

The accuracy of European policies in fostering the sustainability transition - The case of the ‘European Strategy for Sustainable and Circular Textile’

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AFFIDAVIT

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ABSTRACT

The fashion market is a solid and strong sector, which positively contributes to the global economic system. Yet, its negative implications on the planet and societies are becoming progressively worse. If companies do not intend to initiate a sustainability transition, it is in the best interests of governments and International organisations to set the optimal conditions for such change to happen. In this perspective, policy instruments are probably the strongest tool available, if policy-makers correctly identify the market failures to be addressed.

In the European context, the transition toward a greener economic system is among the pillars of the mandate of the current European Commission. Within the framework of the European Green Deal, the Strategy for Sustainable and Circular Textile is the main policy tackling the unsustainability of the fashion market. This study focuses on understanding the accuracy of the strategy in addressing existing failures in the sector. By using a qualitative methodology, a general description of the apparel market is derived, in order to identify key market failures or structural problems that need external interventions. Among the various steps of the supply chain, a more detailed analysis is conducted on the usage of chemical inputs and the implementation of recycling activities. Instead, from an extensive analysis of the content of the strategy, the study extracts the coverage of the instrument, specifically which are the core policy objectives and how it intends to reach them. The comparison between the two results demonstrates that the Strategy and its writers had a quite accurate picture of the weaknesses and un-sustainable segments of the market, especially in the two special cases of chemicals and recycling. Yet, the policy did not provide solid interventions for two of the identified structural problems. In some cases, interventions are not yet clearly defined and still have to be designed. The study therefore suggests that scheduled updates should include more details about the implemented measures, while future research could either evaluate the effect of the policy on the market or follow the status of developed related instruments.

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LIST OF ABBREVIATIONS

CE - Circular Economy

CO₂ - Carbon Dioxide

DI - Disposable Income

DG(s) - Directorate-General (Policy Department(s))

EC - European Commission

EP - European Parliament

EPR - Extended Producer Responsibility

EU - European Union

FI - Fashion Industry

LCA - Life Cycle Analysis/Assessment

MS(s) - Member State(s)

OECD - Organisation for Economic Co-operation and Development

R&I - Research and Innovation

RQ - Research Question

SDG(s) - Sustainable Development Goal(s)

SQ - Sub-Question

UN - United Nations

US(A) - United States of America

Units of Measurement

€ - Euro(s)

Gt - Gigaton(s) (1.000.000.000 [10⁹] tons = 1.000.000.000.000 [10¹²] kg)

m³ - Cubic meter(s)

\$ - US Dollar(s)

1. INTRODUCTION

1.1. The topic

The fashion market represents a really profitable sector in the global economy, accounting for almost 2% of the global GDP based on the data from Statista (2023a). At the same time, it is also one of the most polluting industries, accounting for around 1.02Gt of CO₂ equivalents into the atmosphere (Statista, 2022b). In this context, the European market plays an important role by contributing for almost 20% of those profits (Statista, 2023a); on the other hand, this also implies that it also drives in terms of related emissions and other negative impacts.

It comes that the fashion industry (from now on, the FI) needs to undergo a radical change to address its un-sustainable behaviours and performances, in favour of more conscious and cleaner activities. If companies do not capture this call for actions, it is in the hands of governments and other international institutions to enable such change. The latter in particular would enable a more consistent and homogeneous transition, common and shared by multiple countries and ensuring that different perspectives are taken into account. Thus, within the European contexts, the European Commission (from now on, the EC) and its related institutions definitely represent a mayor player.

The EC has already started working on fostering a sustainable transition in different sectors of its economy, presenting its intended action plan in the "European Green Deal" (European Commission, 2023). It then implemented, with the support of dedicated Directorate-General (from now on, the DG), dedicated strategy to address either a specific sector or aspect, such as the usage of chemicals. For the FI, the EC has created a dedicated plan to address certain market failures that prevent it from undergoing the needed change, while also offering a set of supporting tools and system to actively start the transition. This policy has been named the "European Strategy for Sustainable and Circular Textile" (from now on, the strategy), as it addresses the textile sector as a whole, including its fashion and apparel segment (European Commission, 2022a).

It is fundamental for a sound and effective policy to address exiting problems, or failures, that the market is actually facing and have a structured idea of the intended direction to take. To do so, the EC may have conducted or outsourced an evaluation of the conditions of the fashion and textile market, to identify areas that needed intervention before drafting the strategy. This paper is conducting a similar analysis, observing both the positive and negative characteristics of the market, paying more attention to the second to spot key negative externalities that define the un-sustainability of the FI. By breaking down the content of the strategy, it is possible to understand the objectives and intended actions of the EC, which reflect the issues that the EC (or their consultants) have identified. When comparing such observations with the identified failures, an evaluation of the coverage is developed, and thus on accuracy of the policy in tackling the most crucial, and unsustainable, points of the market.

1.2. Relevance, motivation and purpose of the research

As anticipated in section 1.1., the EC could ensure that a collective action is taken at European level, which represents a great share of the global market. Therefore, if effective measures are implemented in this territory, a step toward a greener industry is taken and it could work as a role model for other territories. For this to happen, it is important that policies are accurate and precise in the measure they intend to employ, thus it is relevant for academics and interested individuals, like ourselves, to observe whether the EC is operating considering a set of different instances. In this perspective, we would like to answer the following research question: *How accurate are EU policies in tackling the un-sustainability of the fashion industry?*

Therefore, this paper aims at understanding whether the “European Strategy for Sustainable and Circular Textile” is addressing existing issues in the European apparel market and the extent of included interventions. Such goal will be attained by, firstly, identifying problems that the FI is experiencing, as of 2022. At the same time, it will analyse the set of measures outlined in the strategy, in order to derive the policy goals and the intended path to obtain them. Lastly, by comparing the two findings, it will be possible to provide an interpretation of the accuracy of the strategy and possible areas of improvement.

From a research across different academic articles databases, it resulted that no similar researches have been conducted, or at least published, in the fashion industry, therefore this paper and the topic it covers result a novelty in the sector.

1.3. Structure of the paper

The paper includes three main chapters dedicated to the in-depth development of the presented topic; these are then supported by an introductory part, a description of the methodology used for the analyses and a conclusive set of statements. The latter will focus on the summary of the findings, and on other observations that arose during the writing process.

The first chapter (numbered as 2) extensively describes the literature in the matter of the conditions of the FI, its core characteristics and un-sustainable aspects. Specific sections are dedicated to two main topics: chemical inputs and recycling, which demonstrate to play an important role in the sustainability of the industry as a whole. An additional segment focuses instead on the importance of policy instruments and in general of the European institutional context, as to favour the understanding of the reasons why and how the strategy has been developed.

The second chapter (numbered as 4) presents two different analysis: a market description (sub-chapter 4.1.) and a policy analysis (sub-chapter 4.2.). The former is dedicated to the observations of the performances of the FI and its characteristics, including the relationship between different aspects, as to understand the most important failures that define its un-sustainability. The second sub-chapter instead works on presenting the ideas and intended actions of the EC in fostering the circular and green transition in the FI.

The third chapter (numbered as 5) summarises and compares the finding of the previous two, as to understand the coherence and accuracy of the policy with the actual conditions of the market. In case of gaps or inconsistencies based on evidences, observations are made and discussed, as to analyse the issue from multiple perspectives.

2. LITERATURE REVIEW

The Fashion Industry (from now on, FI) can be defined as the sub-sector of the Textile Industry devoted exclusively to the production and sale of clothes (Major & Steele, 2010). For the completeness of this paper, we would not consider further categorisations, such as the distinction between fashion (high-end items) and apparel (mass consumption goods) presented by Major & Steele (2010).

As we will show, the FI plays an important role in the global economy, while it also represents one of the most polluting and exploitative industries. Therefore, it is important to understand where it stands and how it should change. In this Chapter, we will report some main findings and theories about the state of the industry and its (un)sustainability.

2.1. The Fashion Industry

2.1.1. The Global Perspective

As a whole, the FI represents one of the most important industries in the world, and its role is and will stay a constant in the global economic system. It is characterised by long value chains and strong interconnections with other sectors; in fact, manufacturing and distribution requires the support and inputs from other markets, ranging from energy supply and chemical additives, to maritime transport (European Commission & Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, 2021).

Western markets are heavily reliant on Eastern countries for the production of clothing, especially with respect to apparel items, with China and Bangladesh biggest exporters (EURATEX, 2022). Among the reasons for this delocalisation and constant exchange, we can find cheap labour force, as well as weak regulations in respect to products qualities and working conditions (Köhler et al., 2021). By looking at market figures collected by Eurostat and presented later, it will be possible to observe that EU countries mostly, if not even exclusively, engage in trade for fashion products with countries located in Asia. Therefore, from now on, we will consider the generalisation of 'consuming' Western, EU, and 'producing' Eastern, Middle East and Asian states.

As a consequence of such dependency, the industry may suffer from the side-effects of global instabilities and unpredictable events, such as conflicts and pandemics (McKinsey's Retail Practice & Business of Fashion, 2021). The implications of such occurrences pose executives under great stress and need to start re-thinking their structures to prevent big disruptions to occur again or to be ready to smooth the negative effects (McKinsey's Retail Practice & Business of Fashion, 2022). In their annual reports properly denominated "The State of Fashion", McKinsey and Business of Fashion describe the conditions of the market, including its performances, the main challenges it is facing and possible future scenarios. With no surprise, the past two editions tackled the Covid-19 crisis and recovery, as well as the Russia-Ukraine conflict. Key findings are presented here, as they are crucial for understand the current conditions.

As for many other industries, the Pandemic represents one of the most striking examples of unpredicted events with heavy economic and social consequences. As McKinsey's Retail Practice & Business of Fashion (2021; 2022) observed, the crisis heavily affected the performances of clothing companies. From the production perspective, lockdowns and goods movement restrictions implied partial or total plants closures, thus slowdowns in manufacturing and consequent delays in deliveries of new (seasonal/up-to-trends) products. This represented big losses for companies, that, on top, had to use financial supports to maintain their assets rather than covering for deficits, also not knowing timing and extent of the recovery (McKinsey's Retail Practice & Business of Fashion, 2021). On the consumption side, restrictions limited the access to stores (with online purchases partially off-setting), while job losses reduced the spendings on clothing and accessories (McKinsey's Retail Practice & Business of Fashion, 2021). On the other hand, with the re-openings, customers that had experienced increasing savings, were more eager to spend, expecting the fashion market to outperform other markets in recovery rates, especially in its luxury segments (McKinsey's Retail Practice & Business of Fashion, 2021).

To these days, rising energy prices and expected increasing inflation will result in increased costs for companies, thus possible higher prices, and consequent contracted consumers' demand. Indeed, transversal global value chains, from production to sale, are posed under threat. While it seemed that the industry had recovered from the pandemic, latest news are stressing executives and experts, forecasting again a slow-down in the growth of the market and distorted figures due to inflation (McKinsey's Retail Practice & Business of Fashion, 2022).

It is important to note that distinct industry segments and companies could react differently, depending on their involvement with the phenomenon under analysis. At the same time, different states may experience different side-effects and with different intensities, based on both governmental decisions and the extent of the interconnection with other countries (McKinsey's Retail Practice & Business of Fashion, 2022). As an example, European Member States (MS) are among the ones that are suffering the most from the consequences of the Russia-Ukraine conflict and their implications on energy costs. The following Section will describe more in details the state of the FI in EU territories.

2.1.2. The European Perspective

The European fashion market constitutes one of the biggest shares of the global industry, but is also among the ones that suffered and suffers the most from current instabilities. It is interesting to consider all MSs as a single element since, despite being independent under multiple aspects, they are subject to same regulations for a multitude of topics and governments tend to agree on a number of priorities, working jointly to achieve them. Among those, a more sustainable and circular FI appears (European Commission & Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, 2021).

EURATEX constantly observes the conditions of the EU clothing and textile market, analysing the behaviour of stakeholders and changes in key economic factors. In their yearly reports, like EURATEX (2022), they present the performances of the Textile and Clothing Industry, breaking

down the figures to understand deficits and/or improvements. Their most recent document EURATEX (2022) shows the adherence of the European system to global trends, aligning also with the observations made by McKinsey's Retail Practice & Business of Fashion (2022) about the state and the future of the European market. The Covid-19 Pandemic hit hard: brands experienced losses in their turnovers due to reduced access to stores, with online stores partially covering, resulting in decreasing number of employees and, in the worst cases, failures, thus reduced number of companies operating (EURATEX, 2022). If it looked as if the FI was recovering, now it is expected to suffer from the energy crisis and the increasing inflation rate. Because of its proximity to the Russia-Ukraine conflict and the European heavy reliance on (Russian) natural gas for its energy mix, forecasts for the whole economy are not that bright. The results are increasing energy costs and high inflation, that together with low GDP growth expect the fashion market to contract again. The only exception could be the luxury sub-sector, preferred by non-EU visiting consumers that are less affected (McKinsey's Retail Practice & Business of Fashion, 2022).

With respect to production, the European system consolidates itself as a strong player, second only to China in terms of exports (EURATEX, 2022). Among the MS, Italy and Germany lead as main exporters, with the former dominating also in terms of Turnover and Employment. The main markets for European products are Switzerland and the United Kingdom, with Women's Clothing and Other Garments favourite exporting products (EURATEX, 2022).

The European system also dominates in terms of innovation and technological development, especially in the numbers of patent filed and industrial designs registered (EURATEX, 2022). Most of those new inventions, whether production processes or inputs, aim at solving or smoothen problems that the FI is facing due to its high degree of un-sustainability, that will be summarised in the upcoming Section.

2.1.3. Emerging Trends

Because of its important role in the society, the fashion industries have to evolve and adapt to latest and emerging trends. Here we are presenting the most popular and important to the (un-)sustainability of the industry.

Fast Fashion: As explained, the FI is characterised by a global supply chain, which has been possible with the rise of globalisation, enabling outsourcing of production activities in locations with cheaper labour force and inputs. This resulted in reduced prices for final consumers, thus in a "democratisation" of fashion and latest trends (Bick et al., 2018). In the industry, this phenomenon is defined as "Fast Fashion" and, over the past 20 years, has gained popularity, therefore market share, and increasing revenues (Gazzola et al., 2020). Despite representing an easy access to trendy products for lower-income consumers, items are usually of lower quality and intentionally conceived with reduced product life. As Centobelli et al. (2022) explains, the business idea is to create commodities that can be easily replaced, either because perceived out-of-style or damaged, in order to stimulate an impulse to constantly purchase. It becomes clear how this model is unsustainable from different perspectives, highlighted in the next Section.

Online shopping: increasing connectivity and portable devices enabled consumers to have access to a wider set of products that can be purchased at any time from everywhere (Silva et al., 2021). In a certain perspective, this also falls under the phenomena of “democratisation” of fashion, representing an additional opportunity for companies to reach out to a larger market. During the Covid-19 lockdown, online stores were actually the only ones open, allowing brands to still make some profits. Whether consumers were already used before or got accustomed during the pandemic, the trend of distance shopping is expected to stay, even to increase its market share, and companies have to keep that in their plans (McKinsey’s Retail Practice & Business of Fashion, 2021). Still, it carries its negative implications.

Second-hand shopping: Gazzola et al. (2020) argues that more consumers are becoming aware of the negative externalities of the FI, from both a social and environmental perspective. Re-considering their purchasing habits is a way to express their concerns by boycotting exploitative brands; reuse instead of buying new is definitely the most popular activity (Gazzola et al., 2020). Dedicated online platform definitely fostered the spreading of such trend by enabling access to a larger variety of items and allowing also consumers to become seller, benefitting both financially and in terms of freeing some space (thredUP, 2022). This habit has also to be kept in the plans of consolidated brands that want to expand their sales channels, either on their own websites or via dedicated platform: it is not only sustainable but also allows to profit multiple times from singular items (thredUP, 2022). Yet, again Gazzola et al. (2020) highlights how this trend as a cultural connotation, depending on the attitude of countries and individuals toward second-hand shopping. For example, in Italy, used clothes are not considered “fashionable” and their purchase is tied to low-income categories (Gazzola et al., 2020).

We could distinguish between two main types of second-hand shopping:

Resale: for profit sale of used items: products can be sold by individuals directly to the final customer or to markets and consignment stores, that then put them in the market. Both groups may take advantage of online dedicated platforms to have access to larger pool of possible clients (Evans et al., 2022).

Thrift and Donation: as the name suggests, clothings are donated by first owners to dedicated shops, where they are sold to new users and the profit is passed on to finance humanitarian causes or charitable works (Evans et al., 2022).

D’Adamo et al. (2022) instead present some downsides of this trend. They argue that it may be used as a greenwashing activity by companies or only increase consumption, in a so-called CE rebound, as products are ‘ensured’ a longer life in any case. It is important therefore to ensure that it works as a complement of to the traditional market, moved by players that are actually committed to extending the life cycle of products (D’Adamo et al., 2022).

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that it works as a complement of to the traditional market, moved by players that are actually committed to extending the life cycle of products (D'Adamo et al., 2022).

Renting: in the flow of the sharing economy, renting is slowly gaining popularity in the fashion market. As clothes ownership loses its value (Gazzola et al., 2020), acquiring items for short periods, even for just a single event, and then giving them back starts having much more sense. In this case, products are up-to-trend, for those interested, yet are given the maximum possible life thanks to the multiple consumers it is sold to (Shrivastava et al., 2021).

Yet, it comes that for the three last points there is a need to revise the conception of how clothes are made: not for single use, but for multiple owners over a long period of time. Also, it is important to consider how products reach consumers, as transport costs in both environmental and financial terms should be kept in mind.

2.1.4. The Un-sustainability of the industry

From the economic perspective, the un-sustainability of the FI has been already explained, especially with respect to the European market. As discussed in the previous Sections, the fashion system is so global and interconnected, that it has become weak and can hardly cope with unpredictable disruptions (McKinsey's Retail Practice & Business of Fashion, 2021). As a consequence, the market is becoming progressively unstable and vulnerable; thus, it becomes important to consider how the situation can be improved.

This undoubtedly results in social negative consequences and imbalances; on the other hand, inequalities between countries are among the main reasons behind the expansion of the supply chain. In fact, Southern and Eastern countries present weaker regulations that favour the application of worse working conditions, up to causing the exploitations of workers and even children (Gazzola et al., 2020). In this respect, some actions have already been taken, such as minimum standards and joint agreement between companies, but it's still quite little.

At environmental level, the situation is even worse: most clothing products are conceived under a linear value chain, envisioning little or no reuse/recycle. On top, global production has steadily increased, as a result of some emerging trends and innovations in a vicious cycle. Consequently, discarded items have skyrocketed, adding up to the already-high waste burden on the planet (European Environment Agency, 2019).

Looking at production processes, the cultivation of inputs, in particular cotton, requires high levels of land use and water consumption, second only to food production. On this point, it is important to observe that the majority of the consequences of the exploitation of those two resources are suffered by non-EU countries, especially the Eastern and Southern states mentioned before as global exporters (European Environment Agency, 2019). It comes without further explanations that this strengthens the social and economical imbalances between the Global North and Global South. Another factor that bends more on the side of exploited countries is the levels of CO₂ Emissions: the FI is a great contributor, with improvements in the past years. Yet, reductions took place mostly on the European territory (EURATEX, 2022), shifting

even more the negative implications to producing countries. Lastly, water is not only consumed but also polluted during production processes, and, in some cases, even wrongly disposed. Among the biggest pollutants we can find (hazardous) chemicals, which play an important role in the treatment of raw materials and textile productions (European Environment Agency, 2019). Because of their importance, they have been dedicated part of the following Sub-Chapter.

Moving to the consumers' side, European consumption of textile has the 4th highest impact on the environment and climate change, following in order habits related to food, housing, and mobility (European Commission, 2022a). As mentioned, products are designed to have reduced product life, thus increasing the post-consumption waste volumes (European Environment Agency, 2019). Online shopping instead contributes to increase FI's emissions, with door deliveries: calculations in this respect are even harder if we consider the option of returns, which amounts to almost 50% of sales according to Stöcker et al. (2021). It is not our intentions to dive into the reasons for returning, yet it is important to emphasise its environmental burden. Not only it contributes in terms of emissions, but companies are not transparent on the post-return treatments, with news talking about immediate burning or disposal in landfills (Business Insider, 2021). While also second-hand and renting also encompasses the negative contribution of deliveries, their positive impact in terms of reducing the need to produce new items is more important.

2.2. Chemicals and Recycling

The rising need for fast and low-cost production resulted in the employment and manufacturing of cheap, in both financial and quality terms, items. Great results were obtained with the introduction of chemicals, whose impacts were not considered at first. In the first part of this Sub-Chapter, we will present the role and implications of the employment of chemicals in production processes. In the second, we will instead discuss the attitude of the FI toward recycling, an important aspect to foster the circularity of the market.

2.2.1. Employment of Hazardous Chemicals

Chemical inputs are widely used in the FI at different stages of products' lives and for multiple purposes, representing important factor for the manufacturing chain. Yet, they also negatively contribute to the burden on the society and the environment.

2.2.1.1. Advantages of Chemical Inputs

European Commission et al. (2023) explains how chemical inputs are utilised in the FI. They may take multiple forms, starting from additives to cultivation activities of resources such as cotton, to finishing dyeing and polishing of clothing items. Chemical inputs serve different functions, as to obtain, among others, the following advantages.

More efficient inputs production: non-human-made inputs, such as cotton and silk, have been cultivated for centuries to satisfy the demand for clothing. Latest trends and the constant

growth of the FI have only exacerbated the need for such kind of materials, thus leading the industry to look for artificial alternatives or solutions to improve inputs farming productivity. With respect to the latter, an interesting perspective has been given with genetically modified inputs, from both an economic and environmental sustainability perspective as Morse and Mannion (2009) have analysed. More related to the topic of chemicals, a significant contribution has been given by products such as fertilisers, herbicides and pesticides. Such kind of additives positively contribute to the increased productivity of fields, by protecting crops from insect and diseases in the latter cases, as well as offering them a more suitable ground to grow for the former (Aktar et al., 2009).

In artificial textiles, chemicals assume the form of primary inputs and treatment additives for the production of textile. Shirvanimoghaddam et al. (2020) distinguish between three main types of fibres: 1. natural: from organic resources - cotton, 2. regenerated, from natural resources but requiring (chemical) treatment and processing - viscose, 3. synthetic, from manipulated non-renewable resources - polyester. European Commission et al. (2023) describes the different techniques to obtain in particular the two last types. The common denominator in all cases is the application of chemicals as starters, complementary inputs, as well as preparation agents to stimulate and fasten manufacturing processes (European Commission et al., 2023).

Improved clothing manufacturing: More in general, all stages of production may be improved with the adoption of more efficient techniques. Beyond mere machineries, companies may decide to increase their chemicals requirements to reduce other costs. Among those strategies, we can mention the cleaning of organic fibres with detergents fastening the process by reducing, for instance, the water temperature or amount required or energy consumption (European Commission et al., 2023). Another common activity is dyeing: while in the past it used to be performed with natural colouring processes, innovative additives enabled faster and more uniform results, in the same product and across multiple items (European Commission et al., 2023).

Improved product quality: Textile fibres may not be ready to be transformed into clothing items as they are, or finished products may need to undergo additional treatments before being delivered to the market. To keep up with trends and requirement of the market, fashion companies may opt to adopt additional activities to artificially modify their products. Refurbishing processes address both the aesthetic characteristics or the mechanical features of apparel. Other treatments include the most common dyeing activities (European Commission et al., 2023): modern inputs enabled to have access to a wider range of colours at lower costs. Other characteristics, such as intrinsic features of clothes, can also be modified either by including additives in fibres or by treating them with covering layers (European Commission et al., 2023). This may be beneficial, for instance, to ensure a safer transport or wearability under extreme weather conditions, like wind or water proofing.

Consumption habits: chemical inputs are utilised also by consumers when taking care of their belongings. Detergents are part of the weekly habits to maintain their purchases wearable:

they range from simple soap to clean items, to other products to emphasise certain characteristics, such as softeners or colour-brighteners.

2.2.1.2. Disadvantages of Chemical Inputs

According to scholars and reports, there are multiple categories of threats that chemical inputs result in. As a whole, the Textile Industry is among the top three pressures on water and land use (European Commission, 2022); part of that burden is imputable to chemical materials and their increased employment.

Waterbodies pollution: European Commission et al. (2023) highlights the presence of chemical loads in water discharges from both production processes and consumers washing habits. Starting from the former, impurities on textiles, accumulated during the production and treatments (e.g., pesticides, detergents...), are washed out before the finishing processing. These end up in the outgoing water flows from plants, with the additional risk of not being properly discarded. Agents may be toxic, mutagenic and carcinogenic, clearly dangerous for rivers' inhabitants and their habitats. In particular, when considering colour dyes, the damage is not merely aesthetic, but they also prevent light penetration, thus reducing the rate of photosynthesis and affect the living conditions for the under-water population (Lellis et al., 2019). Lellis et al. (2019) also points out that in developing countries such water discharges may be realised in flows that are commonly used for human-related purposes, such as agricultural irrigation, resulting in damaging effects also for health of citizens of those regions.

On top of the detergents burden, consumers' washing habits instead contribute to almost 35% of the microplastics released in waterbodies. Synthetic textiles break down into microfibrils, so small in size that do not get trapped in filters, thus end up into rivers and seas. Also During production processes and afterwards while floating in waterbodies, they tend to cumulate chemicals that are then released, provoking similar effects to those listed before to the environment and animals (Boucher & Friot, 2017).

