden side of cargo) by Denis Delestrac (2016), ships emit less GHG than planes but they still impact climate change. The problem is that transporting goods by cargo has become so cheap that a t-shirt travels, on

average, three times around the globe before ending up on a shelf. The reason is that due to globalization, it is cheaper for fashion brands to have every phase of their supply chain in a different country or continent than to produce the whole garment in country A and sell it in country B. Then, the energy consumption during the washing, drying and ironing of clothes also significantly contributes to GHG emissions. Finally, the incineration of end-of-life fashion items emits GHG and during the decomposition process of certain natural fibres like wool, linen or cotton, methane is generated and released into the environment if the landfill is not properly supervised (Ellen MacArthur Foundation, 2017).

To conclude, despite the fact that the fashion industry emits lots of GHG, a report by KPMG (2019) shows that the majority of companies fail to properly measure and report their carbon footprint. Only half of companies analysed disclosed their scope 1 and 2 emissions but only 37 per cent disclose their scope 3 emissions. The issue is that an important part of fashion brands' emissions belongs to scope 3 (which is optional to report), such as the ones due to distribution and transport, manufacturing tiers, waste generated in operations, business travel and flights, or end-of-life treatment of sold products. It is undeniably challenging to measure indirect GHG and improve traceability, but it definitely is necessary for a more sustainable industry.

2.3.5 Materials

This section gives an overview of the different materials used in the TCLF industries and their environmental impact, to complement what has been already explained previously.

Fibres can be classified into two categories: natural (which can be vegetal or animal) and chemical (which can be artificial or synthetical).

a) Natural fibres

They are obtained by physical or mechanical transformation, without modifying their original composition. On one hand, vegetal fibres originate from stems (for example flax, jute or hemp), from leaves (like sisal or shackles), from seeds (cotton) or from fruits (coconut). On the other hand, animal fibres come from the hair of sheep (wool), goat (cashmere or mohair), camels, alpacas, rabbits; from the animal's skin (leathers) or from insects' secretions (like silk).

b) Chemical fibres

Artificial fibres are natural raw materials (most of the time cellulose) which are chemically treated. This category includes viscose (which can be made from wood cellulose like pines or birches, from seaweed, from corn or soja), modal, acetate and lyocell but also rubber and latex

(which are both non-cellulose fabrics). Synthetical fibres are most of the time made from polymers like nylon, polyamide, acrylic, polyester or elastane.

Around one third of fibres used for fashion are natural and the other two thirds are chemical fibres. In 2017, polyester accounted for 55 per cent of total textile fibres production and cotton for 27 per cent (Clothing Industry, n.d.; Ellen MacArthur Foundation, 2017; WWF Switzerland, 2017).

As explained by the Ellen MacArthur Foundation (2017), blending is used to create fibres with several different properties for example elastane is mixed with cotton to add stretch to a garment. Blending is also used to diminish the cost of textiles, such as the well-known "polycotton", a mix of cotton and polyester. Even when an item is labelled 100 per cent of a single material, the sewing can still be made from a different material. The blending makes the recycling of materials particularly difficult or the biodegradation not totally effective.

Cotton, in addition to water consumption, water pollution and the use of chemicals, needs a lot of land. According to the Food and Agriculture Organization (2015), cotton is harvested on almost 3 per cent of the world's arable land. By 2030, the fashion industry is expected to use 115 million hectares to produce natural fibres, from which 35 per cent would be used by cotton only (Fernández Matilla, 2017). The mass culture of cotton can lead to soil infertility and erosion as well as a loss in biodiversity (FAO, 2015). The same issue occurs with animal fibres as animals need a lot of land and they, additionally, release a high amount of methane. However, animal fibres have a much lower carbon footprint than other fabrics because of the usage phase as they cannot be washed often and they last longer (Global Fashion Agenda, 2018).

To conclude this third section of the theoretical framework, most of fashion's environmental footprint is caused by the material mix, as stated by Global Fashion Agenda (2018). It also concerns all segments described previously, from lower mid-price to luxury, which is why the next section analyses the best practices of five brands tackling their impact on the environment.

3. Environmental impact analysis. Quantitative and qualitative research.

The following research section is composed of quantitative and qualitative parts, which are complementary. They both intend to highlight the importance for brands to mitigate their environmental impact because, as explained in *Section 2.3*, it is unsustainable for our planet. First, the survey allows to analyse the consumer's perspective and then, the qualitative research shows through best practices that it is possible to run a fashion brand that minimizes its environmental impact.

3.1 Quantitative research through survey

As seen in *Section 2.3*, the fashion industry is putting a tremendous amount of pressure on the environment and its natural resources. Fashion brands are aware of it, slowly trying to address the issue but an interesting aspect to investigate is the consumer's point of view. Are consumers aware of all the environmental impacts listed previously? Does this impact their buying habits? Do fashion brands meet their expectations in terms of environmental sustainability? To answer all these questions and obtain data to identify the main trends, a survey was conducted.

3.1.1 Survey description

The survey is composed of 20 questions, the majority of which are multiple choice and the rest short answers. At the end, an open question was left for participants who wanted to leave a comment or a reflection on the topic. The survey model with all the questions can be found in *Section 7* as Appendix 1.

The survey was open for four weeks during which 284 responses were collected. 4 answers had to be eliminated because they were duplicates.

In order to understand the profile of respondents, the first four questions were general: gender, age, geographical area and current situation.

To start with the gender, 59 per cent of respondent were female, 40 per cent male and 1 per cent non-binary or preferred not to say. As it can be seen in *Figure 3*, every age category is represented.

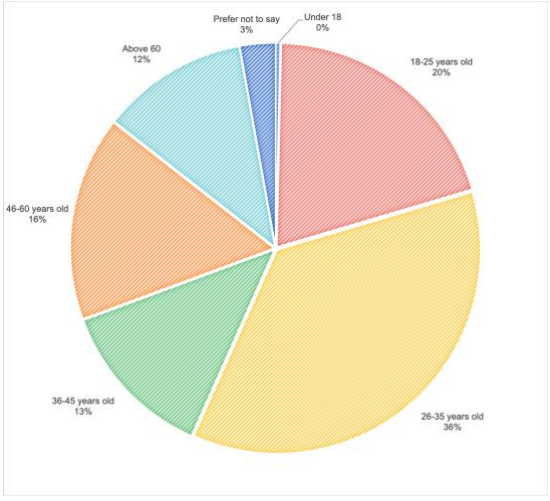

Figure 3 – *Respondents by age*

Figure 4 shows that the majority of respondents live in Europe. A list with the detailed countries can be found in *Section 7* as Appendix 2.

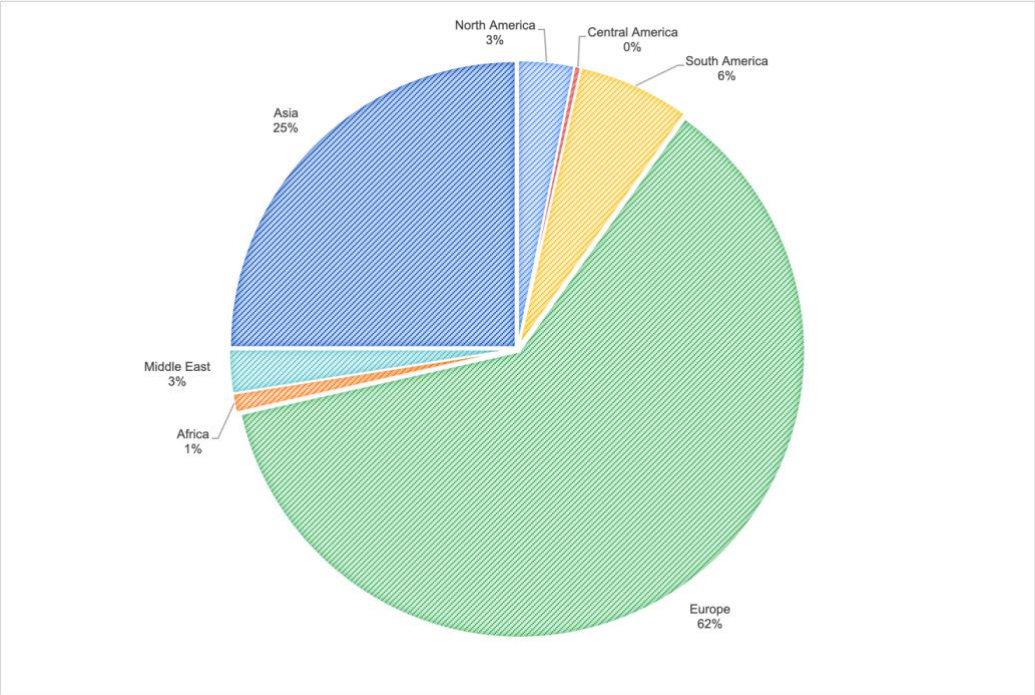

Figure 4 – *Respondents by geographical area*

Figure 5 indicates that most of respondents are currently working.

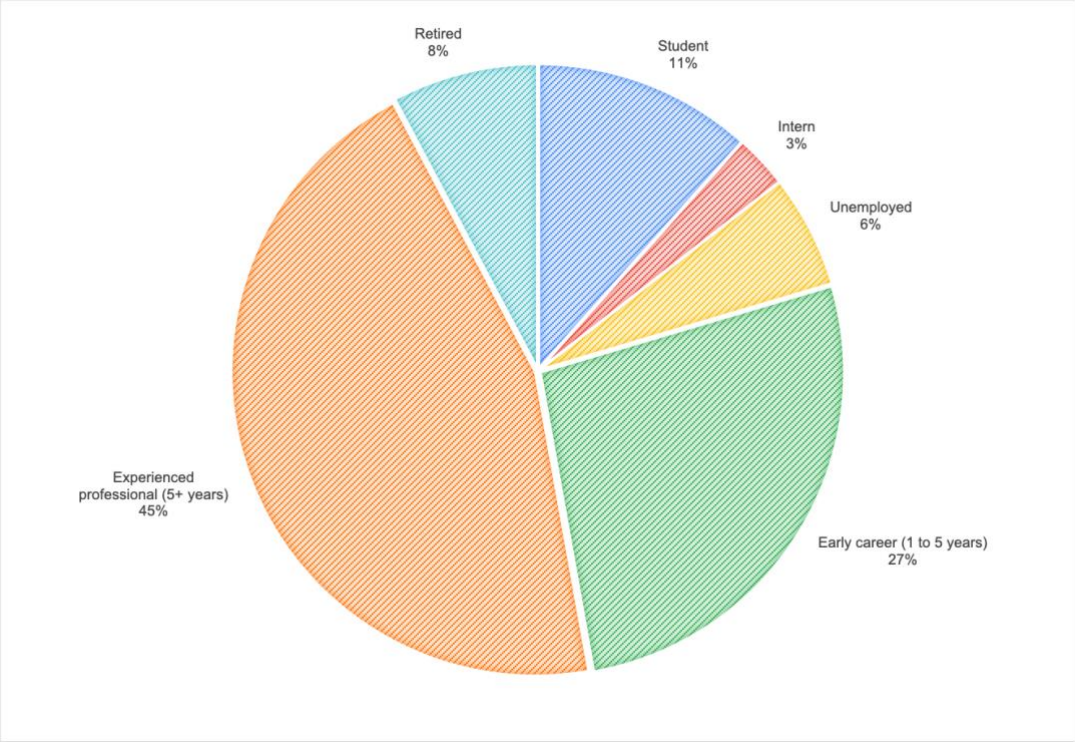

Figure 5 – *Respondents by situation*

3.1.2 Consumer knowledge about fashion's impact on the environment

First of all, since I started working on this project and had conversations about sustainable fashion with many people, I realized that the majority are aware of the negative impact fashion can have on people but not so much of the environmental aspects. However, people desperately want to know more about it because ecological awareness is considerably increasing.

As a consumer, analysing the tag of a fashion item is the first step when searching for information on the environmental impact, which is why the three following questions were asked to respondents:

- When buying fashion items, do you check on the tag where it was made?
- When buying fashion items, do you check the composition?
- Does this information impact your purchase?

Table 2 summarizes the answers and shows that where a fashion item is made as well as its composition, impact the purchase of 50 per cent of respondents. It means that consumers definitely want to have information on the clothes they buy.

	Yes	**No**	**Sometimes**
When buying fashion items, do you check on the tag **where it was made**?	37%	21%	42%
When buying fashion items, do you check **the composition**?	54%	17%	29%
Does this information **impact your purchase**?	50%	16%	34%

Table 2 – *Respondents answers on the fashion item's tag*

When asked what sustainable fashion meant to them, almost all respondents ticked "Environmental-friendly" and "Ethical" which comes back to the Social and Environmental aspects of sustainability explained in *Section 2.2.1*. Other terms often checked were "Locally produced", "Handmade" and "A trend". Some respondents also added words that were not in the list such as "Quality", "Economically viable for producer and buyer", "Second hand" or "Slow fashion". All the answers are in *Section 7* under Appendix 3.

Finally, respondents were asked to define their knowledge on the environmental impact of the fashion industry. The results, *Figure 6*, reveal that only a third considers themselves aware of it, while 50 per cent believe they are somewhat aware and 15 per cent unaware.

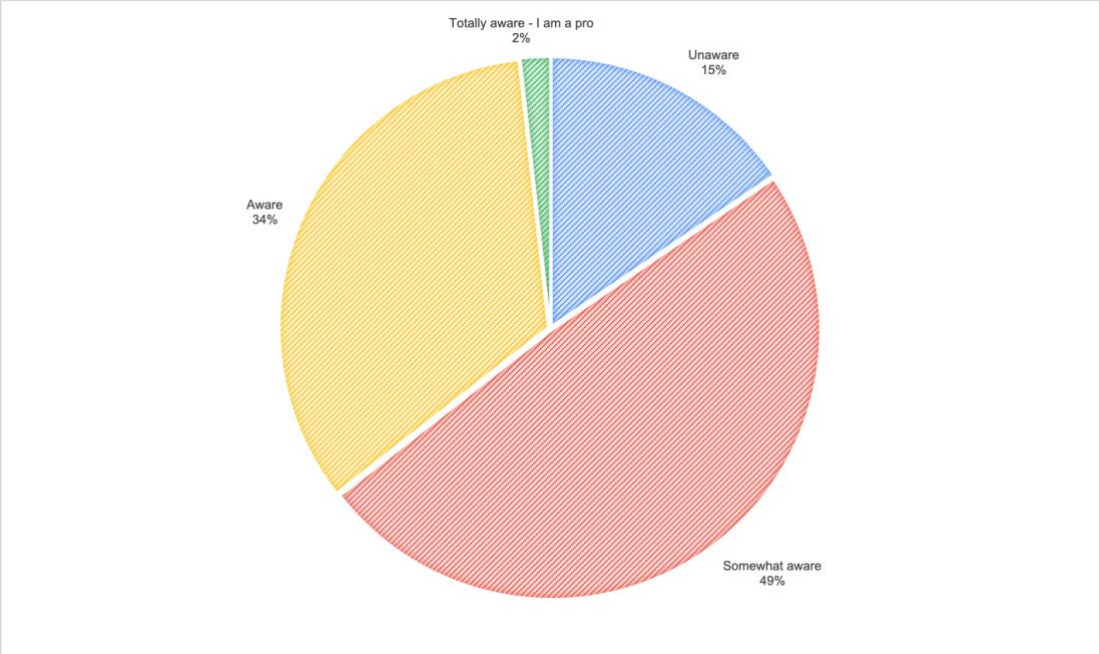

Figure 6 – *Respondents knowledge on the environmental impact of the fashion industry*

3.1.3 Consumer habits

We have seen that respondents, in other words fashion consumers, are not fully aware of the ecological footprint of the industry and as explained previously, consumers indirectly have an impact on the environment when purchasing fashion items. This is why a few questions on the consumer's habits were asked in the survey.

Table 3 shows that the vast majority of respondents purchase less than two fashion items per month but 15 per cent buys at least three items per month, which means 36 per year. It resonates with the numbers of fashion consumption worldwide seen in *Section 2.1,* which is also a cause of the current unsustainable fashion models.

Less than five per year	19%		Three per month	7%
One every two months	33%		Four per month	2%
One per month	22%		Five per month	1%
Two per month	13%		More than five per month	4%

Table 3 – *Number of fashion items bought*

One question asked respondents to name the three top fashion brands where they most often shop. Appendix 4 summarizes all the brands and how many times they were named. However, for the purpose of this research only the top 21 have been analysed which can be

found in *Figure 7*. It is noteworthy that Second Hand/Vintage was named 13 times and Small Local Brands 9 times.