Health Damages and Threats: To follow, we can introduce the health threats that chemicals impose on both populations located in production areas and consumers in general. Chemical toxicity may arise directly, as explained, with toxins dissolving in consumption water; indirectly, they may accumulate in fishes and animals, through the food chain all way to human beings (Lellis et al., 2019).

At production level, employees are the most exposed subjects, especially the ones dedicated to treatment and dyeing processes. If safety measures, such as airing systems and individual protection devices, are not implemented correctly, workers may enter in direct contact with hazardous products that can, immediately or in the long-run, cause heavy damages to their health (Bick et al., 2018). It comes, following up the points made about the social sustainability of the FI, that if in developing countries the situation is not well monitored, it is possible to assume that such accidents are not that rare (Bick et al., 2018).

On the consumers' side, further researches still have to be developed, yet Iadaresta et al. (2018) conducted experiments to prove that certain chemicals, in particular Benzothiazole contained in dyes and herbicides, can be dangerous. They can in fact penetrate the human skin and accumulate in bodies, with possible systemic consequences (both carcinogenic and non-carcinogenic) if transported around (Iadaresta et al., 2018; Aktar et al., 2009).

Land erosion: As of itself, farming of primary organic materials is highly land-intensive to fulfil the demand of the steady growing fashion market. To keep up, farmers employ chemical inputs, such as fertilisers and pesticides, as to boost and save their productions. These carry their embedded negative implications, related especially to the amount of heavy metals they are composed of. Over time, they may tend to cumulate in the soil causing actually damaging (opposite) effects, such as reduced land fertility, or end up in under-the-surface water flows and contaminate other areas and/or enter the food chain (Alengebawy et al., 2021). In particular for the former case, it comes that the negative effects convert into economic disadvantages for the producers in terms of increased costs and/or reduced profits.

At the end of the chain, as pointed out before, clothes may be disposed in inappropriate ways, with one of the most common being cumulation in landfills (Business Insider, 2021). The risk in this case is for textile to degrade and chemicals to decouple and permeate the ground, thus contaminating the soil where the landfill is located (Lellis et al., 2019). Especially in developing countries, this might be dangerous for the local population if it ends up spreading also to the surrounding area, used for other purposes, such as agriculture (Bick et al., 2018).

Other forms of environmental degradation: Alternatively, if the last steps of production processes involve air treatments, chemicals can get transferred to the atmosphere, becoming a threat for workers and, again if not properly filtered, to the surrounding area (European Commission et al., 2023). Lastly, if we extend the perspective of the production chain, artificial textile fibres are manufactured starting from petrochemicals inputs. As the name suggests, they are derived from petrol, with the issues related to extractions such as crust damages and pollution. In addition, transformation into usable inputs implies the great CO₂ emissions (Shen et al., 2010).

2.2.2. The option of Recycling

Waste (over-)production is acknowledged to be a rising problem, especially in urban societies, which is only expected to worsen if the global population does not commit to adjust its habits, as explained by Hoornweg et al. (2013). Among all the root causes, material goods over-production plays an important role, and as explained, fast fashion business model falls within this category (Cornelsen, 2023). To reduce the side-effects, it would become necessary to operate with preventive measures, adjusting manufacturing processes, or with mitigation initiatives, opting for circular activities such as re-use and recycling activities. This last point aligns with our arguments and will be presented in this Sub-Section.

Firstly, it is important to make a clarification: according to Sandin and Peters (2018), the two terms need to be distinguished as Reuse "refers to various means for prolonging the practical

service life of textile products by transferring them to new owners [...], with or without prior modification (e.g., mending)” (Sandin & Peters, 2018; page 354). Emerging trends such as renting and second-hand shopping fall within this category. On the other hand, Sandin and Peters (2018) define Recycling as the re-processing of waste for the production of both new textile and non-textile products.

2.2.2.1. Types of Recycling

All recycling loops aim at the reintegration of (components of) ‘dead’ products in the value chain as to minimise waste and reduce the demand for virgin materials. Additional advantages will be presented in the next Section.

Sandin and Peters (2018) extensively describe different classifications of recycling types that are worth mentioning.

Techniques: There exist three main recycling routes: mechanical, chemical and thermal. The second one will be more extensively presented in the section 2.3., while the last seems to be quite uncommon so we will only briefly present the first. According to Harmsen et al. (2021), mechanical recycling activities imply breaking down the fabric as to retain the fibres via cutting, tearing, shredding or carding of the textile. Products made of organic fibres, such as wool, can be almost exclusively get recycled via mechanical process (Harmsen et al., 2021). Man-made textiles and fibres may instead undergo multiple processes, even in cascade chain of recycling activities, starting from mechanical.

Fabric levels: Composing fabric of textile products can be recycled at different levels. At the top, the fabric as a whole can be recovered and used in other clothing items; in this case, it can also be referred as material reuse as it is essentially a transfer of purpose of the same fabric, without modification. Further down, it is possible to disassemble the fabric, but keeping fibres entire, operating then in the form of fibres recycling. At the lowest level, basic composing polymers are preserved and used to fabricate different fibres, then fabric (Sandin & Peters, 2018).

Quality of the output: Recycling activities may also affect the quality of the fabric/fibres: thus, a further distinction can be made between up-cycling and down-cycling processes. In the case of the former, the quality of the output is higher than the one of the input waste. This tends to be more common for polymer recycling, as the process does not impact the inner structure. Instead, fabric and fibres recycling tend to produce items of lower quality than the original input, as fibres and molecules are more prone to degradation both during the life of the product itself and in the course of the recycling process (Sandin & Peters, 2018).

Open and closed loop: Recycled textile fibres may be used for other purposes than clothing, but also recycled inputs for apparel may come from different industries. In the course of this analysis, only the first case is considered. If fabrics/fibres/polymers are kept within the FI, the recycling process can be defined as a closed loop. If, instead, components are transferred to another market, the strategy falls with the context of open loop (Sandin & Peters, 2018). Shir-

vanimoghaddam et al. (2020) offers a graphical representation of (some of) the possible second lives of textile waste, presented in Figure 1:

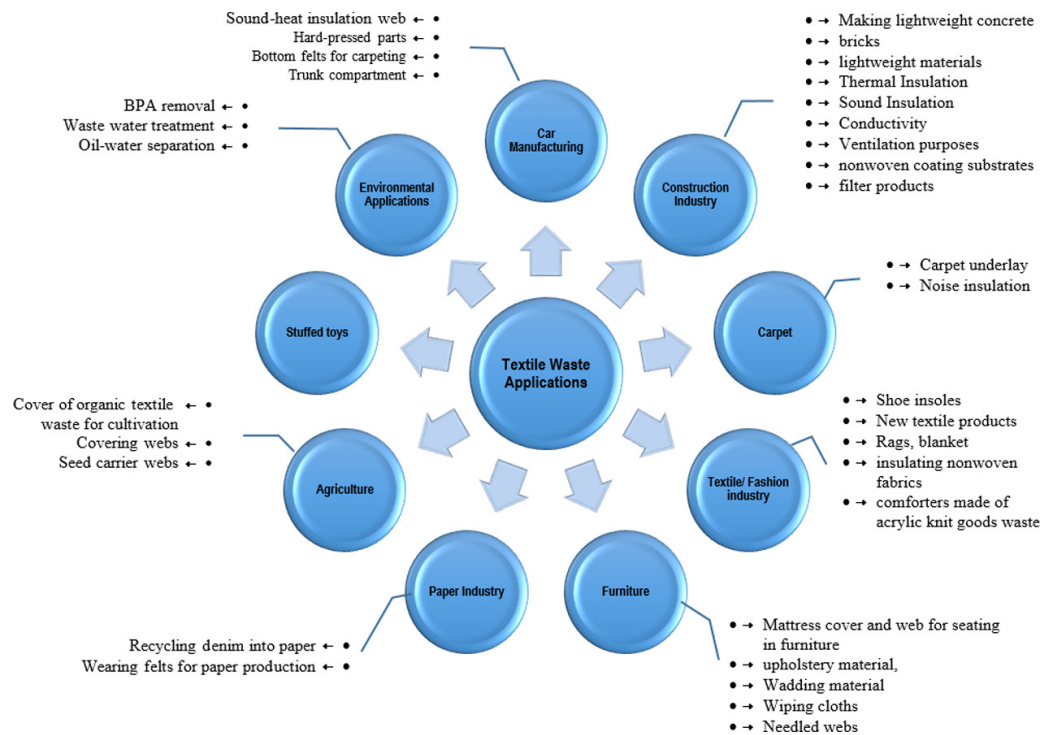


FIGURE 1 APPLICATIONS FOR RECYCLED TEXTILE WASTE IN DIFFERENT INDUSTRIES

Source: Shirvanimoghaddam et al., 2020

2.2.2.2. Stages of Recycling

Clearly, the preferred path is re-use, as it requires no modification, thus lower costs in both financial and environmental terms. Charitable and second-hand businesses are the most interested and invested in such kind of gathering activities (Köhler et al., 2021).

Ideally, alternatively, once clothing cannot be worn anymore, they may enter a recycling loop. Firstly, they are collected, either in stores or in dedicated bins offered by local municipalities and/or organisations in charge of waste management. Legal requirements and management differ between countries as no common ground has been settled yet, also within the EU (Köhler et al., 2021).

Then, depending on the quality of the product, waste is transported to a recycling or recovery plants. While the second term includes the first, recovery activities have been defined according to Piribauer and Bartl (2019) as operations where “waste [is] serving a useful purpose by replacing other materials that would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy” (Piribauer & Bartl, 2019; page 114). As an example, incineration is a form of thermal recovery process in the sense of waste-to-energy activity (Piribauer & Bartl, 2019). Yet, this falls beyond the scope of our analysis, thus we will focus on ‘pure’ recycling.

Before or once reached the recycling plants, items are sorted according to the level of the recycling needed and the type of materials. According to this division, they will subsequently be treated in the most appropriated way, among for example the ones presented before and described by Sandin and Peters (2018). Ultimately, resulting products may stay within the industry or be included as primary input in other markets — open or closed loop — depending on the purpose of the plant and the company in charge of the recycling. (Piribauer & Bartl, 2019)

The whole process can be summarised in the scheme in Figure 2:

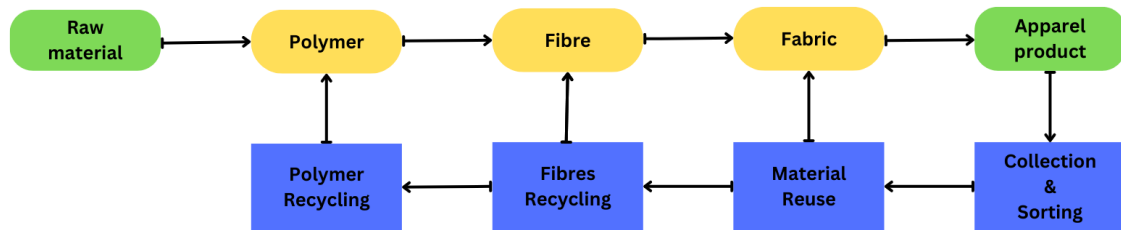


FIGURE 2 TEXTILE PROCESSING CHAIN AND RECYCLING PROCESSES

Source: Adapted from Piribauer and Bartl, 2019

2.2.2.3. Implications of Recycling

It has been highlighted how exploitative the FI industry is, from both an environmental and social perspective. Yet, it also has a great potential to transition to a more sustainable supply chain, especially when considering the end of the life of clothing products. Big expectations are posed on the possibility to build up a more circular market, with recycling playing a really important role as this strategy offers a number of advantages, market as (+).

(+) Higher circularity of the FI: Reducing the burden of the industry on the planet is fundamental for the global community; circularity is probably the most popular and feasible to implement in the short-term. According to the definition of the European Parliament (2023), Circular Economy is a production and consumption model that ensures the longest product life and reduces waste to minimum, by engaging in activities such sharing, leasing and especially recycling. Economically, this also opens up to new business opportunities focused on fostering and supporting such transition. These can imply the birth of new companies or the development of a competitive advantage, in the form for example of reduced costs or unique value proposition. In a social perspective, it may translate into better living conditions by offering job opportunities and better planet to live in (Köhler et al., 2021). More technical descriptions are provided in Section 2.4

(+) Reduction of virgin inputs: the possibility of repurposing some fibres for the same or different purposes definitely represents a major advantage of adequate recycling techniques (Sandin & Peters, 2018). In fact, reintroducing existing fibres or originating them from other products, such as PET plastic bottles (Piribauer & Bartl, 2019), drastically reduce the demand for virgin materials. Little amounts of pure inputs may still be needed to compensate the loss of quality during recycling activities, in the case of down-cycling processes (Sandin & Peters, 2018). As for

recycling for other purposes, fibres and textiles reduce the overall need for new resources in the whole economic system, with a large set of other connected positive implications.

(+) Lower burden on the planet: Reduced demand for virgin material may initiate a domino effect of consequent diminishing impact on the environment (and on the related communities). In fact, by significantly affecting, for instance, the need for virgin cotton, it is possible to indirectly address the usage of chemicals in agriculture and production. As a consequence, toxicity implications mentioned before are significantly mitigated (Köhler et al., 2021). The same reasoning holds for other negative consequences of exploitative behaviour of the FI.

On the other hand, Knäble et al. (2022) collected information from different sources to argue that recycling is definitely a good strategy, yet is still less efficient [(-)] than reuse and remanufacturing approaches. Here are their main arguments.

(-) Increased energy demand: recycling is highly energy-intensive, thus it increases the demand for energy inputs of the industry, up to the point it may offset the above-mentioned environmental benefits. Originating energy from renewable resources may be a way around this issue (Knäble et al., 2022).

(-) Loss of material flow: as presented, recycling activities may downgrade the quality of the materials, thus leading to a decreased material inflow back in the economic system (Knäble et al., 2022). Improvement in recycling processes may reduce the amount of material lost, thus keeping the quality of products to almost the same level.

2.2.3. Relations between Chemicals and Recycling

Chemicals may play an important role in textile recycling, especially when the chemical approach is preferred. According to Ribul et al. (2021), even though such strategy would enable great circularity of the industry, it has not yet acquired such a large industrial scale. Innovative techniques are working to find new solution that can reduce costs and improve efficiency.

In chemical treatments, chemical inputs may be used to initiate, fasten or contribute to reactions, such as enzymes to catalyse — cause or accelerate — polymer lysis — breakdown. Because of the depth of the process, those activities target especially fibres and polymers recycling. It is not uncommon for chemical recycling to come after an initial mechanical process to break down fabrics and prepare them to undergo such processes (Köhler et al., 2021). Also, multiple chemical reactions may concatenate as to ensure a full chain and a more complete recycling, depending of the intended result and the initial material (Piribauer & Bartl, 2019). For instance, in case of fibre blends, chemicals can be used to dissolve one or more components, as to then enable the recycling of the remaining part (Ribul et al., 2021).

Piribauer and Bartl (2019) conclude by emphasising how highly-intensive chemical processes may not be sustainable, especially from an environmental perspective, and/or even not possible to perform. Therefore, latest and future researches may focus on alternative techniques, with lower impact: among those, it is worth mentioning bio-chemical recycling processes.

Here, as the name suggests, organic components are targeted or biological additives are employed, to perform (bio)chemical processes. This includes, for example, bacteria and microorganisms able to dissolve certain polymers or even produce other primary inputs starting from waste (Ribul et al., 2021).

As mentioned previously, chemical inputs can be also used to modify the characteristics of textile products, such as dyeing and smoothening additives. These may represent a barriers to an efficient recycling process, but may also be recycled themselves (Ribul et al., 2021). In the first case, chemicals present on textiles may interfere with reactions, making them hard or slower to occur; chemical removal would be the preparative treatment. Partially related, dyes may also affect the re-employment of fibres in terms of coloured resulting recycled materials. (Köhler et al., 2021) Chemical de-colouring would be the first way, with the connected environmental and health threats, similar to the ones presented previously (Niinimäki et al., 2017). Alternatively, recycling of already-dyed fibres may work for some companies. According to Niinimäki et al. (2017), colour translation may be a valuable option: in this process, textiles are initially sorted by both fibre and colour. In this way, no de-colouring and subsequent dyeing is needed, pulps — result(s) of the recycling process — can be also mixed as to obtain different shades, with no need for new additives (Niinimäki et al., 2017).

2.2.4. Circular Economy

Recycling strategies are often used as synonym for Circular Economy activities; yet, in literature, the former is only one of the four main business models for the implementation of the latter in the economic system (Knäble et al., 2022).

According to Ellen MacArthur Foundation (n.d.), Circular economy can be defined as “A systems solution framework that tackles global challenges like climate change, biodiversity loss, waste, and pollution. It is based on three principles, driven by design: eliminate waste and pollution, circulate products and materials (at their highest value), and regenerate nature”. The concept has gained popularity over the past years, with the raising awareness about environmental concerns; however, as Stahel (2016) presents, successful implementations of CE principles and strategies trace back to the 1990s, while the Ellen MacArthur Foundation (n.d.-b) suggests that the idea of circularity and feedbacks can be even found in ancient philosophical schools.

The Ellen MacArthur Foundation (n.d.-b) provides an extensive descriptions of the concept and funding values of CE, trying to summarising them in Figure 3, in page 17:

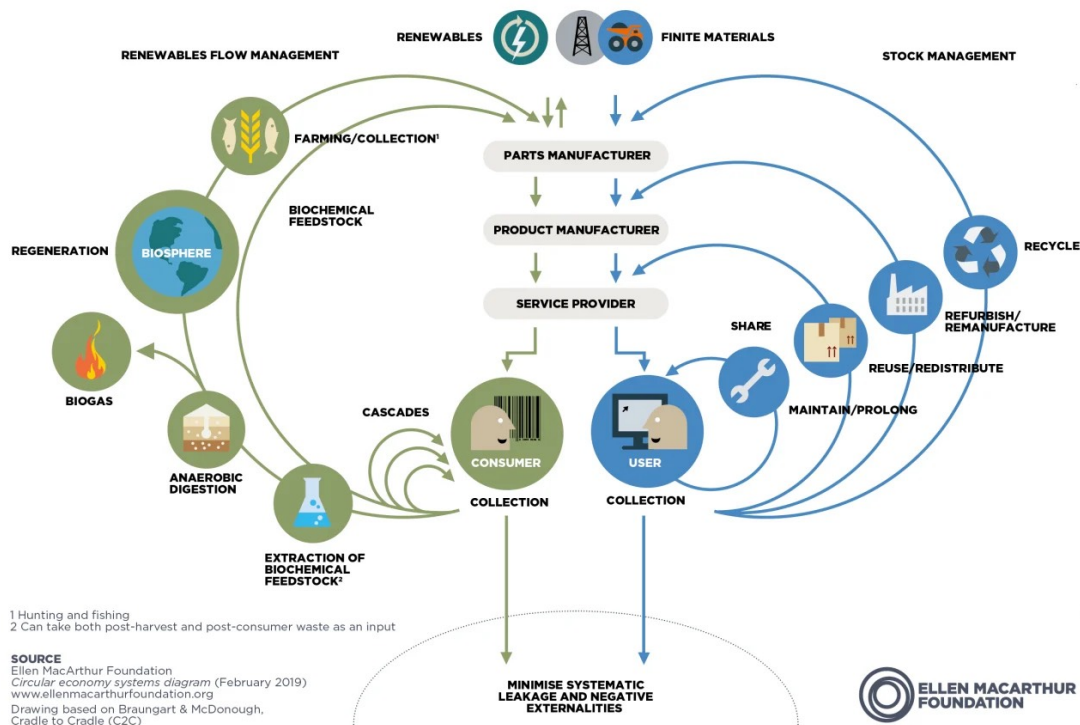


FIGURE 3 THE BUTTERFLY DIAGRAM

Source: Ellen MacArthur Foundation, n.d.-b.

One of the fundamental distinctions here is the Consumer - User dichotomy: the former can be used exclusively for biological materials (e.g. food), that are consumable while the latter instead is more appropriate for technical goods (e.g. car(s)). This dualism also poses the question of the need for ownership, when the service the product provides is what consumers (actually, users) are looking for in the end. The example in this case is why owning a drill when what we need in the is a single hole in the ground. (Ellen MacArthur Foundation, n.d.-b) Related yet important, is the separation Biological - Technical Cycle: as said, the former is dedicated to biological products, based on renewable flows and processes to reduce the impact on the environment (Abdelmeguid et al., 2022). The latter instead is focused on the development of models to foster the first one, in the form of restoring and recovering resources via, for instance, repairing, remanufacturing or recycling (Abdelmeguid et al., 2022).

The ultimate economic benefit mentioned in Ellen MacArthur Foundation (n.d.-b) is the decoupling — that is, breaking the direct link — of economic growth from virgin resources, while stimulating a stronger and more resilient economic system. For the environment instead, the reduced burden on the planet in the form of diminished pollution produced and resources extracted, would positively contribute to the achievement of global climate goals (Ellen MacArthur Foundation, n.d.-b).

More specifically for the fashion context, Dissanayake and Weerasinghe (2021; in Abdelmeguid et al., 2022) identify four main strategies to implement CE:

- I. Improve resource efficiency, by using renewable, regenerative and non-toxic inputs
- II. Application of Circular Design, based on longevity and customisation, aiming at easier dis-assembling, recycling and decomposing
- III. Extend product life, via repair, lease, swap and rent activities
- IV. Ensure circularity at the very end of product's life, fostering reuse or resale, as well as recycling or remanufacturing.

Considering the strengths of such business model and the need for transition in the FI, it becomes crucial to ensure its application in the current global economic system. A common denominator across papers addressing different aspects of CE, such as Abdelmeguid et al. (2022) and Sacconi et al. (2022), is the emphasis on the lack or little contribution of institutions/governments in the development of a sound framework to stimulate companies in the application of CE principles and business models. As Stahel (2016) argues, governments and institutions can play an important role by issuing laws, regulations and procurement rules. These should in fact favour companies and individuals that implement green and circular initiatives and penalise those that do not comply to such standardised behaviours (Stahel, 2016). More extensive description of the role of institutions is presented in the next Section.

Alternatively, Sacconi et al. (2022) suggest the establishment, or better the identification and the support, of the so-called 'orchestrators' in a supply chain to achieve a more systemic transition. Sacconi et al. (2022) defines, more in general, the concept of 'circular supply chain orchestration as "a set of deliberate actions by a focal firm that coordinates and manages diverse interests, ensures alignment among circular supply chain members, and structures, bundles and leverages resources to create circular value" (Sacconi et al., 2022; page 480). Yet, we argue that orchestrators should and have to operate in a bigger context that favours their role, and here is where policies come back into action.

2.3. European Policies

Companies may not consider profitable nor interesting for their business to implement a sustainable transition. Clearly, it requires a certain level of investment that may not be repaid in the short-run but may not only bring monetary benefits. Because of that, it is in the best intentions of governments and international organisation to foster such change with dedicated policies and interventions.

2.3.1. Sustainable Development and Fashion

We would like to recall the definition of Sustainable Development: according to the Brundtland Report – also known as 'Our Common Future' --, the term implies "[...] meeting the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987; page 41). More detailed information on how to achieve such goal were disclosed in subsequent documents, including 'The

2030 Agenda for Sustainable Development', adopted by UN MSs in 2015. At the core of the strategy, lie the Sustainable Development Goals (from now on, SDGs) which address key areas of improvement and advocate for partnership among actors.

It comes that the situation presented in the previous sections does not fulfill the definition of Sustainable Development and fails to meet the SDGs. The current state of the art describes a strong and powerful FI, that could definitely contribute to a more sustainable and equitable development, yet keeps opting for exploitative and polluting actions (United Nations Alliance for Sustainable Fashion, 2021). United Nations Alliance for Sustainable Fashion (2021) describes in details the extent and the role that the FI can play in the achievement of the SDGs. We will summarise the findings based on the three main categories of SDGs identified in Palomares et al. (2021) and presented in Figure 4:

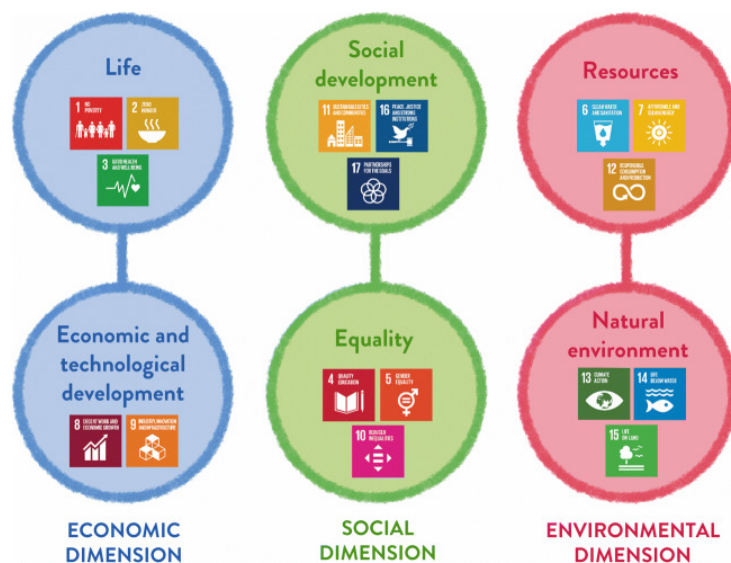


FIGURE 4 CLASSIFICATION OF THE SDGS

Source: Palomares et al., 2021

Environment - SDGs 6, 7, 12, 13, 14, 15: As seen in previous sections, the FI is extremely resource intensive: appropriate water management, both as input and waste, and employment of renewable resources are crucial. A lot can be also done on the consumption side, like boosting customers' information about manufacturing and products to foster more conscious purchases and usage. Getting to chemicals and waste management, stricter strategies and more transparency should be implemented, also to contribute to maintenance of the carrying capacity, especially of production location. This, together with more targeted measure, may contribute to the reversion land degradation and the regeneration ecosystems, as also to address other phenomena, such climate change (United Nations Alliance for Sustainable Fashion, 2021). These goals and interventions will be the main focus of our analysis.