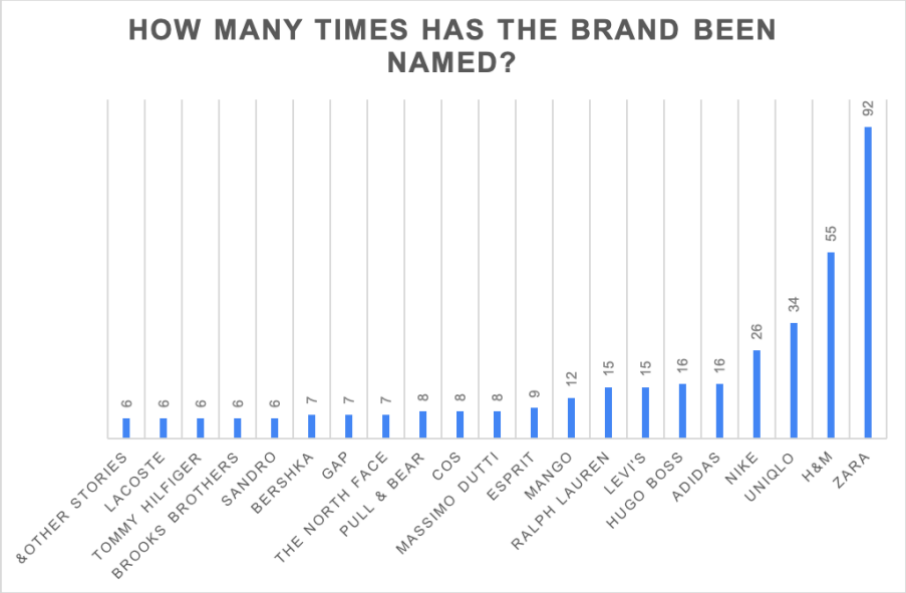

Figure 7 – *Top 21 brands named*

The brands have then been classified into the price segments defined in Section 2.1, mainly based on the price of a basic t-shirt:

- Less than 10€: discount
- Between 11€ and 25€: lower mid-price
- Between 26€ and 80€: mid-market
- Between 81€ and 150€: premium
- Between 151€ and 300€: affordable luxury
- More than 300€: luxury

Figure 8 shows the weighted distribution by segment and the most represented one is the lower mid-price category. It is an important information to highlight because, as explained previously, the majority of discount, lower mid-price and mid-market brands have a linear business model that damages the environment on various stages of the value chain and they are the most consumed brands.

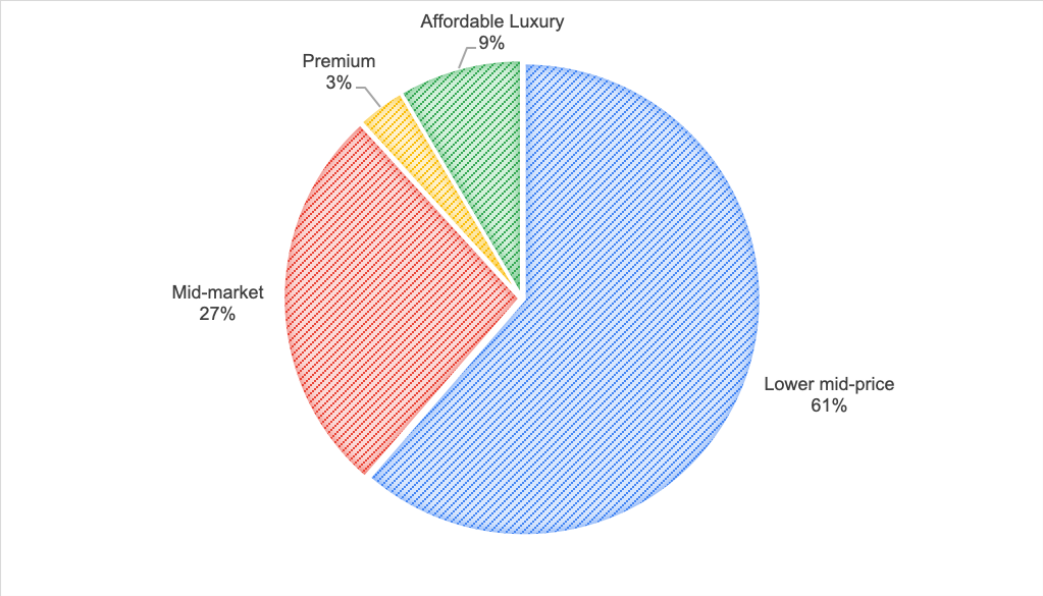

Figure 8 – *Top 21 brands named by price segment*

Another interesting experiment conducted in the survey was to see how much more respondents were willing to pay for eco-friendly clothes because, as mentioned in a comment, price is a key determinant. As shown in *Figure 9*, the vast bulk would pay up to 10 per cent more and for 30 per cent more, respondents start to split into two. Encouragingly, 20 per cent of respondent are willing to pay up to 50 per cent more for an eco-friendly item.

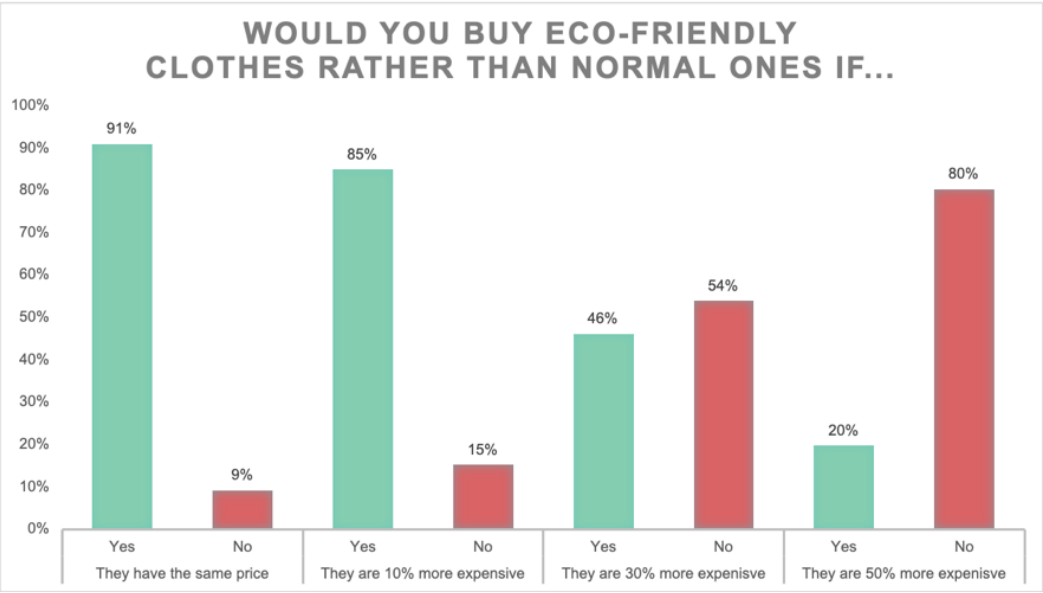

Figure 9 – *Respondents' willingness to pay more for eco-friendly clothes*

Finally, a comment mentioned that "The offer of sustainable fashion is still limited" which is definitely reflected in the following results:

	Yes	No
Would you know where to buy sustainable fashion in your country/city?	32%	68%
Would you know where to buy sustainable fashion online?	37%	63%

Table 4 – *Availability of sustainable fashion*

3.1.4 Consumer expectations

To end the quantitative research with the consumer expectations, the results are straight-forward when it comes to traceability (the term was explained to them in the question):

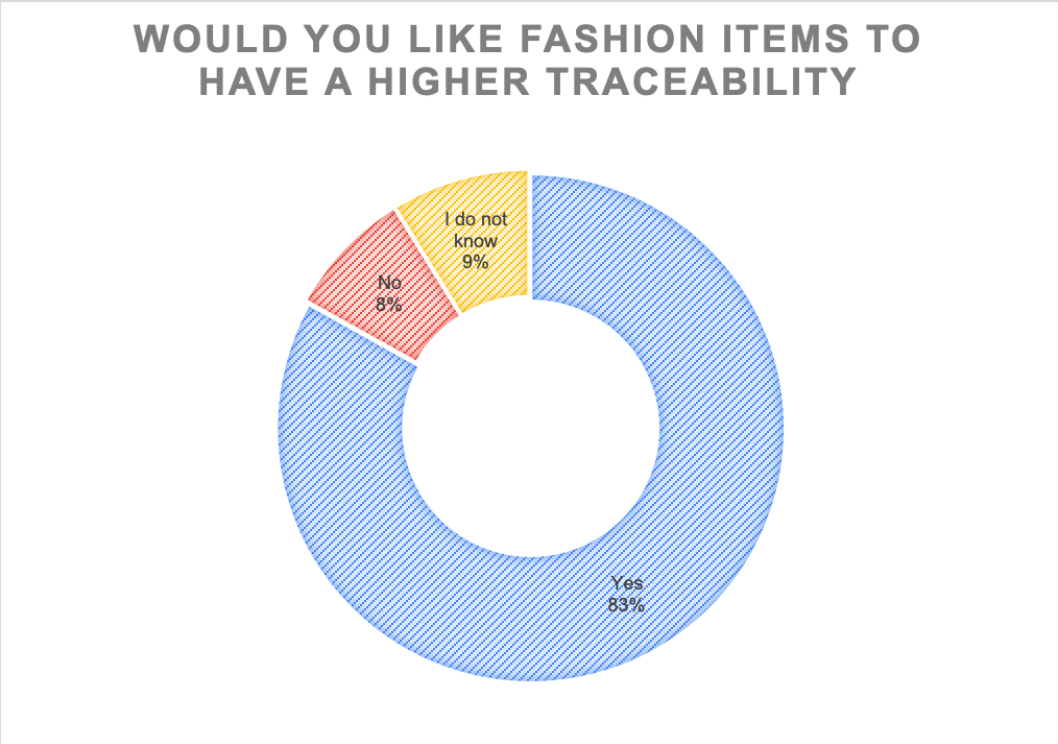

Figure 10 - *Traceability*

83 per cent of respondents wished fashion items were more traceable and numerous comments mentioned the need for more transparency and information.