Economic - SDGs 1, 2, 3, 8, 9: The FI is highly exploitative also in respect to workers, especially those employed in developing countries. Not only wages are really low, they are also not offered the same opportunities as their peers in EU territories. Key profiles such as craftsmen and designers are also located in those 'remote' areas, thus they need to be provided appropriate

conditions for personal development and to foster innovation, therefore stimulate the local economy. It all sums up into giving employees the rights to earn adequate income, while at the same time have a safe and fulfilling work life (United Nations Alliance for Sustainable Fashion, 2021).

Social - SDGs 4, 5, 10, 11, 16, 17: Economic benefits can translate into improved social conditions, starting for example from children's rights. When parents earn adequate income and regulations are enforced, younger generations are guaranteed more enjoyable childhoods, free from work and dedicated to fun and education. The majority of workers employed in the FI are women, yet they are not guaranteed the same treatment as their male colleagues and of their European counterparts. Ensuring gender equality not only pays in terms of productivity, but also ensures better living conditions for workers and their families. Lastly, the industry is reliant on migrant workers who are also not offered the same opportunity and conditions of locals. It is in the best interests of companies to protect such a group (United Nations Alliance for Sustainable Fashion, 2021).

In the light of all these points, it comes that governments and international organisations may play an important role to ensure standards and enforce regulations to monitor businesses' commitment.

We acknowledge the importance of all three areas and recognise the need to operate jointly and simultaneously on each one. On the other hand, for the purpose of this analysis, we will focus exclusively on the environmental perspective as we believe may offer more interesting insights in respect to chemicals employment and recycling activities.

2.3.2. Policies for Sustainable Development through the FI

Institutions can operate to moderate markets by establishing a set of policies and regulation to impose common grounds. These may range and cover a set of different aspects; for the sake of this paper, we will present only the ones that related to the employment of chemicals and recycling. Later, we will also focus only on regulations to be implemented at European level and applied in all MSs.

Extended Producer Responsibility (EPR): OECD (2022) defines EPR as "an environmental policy approach in which a manufacturer's responsibility for an item is extended to the post-consumer stage of a product's life cycle". In this sense, companies are responsible for the correct disposal and recycle of textile products, once their usable life is over. Boiten and Ellen MacArthur Foundation (2022) offer their perspective and recommendations on aspects that have to be considered when drawing policies to foster textile reuse and recycle. Among those, we can highlight the identification of the right measurement tools and rates to evaluate brands' performances, adequate framework and infrastructure to support differentiated collection and treatment, as well as the establishment of fees and eco-modulation strategies —increased fees for unsustainable products and reduced for conscious behaviours; these can be then invested in shared infrastructure for collection and recycle. More on the production side, it would be

important to stimulate the innovation and revision of product designs that facilitate recycling and employ higher rates of non-virgin inputs (Boiten & Ellen MacArthur Foundation, 2022).

Exports: Still Boiten and Ellen MacArthur Foundation (2022) tackle the issue of export of textile waste from the EU area as end point of the chain. Since it would not be possible to completely eliminate such trade, it is important to control the quality of outgoing products. High-quality unused items can in fact reach second-hand markets in other countries or donated to locations in need. Good-quality products can instead be correctly transformed and recycled into new pieces or other materials. The goal of this kind of policies should be to address the export of low-quality waste to destinations where it will be directly (improperly) disposed — that is, incinerated, also just to positively affect recycling and waste treatments rates in European territories or to avoid stricter EU regulations (Boiten & Ellen MacArthur Foundation, 2022).

Recycling: Textile recycling lies at the heart of EPR, yet, has demonstrated, it is far to be extensively implemented. According to Hole and Hole (2020), recycling in the FI can be improved by learning from effective policies in other sectors. The starting point would be to offer adequate infrastructure to enable consumers and companies to properly dispose waste, especially with dedicate collection points/bins. The more accessible they are, even door-to-door and for free, the less actors would feel the burden of properly dispose their unused items. Once collection is improved, it is possible to start working on more innovative and efficient recycling techniques and plants. This relationship is important as strong collection and sorting is already a positive factor for more proper material treatment (Hole & Hole, 2020).

Raising Awareness: Among the policies analysed by Hole and Hole (2020), initiatives to inform consumers about sustainable development and recycling play an important role. When told about the consequences and un-sustainability of certain industries, citizens seem to be more keen to actively contribute to collection activities. Generalised interventions may include, for example, educational workshops in schools and in work places. More wide-spread informational campaigns and advertisements, also in collaboration with brands from the industry, may definitely also play an important role, by emphasising the importance of collaboration and the concrete commitment of firms (Hole & Hole, 2020).

Imports: As presented before, the EU is a net importer of inputs and textile products (European Environment Agency & European Topic Centre, 2022). On one hand, this represents an economic and social opportunity for producing countries, if and only if the conditions for adequate living and working conditions are respected. On the other hand, it corresponds to increasing transport costs, not just expressed in monetary terms. They also include augmented greenhouse gases and transport emissions, as well as increased packaging, thus waste, to ensure a safe journey (European Environment Agency & European Topic Centre, 2022). Lower impact transport systems should be preferred, even if may require more time as products are not perishable. Reusable and more sustainable packaging could also be developed, against plastic and single-use wrappings.

Chemicals: Going back in the value chain and more to our focus, as already presented, chemicals have a strong presence in the manufacturing process of textile products. Producing countries outside of the EU may be subject to different regulations therefore it becomes crucial to require companies importing products to ensure that no hazardous substances have been employed. To support, controls can be enforced to evaluate the presence of such chemicals on items that reach the EU market (European Chemical Agency, n.d.). The same reasoning would hold also for the import of inputs, for instance cotton, verifying that no banned substances have been employed in growing and treatment, just as for food (Aktar et al., 2009).

It comes that there is a need for an harmonised framework of laws and regulations that cover different aspects of the value chain. In European MSs, this can be achieved at higher level with common legislation and cooperation between the different sectors. If properly implemented, the Union can become an example and a reference point in respect to policy for more sustainable industries, working toward its own sustainability and jointly for the achievement of the SDGs world-wide.

It is also important to note that EU MSs may appear to have a lower impact on the planet in terms, for example, of greenhouse emissions or water pollution. Yet, these are not realistic figures as they mostly only take into account negative impact that occur in those territories, while as we have shown, manufacturing takes place in other locations, thus summing up to the burden of those countries. In reality, those states do not 'benefit' from the products obtained from that negative impact, therefore it is not fair to count the negative externalities as theirs (European Environment Agency & European Topic Centre, 2022). EU Policies should therefore start considering the wider picture, considering the actual negative effect of the whole chain.

2.3.3. Other key principles

As we tried to explain, achieving a greater sustainability of the FI is crucial considering its social and environmental impact, not only to reduce the burden on the planet but also to positively contribute to the achievement of SDGs at global level. While there is need for consistent action at both institutional and corporate level, some individual agents are already working on their own initiatives.

However, it is important to distinguish between effective actions and **greenwashing tactics**. According to Fashion Revolution (n.d.), Greenwashing can be defined as "[...] when brands, corporations, organisations or governments co-opt sustainability narratives to portray an environmentally responsible image without sufficiently responsible action". This may imply referring to themselves as sustainable while only changing a few aspects of their business models, for instance improving a really small portion of their offerings, or implementing take-back program to alleviate guilt from new purchases (Adamkiewicz et al., 2022). It is important for both consumers and institutions to identify such players in order to stimulate them to adopt more constructive actions. On the other hand, it is in the best interest of government and international organisation to provide the right framework for such kind of initiatives to not take place. Adamkiewicz et al. (2022) observes how, at the moment, **eco-labels and certifications**

can actually be misleading and favour companies engaged in greenwashing activities. Such systems may, in fact, use ambiguous terms/keywords, require low level of information, thus decreasing the demand for transparency, or be not-so-independent from companies seeking for those seals of approval (Adamkiewicz et al., 2022). Yet, Courtat et al. (2023) suggest that eco-labels as a form of business-to-consumer communication can actually be reliable if stronger rules are imposed; and that does not apply only to textile, but can be extended to other product categories. The claim here is that the complete life cycle of items should be considered — Life Cycle Analysis (LCA) as core pillar —, based on concrete scientific evidences to support claims and foster transparency (Courtat et al., 2023).

To conclude, governments and companies should really start considering operating under **precautionary principle**. It "is an approach to risk management, where, if it is possible that a given policy or action might cause harm to the public or the environment and if there is still no scientific agreement on the issue, the policy or action in question should not be carried out" (Publication Office of the EU, n.d.) Considering that not only the environmental and social threat are public and well-known, existing damaging operations are required to be addressed to reduce, up to eliminate, their negative impact. Policies and interventions shall therefore be created with the intention to not provoke any additional harm and to address the effects of previous ones. In respect to innovations and frameworks to stimulate technological development, they have to be conceived already with a positive connotation and their effects have to be taken into account before they are actually placed in the market. It is important to reduce the risk of incurring into unforeseen negative effects arising as a consequence of inappropriate use of certain substances or techniques, when pre-employment analysis could have been conducted (Greenpeace International, 2012).

2.3.4. The European Framework

As 'SDG 17 - Partnership for the goals' emphasises, there is a need for collaboration between actors to achieve the bold, yet crucial, objectives of the 2030 Agenda. In this perspective, synergies between MSs and with EU institutions becomes fundamental. Due to their supranational and multi-topic competences, they play an important role in ensuring a consistent legislative and regulative framework across the European territory. Defining key objectives and outlining operating strategies, approved and applied by all MSs, works also in this direction. Such framework is an intricate system, which comprises a set of different bodies, procedures and instruments. We believe that it is worth giving a brief introduction as it provides a brief and general explanations of the different tools included in the policy instrument(s) presented later.

2.3.4.1. European (Legislative) Bodies

The EU comprises a set of different official bodies; within the legislative framework, in particular in the decision-making process, three institutions are mainly involved:

European Parliament (EP): gathering representatives democratically elected by citizens of the EU MSs. It works as a co-legislator with the Council, as it can adopt and amend legislative proposals and decide on the budget; it also supervise the work of the Commission. In order to do

so, it organises itself in committees, drawing up, amending and adopting legislative proposals and own-initiative reports, to be presented at the plenary assembly (European Parliament, n.d.).

Council of the European Union: comprising national government ministers from each MSs, grouped according to the policy area tackled. It coordinates MSs' policies and collaborates with the EP in negotiating and adopting legislative acts (The Council of the European Union, n.d.).

European Council: to not be confused with the Council of the EU. It is not a legislative body and gathers the head of states or government (depends on the assigned responsibilities in each MS), meeting to define the political direction and priority (The Council of the European Union, n.d.).

European Commission (EC): composed of 27 Commissioners appointed every 5 years, it takes decisions on the political and strategical direction of the Union. It is organised in departments, or Directorates-General (DGs), which are dedicated to specific policy areas; each DG develops, implements and manages policy, law, and funding programmes in their respective field of expertise.

In the legislative process, the Commission proposes new policy initiatives, based on reports defined as "impact assessment", outlining the potential economic, social and environmental impact and possible advantages and disadvantages. To be as complete as possible in their evaluations, inputs are outsourced to non-governmental organisations, experts and national authorities, but also citizens are given the opportunity to express their opinions (European Union, n.d.).

Once the proposal is drafted, it is passed on the Parliament and the Council of the EU, which can present amendments. If the three institutions do not agree on the text, the proposal can be either withdrawn or a new reading round can take place. New amendments are brought up and if all bodies agree, then the policy is adopted (European Union, n.d.).

2.3.4.2. European Instruments

The EU is based on the rule of law: this implies that every action is founded on treaties that have been approved democratically by its members.

There exist different types of legal acts, which have different implementation processes and coverages. The first distinction that can be made is between Primary and Secondary Law. The former refers to the EU Treaties, which set out fundamental principles, objectives and functions of the EU itself, its institutions and composing MSs. They are and have been negotiated by all MSs and ratified by respective parliaments; new members have to amend them upon entrance in the EU. The most important ones are, chronologically, The Maastricht Treaty [1993] and The Lisbon Treaty [2009]. The former established the European Union as we know it and outlines the drawing joint policy areas, including common foreign and security (CFSP), as well as justice and home affairs (JHA). The Lisbon Treaty instead reformed the previous structure of

the EU and its functioning: in particular, it introduced the European Council as official institution, with its full-time president (The Council of the European Union, n.d.).

From those founding treaties, secondary law instruments are drawn (European Commission, n.d.). The main ones are presented in European Union (n.d.):

Regulations: binding acts, applied in their entirety in all MSs, automatically from the date of application. In some cases, individual national measures to grant the implementation may be needed, from either institutions or regulatory bodies and agencies.

Directives: sets out goals that all EU countries must achieve, with the individual MSs having to draw their own laws in that direction within a certain timeframe. This process requires the incorporation dedicated laws in national legislation; in case of delays or improper implementation, the EC opens infringement procedures. In worst cases, the issue may be brought to the Court of Justice of the European Union and sanctions may be imposed on the failing country.

Decisions: binding law only for whom it is addresses, whether country or organisation, on a specific matter.

Recommendations: do not represent any form of obligation, used to present the view of the issuing body and suggest a line of action for further initiatives.

Opinions: allow all main EU institutions to make a statement in a non-binding way.

It is important to note that policy instruments within the European context are organised as to refer to each other and complement or further implement each other's measures.

2.3.5. Policy Instruments

One of tasks assigned to the Council of European Union and the EC, as mentioned before, is the drafting and proposal of dedicated policies, tackling specific topics and subjects. These particular instruments are not legislations per-se, but rather a plan or strategy developed by either public institutions (as in our case) or private organisations to address a particular situation (Cambridge Dictionary, 2023). To then implement policies, it may become necessary to implement one, or more probably, many of the binding or non-binding instruments presented in the previous Section.

Specifically in the case of the EU, policies ensure, to the extent possible, that the same reasoning and overarching goal is agreed and followed across MSs. Policies topic can range from food and agriculture, to migration and security; sustainability transition is also included, as well as in its fashion subset.

According to the policy theories framework, as a general rule, policies should be based on three pillars, presented in Weiss (2000):

Clear picture of the phenomena to be address - Problem Theory: defining the problem, its origins and consequences is fundamental to understand where action is needed and why. It can be objectively described but the importance may be subject to personal preference (Weiss, 2000). Issues tackled by policies can be also defined as failures; this term includes different categories, among those market failures in particular are relevant in this paper. These specifically can be defined as violations of the basic assumptions that characterise perfectly competitive economies, and therefore interfere with the efficiency of production and consumption. Weimer and Vining (2017) provides an extensive description of the four most common market failures, which are:

- **public goods:** products that are non-rivalrous in consumption and/or non-excludable in consumption; Weimer and Vining (2017) uses national defence as an example.
- **externalities:** “any valued impact (positive or negative), resulting from any action (whether related to production or consumption) that affects someone who did not fully consent to it through participation in voluntary exchanges” (Weimer & Vining, 2017; p. 93). On the negative side, they can be, for instance pollution from production while an example of positive externality is the herd-immunity from vaccination.
- **natural monopolies:** it describes a case in which an individual firm can produce at a cost that is lower than any other. However, it results in a problem of undersupply in the market.
- **information asymmetry:** it occurs when the consumer is not provided with the right amount of information to perform an informed purchases.

Clearly, there exist some other type of problems, a part from the market failures listed here. Among those, as it is relevant for the upcoming analysis, structural issues of the market are particular relevant. These can be considered as intrinsic characteristics that may harm its functioning.

Seked outcome - Desired Outcome Theory: yet related to the previous, it presents the potential sources of improvement, in both terms of desired outcome and actors that have control over its occurrence. Depending on how ambitious the goals is and how heavily its undermines the status quo, interventions may be harder or easier to draft and, subsequently, implement (Weiss, 2000).

Intended means of intervention - Intervention Theory: outlining the plan to influence actors and/or foster a change in the existing situation. It has to include: the agent(s), the one(s) intervening, the target(s), those whose actions are being changed, the mechanism, how to intervene, the time and place, when and where the action is happening (Weiss, 2000).

This theory provides a solid theoretical ground for our research, which will be presented more in details in the next Section and Chapter.

3. METHODOLOGY

In this part, we are presenting the general methodology and research design that will be implemented in the following Chapters. We are starting by describing the topic more in details and then later discuss the research strategy.

3.1. The research topic

In this section we would like to present more in details what the topic of our research is and which questions we would like to answer.

3.1.1. Topic description

As presented in the Literature Review in section 2.1., the FI is one of the most polluting sectors and needs to undergo a radical change. If companies fail to understand the gravity of the current situation, citizens and institutions, but especially governments, must advocate for and stimulate a more consistent sustainable transition with dedicated interventions. On the legislative side, policies and regulations are probably the strongest tools national authorities may utilise.

SDG 17 - 'Partnership for the goals' addresses the need to collaborate as to achieve equitable and strong development for all; individual action still counts, but joint interventions are more powerful. In this perspective, the EU represents a great opportunity to build up a shared and complete framework, agreed and applied by all member states. Therefore, EU institutions and European countries need to work together and develop a common network at supra-national level to address pressing issues and draw common guidelines for future steps. If properly implemented, the Union can actually become a reference point in terms of legislation and initiatives working toward the sustainable transitions of multiple industries.

In respect to the FI, its role in the EU market has been recognised by institutions, but also its negative implications have received the needed attention. Conscious of the environmental and social burden, EU legislatives have already started working on interventions to regulate the FI within the EU borders. The most recent initiative in the field is the 'EU Strategy for Sustainable and Circular Textiles', released in the European Commission on March 30, 2022 and presented in sub-chapter 4.2..

Considering the extent of the initiative and the importance of the sustainability transition, it becomes relevant to evaluate the progress of the initiative and the actual coverage of the strategy. Yet, it is not possible to assess the impact of the instrument, due to its recent implementation — 30th of March 2022 —, and therefore the lack of market data for the post-publishing year and the need for a period of transition for the policy to start working. For this reason, we will instead focus on the assessment of the accuracy of institutions in identifying key market failures and aspects of the FI that need to be addressed, to stimulate a more sustainable and circular system. Industry and market figures for years before 2022 are available and

the strategy is published for consultation, thus it is possible for us to compare the two and make our own conclusions.

3.1.2. Research questions

In the light of the previous observations and the context of the Literature Review, the general research question (RQ) that we would like to answer goes as follows:

RQ: How accurate are EU policies in tackling the un-sustainability of the fashion industry?

As presented in section 2.3.5. in the Literature Review, policy instruments are developed starting from observed market (or governmental) failures. With our analysis, we would like to understand which deficits in the FI the Commission has considered and to which extent, in order to assess the intended coverage of the developed policy instrument(s).

Based on the research and findings useful to answer the RQ, we will also try to address the following sub-questions (SQ):

SQ 1: Which stages of the supply chain are targeted by the EU Strategy for Sustainable and Circular Textiles?

Considering the global extent of the supply chain, it is important to understand if policies are targeting only the portion(s) that takes place in EU Territories or consider the supply chain as a whole.

SQ 2: To what extent (other) policies can be implemented in the fashion industry to reduce the usage of hazardous chemicals and virgin materials in production?

As explained in section 2.3.4.2., EU policies operate in a bigger legislative framework and tend to reference to each other. We would like to observe which other instruments and where they are involved, especially in the context of usage of chemicals and virgin materials.

SQ 3: How are policies tackling the recycling of textile fibers?

Recycling plays an important role in CE, therefore we would like to observe how it is planned to be stimulated, for example by fostering R&I or raising awareness and engagement of consumer.

3.1.3. Research structure

In order to answer the inquiries outlined in section 3.1.2, the paper will cover the following aspects:

Market Description: We will conduct an evaluation of the conditions of the market, starting from the main characterising figures, including revenues and employment, to understand the role of the EU fashion market in the global economy and its changes over time. Subsequently, we will observe more in details information about the demand (and therefore, the production)

for clothing products, the employment of chemical materials in products and the recyclability and recycling rate of textile. The goal is to identify the existing market failure(s), that, for what we have observed, could be described as negative externalities.

Policy Coverage — EU Strategy for Sustainable and Circular Textiles: Subsequently, we will perform a content analysis of the EU Strategy for Sustainable and Circular Textiles. We would like to observe how the current state of the art in the matter of EU policies for a more sustainable fashion industry is operating, which aspects it is tackling and how it intends to operate and under which overarching goal(s). We will then compare the market failures identified with the set of actions and legislation included in the policy, to assess the extent of the coverage.

Remarks — Interpretations and Suggestions: Based on the content of the previous point, we would like to provide some general observations concerning the applicability and the possible effectiveness of the strategy. With these evaluations, we will answer the research questions listed before. To conclude, we will try to formulate some suggestions for adjustments and further actions to take in order to ensure a more consistent transition.

Clearly, to present such content, we will perform a set of researches and analysis that need to follow a logic scheme. This framework is now presented in sections 3.2.1. and 3.2.2..

3.2. The research structure

In this sub-chapter, we will present the research strategy that will guide the subsequent analysis in the upcoming Chapter. We will start by describing the methodology more theoretically, to then tailor it to our needs.

3.2.1. Research strategy

Considering the parts of analysis presented in section 3.1.3 — the market description and the policy coverage — a **qualitative research approach** is the most suitable method. It is structured as a descriptive analysis of secondary data aimed at offering a detailed picture of the characteristics of the European apparel market and a specific policy instrument, addressing the un-sustainability of such sector.

A Qualitative Research has been defined by Corbin and Strauss (1990) as “any type of research that produces findings not arrived at by statistical procedures or other means of quantification. It can refer to research about [...] organisational functioning, social movements, cultural phenomena, and interactions between nations” (Corbin & Strauss, 1990, page 11). The topic of our research fall within this category, as we intend to observe, among others, the functioning of the European market, including its interactions with the global FI.

This method can also be defined as a Flexible Strategy, as its structure and characteristics enable to space across several aspects of the topic considered (Mwita, 2022). In addition, it allows the researcher to explore a number of different interpretations of described data (Mwita, 2022) that, in our case, are market figures and phenomena occurring.

On the other hand, this subjective connotation may cause an excessive inclusion of writers' ideas and preferences, which could compromise the analysis (Mwita, 2022). The output may therefore be contested by other parties that do not agree with observations and conclusions.

Additional barriers or disadvantages specific of the methodology implemented for our analysis will be presented as we describe it more in details.

As briefly introduced, in our specific case, data will not be personally collected, considering both the extend of the market and the amount of information we need to offer a well-structure analysis. Instead, we will observe and extract them from available databases; more details on the procedure will be introduced in section 3.2.3. Considering that we will be working with secondary data, and taken into account our research question, we are opting for a Descriptive Qualitative Analysis. We are not trying to prove hypothesis, but rather offering a view of the current state of the art and how it is meant to be challenged.

To summarize, our research will work with two subsequent stages:

- 1. Identifying market failures:** from secondary data available on public databases, we will extract relevant data regarding the performances on the European market in terms of production, trade with non-EU countries, recycling and chemicals employment. Such information will be presented as to offer a picture of the evolution over time and, if possible, identify reasons for those differences based on other related information. From this data, we will be able to draw some conclusions about the unsustainable characteristics of the market that need to be addressed by policies. This will be done by using of two managerial tools, the SWOT and PESTEL analysis, presented in section 3.2.2.. These instruments enable to classify and summarise identified findings from observed data.
- 2. Adherence of policies to the market failures:** the EU Strategy for Sustainable and Circular Textile is the main instrument dealing with the sustainability transition of the textile industry, including its subset dedicated to apparel products. Therefore, the included set of actions should be tackling issues that such market is currently facing or embodying. The analysis will firstly present the instrument in its entirety to then compare the observed failures with the listed actions. The ultimate goal is to understand which issues are considered and how they are tackled, as to evaluate the adherence of the instrument to the needs of the market.

We will then conclude by providing an overall evaluation of the accuracy of the instrument and offer suggestions on how it can be further implemented in future revisions

3.2.2. Analytical tools utilised

As mentioned in section 3.2.1., we are utilising both a SWOT and PESTLE Analysis to offer a clearer description of the characteristics of the European apparel market, to then emphasise the existing market failures. We have opted for such tools because of their slimness and their intrinsic characteristics, that we will now present.

The **SWOT Analysis** is a fundamental managerial tool that helps to identify identifies the internal and external factors that affect, in this case, market performances. In fact, SWOT is an acronym for Strengths, Weaknesses, Opportunities and Threats. The first two describe internal characteristics of the context analysed: specifically, the strengths identify positive functions while weaknesses represent features that may impede or hinder the performance (Gürel & Tat, 2017). Instead, opportunities and threats are external factors can be either be exploited to in favour of the market, in the case of the former, or that can undermine and obstacle it, as for threats (Gürel & Tat, 2017). In the context of the market description that we will provide, weaknesses and threats can, in some cases, represent market failures. Thus, the SWOT Analysis offers a first perspective to identify negative externalities that need to be addressed.

The **PESTLE Analysis** instead works as a support tool to analyse and monitor macro-environmental factors, by offering a classification by thematic areas (Washington State University, n.d.). These are included in the acronym and are: Political, such as stability, trends...; Economic, including growth or other performance indications; Social, demographics, behaviours...; Technological, existing or possible future innovations; Legal, such as standards and regulations; Environmental, everything that relates to the burden on the planet (Washington State University, n.d.). Identified factors can have both a positive or negative connotation, specifications are left to the analyst or to a subsequent SWOT analysis. For this last reasons, the two tools can be used separately or jointly, to offer a more complete classification of the characteristics of the subject of the analysis. As mentioned already, for our market description, we have decided to implement both.

3.2.3. Data selection process

As mentioned in the previous sections, we have opted for a qualitative methodology, with the usage of secondary data from publicly available source. Dedicated websites offer the opportunity of selecting and applying filters and criteria to tailor the research and data extraction to the needs of the analysis. These include, for instance, selecting time frames, countries or industries included.

We are will now provide more detailed information on the data selection processes, based on the analysis we will subsequently perform.

Market description: As mentioned before, we would like to build a complete picture of the current state of the fashion market. Therefore, extracted data will present monetary performances of internal markets in each member state (MS) and companies operating within their borders in terms of production, sales and waste. For our analysis, we will extract the most recent data (latest from 2022, 2021 or 2020, depending on the availability) back to 2014, only for EU-27 and, when possible, only apparel sector or alternatively apparel and footwear. In the case of monetary and financial figures, we consider Euro (€) as our standard currency and tons, or multiples, for weights. Considering our geographical preference, we will mostly utilise European databases, in particular Eurostat¹, as main source of information about the general

¹ <https://ec.europa.eu/eurostat/web/main/home>

state of the fashion market. For global figures and more detailed information about, for instance about sales channel and second-hand market, we would instead rely on external or dedicated institutional sources, including Statista² and EURATEX³. Please note that, in the case of the former databases, we may have to consider financial information in US dollars (\$); when possible, we would still apply the preference for €.

Policy coverage: as already mentioned, the main body of policy that tackles the sustainability transition of the FI is the “EU Strategy for Sustainable and Circular Textile”. Therefore, for the policy coverage analysis, we will analyse in detail the content of this document as to identify the different areas of interventions and the intended measures to implement, including reference to existing or future legislation and dedicated tools. We will still mention them and describe when they come into action. To fully understand the intended actions of European institutions, we have to look directly to their publicly disclosed documents, as there is no other way to access such kind of information. Therefore, the policy analysis will be conducted on released publications from EU and EC bodies, that can be easily accessed through EUR-Lex⁴ or other institutional websites/linkages.

3.2.3.1. Limitations related to the availability of data

During the extraction of data, it is not always possible to separate apparel items from general textile products, for example in particular when tackling waste and waste disposal activities. Therefore the analysis is based on data available on fibres and textile products and it is assumed that those conclusions are also valid for apparel products, being the latter a subset of the former. However, to the largest extent, figures retrieved are exclusively from the FI.

On another note it needs to be added that the analysis includes the assumption of treating the EU as a single element, taking into account the centralised legislative process. Yet, we have to remind that the Union is comprised of MS, and we specifically considered the so-called EU-27 - those are: Austria, Belgium, Bulgaria, Croatia, Republic of Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden -. Clearly, each country has its own cultural, social, economic characteristics which makes their attitude towards fashion and the performances of the FI different across MSs; some will also be presented. Therefore, the upcoming analysis has to be considered as a generalisation or an average of the behaviour of all components of the EU, leaving behind such variations and diversities. However, this is an important point that will influence our conclusions and is worth mentioning.

Lastly, we have to remind that most firms manufacture in countries outside of EU continental borders, especially in developing nations, as we will present in the upcoming chapter. There-

² <https://www.statista.com>

³ <https://euratex.eu>

⁴ <https://eur-lex.europa.eu/homepage.html>

fore, we have to consider that some information about behaviours of companies, especially for instance in respect to chemicals employment, may not be easily accessible. In that respect, we can only consider the portion of products sold whose manufacturing process occurs within the EU and for which data are available. On the other hand, considering the centralisation of legislation and monitoring activities, we do not expect that large heterogeneity in definitions and information in respect to data and publications collected within European borders.

3.2.4. Intended output

Selected data and policy instruments will be carefully analysed as to deliver observations in two main areas: market failure and policy coverage.

Section 4.1.5.3. - Market failure(s): by analysing the state of the apparel market, on the basis of statistical data and monetary figures, we would be able to identify key market failures, that prevent the FI from undergoing a consistent sustainability transition. In particular, the focus will be on (negative) externalities which, in the context of the clothing market, are the biggest contributors to its (un-)sustainability. It is important to note that, despite the objective and numerical nature of the data selected, market failures will be presented and treated as non-numerical and more subjective, as they are conclusions derived from our personal observation and analysis of data. The reason behind the choice of this form is that, in this way, they assume the same descriptive form as the policy coverage, enabling the comparison between the two.

Section 4.2.5. - Policy coverage: by breaking down the content of the selected policy, it would be possible to establish which failures it is targeting and which instruments it will implement. This analysis would develop a more complete understanding of the idea of sustainable FI that European institutions have in mind and what are their plans to reach it.

Chapter 5 - Discussion of findings: we will summarise our findings by comparing the two groups of observations, as to evaluate the accuracy of EU institutions (the EC in particular) in drafting a strategy that meets the needs of the market. Compatibility between the two highlights the ability of institutions to understand the functioning of the market and its weak points. On the other hand, differences could emphasise areas of improvements for future policy initiatives, as adjustments or new instruments, that we will also formulate in the last Chapter of this document.

4. RESULTS OF THE ANALYSES

4.1. Market Analysis

In this Section, we will present and analyse available data on the conditions of the European FI, its role in the global economy and its engagement in chemicals employment and recycling activities.

Data have been collected from European and Global Databases, as well as private collectors. Sets have not been modified, yet they may have been manipulated to fit the extent of the analysis, as explained in section 3.2.3..

4.1.1. The Global Market

As mentioned, the FI is one of the most solid sectors and plays an important role in the global economic system. In this section, a general overview of the financial performance of the fashion market over the past 10 years and in respect to the global economic system is provided.

4.1.1.1. General Description & Observations

As of 2021, the revenues of the apparel world market summed to a total of \$1,55trillions (Statista, 2023a), roughly €1,31trillions if we consider the 2021 average conversion rate of 1\$ = €0.846, the lowest of the past 6 years (Internal Revenue Service, 2023). In Table 1 reporting from Statista (2023a), we are presenting the revenues of the apparel industry over 8 years to understand its fluctuations and the alignment with the behaviours of the global economy.

Trillion \$	2014	2015	2016	2017	2018	2019	2020	2021
GDP Global Economy	79.45	74.97	76.23	81.05	85.97	87.28	84.89	96.31
% Change (n – (n-1))		-5.64	1.68	6.32	6.07	1.52	-2.74	13.45
Revenues Appaerl Market	1.54	1.45	1.46	1.52	1.58	1.58	1.40	1.55
% Change (n-(n-1))		-5.84	0.69	4.11	3.95	0.00	-11.39	10.71
% Share of Global Economy	1.94	1.93	1.92	1.88	1.84	1.81	1.65	1.61

TABLE 1 REVENUE OF THE APPAREL MARKET WORLDWIDE FROM 2014 TO 2027 (IN TRILLION \$).

Extraction until 2021, as not to include forecasts. % Change calculated on Excel, based on available data.

Source: Statista, 2023a

According to McKinsey's Retail Practice & Business of Fashion (2021; 2022), the two years characterised by the global pandemic, that are 2020 and 2021, exhibit lower revenues than the previous years. According to our calculations of % change, in 2020 the FI experienced a loss [in red in Table 1] in revenues of more than 11% compared to the previous period. In the following year instead the industry managed to recover a little, yet not able to catch up with the performances and trend of the period 2014-2019. We would suggest, and agree with experts' perspective in the Literature Review, that such big loss is due to two main factors: emergency restrictions to daily life activities, including shopping in physical stores, and slow downs in the supply chains, including reduced trades between Eastern and Western markets. In fact, we will demonstrate how EU MSs (and other countries around the world) are heavily reliant on Eastern Asian countries, in particular China and Bangladesh, to satisfy their internal demand. More accurate description of such relationship will be presented later in this chapter.

When considering the apparel market within the context of the overall global economy, we can visualise that, as of 2022, it contributed for 1.61% of global GDP. Yet, this figure has decreased over time, despite the overall constant growth in revenues of the apparel market. This could indicate that consumers are either spending more on other goods or, alternatively that prices of clothing products did not fluctuate at the same rate as other goods. Since the first analysis would be too long to perform, we would instead verify the last point by looking at inflation rates, presented Table 2.

	2014	2015	2016	2017	2018	2019	2020	2021
Global Market								
Inflation Rate	2.35%	1.43%	1.55%	2.19%	2.44%	2.19%	1.92%	3.50%
Change		-0.91%	0.12%	0.64%	0.25%	-0.25%	-0.27%	1.57%
Apparel								
Inflation Rate	0.08%	-1.26%	0.11%	-0.34%	0.03%	-1.28%	-4.81%	2.47%
Change		-1.34%	1.37%	-0.45%	0.37%	-1.31%	-3.53%	7.28%
Correlation	0.6							

TABLE 2 INFLATION RATES OF THE GLOBAL MARKET AND OF THE APPAREL MARKET, FOR THE TIME PERIOD 2014 TO 2021. % Change and Correlation calculated in Excel.

Source: Global market: macrotrends, 2023; Apparel: Official Data Foundation | Alioth LLC, 2023.

The correlation rate for the two inflation rates is 0.6, which is the limit to indicate a positive strong correlation. This means that the two rates have a positive relation - when one increases, the other does so too -, yet not perfect, meaning that they may not vary always by the same extent. This is also visible when looking at the % changes, which are always larger for the apparel industry. If we now look exclusively at the value of inflation rates, we can observe how the apparel industry has always rates lower than the overall global market, meaning that its prices increase at a lower rate than other goods. Therefore, it could be that the reduced shares of contributions to the global market is due to the lower, in respect to other goods, prices. It would be interesting to further investigate the reasons behind this difference: one that comes

to our mind is the low costs of productions arising from the poor working conditions, including low salaries, of textile workers in Eastern locations. However, this falls beyond the scope of our analysis and will therefore be left as an open issue.

Now, we can break down the apparel market into its national markets, to identify its main contributors and the interactions between different geographical locations, mentioned before.

If we observe the rank of the top 5 countries in the world in terms of revenues, we can observe that none of the European MSs contributes as significantly as other individual states around the planet. However, taken collectively as EU-27, they would represent the second or third - depending on the year - biggest global market, which Germany, Italy, France and Spain contributing the most (Statista, 2023a).

Billion \$	2018	% Share of global revenues	2019	% Share of global revenues	2020	% Share of global revenues	2021	% Share of global revenues
Global Revenues	N/A	N/A	1580	100	1400	100	1550	100
United States	315.3	19.96	320.8	20.3	296.4	21.17	317.6	20,49
China	277.0	17.53	274.9	17.4	256.2	18.3	303.3	19.57
Japan	83.61	5.29	84.87	5.37	66.57	4.76	75.89	4.9
India	74.63	4.72	80.02	5.06	66.54	4.75	73.18	4.72
United Kingdom	73.18	4.63	73.64	4.66	66.77	4.77	76.37	4.93
EU27	305.28	19.33	291.46	13.89	259.27	18.52	287.69	18.56
		% Share of EU revenues		% Share of EU revenues		% Share of EU revenues		% Share of EU revenues
Germany	71.08	23.28	68.83	31.36	63.69	24.57	70.59	24.54
Italy	62.46	20.45	56.87	2591	49.26	19	54.3	18.87
France	40.42	13.24	38.08	17.35	32.81	12.65	36.81	12.8
Spain	25.75	8.43	24.46	11.15	20.53	7.92	22.94	7.97

TABLE 3 REVENUE OF THE APPAREL MARKET WORLDWIDE BY COUNTRY IN 2022 (IN BILLION \$).
Extracted 5 highest values, included Germany, Italy, France and Spain.

Source: Statista, 2023a.

The general global trend for the pre-Covid era was of increasing revenues, at different intensities in the different major markets. However, 2020 represents an exception to this phenomenon, recording significant losses in revenues for the apparel market. USA, China and the EU were in the class of the biggest clusters of COVID-19 infections (World Health Organisation, 2023), and as a consequence, were subject to strict restrictions to limit the spreading. Among those, closure of physical stores reduced the possibilities for companies to gain revenues; other emergency restrictions also slowed down production processes of primary inputs and finished products, as well as limited trade across countries. The following year 2021, the only one for

which we already have data, already shows signs of recovery, with growing revenues, in line with the trends of the pre-pandemic era, yet not as profitable as the peak of 2019.

We can now turn to the interdependencies of countries around the world for the trade of apparel goods.

Billion \$			
Leading Exporting Countries	2021	Leading Importing Countries	2021
China	176	EU	195
EU	151	USA	106
Bangladesh	34	Japan	27
Viet Nam	31	United Kingdom	23
Türkiye	19	China	12

TABLE 4 LEADING EXPORTING AND IMPORTING COUNTRIES OF CLOTHING WORLDWIDE BY VALUE IN 2021 (IN BILLION \$).

Extracted 5 highest values.

Source: Statista, 2023c

Considering the role in imports and exports of USA, China and the EU, it comes why and how performances in one market and restricted interactions with another affected the global fashion market and economic system. For instance, China is the leading exporter of clothing products: in case of reduced production volumes in these countries, depending importing countries suffer from lower amount of goods available for sale, thus could experience reduced revenues. On the other hand, restrictions to sales in importing countries, including closure of stores for sanitary reasons, may force importing countries to stop or reduce purchases from exporting countries, thus affecting the economic system in producing country.

Monetary values provide a clear idea of the (positive) economic contribution of the FI to the global economy. On the other hand, the industry is based on the production and trade of material goods, that are manufactured at the expenses the environment and, in some cases, of the communities that depend on production plants or input cultivation. In particular for the former, main focus of the entire document, it is possible to further build upon figures about the environmental impact.

According to Statista (2023a), the global apparent consumption of apparel products summed up to 168.42billion pieces in 2021, and was even more in 2019, around 183.15billion units.

Billion pieces	2014	2015	2016	2017	2018	2019	2020	2021
Children's Apparel	65.36	65.75	66.01	66.38	67.47	68.2	58.5	61.82
Men's Apparel	36.25	36.81	37.4	38.01	39.05	39.85	34.78	37.05

Women's Apparel	71.41	71.88	72.14	72.69	74.04	75.1	65.49	69.55
Total	173.02	174.44	175.55	177.08	180.56	183.15	158.77	168.42
Change (n to n-1)		0.82	0.64	0.87	1.97	1.43	-13.31	6.08

TABLE 5 APPARENT CONSUMPTION OF APPAREL WORLDWIDE FROM 2013 TO 2026.

Extraction until 2021, as not to include forecasts.

Source: Statista, 2023a.

The UN Statistics Division (n.d.) defines the apparent consumption as a “proxy measure for consumption of a product or material, defined as production plus imports minus exports of the product or material”. Considering that the ones in Statista (2023a) are worldwide figures, we assume that no imports or exports have been factored in, therefore such numbers can be used as approximation of the number of apparel pieces manufactured in each year. Here again, we can observe a drop in production [in red in Table 5] due to COVID-19 related restrictions and economic consequences.

Some items might be discarded in the same year they are produced, raising the question of the low quality of products and volatility of trends, contributing negatively to the burden on the planet under multiple aspects - exploitation of resources, waste treatment processes, etc. Those that are kept for longer time, stay in wardrobes and therefore increase the number of existing pieces owned by the global population, which therefore increases over the years. This already provides an initial idea of the environmental impact of apparel manufacturing. In the next pages, we will try to develop some other considerations.

According to Statista (2023c), the FI is accountable for the emission of 1.02gigatons of carbon dioxide equivalents into the atmosphere.

As of 2019	Units	
Total Emission	1.02	Gt CO2 Equivalents
Apparel Production	183.15	Billion units
Emissions per unit	5.56921	Kg/unit
Average Units per capita	24.77	
Per capita emissions	137.94922	Kg CO2 Equivalents
Per capita emissions from driving petrol car	48.00	g CO2 Equivalents per km
km equivalents	2,873.94	

TABLE 6 CALCULATIONS OF THE ANNUAL PER-CAPITA EMISSION FROM APPAREL PRODUCTION IN 2019.

Calculations of the equivalent of kg CO2 Equivalents emitted from apparel manufacturing km of petrol car driving. All calculations were performed in Excel.

Source: Total Emissions: Statista, 2023c. CO₂ Equivalents petrol car: Our World in Data (2020).

From Table 6, we can conclude that the annual production of apparel emits 137.95 kg of CO₂ equivalents per person. To make it more comparable, according to Our World in Data (2020) an individual driving a petrol car emits 48g of CO₂ Equivalents per km. Therefore, to emit 137.95 kg an individual would have to ride almost 2,874 km by car, which is even more than the distance between Vienna and Porto, Portugal [around 2,766km].

This is one of the many calculations that is possible to perform regarding the negative impact of the clothing production. Based on the publicly available data, it is also possible to estimate the per unit consumption of water based on the data available from 2016 in Statista (2018).

As of 2016		Units
Water Withdrawals	215	Billion m ³
Apparel Production	183.15	Billion units
Withdrawals per unit	1.17	Kg/unit
Average Units per capita	24.51	
Per capita withdrawals	28.77	m ³
1 m3 of water =	1,000	Litres
Per capita withdrawals	28,772.32	Litres

TABLE 7 CALCULATIONS OF THE ANNUAL PER-CAPITA WATER WITHDRAWAL FROM APPAREL PRODUCTION IN 2016. calculations performed in Excel.

Source: Statista, 2018; 2023a.

We would like to emphasise that these are average figures and approximate estimations of the emissions/withdrawals. With respect to the first point, these figures are hypothetically the same for each individual in the world; however, we have to be aware of imbalances between the different regions of the planet. We could therefore assume such numbers are way bigger for individuals located in more developed countries, with easier and greater access to apparel products.

When talking about emissions and withdrawals, also Statista (2022b) points out that figures they present are based on estimations, and that primary data may be incomplete, thus their and our calculations can be definitely considered as underestimations of the actual - negative) - contribution of the FI to the burden of the global economy on the planet.

As explained above, one of the strongest emerging trends and a good initiative to partially reduce the negative impact on the environment is second-hand shopping. As we can see from Statista (2022b), this practice has gained popularity over the past years.

Billion \$	2014	2015	2016	2017	2018	2019	2020	2021
Resale	1	1	2	3	5	7	9	14
% Change (n - (n-1))		100	100	50	67	40	29	56

Thrift & donations	13	14	16	17	19	21	18	21
% Change (n - (n-1))		7.69	14.29	6.25	11.77	10.53	-14.29	16.67
Total Second-Hand	14	15	18	20	24	28	27	35
% Change (n - (n-1))		7.14	20	11.11	20	16.67	-3.57	29.63

TABLE 8 SECOND-HAND APPAREL MARKET VALUE WORLDWIDE FROM 2012 TO 2021 (IN BILLION U.S. DOLLARS).

% Change calculated on Excel.

Source: Statista, 2022b.

As we can see from Table 8, second-hand shopping is steadily conquering higher and higher revenues, with resale shopping growing at higher rates. This can be due to the more favourable attitude toward purchasing used clothes, while thrift shopping has more of a negative connotation in multiple cultures. On top of that, dedicated online platforms for customer to customer [C2C] sales have been developed in the past decade and the majority of such trades occur there. The existence of such websites/apps can be considered as the main component of the resilience of the Resale market during the pandemic, considering that they were not affected by emergency restrictions. Instead, thrift and donations are based on direct contact and in-stores purchases suffered from the closures, and experiences loss in revenues, almost to the same extend as the primary goods market. Yet, the recovery was far stronger in terms of percentages: it is debatable whether it is a good or bad news. While it can be that more and more people are becoming aware of the negative impact of the FI, we have to remember that the COVID-19 pandemic had strong economic consequences, thus it may be that more and more people have to visit such stores to stay within strict and restricted budgets.

4.1.1.2. Market Forecasts

Statista (2023a) also provides forecasts for almost all data presented in the previous subsections which are presented here.

We would like to state that these projections “are obtained using an exponential trend smoothing to illustrate the continuous market development. [...] Once the status quo has been established, we assess the recent market growth and the macroeconomic environment of the country or territory in question and its region. Then we move on to trend scouting, looking out for business-critical developments in the industries that provide the basis for the future growth of the markets. “ (Statista Consumer Market Outlook, 2021)

With respect to the revenues of the apparel worldwide for the upcoming years, figures are presented in Table 9.

Trillion \$	2022	2023	2024	2025	2026	2027
Revenues	1.53	1.74	1.79	1.84	1.89	1.94

% Change (n - (n-1))	13.73	2.87	2.79	2.72	2.65
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TABLE 9 FORECASTS OF REVENUE OF THE APPAREL MARKET WORLDWIDE FROM 2022 TO 2027 (IN TRILLION \$).

% Change calculated on Excel.

Source: Statista, 2023a.

These projections are in line with the predictions presented in the Literature Review from McKinsey's Retail Practice & Business of Fashion (2021): the market is expected to recover from the pandemic and getting back to a steady growth rate, fixed at an average of around 2.75%. Considering also the explanation of the methodology used for such forecasts, we are unsure whether Statista is considering a business-as-usual scenario of - unsustainable - production as main source of revenue or if, instead, they embrace their own forecasts for the development of some submarkets. Specific clarification on individual datasets suggests that forecasts are based on a projected steady growth, driven by GDP per capita and consumer spending per capita; no clarification on the market distribution is made. (Statista, 2022a)

Yet, as again presented in the 'Emerging Trends' Subsections - Literature Review, 2.1.3. -, certain segments are expected to grow even more in the upcoming years, as a consequence of the raising awareness of environmental and social issues. Statista (2023a) also acknowledges these phenomena and presents its valuations and projection for the Second-Hand Market in Table 10:

Billion \$	2022	2023	2024	2025	2026
Resale	20	28	37	46	51
% Change (n - (n - 1))		40	32.14	24.32	10.87
Thrift & donations	23	26	28	30	31
% Change (n - (n - 1))		13.04	7.69	7.14	3.33
Total Second-Hand	43	54	65	76	82
% Change (n - (n - 1))		25.58	20.37	16.92	7.89

TABLE 10 FORECASTS OF SECOND-HAND APPAREL MARKET VALUE WORLDWIDE FROM 2022 TO 2026 (IN BILLION \$).

% Change calculated on Excel.

Source: Statista, 2023a.

As said before, the second-hand market is expected to keep growing: if we compare the % changes over the years, we can observe that the growth is expected to decrease in rate, yet at higher intensities than the overall apparel market [in Table 9].

On the other hand, production is also expected to increase to complement the expected increase in revenues and fulfil increasing demand, related also to the forecasted increasing popu-

lation. Statista (2023a) draw its projections based on the available information also in terms of units produced, as visualised in Table 11:

Trillion \$	2022	2023	2024	2025	2026	2027
Children's Apparel	61.99	68	68.74	69.40	70.03	70.67
% Change (n - (n - 1))		9.70	1.09	0.96	0.91	0.91
Men's Apparel	36.71	40.65	41.44	42.18	42.91	43.64
% Change (n - (n - 1))		10.73	1.94	1.79	1.73	1.70
Women's Apparel	68.02	75.43	76.54	77.59	78.60	79.62
% Change (n - (n - 1))		10.89	1.47	1.37	1.30	1.30
Total	166.70	184.10	186.70	189.20	191.50	193.90
% Change (n - (n - 1))		10.44	1.41	1.34	1.22	1.25

TABLE 11 FORECASTS OF APPARENT CONSUMPTION OF APPAREL WORLDWIDE FROM 2022 TO 2027.

% Change calculated on Excel.

Source: Statista, 2023a.

As for revenues, forecasts for units produced exhibit increasing volume, yet at a decreasing rate. We could assume that this is partially due to the increasing importance of the second-hand market.

As a consequence of the still increasing number of manufactured pieces, the environmental impact would still be present. The ultimate goal would be the decoupling of growth from negative consequences, or even the inversion of such direct relation. However, forecasts are still quite non-optimistic in that perspective, as they draw an increasing number of megatons of CO₂ equivalents emitted, as presented in Table 12.

Billion \$	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Yearly emissions	1,067	1,110	1,155	1,202	1,251	1,301	1,354	1,409	1,466	1,526	1,588
% Change (n - (n - 1))		4.03	4.05	4.07	4.08	4.00	4.07	4.06	4.05	4.09	4.06

TABLE 12 PROJECTED CARBON DIOXIDE EQUIVALENT EMISSIONS OF THE APPAREL INDUSTRY WORLDWIDE FROM 2019 TO 2030 (IN MEGATONS).

Data extracted from 2020. Calculations performed in excel.

Source: Statista, 2022b.

If we compare such values with production, it comes that emission will keep growing at a steady rate, while production will increase at a decreasing rate. We could hypothesize that these predictions are based on the assumption that manufacturing processes will keep being

unsustainable and no improvements are made. Under these assumption, we may have to conclude that the desired decoupling of economic growth from emissions is unrealistic.