There are tools for consumers to have more information on their products, such as ratings, certifications or labels. As shown in *Figure 11*, the majority of respondents consider it could help them recognize the environmental footprint of an item, but a few comments mention that “certifications cannot be trusted” or that governments should step in.

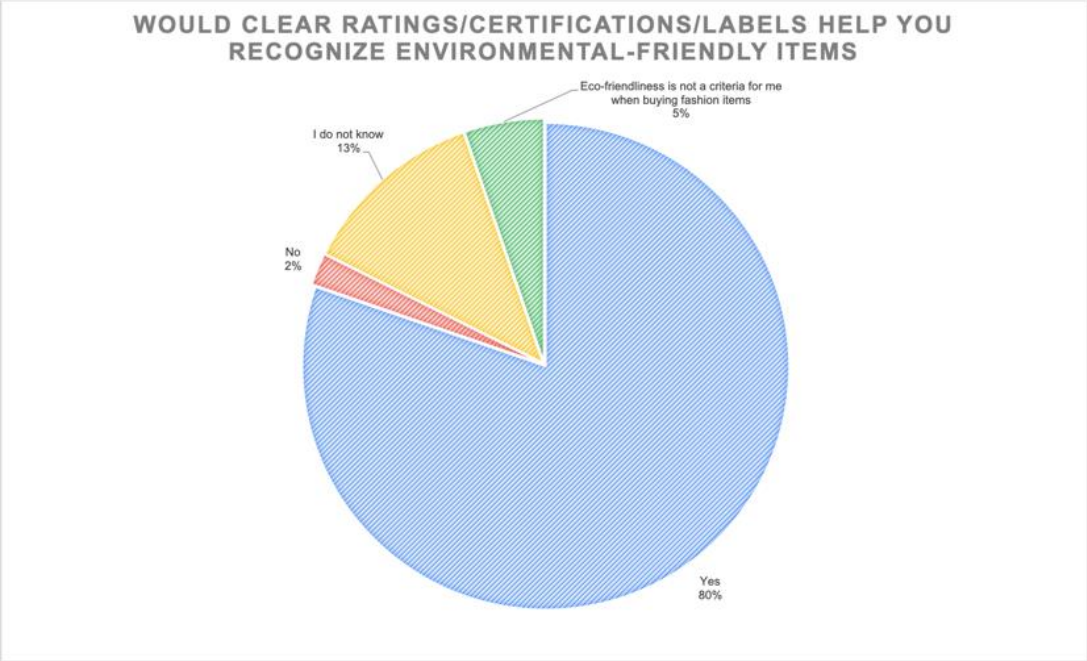

Figure 11 – *Ratings, certifications and labels as tools*

Finally, when asked if they think the fashion industry should do more concerning its environmental impact, 63 per cent of respondents strongly agree, 31 per cent agree, 6 per cent remain neutral and no one disagrees.

To conclude, the results of this survey show that consumers are concerned about the environmental impact of the fashion industry but currently, there is not enough information nor tools to help them make a conscious purchase. For this reason, putting everything in place to mitigate its environmental footprint and being totally transparent about it is an incredible opportunity for fashion brands because they will also meet consumers expectations.

3.2 Qualitative research through best practices

As González Romo et al. (2019) concluded in their paper, no brand can be 100 per cent sustainable because from the moment you produce something, you impact the environment. However, the goal should be to drastically minimize the eco footprint which is exactly the ambition of the five brands presented in this section.

First, I preselected 25 sustainable fashion brands and then narrowed the selection to five, particularly active on the environmental aspect. Obviously, these are not the only brands out there operating in a sustainable manner, but for the purpose of this project a choice had to be made. They cover all the TCFL industries, are different in terms of segments, size and nationality. The following table briefly presents the selected brands and gives the environmental

rating of Good on You, an independent rating system assessing fashion brands' impact on people, the planet and animals to help consumers make an informed choice.

	ECOALF	**GAYASKIN**	**MUD JEANS**	**PEOPLE TREE**	**STELLA McCARTNEY**
Segment	Mid-market	Mid-market	Mid-market	Mid-market	Luxury
Founded in	2009	2018	2013	1991	2001
Nationality	Spanish	French	Dutch	British	British
Number of employees	100	3	17	80	1400
Description	Apparel (casual and sportswear), footwear and accessories for women, men and kids	Women sportswear	Jeans and other denim products for women and men	Women apparel, activewear and underwear	Luxury Ready-to-Wear, bags and shoes for women, men and kids
***Good on You* Environmental review**	Great (5/5)	N.a.	Great (5/5)	Great (5/5)	Good (4/5)
Data recovered from	Academic article and website	Direct contact per email and website	Website	Website	Academic articles and website

Table 5 – *Companies selected for their best environmental practices*

The best environmental practices of these five fashion brands are divided into four sections: the choice of materials, the measures taken to avoid damage to natural resources, how they minimize their impact along the value chain and how they incorporate circularity. The practices presented in this section are only the ones from the selected brands, but many other fashion companies are also leading the way to a more environmentally friendly industry.

3.2.1 Materials

The two first sections are very much connected because the choice of materials will determine the amount of waste and emissions generated by a company, as well as its water and chemicals use. Three of the brands, Ecoalf, Gayaskin and MUD Jeans, use exclusively recycled materials whereas People Tree chooses only certified natural fibres or fibres that allow to "close loops" by being biodegradable. Of the five companies analysed, Stella McCartney is the pioneer in innovative materials as will be described below.

Ecoalf has invested more than four years of time and resources to develop 100 per cent recycled fibres from plastic bottles and plastic waste from the oceans, that allow the same quality and design as non-recycled fibres. To do so, plastic bottles or plastic waste collected by fishermen need to be cleaned through various steps, then crushed to obtain plastic flakes and finally converted into polyester fibre through a mechanical process. The yarn is then ready to be transformed into fabrics (Espinosa Gallego & López Muñoz, 2018). The same process, but with recycled PET bottles only, is used by Gayaskin and Stella McCartney to create their polyester fabrics.

Another material which has gained popularity during the recent years is recycled nylon made from fishing nets, fabric scraps or carpets. They are collected, cleaned and shredded, depolymerized to extract nylon, polymerized and then transformed into yarn (Carruthers, 2019). Ecoalf produces its own recycled nylon but the leader in the field is the Italian company ECONYL, providing yarn to Gayaskin and Stella McCartney.

Ecoalf has researched and found a process that allows to recycle used tyres which are normally burned in landfill or abandoned in the environment. Metals, antioxidants and fabric pieces are extracted to create a clean powder which then becomes rubber. The brand has created a line of flip flops made from recycled tyres thanks to this technique.

When it comes to cotton, all of the brands (except Gayaskin which does not use cotton in its sportswear products) use organic or recycled cotton. To assure a full traceability from seed to finished product, People Tree and Stella McCartney use exclusively cotton which is GOTS (Global Organic Textile Standard) or OCS (Organics Content Standard) certified. Recycled cotton is used by Ecoalf, which is cotton that comes from clothes or textiles that is collected, shredded and turned into a porridge-like substance. The mixture is then broken down to the molecule level and transformed into a fibre substance which can then be threaded to make fabric (Espinosa Gallego & López Muñoz, 2018). Denim, which is made from cotton, can also be recycled into new fabric but has some constraints. MUD Jeans explains that a pair of jeans can

only be recycled if it contains less than 4 per cent of synthetic materials such as elastane (to give the stretch) or polyester (for stitching yarns – they are currently researching to create cellulosic ones). Additionally, a new pair of jeans can only contain 40 per cent of recycled cotton for quality reasons but the company is searching for a way to create a pair of jeans that is 100 per cent recycled in the future.