We could conclude this part by re-computing the calculations for per-capita CO₂ Equivalents emissions:

As of 2027		Units	% Change from 2019
Emission	1.409	Gigatons CO ₂ Equivalents	38.13
Apparel Production	193.9	Billions Units	5.87
Emissions per unit	7.27	Kg/unit	30.48
Average Units per capita	24.4		-1.49
Per capita emissions	177.30	Kg CO ₂ Equivalents	28.53
% Change from 2019	28.53	In 2019	-40.56
In km equivalents	3,693.87		28.53

TABLE 13 CALCULATIONS OF THE ANNUAL PER-CAPITA EMISSION FROM APPAREL PRODUCTION IN 2027.

Calculations performed in Excel.

Source: Statista, 2022b; 2023a.

Even though the average units per capita would decrease from 2019, the per capita emissions are expected to increase dramatically, of almost 29% [both in red in Table 13]. To make it comparable as before, if an individual emits 48g per km of petrol car driving, it would be the equivalent of driving from Vienna, Austria to Baku, Azerbaijan [around 3,480km].

4.1.2. The European Market

As we just saw, the European market is the third biggest contributor in terms of sales [Table 3] and the second for exported value [Table 4]. Considering its important role in the global economy, we believe it deserves to be further analysed in detail.

4.1.2.1. Production

As seen in the analysis of the Global Market, the EU is among the leader exporters of clothing products, which implies that MSs have a consistent level of manufacturing activities in the FI occurring in their territories. By looking at information contained in the Eurostat (2023c) datasets, the total value of production in 2020 was around €56 billion, yet decreasing over time and not only as a consequence of the COVID-19 pandemic.

Billion €	2014	2015	2016	2017	2018	2019	2020	Change 2020 to 2014
Total	62.94	61.4	61.58	63.98	64.69	66.22	56.02	-6.92
Change	2.88	-1.54	0.18	2,4	0,71	1,53	-10.2	
% Change	4.8	-2.45	0.29	3.9	1.11	2.37	-15.4	-10.99

Italy	27.89	27.76	28.04	30.82	31.13	31.85	27.27	-0.62
Germany	8.38	7.37	7.74	7.66	6.91	6.98	5.88	-2.5
France	7.83	6.97	6.11	5.33	6.51	7.25	5.45	-2.38
Spain	4.2	4.58	4.64	4.5	4.41	4.42	3.7	-0.5

TABLE 14 PRODUCTION VALUE, MANUFACTURING OF WEARING APPAREL FROM 2014 TO 2020.

Conversion million € to billion € and calculations performed in Excel.

Source: Eurostat, 2023c.

Over the past 10 years, as seen in Table 14, the EU manufacturing of wearing apparel has lost value for more than €6billions, almost 11% of the 2014 production. This reflects a general tendency of EU composing countries, with some exceptions; we could hypothesise, in line with the findings presented in the Literature Review, that such loss in value is due to the increasing globalisation of the industry and the relocation of suppliers in Eastern countries, with lower standards and cheaper labour force. This claim will be supported by additional findings presented in the rest of this section.

If we have a look at the biggest manufacturer MSs, they coincide with the ones that contribute the most in terms of revenues to the global economy, as presented in Table 2. We can therefore state that Italy, Germany, France and Spain are among the strongest players in the EU fashion market. If we compare such figures with the number of enterprises operating in those territories, we could try to understand the quality/level of products manufactured in those areas.

Milion €		2014	2015	2016	2017	2018	2019	2020
Italy	Value	27,887.8	27,760.9	28,041	30,819.5	31,129.2	31,854.4	27,273.3
	Enterprises	29,442	28,865	28,317	29,253	29,709	29,774	28,312
	Average	0.94	0.96	0.99	1.05	1.04	1.07	0.96
Germany	Value	8,382.9	7,374.3	7,735.3	7,657.3	6,913.2	6,977.2	5,876.8
	Enterprises	2,910	3,015	2,993	2,625	2,961	3,306	3,306
	Average	2.88	2.44	2.58	2.91	2.33	2.11	1.78
France	Value	7,825.1	6974.3	6108.7	5333.4	6512,00	7253.7	5453.3
	Enterprises	10,996	9,767	10,632	9,694	12,175	13,482	15,840
	Average	0.71	0.71	0.57	0.55	0.53	0.53	0.34
Spain	Value	4,201.9	4,576.6	4,638.1	4,498.7	4,408	4,423	3,704.1
	Enterprises	8,796	8,632	8,557	8,540	9,008	9,009	8,991
	Average	0.47	0.53	0.54	0.52	0.49	0.49	0.41
Poland	Value	1,760	1,880.4	1,924.1	1,907	2,308.6	2,250.2	2,274.5
	Enterprises	12,092	11,944	12,867	12,688	14,350	13,965	13,310
	Average	0.14	0.16	0.15	0.15	0.16	0.16	0.17
Czechia	Value	562	598.4	622.2	666.4	693	733.1	692
	Enterprises	11,280	11,739	12,563	12,917	13,684	14,294	14,459

Average	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04
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TABLE 15 PRODUCTION VALUE AND NUMBER OF ENTERPRISES, MANUFACTURING OF WEARING APPAREL FROM 2014 TO 2020.

Calculations performed in Excel.

Source: Eurostat, 2023c.

By looking at the whole table of number of enterprises operating in each EU27 countries, we notice a discrepancy with the leading countries in production value. In fact, the leading four MSs in number of enterprises will be, in order, Italy, Poland, Czechia and Spain. The two middle states yet have a production value that is far below the other two; then we would like to observe if there is any kind of relation between the production value and the number of enterprises. We decided to compute an average production value per enterprise: it came out that producing value leading countries are leaders also in this additional variable. Poland and Czechia have lower values for average production value, despite the great number of enterprises present. We could therefore suggest that, in those countries, production of lower-end/cheaper products, might take place. Instead, Italy and Germany may be dedicated especially to higher-quality production.

One additional observation that we could make, in respect to the number of enterprises, is the number of employees working in apparel manufacturing. Again, in Table 16 we present the top countries in terms of number of enterprises and their related number of employees.

Units		2014	2015	2016	2017	2018	2019	2020
Italy	Enterprises	29,442	28,865	28,317	29,253	29,709	29,774	28,312
	Employees	198,506	197,292	199,047	207,478	207,050	209,703	202,492
	Average	6.74	6.83	7.03	7.09	6.97	7.04	7.15
Poland	Enterprises	12,092	11,944	12,867	12,688	14,350	13,965	13,310
	Employees	89,083	88,463	89,268	85,406	95,583	90,211	82,026
	Average	7.37	7.41	6.93	6.73	6.66	6.46	6.16
Czechia	Enterprises	11,280	11,739	12,563	12,917	13,684	14,294	14,459
	Employees	24,841	25,717	26,222	26,421	26,163	26,322	25,654
	Average	2.20	2.19	2.09	2.04	1.91	1.84	1.77
Spain	Enterprises	8,796	8,632	8,557	8,540	9,008	9,009	8,991
	Employees	44,343	42,550	44,385	43,210	43,715	42,396	39,633
	Average	5.04	4.93	5.18	5.06	4.85	4.70	4.41
Romania	Enterprises	4,584	4,759	4,812	5,037	5,137	5,121	5,130
	Employees	160,147	157,296	150,003	139,965	128,401	114,833	96,412
	Average	34.94	33.05	31.17	27.79	24.99	22.42	18.79
Bulgaria	Enterprises	4,379	4,324	4,405	4,381	4,373	4,428	4,419
	Employees	108,708	106,101	104,806	103,446	100,536	95,849	91,731
	Average	23.61	22.99	21.65	20.76	19.83	19.12	18.27

TABLE 16 NUMBER OF ENTERPRISES AND PERSONS EMPLOYED, MANUFACTURING OF WEARING APPAREL FROM 2014 TO 2020.

Calculations performed in Excel.

Source: Eurostat, 2023c.

We observe that leading countries in terms of number of enterprises are not necessary the leaders for number of employees. In fact, the highest values in this last variable are presented by Italy, Romania, Bulgaria and Poland. While the first and the last one has also quite some enterprises operating in the territories, the other two haven't. We could therefore assume that the first couple, Italy and Poland, have either smaller firms, in terms of employees, even maybe individual enterprises or artisanal production, or are more technology intensive. The second couple, Romania and Bulgaria, could have the opposite characteristics. It could be interesting to then monitor the labour conditions in those two countries, to ensure that high-labour intensity is well-paid and standards are respected. We could also argue that, maybe in the first two countries, there may be cases of undeclared work: in fact, according to European Commission (2017), Italy estimates that 15.7% of its labour force works under undeclared working condition, while for Poland the same variable is around 4.5%.

We could therefore conclude that manufacturing in EU territories is quite heterogeneous, both in terms of value of production, enterprises operating in the market and number of employees. The only country that dominates in all three categories, always in the leading position, is Italy. It is with no surprise that we come this conclusion as, in pop-culture, Italy is always considered a synonym of fashion and style. Yet, if we look at the leading retailers from EU operating in the Union, none of them is actually Italian. According to Statista (2023b), in fact, the top three leading retailers in Europe, based on their turnover within its borders, are Inditex [Spain] and H&M [Sweden] (Statista, 2023b). Yet, as we will see in the next Sub-Section in Table 18, these companies have suppliers and mostly factories located in Eastern locations of the world.

4.1.2.2.Extra-EU Trade

Again, as presented in the previous Section in Table 3, the EU is a leader in terms of both imports and exports. This implies that, despite the good level of production, the EU is heavily reliant on trade with Eastern countries for clothing products.

Billion €	2014	2015	2016	2017	2018	2019	2020	2021	Change 2021 to 2014
Total Imports	64.41	71.01	72.18	73.95	76.65	79.93	68.49	72.22	7.81
from China	23.71	25.10	23.40	23.06	23.11	23.11	20.57	21.87	-1.84
% Share	36.81	35.35	32.42	31.18	30.15	28.91	30.03	30.28	-6.53
from Bangladesh	9.37	11.54	12.59	12.93	13.92	14.96	12.32	14.29	4.92
% Share	14.55	16.25	17.44	17.48	18.16	18.72	17.99	19.79	5.24

from Turkey	7.60	7.79	8.00	8.18	8.40	8.81	8.03	9.22	1.62
% Share	11.80	10.97	11.08	11.06	10.96	11.02	11.72	12.77	0.97
to Germany	16.95	18.50	18.37	18.52	18.41	18.54	16.94	16.97	0.02
% Share	26.32	26.05	25.45	25.04	24.02	23.20	24.73	23.50	-2.82
to Spain	8.37	9.68	10.49	11.49	12.08	12.69	10.16	11.23	2.86
% Share	12.99	13.63	14.53	15.54	15.76	15.88	14.83	15.55	2.55
to France	9.59	10.38	10.11	10.43	10.66	11.23	9.68	10.35	0.76
% Share	14.89	14.62	14.01	14.10	13.91	14.05	14.13	14.33	-0.56

TABLE 17 VALUE OF IMPORTS OF ARTICLES OF APPAREL AND CLOTHING ACCESSORIES IN THE EU FROM 2014 TO 2021.

Calculations performed in Excel.

Source: Eurostat, 2023e.

In line, again, with the observations of Table 3, the majority of imports come for China, Bangladesh and Turkey. Imports have steadily increased over the years, following the increasing demand of cheap products and the augmented globalisation of the value chain, causing a delocalisation of production processes in - Eastern - locations. Following the generalised trend, the only exceptional year is 2020, following the consequences of the reduced trades between countries due to COVID-19 restrictions. For importing countries, shares have been stable over the years, that could be interpreted as a sign of the stability of European market. With respect to importers, China has slightly lost share, yet keeping the leading position, probably in favour of other locations with "less strict" regulations or with lower international tensions - e.g. trade taxes and sanctions. Still, this situation endangers the resilience of the EU market, making it more subject to disruptions occurring around the planet in supplying and importer counties. In addition, if no regulations or controls are placed on production plants, outsourcing to those locations may stimulate exploitation of resources and individuals, against the guiding principles of the SGDs.

If we look at the leading retailers mentioned before, that are Inditex [Spain] and H&M [Sweden], we can observe where their business partners come from and their alignment with the Union's trends. (Statista, 2023b)

H&M (Sweden)	Suppliers	% Share	Factories	% Share	Inditex (Spain)	Factories	% Share
China	366	39.96	430	31.76	China	415	29.68
Bangladesh	139	15.17	235	17.36	Turkey	194	13.88
Turkey	105	11.46	179	13.22	Morocco	173	12.37
EU MSs	80	0	126	9.31	Spain	162	11.59
India	75	8.19	154	11.37	Portugal	151	10.80
Indonesia	44	4.80	70	5.17	Bangladesh	129	9.23
Vietnam	35	0	49	3.62	India	99	7.08

Myanmar	26	0	40	2.95	Pakistan	48	3.43
Pakistan	18	0	29	2.14	Argentina	14	1.00
Cambodia	9	0	18	1.33	Vietnam	9	0.64
Morocco	6	0	16	1.18	Cambodia	3	0.21
South Korea	9	0	4	0.30	Brazil	1	0.07
Ethiopia	4	0	4	0.30	Total	1398	100
Sweden	0	0	0	0			
Total	916	100	1354	100			

TABLE 18 NUMBER OF MANUFACTURING FACTORIES AND SUPPLIERS, INDITEX (SWEDEN) AND INDITEX (SPAIN).
EU MSs clustering and calculations performed in Excel.

Source: Eurostat, 2023b.

It is interesting to present such information as it is important to observe how major (fast) fashion retailers only keep a portion of their manufacturing within the borders of the Union. In particular, in the case of H&M, it does not even engage in activities in its country of origin: this is not surprising considering that, according to Eurostat (2023c), in 2018 Sweden had manufacturing value of around €230millions - 0.36% of the European total - and counts “only” 1,915 enterprises operating in the FI (1,5% of the European total). Yet, still a small portion of H&M’s partners, around 9%, are European, whereas for the Inditex group this figure raises to more than 20% [Spain and Portugal together]. This last point is in line with the figures relative to EU production presented earlier, considering the leading role especially of the first country. However, it is important to note that the group encompasses multiple brands and they all have different target groups budget-wise, thus they probably also have different manufacturing standards and locations. Anyhow, for both H&M group and Inditex, it is evident how reliant they are on Eastern countries, especially China; again, this is in line with the observations made before according to Table 17.

Back to the MSs, despite their leading positions in manufacturing, as seen in Table 14, Germany, Spain and France dominate also in terms of import of apparel and clothing products. If compared with their export figures, we could understand whether, in theory, they would be able to satisfy their internal demand by themselves, that is whether they are net importers or exporters.

Billion €	2014	2015	2016	2017	2018	2019	2020	2021	Change 2021 to 2014
Total Exports	26.38	27.68	28.43	31.29	33.04	35.60	30.39	33.09	6.71
to USA	2.25	2.69	2.71	2.76	2.93	3.20	2.41	3.20	0.95
% Share	8.53	9.72	9.53	8.82	8.87	8.99	7.93	9.67	1.14
to Russia	2.79	2.01	2.00	2.21	2.32	2.36	2.00	2.25	-0.54
% Share	10.58	7.26	7.03	7.06	7.02	6.63	6.58	6.80	-3.77

to China	1.03	1.22	1.24	1.36	1.70	1.79	1.80	2.81	1.78
% Share	3.90	4.41	4.36	4.35	5.15	5.03	5.92	8.49	4.59
from Italy	9.25	9.50	9.78	10.16	11.03	12.19	10.19	11.56	2.31
% Share	35.06	34.32	34.40	32.47	33.38	34.24	33.53	34.94	-0.13
from Germany	3.82	3.87	3.82	5.33	5.60	5.83	5.05	5.17	1.35
% Share	14.48	13.98	13.44	17.03	16.95	16.38	16.62	15.62	1.14
from Spain	3.58	4.23	4.70	5.13	5.28	5.46	4.15	4.97	1.39
% Share	13.57	15.28	16.53	16.40	15.98	15.34	13.66	15.02	1.45
from France	3.46	3.79	3.69	3.84	4.15	4.49	3.84	4.42	0.96
% Share	13.12	13.69	12.98	12.27	12.56	12.61	12.64	13.36	0.24

TABLE 19 VALUE OF EXPORTS OF ARTICLES OF APPAREL AND CLOTHING ACCESSORIES FROM THE EU FROM 2014 TO 2021. Calculations performed in Excel.

Source: Eurostat, 2023e.

Billion €		2014	2015	2016	2017	2018	2019	2020
EU	Imports	64.41	71.01	72.18	73.95	76.65	79.93	68.49
	Exports	26.38	27.68	28.43	31.29	33.04	35.60	30.39
	Net Trade	38.03	43.33	43.75	42.66	43.61	44.33	38.10
Germany	Imports	16.95	18.5	18.37	18.52	18.41	18.54	16.94
	Exports	3.82	3.87	3.82	5.33	5.60	5.83	5.05
	Net Trade	13.13	14.63	14.55	13.19	12.81	12.71	11.89
Spain	Imports	8.37	9.68	10.49	11.49	12.08	12.69	10.16
	Exports	3.58	4.23	4.70	5.13	5.28	5.46	4.15
	Net Trade	4.79	5.45	5.79	6.36	6.80	7.23	6.01
France	Imports	9.59	10.38	10.11	10.43	10.66	11.23	9.68
	Exports	3.46	3.79	3.69	3.84	4.15	4.49	3.84
	Net Trade	6.13	6.59	6.42	6.59	6.51	6.74	5.84
Italy	Imports	7.20	7.82	7.56	7.64	7.86	8.10	7.16
	Exports	9.25	9.50	9.78	10.16	11.03	12.19	10.19
	Net Trade	-2.05	-1.68	-2.22	-2.52	-3.17	-4.09	-3.03

TABLE 20 NET TRADE OF ARTICLES OF APPAREL AND CLOTHING ACCESSORIES IN THE EU FROM 2014 TO 2021. Calculations performed in Excel. Net Trade = Imports - Exports

Source: Table 18 and 19; Eurostat, 2023e.

As a whole, the EU is a net importer of clothing products (in red in Table 20), that is its internal market is reliant on trade with extra-EU27 countries to fulfil its internal demand. The only exception to this tendency is represented by Italy (in green in Table 20). In line with the observations made before, we could assume that the type of production exported by Italy results in

greater monetary flows, thus economically benefitting the country when import is of lower-prices products.

We will now proceed to understand what causes such trade, that is the market demand and the purchases within the EU.

4.1.2.3. Consumption

The EU is “performing” well also in terms of consumption; as of 2021, European citizens have purchased for a total of more than €243billions. (Statista, n.d.) Yet, as for production, such figures fluctuate a little over time and vary a lot between different MSs. The great heterogeneity observed across countries in terms of manufacturing figures replicates also for spending data. As of 2021, the top spenders were, in order, Luxembourg [€1,686.9], Denmark [€1,172.2] and Austria [€1,124.6]. Yet, these numbers are in absolute terms, therefore it is interesting how they related to other wealth indicators, such as Disposable Income. Such comparison is presented in Table 21.

€	Country	Spending	Disposable Income	Rate
Highest Spending (Absolute Values)	Luxembourg	1,686.90		
	Denmark	1,172.20		
	Austria	1,124.60		
Highest Spending (Compared to Disposable Income)	Luxembourg	1,686.90	36,319	4.64%
	Denmark	1,172.20	25,698	4.56%
	Italy	1,038.80	23,460	4.43%
	Portugal	781.50	19,315	4.05%
Lowest Spending (Absolute Values & Compared to Disposable Income)	Croatia	390.70	16,433	2.38%
	Czechia	343.10	21,100	1.63%
	Hungary	266.90	17,335	1.54%

TABLE 21A RANKING OF THE PER CAPITA CONSUMER SPENDING ON CLOTHING & FOOTWEAR IN EUROPE BY COUNTRY 2021. Data converted from \$ to € using average conversion rate of 2021, 1\$=0,95304€. Calculations performed in Excel.

Source: Ranking: Statista, 2022a. Disposable Income: Eurostat, 2023f.

It comes that there is quite an heterogeneity in the spendings on clothing products across EU MSs. Those than spend more in absolute term may not invest that much when compared to their Disposable Income, such as Austria. It may indicate that they have preferences over other type of products. These same countries no not appear in our previous analysis based on manufacturing figures as leading producers, implying that that even more may rely on imports from other EU and non-EU countries to satisfy their demand. Only Italy leads in both pictures, again sticking to the stereotype; yet, this may indicate that, theoretically, the country may be able to cover for its own demand but further analysis is needed. On the other hand, the lowest absolute spenders are also the lowest in relative terms. Yet, Croatia, Czechia and Hungary do not

exhibit the lowest disposable incomes in the EU, meaning that despite their relatively high capabilities, are not that interested in clothing products.

€	Country	Spending	Disposable Income	Rate
Highest Disposable Incomes	Luxembourg	1,686.90	36,319	4.64%
	Germany	886.30	30,462	2.91%
	Netherlands	1,096.00	28,700	3.82%
Lowest Disposable Incomes	Slovakia	447.90	15,920	2.81%
	Greece	657.60	16,343	4.02%
	Croatia	390.70	16,433	2.38%

TABLE 21B RANKING OF THE PER CAPITA CONSUMER SPENDING ON CLOTHING & FOOTWEAR IN EUROPE BY COUNTRY 2021. Data converted from \$ to € using average conversion rate of 2021, 1\$=0,95304€. Calculations performed in Excel.

Source: Ranking: Statista, 2022a. Disposable Income: Eurostat, 2023f.

If we now observe the highest and lowest figures for DI: with no surprise, Luxembourg leads again. Despite the high DI, Germans seems to prefer other type of products as they spend less than 3% of their DI on clothing [in red in Table 21b]. On the other hand, Greeks invest a great portion of their DI in fashion products, with rates definitely not consistent with other counties in the same group [in green in Table 21b].

We would like to suggest a possible reason for such striking differences: the costs of living across countries. It is not a secret that there are evident differences across MSs in terms economic standards and well-being. This is reflected also in the cost of goods and what is considered a living income and sufficient DI; as a consequence, citizens may have different ("imposed" or natural) preferences in terms of purchases, with higher DI going for higher-end products and lower DI to fast fashion items. We would also highlight that, as of 2021, Croatia also had a different national currency, which poses the additional burden of conversion rates on the sense and the actual contributions of this analysis.

Taken this into account, it might have been more interesting to consider the amount of units purchased, rather the monetary spendings, as it would have been a more objective and comparable measurement unit. However, this data is not available. Therefore, for our qualitative analysis, this section builds up on the point that the EU is highly heterogeneous.

We can now go back to the overall EU market and break it down into some of its segments. Women's apparel is the most profitable one, worth more than €130 billion in 2021.

Billion €	2014	2015	2016	2017	2018	2019	2020	2021
Children's Apparel	30.73	31.08	31.64	32.52	32.99	33.17	28.82	30.80
% Change		1.14%	1.80%	2.78%	1.45%	0.55%	-13.11%	6.87%

Men's Apparel	78.28	79.50	81.47	84.11	85.86	86.48	75.51	80.89
% Change		1.56%	2.48%	3.24%	2.08%	0.72%	-12.69%	7.12%
Women's Apparel	129.40	131.10	133.90	137.90	139.60	140.70	122.80	131.40
% Change		1.31%	2.14%	2.99%	1.23%	0.79%	-12.72%	7.00%
Total	238.40	241.70	247.00	254.50	258.50	260.30	227.20	243.10
% Change		1.38%	2.19%	3.04%	1.57%	0.70%	-12.72%	7.00%

TABLE 22A REVENUES BY SEGMENT (IN BILLION €).

Calculations performed in Excel.

Source: Statista, n.d.

In line with global trends, 2020 exhibited lower revenues due to COVID-19 restrictions and reduced purchases in physical stores. The general trend is of increasing revenues, coherent with the trend of increasing consumption; Children's apparel purchases seem to grow at a lower rate than the two other categories, maybe also as a consequence of the decreasing natality rate affecting MSs at different intensities. Statista (n.d.) also provides estimates for the following years, which we find quite interesting.

Billion €	2022	2023	2024	2025	2026	2027
Children's Apparel	31.41	39.18	39.69	39.94	40.17	40.42
% Change		24.74%	1.30%	0.63%	0.58%	0.62%
Men's Apparel	82.84	103.90	105.90	107.10	108.20	109.10
% Change		25.42%	1.92%	1.13%	1.03%	0.83%
Women's Apparel	134.40	168.60	171.80	173.90	175.60	177.00
% Change		25.45%	1.90%	1.22%	0.98%	0.80%
Total	248.70	311.70	317.40	321.00	323.90	326.40
% Change		25.33%	1.83%	1.13%	0.90%	0.77%

TABLE 22B FORECASTS FOR REVENUES BY SEGMENT (IN BILLION €).

Calculations performed in Excel.

Source: Statista, n.d.

We do understand the optimism in terms of recovery from the pandemic [in green in Table 22b], yet we do consider such intense increase as quite excessive, considering the figures of the pre-COVID era. If we consider 2019 and 2023, they forecast an increase of more than 19%, which is definitely an outlier in the trend of a 2-3% annual increase. In addition, as for the global market, it feels like there is consideration for the raising awareness of the population over the impact of the FI on the environment and society. We will only accept such figures if they include - yet, we do not have any prove - the increase in revenues due to the growth

trend of second-hand shopping, a by far more sustainable segment that can be also split in the three categories mentioned before. In fact, Statista (n.d.) considers a consistent increase in such business model, together with sustainable products.