Gayaskin and People Tree use a fibre called Tencel which has a lower impact and a ten times higher yield than cotton. Tencel is made from eucalyptus pulp which comes from FSC (Forest Stewardship Council) certified forests. The pulp is transformed into cellulosic fibres by using a solvent-spinning process which extracts the solvent at 99 per cent so that it can be reused and the water can be recycled. In the same idea, Stella McCartney uses short circuit and traceable viscose (as a reminder, it is made from wood pulp) which comes from sustainably managed forests in Sweden. The fabric is produced without harmful chemicals (based on the ZDHC Manufacturing Restricted Substances List explained previously), in an energy-efficient plant where wastewater is biologically treated and complies with the strict EU regulations on emissions.

Stella McCartney is always searching for new sustainable materials which is why the brand teamed up with an innovative Californian company called Bolt Threads. Studying the DNA of spiders, they found a way to synthetically reproduce silk (with green chemistry practices). On top of that, the Bolt Threads silk is softer, stronger, more durable and more elastic than spider's silk.

Another eco alternative is the Re.Verso cashmere used by Stella McCartney, which is not virgin material but instead made from post-factory cashmere waste in Italy. Cashmere is one of the most luxurious fabrics on the market but has a significant environmental impact because it takes 4 goats (cashmere) to generate the same amount of fibre than 1 sheep (wool).

Wool is another material that can be made from leftover fabrics. They need to be collected, divided according to thickness, colour and composition and finally shredded to become raw material again. Ecoalf uses recycled wool while Stella McCartney has gone even further, by developing a Cradle to Cradle (a system scoring the commitment to circular economy) certified organic wool. The certification means that no chemicals nor harmful dyes are used in the process so that wool can be recycled without problem or even biodegrade in the environment.

These brands try to find recycled materials or environmental-friendly alternatives for every tiny piece of their products. MUD jeans for instance, uses paper and printable labels on

their jeans instead of the classical leather patch so that it can be recycled. Their buttons and rivets are made from 100 per cent stainless steel (the standard in the jeans industry is usually a mix of metals and plastic) so that they are fit for recycling. However, sometimes recycled alternatives do not exist (yet) or are very limited, such as recycled or sustainable elastane explains the co-founder of Gayaskin.

To conclude, the brands recognize it is not ideal to be dependent on plastic bottles or waste in general to create fabrics but for now, waste is a tremendous problem we are unable to tackle properly. Therefore, in the medium run, collecting trash and turning it into usable fabrics is helping reduce the amount of waste that ends up in the environment. Once the waste problem is under control, innovative solutions will hopefully allow fabrics to be recycled endlessly in order to close the loop.

3.2.2 Water, emissions, chemicals and others

Now that the materials used have been presented, this section analyses how the brands handle their waste, water consumption, emissions and chemicals use, and presents some of the tools or practices they have put in place to minimize their impact on the environment.

As mentioned previously, the choice of recycled or sustainable materials considerably reduces a fashion brand's environmental footprint. As explained in *Section 2.3*, the chemicals used by the TCLF industries have terrible consequences on the environment which is why the five brands avoid them as much as possible. To start with Ecoalf, they strictly apply the European REACH legislation from 2006 and even developed their own list of restricted substances. For example, their water-resistant products do not contain PFC (Fluorocarbon which, as explained previously, persists in the environment, accumulates and is hormone-disrupting). Technologies based on nature's own chemistry such as OrganoTex do the same as PFC, without harming the environment. People Tree claims it does not use chemicals and MUD Jeans assures that "the few chemicals still used throughout the production are entirely non-toxic and are Nordic Swan Ecolabel certified". To do so, polluting substances are avoided by using certified organic cotton, and dyes need to be azo free. By using organic fabrics, People Tree contributes to maintain soil fertility, reduce the use of toxic and persistent pesticides and fertilisers, and build biologically diverse agriculture. MUD Jeans for example eliminated PP spray (serves to make a specific abraded area appear whiter than the background blue jeans shade and is highly toxic) and uses the Cradle to Cradle gold certified indigo dye from DyStar which is natural. Many chemicals are needed to produce a pair of jeans such as potassium permanganate which led both MUD Jeans and People Tree to use the latest techniques to eliminate chemical substances and a disproportionate amount of water used. The worn effect on jeans can now be created with a

laser which burns the surface of the yarn until the white core is revealed instead of chemicals. To obtain the bleach effect, denim fabric is most of the time soaked in a bath of water and heavy chemicals. However, the ozone technique does exactly the same: the jeans are dampened, exposed to oxygen which is converted to ozone and then rinsed. Afterwards, the ozone is converted back to oxygen so that it is not released in the environment.

Considerable water savings can be made by using recycled fibres instead of virgin ones. According to Gayaskin, regenerated nylon for example saves up to 97 per cent of water compared to virgin nylon. To produce one pair of MUD Jeans with 40 per cent of recycled fibre, 577 litres of water are used compared to 7,000 litres for industry standard jeans. Imagine how much lower the amount can drop if they manage to produce a pair of 100 per cent recycled jeans! Both People Tree and MUD Jeans have water recycling plants, for example: one of MUD Jeans factories operates on rainwater only while recycling 95 per cent of its water through reversed osmosis and one of People Tree's factories treats and reuses effluent water.

Concerning the CO2 emissions, Gayaskin estimates that they are reduced by at least 50 per cent if a recycled fibre is used instead of a virgin one. MUD Jeans has come to the same conclusion thanks to a Life Cycle Assessment: they emit 7.14 kg of CO2 to produce a pair of jeans which is 69 per cent less than the industry standard. It is partly due to the use of recycled materials but also because the company decided to use renewable energy in their factories. One of their factories is even self-sufficient thanks to a cogeneration engine ("while a boiler produces energy, a steam engine catches the byproduct, heat, and converts it into more energy"). On top of that, MUD Jeans is carbon neutral since 2016 because they have been offsetting their emissions.

Finally, the brand Gayaskin limits the number of fabric types used in their collections so that they limit the quantity of scraps and unused "end rolls" at the end of the production. They upcycle these scraps and fabrics left by using them as lining for their bras (instead of using a fabric of lower quality and less expensive) or by creating limited products such as sport headbands. As a much bigger structure, Stella McCartney uses a tool called Environmental Profit & Loss (EP&L) to measure and understand their environmental impact: "The EP&L is a form of natural capital accounting that measures our greenhouse gas emissions, water use, water pollution, land use, air pollution and waste across our entire global supply chain. Our impacts are then translated into a monetary value, which allows us to understand the hidden costs and benefits we generate from the way we operate.". The EP&L includes a Life Cycle Assessment and helped for example point out the huge environmental impact of virgin cashmere, pressuring the company to search for a better solution. The results of this tool

highlight that the production of raw materials generate the biggest environmental impact of a fashion brand.

3.2.3 Value Chain

As opposed to fast fashion, Ecoalf, Gayaskin and MUD Jeans are proudly part of the slow fashion movement. Gayaskin and MUD Jeans do not offer six to ten new collections per year. On the contrary, they only have permanent collections, with pieces designed to last. This avoids having unsold items that usually end up in landfills and it does not put pressure on the consumer to buy straight away. Additionally, MUD Jeans offers free repairs to increase the lifespan of their pieces and Ecoalf has invested a lot in Research & Development (R&D) to offer highly qualitative products which are expected to last 30 years.

When it comes to the supply chain, all five brands have close relationships with their suppliers and providers in order to monitor the environmental impacts. Gayaskin for instance, has no intermediaries between the founders and their garment factory. Furthermore, People Tree collaborates closely with small local producers in Bangladesh, Nepal or Kenya who still work by hand to produce woven fabrics, embroidery, dyeing techniques and knitting. While empowering local communities, this also allows to have a strong relationship with the workers and on top of that less emissions are produced because no machinery is needed. However, selecting suppliers and providers who are certified ensures compliance with environmental standards. Ecoalf for example demands at least one of the following environmental certifications: Bluesign, Standard 100 or Oeko-Tex. Gayaskin also requires Oeko-Tex, Global Recycle Standard (GRS) or ISO 14001 from their fabric providers. People Tree ensures GOTS certification throughout their suppliers as much as possible.

Much of environmental impacts along the supply chain can be avoided if the company can trace every step. This reason pushed Gayaskin to keep the entire process in Europe (Italy, France, Spain, Portugal and Germany) so even the recycled PET bottles needed for the production of their fabrics come from Italy. They keep the circuit as short as possible whereas MUD Jeans keeps the supply chain as simple as possible to ensure full transparency: they only use five fabrics, one type of button and one type of rivet to produce all their jeans. To come back to Gayaskin, they thought about every single detail: they only use road transport (until 2019 the goods were even transported in the baggage holds of existing touristic bus lines), the packaging is absolutely plastic-free, they produce small quantities and use pre-orders to avoid waste, and they co-create their pieces with their community. Co-creating means they involve their consumers (via surveys) in the design process and in the choice of fabrics which guarantees the

product they are launching answers their customers' needs. It makes them happy and allows the brand to avoid more waste.