Billion €	2014	2015	2016	2017	2018	2019	2020
Secondhand	3.1	3.6	4.0	4.4	5.0	5.6	6.3
% Change		16.13%	11.11%	10.00%	13.64%	12.00%	12.50%
Sustainable	3.0	3.2	3.4	3.7	4.0	4.3	4.7
% Change		6.67%	6.25%	8.82%	8.11%	7.50%	9.30%
Total	6.1	6.8	7.4	8.1	9.0	9.9	11
% Change		11.48%	8.82%	9.46%	11.11%	10.00%	11.11%

TABLE 23A SECONDHAND APPAREL SHARE; SUSTAINABLE APPAREL SHARE.
Calculations performed in Excel.

Source: Statista, n.d..

Billion €	2021	2022	2023	2024	2025	2026	2027
Secondhand	7.1	8.4	9.8	11.4	13.4	15.6	18.2
% Change	12.70%	18.31%	16.67%	16.33%	17.54%	16.42%	16.67%
Sustainable	5.2	5.6	6.1	6.7	7.3	8.0	
% Change	10.64%	7.69%	8.93%	9.84%	8.96%	9.59%	
Total	12.3	14	15.9	18.1	20.7	23.6	18.2
% Change		13.82%	13.57%	13.84%	14.36%	14.01%	-22.88%

TABLE 23B FORECASTS FOR SECONDHAND APPAREL SHARE; FORECASTS FOR SUSTAINABLE APPAREL SHARE.
Calculations performed in Excel.

Source: Statista, n.d.

As we can see from the table, both Second-hand Shopping and sustainable products are growing exponentially, at rates around 10%. This is definitely good news as it shows the potential for such kind of segment of the apparel market. We could suppose that the increasing presence of dedicated platform is positively contributing to such trend.

Share	2017	2018	2019	2020	2021	2022	2023	2024	2025
Offline	86.9%	84.6%	81.8%	77.4%	70.1%	67.8%	64.5%	60.5%	56.3%
Online	13.10%	15.40%	18.20%	22.60%	29.90%	32.20%	35.50%	39.50%	43.70%
Change		2.3%	2.8%	4.4%	7.3%	2.3%	3.3%	4%	4.2%

TABLE 24 SALES CHANNELS.

Calculations performed in Excel. Forecasts highlighted in grey.

Source: Statista, n.d.

As we can see from Table XX, online shopping is slowly conquering the favour of EU consumers. In particular, during the COVID-19 Pandemic [year 2020], the online segment has gained around 7 percentage points, almost double the yearly growth figure. As already explained, this is probably due to the fact that restrictions limited the access to physical stores, so consumers had to adapt to the situation. Yet, the segment is also expected to keep such trend, yet at lower levels. This is a sign that the transition happened and will stay.

Now that we have presented some general figures about the economic performances of the EU market for apparel, we can turn to the two main sub-topics of this dissertation: chemicals and recycling.

4.1.3. Chemical inputs

As presented in the Literature Review in section 2.2., chemicals played and play an important role in the FI. They have both their advantages and disadvantages, which in part also affect the life cycle of products in both their duration and end-of-cycle treatments. Therefore, it is interesting to observe the amount of the chemicals inputs in EU production. We will therefore take two main directions: chemicals as inputs in general and production of chemical fibres.

4.1.3.1. Chemicals as input

Chemicals can work as both additives to production, to make processes more efficient or obtain goods encompassing certain characteristics. As introduced before, this is particularly important in Fast Fashion production, which works on the manufacturing of large quantities, all identical and costs as low as possible. We are already suggesting that EU production is quite heterogeneous in terms of quality of production, therefore we could observe the same behaviour in respect to chemical inputs. To make such comparison, we take again the MSs with the highest number of enterprises, in order, Italy, Poland, Czechia and Spain; we also recall that the first and the last dominate over the two in terms of average production value per enterprise, therefore could theoretically produce at higher qualities.

Million €		2014	2015	2016	2017	2018	2019
EU	Total Inputs	192,127.58	193,168.47	191,138.76	195,565.20	196,518.15	195,276.38
	Chemicals	867	964	732	716	825	785
	% Chemicals	0.45%	0.50%	0.38%	0.37%	0.42%	0.40%
Italy	Total Inputs	82,065.46	82,696.90	81,347.50	83,188.70	86,454.30	85,771.40
	Chemicals	492.43	411	347.00	338.10	350.30	313.10
	% Chemicals	0.60%	0.50%	0.43%	0.41%	0.41%	0.37%
Poland	Total Inputs	6,494.02	6,876.44	7,212.85	7,577.61	7,597.69	7,643.12
	Chemicals	16.14	18.21	17.99	20.67	19.44	27.48
	% Chemicals	0.25%	0.26%	0.25%	0.27%	0.26%	0.36%
Czechia	Total Inputs	2,650.30	2,715.63	2,810.55	2,907.98	2,955.38	2,998.52
	Chemicals	39.08	43.50	37.58	35.97	36.42	33.13

	% Chemicals	1.47%	1.60%	1.34%	1.24%	1.23%	1.10%
	Total Inputs	19,900.00	20,762.00	19,640.00	20,095.00	19,985.00	19,434.00
Spain	Chemicals	179.20	295.30	187.00	180.50	240.60	252.00
	% Chemicals	0.90%	1.42%	0.95%	0.90%	1.20%	1.30%

TABLE 25A SUPPLY TABLE AT BASIC PRICES IN THE EU FROM 2014 TO 2019, TOTAL PRODUCTS AND CHEMICAL AND CHEMICAL PRODUCTS FROM MANUFACTURE OF TEXTILES, WEARING APPAREL, LEATHER AND RELATED PRODUCTS.

Calculations performed in Excel.

Source: Eurostat, 2023d.

It is with surprise that we observe that our prediction is kind of respected for Italy and Czechia, with the former employing a relatively low percentage of chemical inputs yet in line with the European average and a higher share for Czechia. Instead, Poland aligns with Italy and Spain with Czechia, changing the pair from our previous analysis. We could suggest that, while Italy may be opting for more “natural” processes, Spain is more engaged in manufacturing closer to Fast Fashion, considering that the Inditex group is from there and is engaged with the territory for its production [see Table 18], yet of higher perceived quality. We could further develop the analysis but considering the two other biggest manufacturing states, that are from Table 14, Germany and France.

Million €		2014	2015	2016	2017	2018	2019
	Total Inputs	23,494	22,507	22,936	23,384	22,929	22,020
Germany	Chemicals	14	50	15	20	68	59
	% Chemicals	0.06%	0.22%	0.07%	0.09%	0.30%	0.27%
	Total Inputs	15,884	16,318	16,121	16,431	17,027	17,263
France	Chemicals	0	0	0	0	0	0
	% Chemicals	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

TABLE 25B SUPPLY TABLE AT BASIC PRICES IN THE EU FROM 2014 TO 2019, TOTAL PRODUCTS AND CHEMICAL AND CHEMICAL PRODUCTS FROM MANUFACTURE OF TEXTILES, WEARING APPAREL, LEATHER AND RELATED PRODUCTS.

Calculations performed in Excel.

Source: Eurostat, 2023d.

To some extent, Germany respects our prediction as it employs a lower percentage of chemical inputs in its production, thus may opt for more sustainable practices. We doubt that the figures for France are actually realistic as we do not consider feasible a purchase of 0% of chemical products. If that was the case, the country would be a role model. It might be interesting to observe more in details the reasons for such figure; in the dataset Eurostat (2023d), no special comments have been made next to those figures so we cannot make a straight-forward conclusion and it needs a deeper analysis.

Other artificial components employed in clothes production are rubber and plastic products; in these cases, inputs can contain chemicals as traces from the treatment process or as primary

additive in their manufacturing. In addition, presence of such materials may affect a possible future recycling process. It is therefore interesting, as for general chemical input, to observe the extent of their presence; we will again consider the same six MSs.

Million €		2014	2015	2016	2017	2018	2019
EU	Total Inputs	192,127.58	193,168.47	191,138.76	195,565.20	196,518.15	195,276.38
	Rubber & Plastic (R&P)	1,814.32	1,514.97	1,542.72	1,587.66	1,657.97	1,733.91
	% R&P	0.94%	0.78%	0.81%	0.81%	0.84%	0.89%
Italy	Total Inputs	82,065.46	82,696.90	81,347.50	83,188.70	86,454.30	85,771.40
	Rubber & Plastic (R&P)	442.68	349	397.1	398.3	498.7	676.6
	% R&P	0.54%	0.42%	0.49%	0.48%	0.58%	0.79%
Poland	Total Inputs	6,494.02	6,876.44	7,212.85	7,577.61	7,597.69	7,643.12
	Rubber & Plastic (R&P)	87.95	97.81	134.04	143.02	143.79	134.23
	% R&P	1.35%	1.42%	1.86%	1.89%	1.89%	1.76%
Czechia	Total Inputs	2,650.30	2,715.63	2,810.55	2,907.98	2,955.38	2,998.52
	Rubber & Plastic (R&P)	100.12	97.6	90.88	106.89	115.08	110.93
	% R&P	3.78%	3.59%	3.23%	3.68%	3.89%	3.70%
Spain	Total Inputs	19,900	20,762	19,640	20,095	19,985	19,434
	Rubber & Plastic (R&P)	342.6	192.2	176	201.4	172.1	152
	% R&P	1.72%	0.93%	0.90%	1.00%	0.86%	0.78%
Germany	Total Inputs	23,494	22,507	22,936	23,384	22,929	22,020
	Rubber & Plastic (R&P)	322	308	305	299	295	254
	% R&P	1.37%	1.37%	1.33%	1.28%	1.29%	1.15%
France	Total Inputs	15,884	16,318	16,121	16,431	17,027	17,263
	Rubber & Plastic (R&P)	0	0	0	0	0	0
	% R&P	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

TABLE 26 SUPPLY TABLE AT BASIC PRICES IN THE EU FROM 2014 TO 2019, TOTAL PRODUCTS AND RUBBER AND PLASTIC PRODUCTS FROM MANUFACTURE OF TEXTILES, WEARING APPAREL, LEATHER AND RELATED PRODUCTS. Calculations performed in Excel.

Source: Eurostat, 2023d.

The first and more obvious observation that can be made is that, again, France does not employ Rubber and Plastic Products. We do not want to say that it could not be possible, yet further explorations may be interesting, but it falls beyond the scope of this analysis.

On the other hand, almost all countries, with the exception of Italy and Spain in more recent years, utilise a greater quantity of such materials than the EU average, with Czechia leading the way with percentages that are more than three times higher. This means that somehow indirectly, chemicals still enter European textile production through other components, even when production does not directly employ them, as in the case of Germany. In this case, it is not only a matter of the quality of products, but also of the type: rubber can be in fact utilised to produce fake leather products, which can be then employed in a number of other clothing items (Ciavatta Pantoja, 2004).

4.1.3.2. Chemical fibres

As presented earlier, chemical inputs can be used as additives or for manufacturing chemical textiles and fibres. According to Statista (2022c), the EU production of chemical fibres accounts for 2% of global production, with Germany worth an additional 1% by itself. This could explain why large amount of rubber and plastic products are employed in the German textile manufacturing industry, transforming them into chemical fibres. On the other hand, a sum of 2% of the rest of the EU is not that much if we compare with the two main producers, respectively China 73% and India 7% (Statista, 2022c).

It is important to note that, despite the fact that maybe the EU does not produce large quantities of chemical fibres, they may still reach the market directly in the form of finished clothes. This observation comes from the alignment of the large quantities of clothing imports from China and India and their large amount of chemical fibres production.

Unfortunately, there is little information about volumes produced in the EU, therefore we will proceed our analysis considering the 3% [2% EU + 1% DE] share over the over the global production. Data about monetary values and other production-related figures are available in Eurostat (2023d) and will be presented later.

As a consequence of the increasing demand for clothing products, the manufacturing of textile fibres has to follow the same trend to support producers' need.

1.000 metric tons	2014	2015	2016	2017	2018	2019	2020	2021	Average
Total Textile Fibres	90,800	89,900	95,100	98,500	105,600	107,500	108,300	113,600	
% Change		-0.99%	5.78%	3.58%	7.21%	1.80%	0.74%	4.89%	3.29%
of which Chemical	63,300	66,800	71,200	71,00	73,400	80,500	80,900	88,200	
% Change		5.53%	6.59%	0.56%	2.51%	9.67%	0.50%	9.02%	4.91%
% of Total	69.71%	74.30%	74.87%	72.69%	69.51%	74.88%	74.70%	77.64%	74.09%
European Production (3%)	1,899	2,004	2,136	2,148	2,202	2,415	2,427	2,646	

TABLE 27A PRODUCTION VOLUME OF CHEMICAL AND TEXTILE FIBRES WORLDWIDE FROM 1975 TO 2021.
Extracted from 2014 to 2021. Calculations performed in Excel.

Source: Statista, 2022c.

We can observe that the global production of textile fibres has progressively increased over time, as suggested from previous observations. What we consider interesting is the different growth rates in production: in fact, chemicals fibres manufacturing has steadily raised by an average of almost 5%, while total fibres around 3.3%. This of course has determined an increasing share of chemical fibres over the whole textile fibre production.

This phenomenon is definitely related to the need for cheap fibres and that encompass certain characteristics to support the fast fashion segment. This observation also comes from the analysis of the type of chemical fibres produced, in Table 27b.

1.000 metric tons	2014	2015	2016	2017	2018	2019	2020	2021
Total Chemical Fibres	63,300	66,800	71,200	71,600	73,400	80,500	80,900	88,200
% Change		5.53%	6.59%	0.56%	2.51%	9.67%	0.50%	9.02%
of which Cellulose	6,200	6,100	6,400	6,700	6,800	7,000	6,800	7,400
% Change		-1.61%	4.92%	4.69%	1.49%	2.94%	-2.86%	8.82%
% of Total Chemical	9.79%	9.13%	8.99%	9.36%	9.26%	8.70%	8.41%	8.39%
of which synthetic	57,100	60,700	64,800	64,900	66,600	73,500	74,100	80,900
% Change		6.30%	6.75%	0.15%	2.62%	10.36%	0.82%	9.18%
% of Total Chemical	90.21%	90.87%	91.01%	90.64%	90.74%	91.30%	91.59%	91.72%

TABLE 27B CHEMICAL FIBRE PRODUCTION WORLDWIDE FROM 2000 TO 2021, BY FIBRE TYPE.
Extracted from 2014 to 2021. Calculations performed in Excel.

Source: Statista, 2022c.

The majority of fibres produced, more than 91%, are of the synthetic type: as Preston (2022) in the Encyclopedia Britannica explains, these are entirely produced in chemical plants and laboratory, using artificial additives and from by-products of petroleum and/or natural gases, like acrylics. Cellulose fibres instead start from organic inputs, such as cotton and wool, to be then chemically altered in labs; rayon and acetate fall within this category (Preston, 2022). It comes that the former result in cheaper fibres produced, thanks or due to their primary inputs, even though we could argue that costs may fluctuate as a consequence of changes in prices or petroleum and natural gases, now becoming quite expensive due to the conflicts. Another negative aspect could be the difficulty in recycling processes of synthetic textile caused by the large number of chemical additives, working as a barrier. Further information in this respect will be presented in the next Section.

4.1.4. Recycling Activities

At the end of their useful life, clothing products are disposed, as any other material good. The problem of waste overproduction is widely recognised as a major issue that the modern society is contributing to and is heavily threatening the planet (Hoorweg et al., 2013); unfortunately, as presented earlier, also textile plays role. It is therefore important to understand the extent of the contribution and attitude of the European FI toward the mitigation this phenomenon.

4.1.4.1. Waste Production

According to Eurostat (2023a), in 2020 the EU, as both households and industries, has produced more than 2 Gt [2,000 Mt] of waste; of those, around 1 Mt [0.001 Gt] was in the form of textile products. To make the picture clearer, we present some key figures in Table 28.

Megatonnes	2006	2008	2010	2012	2014	2016	2018	2020
Total Waste	2,276	2,145	2,213	2,246	2,244	2,259	2,338	2,153
% Change		-5.76%	3.17%	1.49%	-0.09%	0.67%	3.50%	-7.91%
of which textile	3.58	2.15	1.96	1.62	2.01	1.98	2.17	1.95
% Share of Total	0.16%	0.10%	0.09%	0.07%	0.09%	0.09%	0.09%	0.09%
% Change		-39.94%	-8.84%	-17.35%	24.07%	-1.49%	9.60%	-10.14%
from Apparel Industry	2.08	0.92	0.74	0.54	0.7	0.60	0.65	0.51
% Share of Total	58.10%	42.79%	37.76%	33.33%	34.83%	30.30%	29.95%	26.15%
% Change		-55.77%	-19.57%	-27.03%	29.63%	-14.29%	8.33%	-21.54%
from Households	0.69	0.43	0.42	0.49	0.57	0.71	0.74	0.79
% Share	19.27%	20.00%	21.43%	30.25%	28.36%	35.86%	34.10%	40.51%
% Change		-37.68%	-2.33%	16.67%	16.33%	24.56%	4.23%	6.76%

TABLE 28 GENERATION OF WASTE AND OF TEXTILE WASTE IN THE EU FROM 2006 TO 2020.
Calculations performed in Excel.

Source: Eurostat, 2023a.

From Table 28 we can observe that textile disposals represent only a minimum part of the total amount of waste produced within the EU, around 0.05%. This is a good starting point as it implies that the FI is not playing a major role in waste over-product. Yet, we do not deny that those numbers are still relevant and that the issue is present, therefore both prevention and mitigation measure are needed. It is important to notice how the amount of textile waste has decreased from the beginning of the period analysed yet maintained quite stable in the 2010s. On top, by looking at the two producing groups considered, we can observe that shares have progressively inverted: if in 2006 industries were the major contributors, in 2020 the amount of waste discarded by households has surpassed the other actor and even reached the highest value of the 21st century. This phenomenon may have two explanations: if we factor in the ob-

servations made before, we can state that waste production may have decreased because the total manufacturing of the textile production within the EU has significantly decreased during this century, as seen in Table 14. Alternatively, we may take it as a sign that stricter controls got imposed in the FI, especially in respect to disposals produced by the textile industry.

Anyhow, it comes that greater attention should be paid to the purchasing and discharging behaviours of consumers, working on their education and raising awareness about the environmental impact of their habits. At the same time, it is needed to offer citizens the right infrastructures to implementing sustainable behaviours, for instance by strengthening the separate collection system as presented by Köhler et al. (2021) and suggested by Hole and Hole (2020).

Indeed, a certain threshold of discarded material has to be taken into account: in this case, it is worth noting the attitude of the Union toward waste and textile waste products. There are two possible directions: disposal, and then further treatment, or export, with unknown end of life.

4.1.4.2. Waste Treatment

Waste Trade: We will start by considering the second option, export to other locations outside the EU. MSs may decide to trade their waste with other countries, as either they do not have the capability or availability to properly dispose it or because arrival destinations requested it. We can now present some general figures about the trade of waste to non-EU countries from EU MSs.

Megatonnes	2012	2014	2016	2018	2020
Total Waste	2,246	2,244	2,259	2,338	2,153
Of which Exported	31.93	28.39	29.23	30.94	32.81
% Share of Total	1.42%	1.27%	1.29%	1.32%	1.52%
Textile Waste	1.62	2.01	1.98	2.17	1.95
Of which Exported	1.12	1.16	1.24	1.38	1.36
% Share of Export	69.14%	57.71%	62.63%	63.59%	69.74%
Of which synthetic and exported	1.04	1.07	1.16	1.28	1.29
% Share of Textile Export	92.86%	92.24%	93.55%	92.75%	94.85%

TABLE 29 TRADE IN WASTE AND IN TEXTILE WASTE IN THE EU FROM 2012 TO 2020.
Calculations performed in Excel.

Source: Eurostat, 2022.

We have to admit that we find strange that textile export reaches such dramatic levels, far away than the rest of the waste produced. Yet, this observation is in line with the analysis of the European Environment Agency (2023), which also highlights the danger of such figures. In fact, it is not publicly stated which process such materials undergo once they reach the final destinations and therefore, it is not possible to define whether they are given a second life or are unsustainably disposed. In particular, reading from the analysis performed by the European

Environment Agency (2023) based on data from Eurostat (2022), greatest shares of such waste are exported to African and Asian countries, where, as said, restrictions and controls are less strict, thus the chances that they are improperly disposed is higher. If we then consider that the majority, meaning more than 90% of that textile waste is synthetic, thus chemically produced or altered, the threat to the environment and communities of importing location becomes even more frightening.

We consider it a crucial point of our analysis in the matter of waste treatment and some actions need to be taken within the policy framework implemented at Union level.

Disposal Activities: if instead the end of the life takes place within the EU, it is possible to monitor the type of disposal treatment. With this term we would like to focus on activities that imply the destruction or the “abandoning” of waste; we have selected, in line with latest news as the one mentioned in the Literature Review from Business Insider (2021), two main activities, disposal in landfill and incineration; these are the figures in the EU.

Megatonnes		2012	2014	2016	2018	2020
Landfills	Total Waste	2,246	2,244	2,259	2,338	2,153
	Disposed	923.35	896.72	844.44	830.53	631.77
	% Disposed	41.11%	39.96%	37.38%	35.52%	29.34%
	Textile Waste	1.62	2.01	1.98	2.17	1.95
	Disposed	0.12	0	0.11	0.15	0.15
	% Disposed	7.41%	5.97%	5.56%	6.91%	7.69%
Incineration	Total Waste	2.246	2.244	2.259	2.338	2.153
	Incinerated	29.89	25.77	17.53	14.32	9.72
	% Incinerated	1.33%	1.15%	0.78%	0.61%	0.45%
	Textile Waste	1.62	2.01	1.98	2.17	1.95
	Incinerated	8	6	9	11	11
	% Incinerated	0.49%	0.30%	0.45%	0.51%	0.56%

TABLE 30 TREATMENT OF WASTE AND OF TEXTILE WASTE IN THE EU FROM 2012 TO 2020.
Calculations performed in Excel.

Source: Eurostat, 2023b.

Both disposal in landfills and incineration have negative implications: among all, the discharge of hazardous materials in the ground or in the air, following the treatment especially of synthetic materials composed of artificial fibres, rich in chemicals. The breakdown of such substances, from both incineration or degradation in landfills, may be harmful for the environment and human in the proximity of those locations, if not properly controlled. Luckily, figures in this respect in the EU are quite satisfactory: textile waste is definitely performing better than the rest of waste in the matter of disposal in the landfills. Yet, it tends to be more incinerated than other types of waste, but the percentage here is very small. It is important to notice that incineration activities do not imply the recovery of energy, presented in the next point. Anyhow,

figures in Table 30 represent a good news as such statistics are pretty small and these approaches are definitely not among the most sustainable ones. As a consequence, we would suggest that there should be another preferred way to end the lifecycle of textile products, hopefully more sustainable such as recycling, as reuse figures are not available nor possible to estimate.

Recovery Activities: in this case, waste is serving a useful purpose in the economic system; as explained in the Literature Review, a more appropriate treatment of (textile) waste would be recycling. Yet, also energy recovery falls within this category as energy created in the process can be used, for instance, for power generation. Figures in this matter are actually reassuring, as presented in Table 31.

Megatonnes		2012	2014	2016	2018	2020
Recycling	Total Waste	2,246	2,244	2,259	2,338	2,153
	Recycled	749.26	749.61	768.90	826.20	784.80
	% Recycled	33.36%	33.41%	34.04%	35.34%	36.45%
	Textile Waste	1.62	2.01	1.98	2.17	1.95
	Recycled	0.77	1	1.12	1.16	1.02
	% Recycled	47.53%	53.23%	56.57%	53.46%	52.31%
Energy Recovery	Total Waste	2,246	2,244	2,259	2,338	2,153
	Burned	99.26	103.45	118.27	125.73	124.25
	% Burned	4.42%	4.61%	5.24%	5.38%	5.77%
	Textile Waste	1.62	2.01	1.98	2.17	1.95
	Burned	0.12	93	0.14	0.17	0.18
	% Burned	7.41%	4.63%	7.07%	7.83%	9.23%

TABLE 31 TREATMENT OF WASTE AND OF TEXTILE WASTE IN THE EU FROM 2012 TO 2020.
Calculations performed in Excel.

Source: Eurostat, 2023b.

As anticipated, recycling figures for textile waste are way better than statistics for the same treatment on all type of waste. In fact, despite some fluctuations, textile recycling always stayed above 50%, whereas it never reached more than 37% for all waste. This is definitely a good starting point for a more sustainable industry; yet, there are no specifications on the type of recycling treatment, especially whether it is closed loop (materials stay within the FI) or an up-cycling process - outputs of the same quality as inputs). As presented in the Literature review, these are the preferred approaches, especially the last one as it ensures a lower need for new virgin inputs.

With respect to incineration for energy recovery instead, figures are bigger than general waste; on one hand, this is not ideal as we would prefer to avoid such kind of treatment. On the other hand, it is not mere incineration but used for purpose, that is energy generation, therefore it at

least contributes to the society in some way.

We have now concluded the market analysis, based on figure extracted from European and International databases. From such data, we can derive some, more or less, subjective observations presented in the next Sub-Chapter.