As seen previously, negative environmental impacts also happen during the post-consumer life of the garments which is why Ecoalf and MUD Jeans took on an educational role to raise awareness. The founder of Ecoalf, Javier Goyeneche, regularly gives conferences or interviews to draw attention on our excessive consumption of fashion, on the fact that an item can be repaired or reused instead of directly discarded and on the importance of picking quality over quantity. Ecoalf and MUD Jeans have an entire section on their website dedicated to tips on how to wash and take better care of the items.

Some brands go even beyond the value chain such as Gayaskin who donates 1 per cent of their sales to the Surfrider Foundation who fights to protect the oceans. In the same mindset, Ecoalf launched its own foundation and, in collaboration with the HAP foundation, the project "Upcycling the Oceans" aims at protecting and conserving the oceans (Espinosa Gallego & López Muñoz, 2018).

To conclude, it is important to underline that these brands are so proactive on minimizing their negative impacts because environmental concern is part of their identity. The mission of Ecoalf for example is, as stated by Espinosa Gallego & López Muñoz (2018), "to reduce the negative impact of the fashion industry and the indiscriminate use of natural resources through different types of sustainable innovation processes in order to create a new generation of responsible products with the same quality and design than the best in the market". As Salvador Maceira (2018) explains in her analysis of Stella McCartney's value chain, the company includes its social and environmental values in every step, which results in sustainable activities all along the process. Even if environmental activism is not part of every brand's identity, there should be no excuse for them to leave out environmental aspects from their value chain as the issue is urgent.

3.2.4 Circular thinking

As pointed out by Carrera i Gallissà (2017), the biggest challenge of the TCLF industries is to transition towards a circular model: doing more with less, improving quality and product lifetime so that at the end of it, they can be reintroduced in the process. As a quick reminder, according to the Ellen MacArthur Foundation (2017), a circular economy redefines the traditional concept of growth by gradually shifting away from the consumption of limited resources and towards a system designed without waste, which creates economic, social and environmental

value. A couple good examples of circular practices can be found in the five selected fashion brands.

To start with MUD Jeans, circularity is at the core of their business model because every process and detail is developed to be circular. In addition to taking back jeans from any brands (the only condition is that it needs to contain at least 96 per of cotton), sending it to their recycling factory in Spain and therefore saving 20,000 jeans from landfill and incineration, the brand has created a concept called *Lease a jean*. People pay a small monthly fee and can lease up to three pair of jeans. When they are worn out or after a year, they have the possibility to change them for new pairs. The old pairs are either sold on MUD Jeans vintage program after a little repair or, if not reparable, recycled. It promotes use over ownership and more interestingly it allows the company to remain the owner of the raw material, making sure it is reintroduced in the supply chain at the end-of-life.

As explained earlier, Stella McCartney uses several innovative recycled materials such as Re.Verso cashmere or the Cradle to Cradle wool, which are aligned with the circular economy principles. The brand has also partnered up with the RealReal, an online second-hand platform for luxury items, to make sure consumers give a second life to their Stella McCartney products which are designed to last.

Ecoalf, Gayaskin and People Tree all designed their e-commerce packaging to be circular: Ecoalf uses a 100 per cent recycled and recyclable paper box made in Spain, People Tree has biodegradable and recyclable boxes FSC certified and Gayaskin uses a reusable packaging called Hippli that can be sent back without charges through the post.

In conclusion, all the analysed brands have demonstrated circular thinking through their choice of materials. Recycled materials are per se a circular concept and I truly hope more fashion brands will use them in the near future. However, the next challenges for recycled materials will be:

- To become more competitive in terms of price because it is still much cheaper to produce virgin materials (mainly due to the low oil price)
- To find a solution to microplastics pollution, as recycled materials are no exception.

4. Research Findings

By cross analysing the quantitative and the qualitative research conducted previously, this section will highlight four key areas for fashion brands to work on, in order to minimize their

environmental footprint. The first one is radical transparency and traceability, then environmental tools, followed by material innovations and finally clear communication.

4.1 Radical transparency and traceability

As a reminder, Fashion Revolution (2020) defines transparency as "the public disclosure of credible, comprehensive and comparable data and information about fashion's supply chains, business practices and the impacts of these practices on workers, communities and the environment". Radical transparency involves traceability, which is defined by ISO (9001:2015) as "the ability to identify and trace the history, distribution, location, and application of products, parts, materials, and services. A traceability system records and follows the trail as products, parts, materials, and services come from suppliers and are processed and ultimately distributed as final products and services".

In its transparency index, Fashion Revolution (2020) researched how much supplier information was being published by the 250 major global fashion brands and the results are alarming: 40 per cent publish the names of their first tier manufacturers, 24 per cent publish the location of their processing facilities and only 7 per cent publish some of the names of their raw materials suppliers. This opacity shows that many companies still have very little knowledge of where their raw materials are being sourced (Baptist World Aid Australia, 2019) and therefore have no way of controlling and reducing their environmental impact nor to inform consumers. However, transparency matters a lot because assuring traceability on the entire supply chain is crucial for the survival of both the fashion sector and our planet, as explained by Stella McCartney (González Romo et al., 2019). The survey conducted for this project shows it is also important in the consumer's mind because the majority of respondents consider that fashion brands are not transparent enough concerning their environmental impact (*Figure 12*). Additionally, it is worthy to remember that 83 per cent of respondents said they wanted their fashion items to have more traceability.

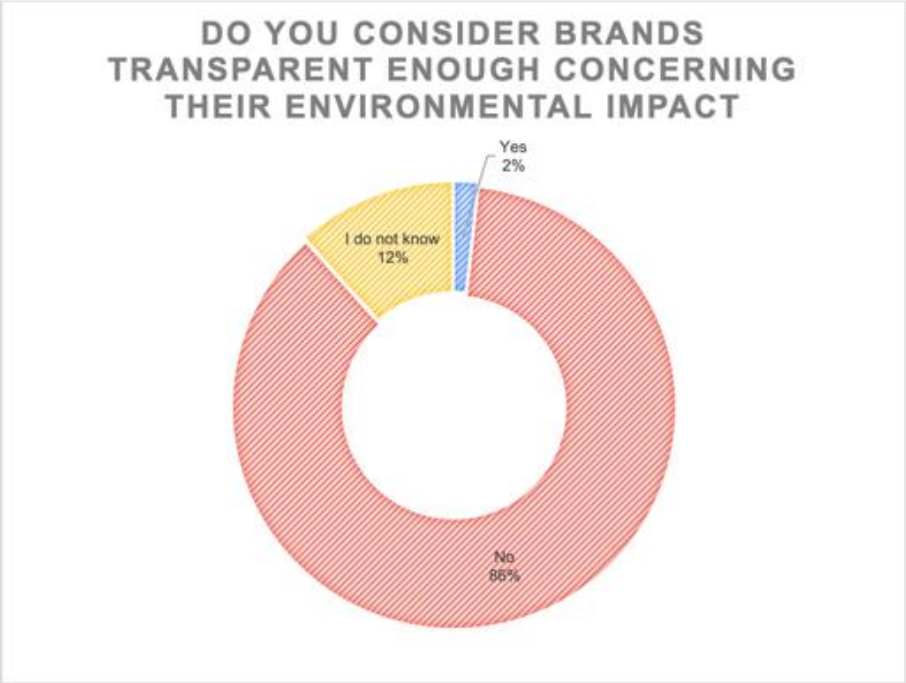

Figure 12 – *More transparency needed*

The brands studied in the best practices section prove that it is possible to be radically transparent and that despite being complicated, it is mostly a question of willpower. Gayaskin, which located its entire supply chain in Europe, has a section on its website called #MadeInEurope where you can trace every single part of the products. For example, the bra elastics are woven by a family business in France, the tags are made from recycled polyester in Italy and the zips are certified Oeko-Tex but the brand was not able to trace them (and that is fine! No one is perfect, as long as there is an explanation). MUD Jeans displays as well in its sustainability report the list of all their suppliers, raw materials included.

As discussed with the UN representative, he explained that the UN Alliance for Sustainable Fashion is developing a globally approved application which will help brands be more transparent. He also said that some brands he works with use an innovative DNA tagging tool, which is a QR code tagged on the fashion item so that the consumers can scan it and see all the information about the product (including who grew the cotton, who embroidered it, etc.).

To conclude, it is undeniable that radical transparency costs a company money and time but it responds to an urgent consumer concern. Additionally, as defended by the Baptist World Aid Australia (2019), it demonstrates a brand's willingness to take responsibility for its actions and to be accountable to the civil society, consumers and workers.

4.2 Environmental tools

In order to reduce their environmental footprint, fashion brands need to assess where the negative impacts occur which is why this section firstly presents three tools to do so and then discusses the added value of labels and certifications.