4.1.5. Observations from the market

In this section, we will summarise the key findings identified in the market description. We will use two main tools to classify our observations: a SWOT Analysis and a PESTLE Analysis. In this way, we are able to distinguish the positive connotations of the FI and the areas that have to be addressed by policy instruments.

4.1.5.1. SWOT Analysis

As presented in section 3.2.2., strengths identify positive functions while weaknesses represent features that may impede or hinder the performances of the market (Gürel & Tat, 2017). Instead, opportunities and threats are external factors can be either be exploited to in favour of the market, in the case of the former, or that can undermine and obstacle it, as for threats (Gürel & Tat, 2017).

Based on the market analysis and related interpretations presented in sections from 4.1.1. to 4.1.4, we have developed the following SWOT Analysis, presented in table 32.

Strengths	Weaknesses
<p>I. Consolidated Reality: the EU market has demonstrated to have gained and maintained an important role in the global economy, including in the FI.</p>	<p>I. High Heterogeneity: despite its good performances, there are quite some differences across MSs, with some playing a major role and contributing the most to the market. This may cause some inefficiencies when applying common policies and strategies.</p>
<p>II. Industries are already working in a good direction: industries operating in the market are already working toward a sustainability transition in some aspects of their supply chain.</p>	<p>IIa. Net Importer of products: globalisation fostered the delocalisation of manufacturing to Eastern countries, making the EU reliant on international trade to satisfy its internal demand.</p>
<p>III. FI as a good example: in certain aspect, the FI is already outperforming other industries and can therefore work as a role model for the rest of the economic system.</p>	<p>IIb. Lack of transparency of imported products: it is not always possible (for consumers and institution) to control the supply chain of imported product, thus informed purchases may be not occur. See also, Weakness - Vi and Threat - II.</p>
	<p>III. Great Exporter of waste: the majority of textile waste is exported to non-EU countries, making it hard or even impossible to ensure that it is granted a proper end-of-life treatment (e.g. reuse or recycle).</p>
	<p>IV. Great reliance on chemical products: the majority of fibres produced in EU territories and in the world are either fully or partially obtained via chemical treatment. This may result in a number of threats to the environment and communities.</p>

V. Overproduction: to keep up with the increasing demand and to increase exponentially their profits, companies operating in the FI are boosting their production. This leads to a set of negative implications, including an augmented employment of chemical products and exploitation of natural and human resources etc. Additional negative consequences arise from the placing of such products in the market and the rest of their lives.

VI. Low transparency of products: in statistics, as well as in labels, inputs are not clear to be identified. In addition, they do not reflect the process that products have gone through, its implications or in general its characteristics and how it should be handled during and after its life (e.g. washing, repairing or disposal).

Opportunities	Threats
<p>I. Raising Awareness: consumers are becoming more aware of sustainability issues and demand for more conscious products. The sustainability transition (and the related investments) will find market and will be repaid in the long run.</p>	<p>I. Low Resilience: Reliance on international trade makes the EU more subject to the consequences of internal and inter-state disruptions occurring in other areas of the globe. The COVID-19 Pandemic was a striking example.</p>
<p>II. Positively Contribute to the achievement of SDGs at global level: by imposing quality and production control on imported products, the EU can positively contribute to increase quality of life and reduce the burden on the planet in outsourcing locations.</p>	<p>II. Negatively contribute to the achievement of SDGs at global level: with no control and increased demand and raising waste export, the EU may fuel the exploitation of workers and resources, as well as increasing the burden on the planet and communities outside the EU.</p>
<p>IIIa. Consolidated supporting system: as seen for recycling, overarching systems seem to work already pretty well, therefore it might be interesting to benefit from it and improve it even more.</p>	<p>III. Increasing demand: despite the raising awareness of a share of the global population, the overall demand for clothing products is steadily increasing. Globalisation and increased connectedness ensures that it gets fulfilled, entering a vicious cycle tied with overproduction from companies. This results in a greater burden on the planet due to the increasing need for manufacturing of fibres and products, with the related negative implications.</p>
<p>IIIb. Strong institutional system: the EU and (the partnership with) other international and non-profit organisations offer a great environment and supporting structure to foster the transition toward a more sustainable FI.</p>	

TABLE 32 RESULT OF THE SWOT ANALYSIS OF THE EUROPEAN APPAREL MARKET.
Based on the findings of conducted market analysis.

Source: Findings from sections 4.1.1, 4.1.2., 4.1.3., 4.1.4..

4.1.5.2. PESTLE Analysis

The PESTLE Analysis, as introduced in section 3.2.2., focuses on classifying and grouping market characteristics in six categories. These are included in the acronym and are: Political, such as stability, trends...; Economic, including growth or other performance indications; Social, demo-

graphics, behaviours...; Technological, existing or possible future innovations; Legal, such as standards and regulations; Environmental, everything that relates to the burden on the planet.

Table 33 summarises the key features identified in the market description, according to the PESTLE tool. Symbol (+) identified positive characteristics, whereas (-) negative features.

Political	Economic	Social
<p>Ia, (-). EU Composition: the EU is composed of independent MSs, which may result in an obstacle to the implementation of a unique strategy, harming the coherence and homogeneity across MSs.</p>	<p>I, (+). The FI is an important sector: FI has demonstrated to be a fundamental sector in the global economy, considering the cultural and economic importance of clothing. It positively contributes to the solidity of the global and European economy and could positively contribute to the achievement of SDGs at global level, becoming a role model.</p>	<p>Ia, (-/+). Attitude toward apparel [from P I]: another sign of the heterogeneity of MSs is the cultural differences between MSs. Some countries have preferences over apparel products rather than others etc or purchase more sustainable items/second hand etc. It can be an advantage for sustainable transition, yet makes it harder to design common marketing or awareness campaigns.</p>
<p>Ib, (-). EU Heterogeneity: as a consequence of the independence of MSs, there is a certain level of heterogeneity. Observations have therefore to be made at EU level as an average of performances of composing countries.</p>	<p>II, (+). The EU is a strong market and player for the global Fi: both as producer and consumer, the EU plays an important role in the global market for apparel product. Forecasts only expects the EU to maintain its leading position.</p>	<p>Ib, (-/+). Spendings [from P I]: again, different MSs have different economic performances, which translate into incomes and possible spendings of their inhabitants. As a consequence, they may find it more or less easy to afford more sustainable product.</p>
<p>III, (-). EU Dependency on other non-EU countries: EU consumption is heavily reliant on Eastern production; this poses the Union in the condition of suffering from the negative consequences of event occurring somewhere else in the world, thus harming its resilience.</p>		<p>II, (+). Raising awareness: consumers are becoming more aware of sustainability issues, thus are taking measures to reduce their impact.</p>
	<p>IV, (-/+). Contribution to SDGs: Considering its involvement in the global market, the EU plays an important role in the achievement of SDGs at global level, both in a negative and positive sense. At the moment, it is mostly fuelling a value chain that takes advantages of poor working conditions/standards. On the other hand, with stricter controls and legislation, it could force companies operating in the EU to pose stricter and more sustainable value chains.</p>	
	<p>V, (-). Low Transparency, Greenwashing: to take advantage of the raising awareness of the population, companies may play with their performances to portrait a nicer picture. As a consequence, consumers are misled or confused, and no concrete action toward a sustainable transition is carried out.</p>	
	<p>VI, (+/-). Current business models are profitable for companies: current business models, especially fast fashion, have demonstrated to be extremely profitable for companies. Thus, they are not really incentivised to invest and perform a sustainability transition.</p>	

Technological	Legal	Environmental
<p>I, (+). Recycling is already at a good level: apparel recycling is performing better than other type of waste, therefore we would like to suggest that it can only improve. This also points that technology for such kind of disposal activity is already in the good track and that only more efficient machineries can be developed.</p> <p>Supporting systems can improve, for instance with easier access to collection bins.</p>	<p>I, (+). EU policy system: the EU works under an intricate system of policies and instrument that work together as a solid framework. Therefore, they point at each other for more targeted solutions; in this perspective, latest policies do not have to explicitly target a certain aspect of the issue, but can instead refer to a more specific instrument.</p> <p>Note: We acknowledge that it might be confusing and too intricate to be followed to a less expert eye.</p>	<p>I, (-/+). Contribution to SDGs: Considering its involvement in the global market, the EU plays an important role in the achievement of SDGs at global level, both in a negative and positive sense. At the moment, it is mostly fuelling a value chain that imposes a heaving burden on the planet both at the beginning and end of the life of products. On the other hand, with stricter controls and legislation, it could enforce stronger sustainability strategies and get companies on board.</p>
<p>II, (-). Chemicals are (too) present: chemicals have brought their advantages to the manufacturing of apparel products (e.g. speed, homogeneity...). Yet, they have some negative side effects, mostly on the environment, considering for example discharges. They may also hamper the possibility of products to receive an appropriate end-of-life process or increase the negative impact in case of improper disposal.</p>	<p>II, (-). Lag between strategy and impact: as for any other policy, it takes some time to be developed and put into action. In addition, it may take some time for it to have the desired effects, therefore the (hopefully positive) consequences have a more long-run perspective.</p> <p>Note: We would like to emphasise that this is the main reason why this paper deals with the analysis of the market failures to be addresses in the policies rather than the effects of the instrument, as it has been established more or less a year ago, too little time to have visible effects.</p>	<p>II, (-). Overconsumption: despite the raising awareness of a share of the global population, the overall demand for clothing products is steadily increasing. Globalisation and increased connectedness ensures that it gets fulfilled, entering a vicious cycle tied with overproduction from companies. This results in a greater burden on the planet due to the increasing need for manufacturing, with the related negative implications.</p>
<p>III, (+). Researches are on-going: more and more companies are realising the negative implications of chemical substances and are committed to their reduction and in finding more sustainable alternatives.</p> <p>Note: Yet, we have to warn that we can not disregard the fact that maybe such innovations may be disregarded in the future because negative effects will be identified, as it happened for chemicals.</p>	<p>III, (-). Legislation is more applicable on products manufactured in the EU: legislation is legally enforceable in EU MSs, making it applicable on products manufactured in the Union. It may extend to imported products, but controls are hard to carry out.</p>	<p>III, (-). Overproduction [shared with social]: to keep up with the increasing demand and to increase exponentially their profits, companies operating in the FI are boosting their production. This leads to a set of negative implications, including an augmented employment of chemical products and exploitation of natural resources etc. Additional negative consequences arise from the placing of such products in the market and the rest of their lives.</p>

TABLE 33 RESULT OF THE PESTLE ANALYSIS OF THE EUROPEAN APPAREL MARKET. Based on the findings of conducted market analysis.

Source: Sections 4.1.1, 4.1.2., 4.1.3., 4.1.4..

4.1.5.3. Identification of market issues

The SWOT and the PESTLE Analysis served to identify weak or unstable points of the market that could serve as an obstacle to the sustainable transition. Among all the points included in Table 32 and 33, we are now listing the ones that actually represent problems that need exter-

nal (policy) intervention, as to adjust the functioning of the European market and fostering its transition to a more sustainable system. As presented in section 2.3.5., existing problems can be categorized in different groups, according to the way it affects the market. We are also classifying each identified problem according to the categories listed in section 2.3.5..

i) *Structural problem - EU is a net importer of apparel products; decreasing resilience of the European market:* the European manufacturing system is not capable of fulfilling its internal demand, both in terms of quantity and quality of products. As a result, it is reliant on import from Eastern Asian countries, making the EU apparel market more sensitive to shocks and instabilities emerging in those countries (Section 4.1.2.2.).

ii) *Asymmetric information and negative externality (market failures) - Low control and transparency of imported products:* European legislation is enforceable (depending on the type) on products manufactured within its borders, thus generating inequalities between EU and non-EU producers, as well as between their goods (Section 4.1.2.2. and 4.1.2.3.). As a consequence, consumers do not have complete information the characteristics of purchased products. This could endanger both customers and their health, as well as the environment in the case of improper treatment and disposal of goods.

iii) *Structural problem and asymmetric information (market failure) - Large amount of exported waste, for unknown disposal treatment:* Section 4.1.2.4. demonstrated that large amount of textile waste is exported to non-EU countries. In those cases, it is not possible to report the applied disposal activities, resulting in a lack of transparency on that stage of the life cycle and, in the worst case, contributing to the negative environmental burden of the industry.

iv) *Structural problem - Large usage of chemical input:* In section 4.1.2.3., we have demonstrated that large quantities of chemical inputs introduced in production processes, either as component to synthetic fibres or additives. In both cases, they negatively affect the sustainability of products and the industry, in different ways presented in section 2.2.1.2.

v) *Structural problem and negative externality (market failure) - Overproduction:* current business models, in particular the fast-fashion industry, are highly exploitative toward the environment and societies. The constant inflow of new products and their low prices fuels the over-consumeristic attitude of consumers that, as presented in section 4.1.2.1., defines the related growth in the negative impacts of the FI.

vi) *Structural problem and negative externality (market failure) - Overconsumption:* current business models, in particular the fast-fashion industry, are enabled fast and cheap availability of new products, that got consumers accustomed to such variety and stimulated their ever-increasing demand, as seen in in section 4.1.2.2.. This trend enters a vicious cycle with overproduction, in a spiral that only contributes to un-sustainability of the industry.

vii) *Negative externality (market failure) - Negatively contribute to the achievement SDGs at local and global level:* as a consequence of points IVa and IVb, the European fails to con-

tribute to the achievement of SDGs at local and global level, in all groups of goals but especially at environmental level.

viii) Structural problem - High quantities of non-recycled products: other activities rather than recycling still occupy a large share of disposal initiatives of MSs and companies, as presented in section 4.1.2.4., resulting in a loss of material products and potential additional negative impacts on the environment and societies, as listed in section 2.2.2.3..

As we can observe, the majority of the identified problems are either structural issues, due to the internal organisation of the apparel system, or market failures, either negative externalities or asymmetric information. From section 4.1.2., we could not detect any sign of public goods nor natural monopoly, given the definitions provided in section 2.3.5.. With respect to the former, apparel products cannot be considered as public: by being offered only for sale, people are obliged to pay for them in order to use/possess them. They are also offered in limited amount, which implies that purchases prevent other consumers to have access. Also, the FI cannot be considered as a natural monopoly since there is a large number of firms present in the market; the great competition actually stimulated the rise of new trends, such as the fast fashion presented in section 2.1.3.

With this concluding and summarising section, we can now move to the analysis of the instrument that is being considered as the main policy in fostering the sustainability transition of the European FI, the European Strategy for Sustainable and Circular Textile.

4.2. Policy Analysis

In the matter of sustainable fashion, the most recent policy document is the “European Strategy for Sustainable and Circular Textile” [from now on, referred as ‘the strategy’]. As mentioned, multiple times across this paper, our main focus will be now on breaking down the content of this document. We would then use such analysis to understand whether it actually tackles the main issues identified in section 4.1.5.3., therefore whether the policy coverage matches the existing market problems.

Anyhow, we will start by outlining the overarching policy instrument that influenced and includes the strategy: The European Green Deal (European Commission, 2023).

4.2.1. The European Green Deal

The European Green Deal is the Commission’s initiative to fight climate change and environmental degradation. It will do so by transforming the Union into a modern, resource-efficient and competitive economy (European Commission, 2023). Presented in 2019, it aims at making Europe the first climate neutral continent by 2050 and to reduce emissions by at least 55% by 2030, compared to 1990 levels (European Commission, 2021). The Commission is planning to achieve this goal by working into the following directions:

- **Sustainable Transport for all:** the green transition aims at offering accessible, affordable and clean transport. In particular, interventions are targeting the progressive reduction of CO₂ emissions from all types of means of transport, up to reaching the goal of 0 emissions from new cars in 2035 (European Commission, 2021).
- **Clean energy system:** also in the light of the current Ukraine-Russia conflict, the Commission commits to increase the share of renewable sources used for the European energy mix, up to a target of 40% by 2035, as set by the European Commission (2021). On top, energy consumption needs to be reduced as to address related emissions and costs; therefore, other interventions will address the improvement of energy efficiency (European Commission, 2021).
- **Renovating buildings for greener lifestyles:** renovations and improvements in housing can improve living conditions from both a social, economic and environmental perspective. Working on energy efficiency, insulation and aeration systems can benefit the health of inhabitants, reduce heating and energy costs, as well as limiting emissions (European Commission, 2021).
- **Protect planet and health:** restoring nature and biodiversity is a core goal, which would enable also to increase absorption of CO₂ and make the environment more resilient to climate change. This also imply a more sustainable and circular management of natural resources, including forests, soils, wetlands and peatlands. Lastly, the Commission also commits to a decarbonization of the economy, up to a reduction of 310 Mt of natural carbon removals (European Commission, 2021).
- **Boosting global climate action:** the EC advocates for a global action to achieve its targets and SDGs. This implies collaboration between MSs, with other international organizations, as well as with private companies and individuals (European Commission, 2021).
- **Third Industrial Revolution:** the green transition and the previous points represent an opportunity to shift and create new markets for cleaner and more sustainable products. Both the transition itself and the new business models are expected to generate new jobs and employment opportunities. Considering the globalized supply chains, the EC commits to avoid that efforts by European industry to cut emissions are undermined by unfair competition from abroad, especially countries with less strict regulations; therefore, measures to discourage imports, including carbon fees, will be placed (European Commission, 2021).

These three last points guide the intended actions for transition of the FI. In fact, the European Strategy for Sustainable and Circular Textiles falls within the large number of interventions included in the Green Deal, as we are explaining more in details in section 4.2.2..

To implement other areas, the Commission has drawn dedicated plans targeting either specific industries, SDGs or societal aspects. For instance, the 'European Research Area (ERA)' for stronger research and innovation system or the 'Union of Equality: Gender Equality Strategy 2020-2025' to foster gender equality in the Union. More interesting to this research are the 'New Circular Economy Action Plan' and the 'Chemicals Strategy for Sustainability'. These are in

fact applied also in the context of the fashion industry, by guiding and aligning the interventions included in the European Strategy for Sustainable and Circular Textiles.

4.2.2. Overview of the strategy

On the 30th of March 2022, the EC adopted the European Strategy for Sustainable and Circular Textiles. It represents the intended interventions of the Union to address the un-sustainability of the production and consumption of textile, including apparel products. In line with the framework of the European Green Deal, the New Circular Economy Action Plan and Industrial Strategy. As a whole and in line with other overarching instruments, the strategy aims at creating a greener, more competitive FI, more resistant to global shocks. In this perspective, as presented by European Commission (2022b), intended interventions included in the strategy will work in the following directions:

- Setting design requirements for products that will last longer and be easier to repair and recycle
- Introducing clearer information on textiles and its characteristics, as well as introducing a digital product passport
- Empowering consumers and addressing greenwashing activities, by ensuring the accuracy of companies' green claims
- Stopping over-production and over-consumption, and discouraging the destruction of unwanted items
- Harmonising EU Extended Producer Responsibility rules for textile products and introduce economic incentives for more sustainable products
- Addressing the unintentional micro-plastics releases from synthetic fibres
- Facing the challenges of the export of textile waste
- Adopting an EU Toolbox against counterfeiting
- Publishing a Transition Pathway: 'an action plan for actors in the textiles ecosystem to successfully achieve the green and digital transitions and increase its resilience.

Note on the Textiles Ecosystem Transition Pathway: it was planned to be published by the end of 2022 then postponed to March 2023. As of May 2023, it is not available yet.

In working on such goals, The Strategy can rely on number of pieces of legalization and other policies that target specific elements of the FI that need to be tackled. In figure 5, we have schematized the most important instruments that are explicitly mentioned in the Strategy, how they are interconnected and how they fit the fashion framework.

4.2.3. Policy Content

In this section, we are reporting the actual content of the policy, in the way it is presented in the official document, referred as European Commission (2022a).

The strategy is organized as to include three main points of actions; we will now present them. We would like to emphasize that each point is directly connected to the others, setting the conditions for and/or reacting to actions and interventions also included in the Strategy. This is again in line with the whole concept of European legislators being interdependent.

4.2.3.1.A new pattern for Europe: key action for sustainable and circular textiles

This section addresses more on the characteristics of products, and how they can be modified as to enable higher circularity and sustainability of the related markets. The strategy will work on this point with six main groups of activities, which will now be presented and connected. The main body of legislation it refers to in this area is the Ecodesign for Sustainable Products Regulation (European Commission, 2022a). By definition, a regulation is a binding act, which makes the content immediately applicable in all member states; therefore, it is a strong tool to foster the intended sustainability transition. The intended activities are:

I. Introducing mandatory Ecodesign requirements: ecodesign requirements would extend the life of textile products, by increasing their durability and recyclability. The intention here is to enlarge existing voluntary schemes, in particular the EU Green Public Procurement [GPP] Criteria for Textile Products and Services and the EU Ecolabel Clothing and textiles [Figure 6] as to include also the environmental footprint of products. (European Commission, 2022a) In fact, the current Ecolabel in particular, tackles exclusively:

- “Limited use of substances harmful to health and environment”
- “Reduction in water and air pollution”
- “Colour resistance to perspiration, washing, wet and dry rubbing and light exposure”

(European Commission, DG Environment, n.d.)



FIGURE 6 LOGO FOR THE EU ECOLABEL CLOTHING AND TEXTILES.

Source: European Commission, DG Environment, n.d.

On the side of chemicals, the Strategy refers to the REACH Regulation (REACH - Registration, Evaluation, Authorization and Restriction of Chemicals), enforced in 2007 and updated over the years (European Commission, DG Environment, 2022). As it is a regulation, the content is legally binding to MSs from the date of application. To target more specifically the textile industry, the Commission is planning to develop and add criteria to substitute or reduce as much as possible the presence of chemicals in textile products, within the framework of the Chemical Strategy for Sustainability launched in 2020. This also aims at increasing the protection of

workers, as defined by the strategic framework on health and safety at work 2021-2027. Yet, this framework is not legally binding (European Commission, 2022a).

Lastly, the Strategy will update the existing Ecodesign for Sustainable Products Regulation, as to include binding product-specific ecodesign requirements to address specifically performances in terms of durability, reusability, reparability and recyclability (European Commission, 2022a). This falls within the planned update of the Ecodesign Regulation, firstly released in 2009: the next extension proposed 2022 aims at enlarging the coverage of the instrument, which was limited only to energy-related products (European Commission, DG Communication, 2022b). This new proposal also refers to the introduction of a Digital Product Passport, also included in the Strategy in the next point.

II. Introducing information requirements and a Digital Product Passport (for textile): as mentioned before, as part of the measures include in the Ecodesign for Sustainable Products Regulation, the European Commission (2022a) will introduce a Digital Product Passport for textile, based on mandatory requirements on disclosing information on circularity and other environmental characteristics. To ensure consistency with the existing framework, the Textile Labelling Regulation will be revised to include more transparent labelling on fiber composition and possible animal origins. Additionally, the EC will set mandatory disclosure for information regarding sustainability and circular parameters, product size and manufacturing country(ies) (European Commission, 2022a).

III. Stopping the destruction of unsold or returned textile: in this context, the Commission (2022a) has to main goals within the context of the Ecodesign for Sustainable Products Regulation. Firstly, to increase transparency obligations to publish number of products discarded and destroyed, and their further treatment in terms of preparing for reuse, recycling, incineration or landfilling. As a consequence, they also target the complete banning of destruction of unsold items. In the meanwhile, to reduce the number of items that could enter this cycle, the Commission will jointly work on the development of digital tools to reduce rates of returned items and improve the efficiency of manufacturing process, for instance with on-demand production, to address the overall carbon footprint of e-commerce (European Commission, 2022a).

IV: Tackling Microplastic Pollution: again, in within the framework of the Ecodesign for Sustainable Products Regulation, the Commission (2022a) intends to set binding design requirements to impact on unintentional release of microplastics. In addition, other measures will target manufacturing activities, from machineries to individual processes - e.g. washing (European Commission, 2022a).

V. Green claims for truly sustainable textiles: two main initiatives will amend on the existing body of legislation on the truthfulness of claims and statement. The Empowering Consumers for the Green Transition will update the incumbent Unfair Commercial Practices Directive [published in 2005] and the Consumer Rights Directive [released in 2011]. The Empowering Consumers for the Green Transition initiative will ensure that information about a

guarantee of durability as well as information relevant to repair, are provided at the point of sale. Instead, the Green Claims Initiative will work on minimum criteria for all types of environmental claims, with Environmental Footprint methods representing an important tools to communicating statements (European Commission, 2022a). Also, in line with point 4.2.1.3.1.1., reviews to the EU Ecolabel Clothing and textiles will ensure that General environmental claims, such as “green”, “eco-friendly”, “good for the environment”, are proven by positive environmental performances certified by third-parties. Lastly, by aligning the Green Claims Initiative and the criteria for EU Ecolabel Clothing and textiles, the European Commission (2022a) will introduce binding product-specific ecodesign requirements, to limit open-loop recycling activities from the plastic packaging sector to the FI and prioritise fibre-to-fibre recycling.

VI. Extended producer responsibility (EPR) and boosting reuse and recycling of textile waste: As part of the scheduled revision of the Waste Framework Directive, the EC will propose a more harmonised EU EPR framework, in particular for textiles, including also with eco-modulation of fee. Interventions will mostly target waste prevention measures and preparation for reuse, such as waste collection. The ultimate goal is to foster the decoupling of waste generation from the growth of the textile market (European Commission, 2022a).

4.2.3.2. Weaving the industry of tomorrow: creating the enabling conditions

In this section, the strategy is more dedicated in setting the industry conditions that will enable a smoother transition. To ensure consistent action, the EC will build a dedicated Transition Pathway for the Textiles Ecosystem, that will be presented in Section 4.2.1.3.2.1. As for the previous, it intends to operate in five main areas listed here.