The Life Cycle Assessment (LCA) is a recognized international standard ISO 14040:2006 which quantifies and analyses environmental impacts of a product throughout its lifecycle. For a fashion item it starts at the raw material extraction, all along the production and distribution process, and finishes with the end-of-life phase. The LCA provides the company with data on its water, land and energy use as well as on its emissions. The data is then used to identify which parts of the process generate the highest impacts so that concrete measures can be taken (Reuter & Zetterlund, 2018). MUD Jeans has published its 2019 LCA which for example shows that the virgin cotton consumption should be improved along with the energy consumption related to ironing, sewing and washing.

The European tool EMAS (which stands for Eco-Management and Audit Scheme) can also help fashion brands evaluate their environmental risks and opportunities. Additionally, EMAS assists companies in reporting their environmental impacts and measures taken in a transparent manner, which increases their credibility. The concept is pretty simple: first an initial review is conducted, then an Environmental Management System (EMS) defined and implemented, and finally internal and external environmental audits are run regularly so that the company can continuously improve.

Lastly, the HIGG Index created by the Sustainable Apparel Coalition is a toolbox which helps fashion brands assess their environmental impact and then make better decisions at every step of the product's development. The HIGG Index is a self-assessment analysis which means the score (ranging from 0 to 100 based on environmental quantitative and qualitative criteria) cannot be published or used for marketing purpose (Reuter & Zetterlund, 2018). However, the tool still helps identify areas of improvement.

Other environmental assessment tools exist of course, it is up to brands to find the one better adapted to their structure.

Labels and certifications are also great instruments to assure environmental standards in addition to allowing customers to have a better judgment on the value and quality of their products (Ellen MacArthur Foundation, 2017). The problem is that today, there are a few recognized certifications but not famous enough amongst consumers to really weigh in their purchasing decision. Nevertheless, the majority of respondents from the survey conducted for

this project believed it would help them recognize the eco-friendliness of a fashion item (*Figure 13*).

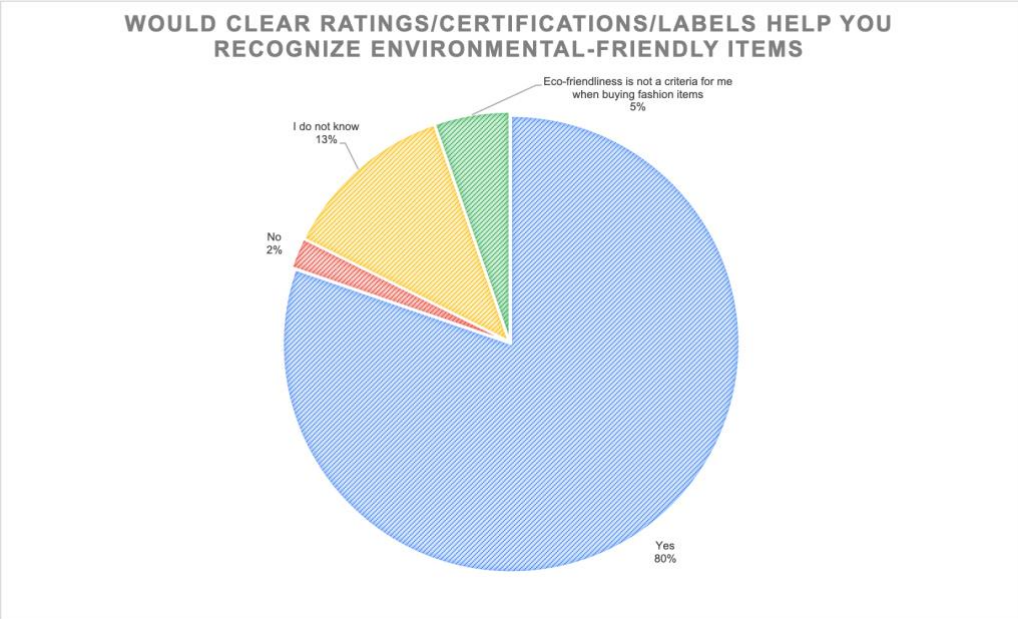

Figure 13 – *Thoughts on certifications and labels*

Coming back to the most common certifications, all five brands analysed use at least one for cotton which is the Global Organic Textile Standard (GOTS). It guarantees that the raw material is totally organic, in other words without pesticides, dyes or other hazardous chemical substances. Another well-known certification is the Oeko-Tex Standard 100, used by Gayaskin, which assures the fabrics do not contain any toxic chemicals for the human body or the planet (Preda, 2018). Other certifications are:

- the Global Recycle Standard (GRS), which is an international norm certifying the amount of recycled fabrics and minimum standards concerning water and waste management (Gayaskin and MUD Jeans are GRS certified).
- ISO 14001, which certifies that the environmental impact is measured and improved
- Bluesign, used amongst others by Ecoalf and Gayaskin, which guarantees like Oeko-Tex that the fabric contains no toxic substance and sets quite high standards for energy and water consumption.

Once again, many more environmental labels exist but they might not be as well-known as the ones described above, or they serve other purposes.

Another option is to use certifications that apply to the entire company and evaluate more than just the environmental criteria. A wonderful example is the B Corporation Certification,

which checks specific social and environmental standards as well as transparency and accountability. Ecoalf and MUD Jeans are both certified B Corp.

To conclude, many quality and sustainability labels exist which can be confusing for consumers. As suggested by the Ellen MacArthur Foundation (2017), the entire fashion sector (brands, producers and retailers) should work together to develop a common, global and standardized set of standards for labelling.

4.3 Material innovations

As explained in the previous sections, the choice of materials used can considerably reduce a brand's environmental impact. Shifting to recycled and innovative materials is a wonderful opportunity for companies! As a small reminder, 54 per cent of survey respondents regularly check the composition of the item and 29 per cent do so sometimes. Additionally, the majority of people are ready to pay 10 per cent more for eco-friendly items and one fifth is ready to pay up to 50 per cent more. As pointed out by Global Fashion Agenda (2018): "Reducing the effects of existing materials and developing new sustainable materials must be a fashion priority". The challenge that lies ahead is to find scalable solutions because if tomorrow the entire fashion industry wanted to shift towards recyclable materials, there just would not be enough (also largely due to overproduction and overconsumption of products). Therefore, to close the loop, brands should put in place fashion waste management systems to retrieve their end-of-life products and use them as a base to create new ones (just like MUD Jeans does). Existing innovations, technologies and initiatives could assist the brands in doing so. A few examples: Worn Again (recycles clothes made from mixed fabrics by separating them and creating new virgin materials), the Relooping Fashion Initiative (using technology to recycle cotton), Cradle to Cradle product innovations or the Ellen MacArthur Foundation.

Once recycled materials have become scalable and the norm in the industry, hopefully the crazy innovative and circular materials out there will be accessible too. Interestingly enough, yet extremely small-scaled, there are various alternatives to traditional fabrics such as:

- plant and algae textile by Vollback, biodegradable in 8 to 12 weeks
- Desserto, vegan leather made from cactus leaves that grow back on their own once cut
- textile made from fish skin, developed by the BlueFashion movement
- mushroom textile by MycoTex, totally biodegradable as it needs no sewing
- recycled chewing-gum to make rubber by Gum-Tec
- Vegea leather made from wine and grapes waste

These are only a few examples, but many more innovations are launched weekly, which is extremely promising for the future of the industry. Now it is up to the bigger players of the fashion sector to show their willpower and lead the change.

4.4 Clear communication

For various reasons such as misinformation, lack of standardization or lack of transparency, consumers have partly lost trust in brands, as it can be seen in *Figure 14*. Only a small proportion of respondents, 11 per cent, trust fashion brands when they communicate on their environmental impact.

Additionally, when respondents were asked if they consider conscious collections to be sustainable (the biggest players such as H&M and Zara have product lines which are supposed to be socially and environmentally sustainable but when one takes a closer look at them, they are not at all[1]), only 5 per cent answered yes! 37 per cent responded “maybe a little” and 58 per cent a categorical no. Moreover, a few respondents left a comment saying that they feel too many companies use Corporate Social Responsibility (CSR) and sustainability as greenwashing. According to Bick, Halsey & Ekenga (2018), greenwashing is when companies use the emotional appeal of eco-friendly goods for marketing purposes, without actually adhering to environmental criteria.

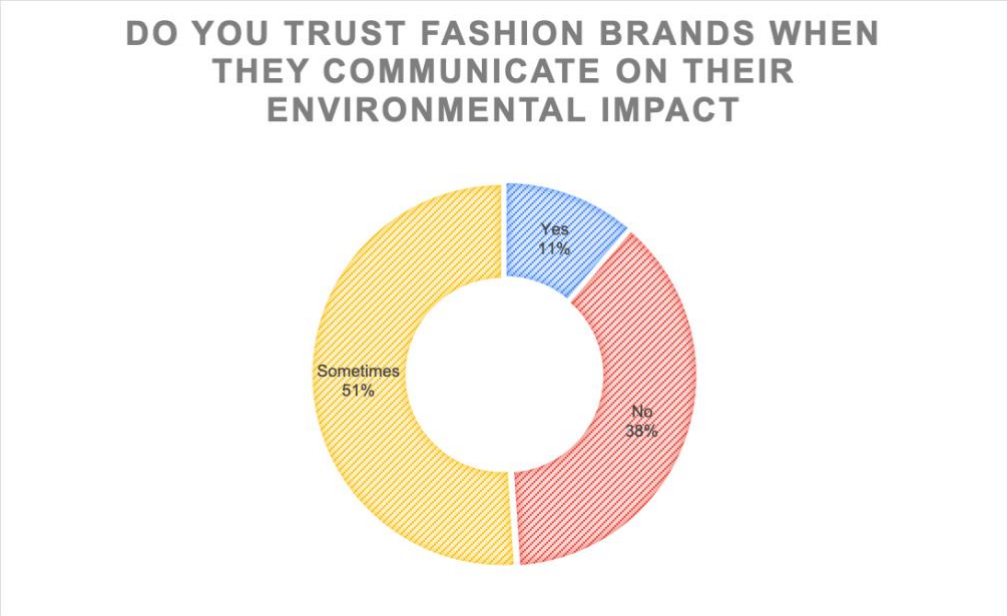

Figure 14 – *Respondents trust on brands’ environmental communication*

[1] Documentary *Patriot Act with Hasan Minhaj*, The Ugly Truth of Fast Fashion, 21m25.

As the UN Guidelines for Providing Product Sustainability Information (2017) underline, brands have to rebuild trust with consumers and a great tool to achieve that is communication. As explained previously, brands should aim for radical transparency and it starts with displaying a maximum of information on their different channels. The five brands analysed in Section 3 have a visible tab on their website with detailed information on their environmental footprint. This section includes various reports, including sustainability reports, Life Cycle Assessments or environmental analysis results. They all are active on social media and have newsletters, informing about their environmental impact and actions taken in consequence, but also bringing attention to the global impact of the fashion industry. All brands, except Ecoalf, have a blog on which they share all sorts of information such as tips on how to take care of clothes, or answering questions consumers might have on a type of fabric for example. The brands also regularly give interviews to raise awareness on overconsumption, climate change, etc. and no question is taboo unlike some big fashion companies. Lastly, in order to maintain consumer trust and avoid greenwashing, Gayaskin chose to work with Slow We Are which is an independent label auditing transparency and the eco-friendliness on the entire value chain of fashion brands.

All these types of actions bring brands closer to consumers, by transparently and honestly showing them that they monitor their impacts and are doing their best to continuously look for improvement areas. As simple as it sounds, it is an excellent way to build back consumer trust.

5. Conclusions and prospects

5.1 General conclusions of the research

The fashion industry puts a tremendous pressure on the environment as it negatively affects water, land, atmosphere and biodiversity. The majority of these impacts are linked to the choice of materials all along the value chain: from the growing stage, to the production and to the post-consumer phase. Through a consumer survey and an analysis of the best environmental practices of five brands, the initial hypothesis has been validated: the fashion industry can tackle its environmental impact by adopting a sustainable material mix, taking a more circular approach and improving its communication.

To recapitulate the key findings from the survey conducted, most of respondents want more information on the environmental impact of their fashion items. However, only one third considers themselves aware of it. The majority of respondents searches for information on the fashion item's tag (the composition and where it was made), which for most of them, impacts their purchase decision at least sometimes. Roughly 75 per cent of respondents buy less than

two fashion items per month but almost two thirds shop from lower mid-price brands which are the ones with the highest environmental impact. In terms of price sensitivity, the vast bulk would pay 10 per cent more for eco-friendly fashion items instead of regular ones. Finally, more than 80 per cent of respondents wished there was more traceability and that clear ratings or certifications existed to help them identify the environmental impact of their clothes.

Moving on to the qualitative research, key best practices applied by all the analysed brands have been highlighted. The five companies (Ecoalf, Gayaskin, MUD Jeans, People Tree and Stella McCartney) all use as many recycled materials as possible, except People Tree who chose mainly organic materials. Stella McCartney has gone even further by adopting innovative materials such as the Bolt Threads silk. When it comes to chemicals, all of the brands try to minimize their use by finding eco-friendly alternatives such as indigo dyes. The use of recycled materials significantly helps the brands reduce their water and environmental footprints. They based their models on slow fashion, meaning they have few collections per year (except Stella McCartney), and they carefully select their suppliers and providers. As environmental concern is part of the brands' identities, most of them have taken on an educational role to raise awareness amongst consumers and minimize their impact during the post-consumer stages of their value chain. Finally, circularity is also at the core of how the five brands operate and the choice of recycled materials is the first step.

The cross analysis of both quantitative and qualitative research led to some interesting findings. Radical transparency would force fashion companies to operate in a more environmentally sustainable manner and at the same time answer a rising consumer's concern. It would also be a great opportunity for brands to rebuild consumer trust which has significantly decreased during the last decade due to, for example, greenwashing. Companies should use the environmental tools currently available such as the LCA, the EMAS or other certifications and labels which, once again, survey respondents would consider helpful in their purchasing process. Innovative materials are also an opportunity for fashion brands as consumers are willing to pay a bit more for eco-friendly items. Finally, the red thread between all these findings is communication: the civil society and the consumers have the right to know how the fashion brands they buy affect the environment, how they are trying to minimize their impact but also how they try to continuously improve. According to González Romo et al. (2019), communication is also a key to involve the consumer in the path towards a more sustainable fashion industry.

5.2 Conclusions on environmental sustainability in the fashion industry

Through the theoretical framework and state of play, it has been seen that fashion is a globalized industry, which has a colossal impact economically and employs millions of workers. Fashion is mass-consumed due to its current linear model which is unsustainable for the environment. As underlined by the majority of reports used for this project, fashion companies unable to address the sustainability issue shortly will not stand a chance of survival in the long run. This is why brands should consider the strategic aspect lying under the shift towards a proper sustainable model. Teresa Yang, Vice Chairman of Esquel, summarizes it pretty well: "There is no shortcut to sustainability. Getting the basics right is critical."

5.2.1 Final recommendations for a sustainable model

As Deloitte (2012) demonstrates, sustainable models can save costs, be a primary driver for strategic product innovation, capture market share, be more relevant to consumers and help the company be flexible and operate in a fast-changing world. Additionally, environmental sustainability should not be a nice add-on for a fashion brand, it should be part of its DNA and every single decision made. One way to get there is to always keep circularity in mind, at every step of the value chain: when choosing materials, suppliers, production sites, retailers, etc. As emphasized previously, the industry has to shift away from the linear model and reverse it: it has to produce more on demand, custom made and, as stated by the slow fashion movement, prioritize quality over quantity. This change has to go hand in hand with an adjustment in consumer habits, who have been used to consuming massively and sometimes see fashion products as disposable items. Therefore, brands also have an educational role to play and for that, they need to be exemplary.

To conclude, shifting towards a more sustainable model needs to be a collective effort from all players in the fashion industry where they push each other to be always more innovative and creative in finding environmentally sustainable solutions.

5.3 Prospective and future research

Some limitations were encountered during the development of this project. First, it was decided to define fashion items as all textile, clothes, leather and footwear (TCLF) products but the border between TCLF items and "clothing" quickly became blurry, especially in the theoretical framework section. Some reports or articles only mentioned "clothing" or "textile" and others included all TCLF, which means that some numbers and facts might not always apply to all TCLF industries.

The two limitations of the survey are that all countries or geographical areas are not equally represented and that the average revenue of respondents was not asked because I did not see it relevant in the first place. Therefore, the results show a tendency but are not 100 per cent representative as mainly people with a decent situation and buying power answered.

Many survey respondents left comments at the end of the questionnaire which brought up aspects I had not thought of. One of them was the legal aspect because some said the only certifications or labels they would trust would be governmental ones. This led me to realize that it would be useful to conduct research and list all the current international, European and national laws in place concerning the environment for the fashion industry.

Finally, the best practices analysis and research findings all point out the importance of switching to a sustainable material mix, with recycled and circular materials. However, it does not seem properly scalable for the entire industry at the moment and an area of further research would be to investigate if sustainable materials really are scalable and if the demand could be met. Interestingly enough, Global Fashion Agenda (2018) predicted that technology and innovation would make these sustainable solutions scalable.

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