I. Launching the Transition Pathway for the textiles ecosystem of the future:

Among the overarching goals of the strategy presented in Section 4.2.2., the European Commission (2022a) has listed the publishing of a dedicated Transition Pathway for the Textiles Ecosystem. It falls within the intended update of the EU’s Industrial Strategy, working to boost the green and digital transitions, as well as increase the resilience of whole European industrial ecosystems. Specifically, the Transition Pathway for the Textiles Ecosystem will include commitments on circularity and related business models, actions to strengthen competitiveness, and identifying specific investments needed for the twin transitions (European Commission, Internal Market, Industry, Entrepreneurship and SMEs, 2023). It will also serve as an opening tool for the following release of the Ecodesign for Sustainable Products Regulation and Digital Product Passport.

However, as anticipated in Section 4.2.2., the Transition Pathway for the Textiles Ecosystem was supposed to be published by the end of 2022 but, as of May 2023, it is not available yet (European Commission, Internal Market, Industry, Entrepreneurship and SMEs, 2023). What we could found is only the Report on the Targeted Stakeholder Consultation. This document provides an overview of the output of a workshop held between September and October 2022, inviting a set of key stakeholders to discuss on sustainability, digitalisation, resilience and the social dimension of the textiles ecosystem (European Commission, Internal Market, Industry,

Entrepreneurship and SMEs, 2023). Such observations would help policy-makers to build up a strategy that aligns to the largest extent possible to the actual needs of the market.

II. Reversing the overproduction and overconsumption of clothing: driving fast fashion out of fashion: The European Commission (2022a) considers companies the key actor in shifting the paradigm of fast fashion toward more sustainable and circular business models. In this perspective, the Transition Pathway for the Textiles Ecosystem would engage stakeholders to facilitate the scaling up of resource-efficient production processes, and promote the adoption of processes, reuse, repair activities and other circular business models (European Commission, Internal Market, Industry, Entrepreneurship and SMEs, 2023). Additional stimulus in that direction can be offered by social enterprises active in the reuse sector. In line with the Transition Pathway on the Proximity and Social Economy and EU Social Economy Action Plan, the EC will boost the number of active social enterprises by adopting guidelines on how to support uptake and partnerships between social enterprises and other actors in the context of the circular economy. As most of these interventions are non-binding, the Commission calls upon MSs to intervene as to offer favorable market conditions for the above-mentioned change to happen (European Commission, 2022a).

Other actions will instead target consumers to promote new consumption patterns, focused on durability, quality, as well as repair and reuse activities. Among others, key initiatives are #Re-FashionNow motto and related actions, the European Bauhaus, and the Sustainable Consumption Pledge (European Commission, 2022a).

III. Ensuring fair competition and compliance in a well-functioning internal market: The EU Product Compliance Network established in 2019 sets out cross-border market surveillance practices, to activate collaborations between relevant actors, notably customs and other market surveillance authorities. They aim at strengthening the enforcement of EU legislation on all products placed on the EU market, irrespective of their origin (European Commission, Internal Market, Industry, Entrepreneurship and SMEs, 2019). Among those, the REACH4-TEXTILE targets the monitoring of non-EU textile products entering the borders, in respect to their compliance with the REACH Regulation (EURATEX, 2021). Lastly, the European Commission (2022a) will fight IP infringements with the implementation of the EU Toolbox against counterfeiting: it was planned to be released in the end of 2022, but as of May 2023, it has not been published yet.

VI. Supporting research, innovation and investments: here the European Commission (2022a) is still working on a common industrial technology roadmap on circularity. Yet, it has already defined some key Public-Private Partnerships to stimulate research and ensure leadership in the ecosystem, in the field for instance of circular business models, bio-based innovations and de-carbonization of the industry. Some projects will be also directly co-financed by the EC, including them in the set of initiative funded with the LIFE Programme, for environmental and climate action. The initiative in fact supports also independent third-party initiatives that intervene in one of the following areas: (i) Nature and Biodiversity, (ii) Circular Economy and Quality of Life, (iii) Climate Change Mitigation and Adaptation, and (iv) Clean Energy

Transition (European Climate, Infrastructure and Environment Executive Agency, 2023). Among the other possible partnerships, the EC developed the European Green Deal Dataspace and the Manufacturing Dataspace, so as to more easily share and reuse data across companies. Both are already functioning and are waiting for more contributing partners. Lastly, under the Regulation on Taxonomy for Sustainable Investments, new technical screening criteria, based on circular economy and anti-pollution principals, will be developed to mobilize private investment in the industry and its transition (European Commission, 2022a).

V. Developing the skills needed for the green and digital transitions: the majority of the initiative targeting innovation and new production processes require highly skilled workforce, both to develop and implement them. In this perspective, the EU Pact for skills will promote the up- and re-skilling, as well as the acquisition and transfer of green and digital abilities, including knowledge on life cycle and value chain assessment (European Commission, 2022a).

4.2.3.3. Tying together a sustainable textiles value chains globally

This last point tackles the partnerships between European institutions, non-EU countries and other international organizations and their initiatives, as to promote cooperation and projects to support sustainable textile value chains. The Strategy will operate in two main directions.

I. Due diligence for environmental and social fairness: the European Commission (2022a) will promote decent working conditions in textile supply chains by engaging in bilateral relations and multilateral fora, such as the Better Work Programme developed by International Labour Organization. With its own Corporate Sustainability Due Diligence Directive the Union will introduce horizontal due diligence for companies to address and make them accountable for actual or potential violation of human rights and impact on environment. This does not extend only to companies manufacturing in EU territories, but also to third-country companies employed by European buyers, or any large buyers generate significant turnover in the within the EU borders. Extreme actions are taken against child labor, where according to the EU Strategy on the Rights of the Child, the EC prohibits the sale on EU market of items made from any form of forced labour, including child labour (European Commission, 2022a).

II. Addressing the challenges from the export of textile waste: the strategy ends with addressing the export of textile waste to non-EU countries. Under the framework set by the EU rules on the shipment of waste, transport to non-OECD countries would be allowed only when the state will express to the EC their willingness to import specific types of waste and prove to manage it sustainably. This will also include the development of bilateral agreement and region-to-region trade agreements, in line with point 4.2.1.3.1.. In addition, to avoid false labelling of waste as second-hand to escape waste regulations, the EC will set specific criteria to distinguish between waste and certain second-hand textile products (European Commission, 2022a).

4.2.4. Policy Coverage

In this section, we are summarizing the intended actions presented in the strategy as to give a more general overview of the actual policy coverage. This will help us connect the content of the instrument with the identified market issues.

a. Extension of product life: with ecodesign requirements, the strategy aims at extending the life of products, by increasing its durability and reusability, strengthening and emphasizing the opportunities for repairing (European Commission, 2022a).

a. i. Recycling, against destruction: when reusing is not a feasible option, recycling activities are definitely the preferred alternative, especially in the form of closed-loop. The European Commission (2022a) aims at promoting such treatment processes by again imposing conditions on product design to ensure the highest chances of recycling.

a. ii. Controlling exports: the strategy commits to give products the most sustainable end-of-life possible. Firstly, the EU will ensure that transported items are not mis-labelled, to then approve export only when receiving countries will have presented and confirmed the treatment they will employ on waste (European Commission, 2022a).

b. Engaging firms: the strategy will hold companies accountable for their inappropriate behaviors, whether against the environment or in breach of human rights. At the same time, it will also offer the conditions to develop innovations and more sustainable products, via for instance private-public partnerships, funding opportunities... Among all organisations, social enterprises will play an important role and will be offered favorable conditions to grow (European Commission, 2022a).

b. i. Targeting greenwashing: by imposing stricter rules on green claims, in the European Commission (2022a) aims at backing company's statement with actual performance checks and third-party certifications. To make it also clear and publicly available, labelling will also be updated accordingly.

b. ii. New business model: also by engaging private companies, the strategy aims at changing the current the current paradigm of overproduction and overconsumption, based on fast and easy access to items (European Commission, 2022a).

c. Product design: the European Commission (2022a) acknowledges that to enable actions in point 4.1.4.a., it comes necessary to impose stricter requirements on inputs and how products are design. This includes, for instance, easy separation of components to enable as complete as possible and specific recycling process, or usage of non hazardous inputs, for both humans and the environment. Such information will be made as transparent as possible, with dedicated labelling and digital tools.

c. i. Chemical employment: in line with the content of existing policies, the European Commission (2022a) will develop and enforce stricter rules of the usage of hazardous chemi-

cals in textile products. In order to extend such requirements to products manufactured outside the EU, bi- and multi-lateral agreement will be enforced with partner countries, as well as collaborations with customs, market surveillance authorities and labs to control imported items.

c. ii. Reducing microplastics: by imposing stricter controls on components and manufacturing processes, it will be possible to control the unintentional release of micro plastics (European Commission, 2022a).

4.2.5. Policy Interventions

As visible in section 4.2.3., the strategy references to a wide number of instruments and legislation, some of which cover multiple aspects. We are now presenting in Table 34 a complete list of measures, paired with the policy objective(s) they aim at and their status, as of end of May/beginning of June 2023. This schematization works as a useful tool for the subsequent comparison with existing market failures.

Objective	Dedicated Instrument	Characteristics and/or Functioning	Applicability and Implementation
Circularity of products: current products are designed with a linear perspective. The Commission instead favours more circular and sustainable goods.	<i>Digital Product Passport:</i> Not available yet (European Health and Digital Executive Agency, 2023).	Aim at favouring clear, structures and accessible information on product characteristics and their circularity. (European Commission, 2022a p.5)	The tool is still being developed and will be published not before 2024; planned to be a supportive tool (European Health and Digital Executive Agency, 2023).
Stimulating reuse and recycling: circularity of products can be achieved also thanks to the promotion of alternatives to disposal and destruction.	<i>Ecodesign for Sustainable Products Regulation:</i> 2022 proposal to build on the 2009 <i>Ecodesign Directive</i> (European Commission, DG Communication, 2022b).	Latest update include ecodesign requirements extend the life of textile products, by increasing their durability and recyclability. (European Commission, 2022a p.3-4)	Regulation would be a binding acts, therefore have immediate and global (in EU territories) applicability (European Union, n.d.). Yet, it has not been developed and approved yet
Accountability of producers: manufactures and buyers should be made accountable for their unsustainable behaviours, whether against the environment or individuals.	<i>Waste Framework Directive:</i> published in 2008 and updated periodically; latest updates are planned for 2023, not available yet (European Commission, DG Environment, 2022b).	As part of the planned revision, a more harmonised EPR framework and mandatory targets will be included, as well as guidelines on ideal measures. (European Commission, 2022a p.7)	Directives set out goals, thus MSs should implement their own interventions (European Union, n.d.). Under development so not applied yet.
	<i>Corporate Sustainability Due Diligence Directive:</i>	Introduce horizontal due diligence initiatives for companies to address and make them accountable for actual or potential	Once adopted, MSs have two years to transpose

	<p>proposal presented in February 2022, for approval by Parliament and Council in 2023 (European Commission, DG Communication, 2022a).</p>	<p>violation of human rights and impact on environment. Applicable on The directive applies to both companies manufacturing in the EU and big buyers generating large profits in the region (European Commission, 2022a p.12).</p>	<p>into national law and communicate the relevant texts to the Commission (European Commission, DG Communication, 2022a).</p>
<p>Stricter controls on imports: Strengthening the enforcement of EU legislation on all products placed on the EU market, irrespective of their origin.</p>	<p><i>EU Product Compliance Network:</i> established in 2019 (European Commission, DG for Internal Market, Industry, Entrepreneurship and SMEs, 2019).</p>	<p>To structure the coordination and cooperation between market surveillance authorities in EU countries (European Commission, 2022a p.9)</p>	<p>Already in force, as an entity. composed of representatives from each EU country, the chairs of the Administrative Cooperation Groups and representatives from the European Commission (European Commission, DG for Internal Market, Industry, Entrepreneurship and SMEs, 2019).</p>
<p>Reduce chemical inputs usage: substitute or reduce as much as possible the presence of chemicals in textile products, to guarantee reduced environmental impact and health hazard.</p>	<p><i>REACH4TEXTILE:</i> pilot project launched in 2021 for a 2-years period; funded by the EC DG Growth (EURATEX, 2021).</p>	<p>Monitoring of non-EU textile products entering the borders, in respect to their compliance with the REACH Regulation on chemicals components (European Commission, 2022a p.9).</p>	<p>According to EURATEX (2021), Belgium, Germany and Italy are already actively participating. Other MSs are welcome to join.</p>
	<p><i>REACH Regulation:</i> entered in force in 2007 and periodically updated (European Commission, DG Environment, 2022a).</p>	<p>Develop and add criteria to substitute or reduce as much as possible the presence of chemicals in textile products, in line with <i>Chemical Strategy for Sustainability</i> (European Commission, 2022a p.4).</p>	<p>REACH Regulation is already in place and binding legalisation for MSs and companies (European Commission, DG Environment, 2022).</p> <p>Updated criterias still under development</p>
<p>Ban destruction of products: current products are designed with a linear perspective. The Commission instead favours more circular and sustainable goods.</p>	<p><i>Ecodesign for Sustainable Products Regulation:</i> established in 2009 and updated in 2022 to include the mentioned wider range of requirements (European Commission, DG Communication, 2022b).</p>	<p>Latest update sets transparency requirements on firms to disclose amount of discarded and destroyed products (European Commission, 2022a p.4)</p>	<p>Regulations are binding acts, therefore have immediate and global (in EU territories) applicability (European Union, n.d.).</p>
	<p><i>Transition Pathway for the Textiles Ecosystem:</i> Not published yet (European Commission, Internal Market, Industry, Entrepreneurship and SMEs, 2023).</p>	<p>Development of digital tools to improve efficiencies in production processes (European Commission, 2022a p.4)</p>	<p>Immediate applicability upon publishing; implementation depends on the individual included actions.</p>

<p>Reduce micro-plastics release: synthetic fibres are shed into the environment as small hazardous components, harmful for habitats, animals and humans.</p>	<p><i>Ecodesign for Sustainable Products Regulation:</i> established in 2009 and updated in 2022 to include the mentioned wider range of requirements (European Commission, DG Communication, 2022b).</p>	<p>Introducing measures to target manufacturing processes and development of innovative materials (European Commission, 2022a p.5).</p>	<p>Regulations are binding acts, therefore have immediate and global (in EU territories) applicability (European Union, n.d.).</p>
<p>Targeting greenwashing: consumers should be provided with transparent information, making them able to perform conscious and informed purchases.</p>	<p><i>Empowering Consumers for the Green Transition:</i> update existing directives on the matter of consumers rights and commercial practices (European Commission, 2022a p.6).</p>	<p>It will ensure that ensure that information about durability and repair, are provided at the point of sale (European Commission, 2022a p.6).</p>	<p>Update on directive, so not legally binding but guideline for MSs. The instrument is still undergoing debate between institution but is expected to be approved in by the end of the year (European Parliament, n.d.-b).</p>
<p>Targeting greenwashing: consumers should be provided with transparent information, making them able to perform conscious and informed purchases.</p>	<p><i>Green Claims Initiative:</i> update existing directives on the matter of consumers rights and commercial practices (European Commission, 2022a p.6).</p>	<p>Green claims are allowed if underpinned by recognised environmental performances based on EU Ecolabel and environmental footprint methods (European Commission, 2022a p.6).</p>	<p>Intended to be a directive, thus not legally binding but guideline. Still undergoing development processes, no stated implementation date (European Commission, 2022a).</p>
<p>Targeting greenwashing: consumers should be provided with transparent information, making them able to perform conscious and informed purchases.</p>	<p><i>Textile Labelling Regulation:</i> 2023 review to existing text from 2011 (Your Europe, 2023).</p>	<p>Require textile sold in the EU market specifying fibre composition and other mandatory disclosure information (European Commission, 2022a p.5).</p>	<p>Regulations are binding acts, therefore have immediate and global (in EU territories) applicability (European Union, n.d.).</p>
<p>Targeting greenwashing: consumers should be provided with transparent information, making them able to perform conscious and informed purchases.</p>	<p><i>Transition Pathway on the Proximity and Social Economy:</i> launched in November 2022 (European Commission, DG for Internal Market, Industry, Entrepreneurship and SMEs, 2022).</p>	<p>Boost the number of active social enterprises by adopting guidelines on how to support uptake and partnerships between social enterprises and other actors in the context of the circular economy (European Commission, 2022a p.4).</p>	<p>Implementation depends on the individual included actions. MSs are encouraged and guided in creating the adequate internal conditions.</p>
<p>Developing alternative business models (to fast fashion): current business model define a overproducing system, which also contribute to overconsumption habits. It becomes crucial to develop solid and more sustainable alternatives, to both</p>	<p><i>EU Pact for skills:</i> network launched in 2020 (European Commission, DG for Employment, Social Affairs and Inclusion, 2023).</p>	<p>Promote the up- and re-skilling, as well as the acquisition and transfer of green and digital abilities, including knowledge on life cycle and value chain assessment (European Commission, 2022a p.11).</p>	<p>Already in place. Based on voluntary participation of both public and private entities, grants access to set of initiatives and services (European Commission, DG for Employment, Social Affairs and Inclusion, 2023).</p>

stimulate greener manufacturing and promote more conscious purchases.	<i>Sustainable Consumption Pledge:</i> launched in January 2021, gathering participants (European Commission, DG Communication, 2023)	Promote transition under the motto #ReFashionNow, putting quality, durability, longer use, repair and reuse at the core (European Commission, 2022a p.11).	Inviting manufacturers of non-food products or service providers to take the pledge and committing to respect certain guidelines and points (European Commission, DG Communication, 2023).
	<i>Transition Pathway for the Textiles Ecosystem:</i> Not published yet (European Commission, Internal Market, Industry, Entrepreneurship and SMEs, 2023).	Engage stakeholders to facilitate the scaling up of resource-efficient production processes, and promote the adoption of processes, reuse, repair activities and other circular business models (European Commission, 2022a p.4).	Immediate applicability upon publishing; implementation depends on the individual included actions.
	Not specified.	Stimulate research and ensure leadership in the ecosystem.	Depends on developed instruments.
Making firms actors of change: companies are pushed in the change, but also invited to actively take part.	<i>LIFE Programme:</i> co-financing tool to support projects in the matter of environmental and climate action (European Climate, Infrastructure and Environment Executive Agency, 2023).	Co-finance projects on technological innovation for circular fashion business models and support the uptake of partnerships within the social and circular economy (European Commission, 2022a p.10).	Calls for proposals in dedicated fields open periodically, every year. For 2023, the circular economy call was opened on April 18 and will close on July 27. Projects that meet the criterias are evaluated by experts and granted a certain amount of public funding, private investment is still required (co-financing (European Climate, Infrastructure and Environment Executive Agency, 2023)).
Stricter control on waste export: monitor the export of textile waste, both in respect their classification and to the planned disposal activity .	<i>EU rules on the shipment of waste:</i> proposal for Regulation (European Parliament, Press Room, 2023).	Non-OECD countries would be allowed import only under the condition they notify the EC on their willingness to and demonstrate their ability to manage it sustainably. (European Commission, 2022a p.14).	Text has not been approved yet and no timeline has been defined (European Parliament, Press Room, 2023) Regulation intended to be binding to all MSs (European Union, n.d.).
	Not specified, general bilateral and region-to-region agreements.		Depends on developed instruments.
	Not specified.	Set specific level criteria to make a distinction between waste and second-hand products, to prevent mis-labelling and export as to avoid existing regulation within EU borders.	Depends on developed instruments.

TABLE 34 SUMMARY OF POLICY COVERAGE AND INTERVENTIONS.

Source: Sections 4.2.3 and 4.2.4..

Now that we have outlined the set of actions that the Commission is planning to implement or has already in place, we can understand which market failures the strategy is addressing.

5. DISCUSSION OF FINDINGS

In this last Section, we employ our findings from the previous parts to make a complete assessment and answer each one of our research questions.

We are firstly pairing the identified market failures in section 4.1.5.3. together with the outlined policy objectives and interventions presented in section 4.2.5. Based on the results of such comparison, we are presenting some concluding observations, which are contributing to the formulation of consistent answers to our research questions.

5.1. Comparison between Failures and Intervention(s)

As introduced before, we are proceeding now by matching the identified market failures with the interventions outlined in the strategy. The results are presented in Table 35.

Identified problems (section 4.1.5.3.)	Policy objective(s) (section 4.2.4)	Policy Intervention(s) (section 4.2.4)	Comments or observations
Structural problem - EU is a net importer of apparel products; decreasing resilience of the European market: the European manufacturing system is not capable of fulfilling its internal demand, both in terms of quantity and quality of products. As a result, it is reliant on import from Eastern Asian countries, making the EU apparel market more sensitive to shocks and instabilities emerging in those countries (Section 4.1.2.2.)	None.	No direct intervention.	More specific observations presented in section 5.2.

Asymmetric information and negative externality (market failures) - Low control and transparency of imported products:

European legislation is enforceable (depending on the type) on products manufactured within its borders, thus generating inequalities between EU and non-EU producers, as well as between their goods (Section 4.1.2.2. and 4.1.2.3.). As a consequence, consumers do not have complete information the characteristics of purchased products. This could endanger both customers and their health, as well as the environment in the case of improper treatment and disposal of goods.

Stricter controls on imports: develop instruments aimed at strengthening the enforcement of legislation on all products placed on the EU market, irrespective of their origin.

Corporate Sustainability Due Diligence Directive: make companies accountable for actual or potential violation of human rights and impact on environment

The content and requirements of the implemented directive are applicable on both manufacturing companies within the EU and firms generating great profits from sales in the European market (European Commission, 2022a p.12) to ensure equal treatment.

The directive has not been approved yet, therefore the content is not available and implementation by MSs will take up to two more years (European Commission, DG Communication, 2022a).

EU Product Compliance Network: structure the coordination and cooperation between market surveillance authorities in EU countries.

The agreement sets measures and establishes internal cooperation within the EU. Sound application is guaranteed by a dedicated entity (European Commission, DG for Internal Market, Industry, Entrepreneurship and SMEs, 2019)

Structural problem - Large usage of chemical input:

In section 4.1.2.3., we have demonstrated that large quantities of chemical inputs introduced in production processes, either as component to synthetic fibers or additives. In both cases, they negatively affect the sustainability of products and the industry, in different ways presented in section 2.2.1.2.

Reduce chemical inputs usage: substitute or reduce as much as possible the presence of chemicals in textile products, to guarantee reduced environmental impact and health hazard.

REACH4TEXTILE: monitoring of non-EU textile products entering the borders, in respect to their compliance with the REACH Regulation on chemicals components.

The partnership between different MSs, their respective national authorities and industry organisation is fundamental to guarantee strong and homogeneous controlling systems. Yet, only few countries are participating, thus the positive effects are limited (EURATEX, 2021)

REACH Regulation: Develop and add criteria to substitute or reduce as much as possible the presence of chemicals in textile products, in line with Chemical Strategy for Sustainability.

The Regulation is being applied on all MSs equally from 2007 (European Commission, DG Environment, 2022).

The specific updates on dedicated criteria for textiles have not been included yet (European Commission, DG Environment, 2022).

<p>Structural problem and asymmetric information (market failures) - Large amount of exported waste, for unknown disposal treatment: Section 4.1.2.4. demonstrated that large amount of textile waste is exported to non-EU countries. In those cases, it is not possible to report the applied disposal activities, resulting in a lack of transparency on that stage of the life cycle and, in the worst case, contributing to the negative environmental burden of the industry.</p>	<p>Stricter control on waste export: monitor the export of textile waste, both in respect their classification and to the planned disposal activity.</p>	<p><i>EU rules on the shipment of waste:</i> Non-OECD countries would be allowed import only under the condition they notify the EC on their willingness to and demonstrate their ability to manage it sustainably</p>	<p>The proposal includes the establishment of a Regulation on the topic (European Parliament, Press Room, 2023), thus binding on MSs (European Union, n.d.).</p> <p>The proposal is still being discussed, thus its full content is not available for reading. Therefore, it is not possible to evaluate the intended set of included actions and their extent (European Parliament, Press Room, 2023).</p>
		<p>Not specified general bilateral and region-to-region agreements.</p>	<p>In the policy text, there is no direct reference to any existing agreement, thus not possible to understand the implications and conditions.</p>
		<p>Instruments will be developed to better distinguish between exported second-hand products and waste (European Commission, 2022a; p. 13). This aims at avoiding the voluntary mis-labelling of products to avoid restrictions on trade.</p>	<p>As of May 2023, there are no existing nor planned instrument for which we could find a more precise set of included actions. Therefore, it is not possible to clarify the extent of the intervention.</p>
<p>Structural problem and negative externality (market failure) - Over-production: current busi-</p>		<p><i>Transition Pathway on the Proximity and Social Economy:</i> boost the number of active social enterprises by adopting guidelines on how to support uptake and partnerships between social enterprises and other actors in the context of the circular economy.</p>	<p>It has been implemented already and comprises a large set of interventions, none textile-specific, rather addressing the industrial system in general (European Commission, DG for Internal Market, Industry, Entrepreneurship and SMEs, 2022).</p> <p>Thus, the implementation and effects depend on the initiatives that have been adopted by firms in the sectors.</p>

business models, in particular the fast-fashion industry, are highly exploitative toward the environment and societies. The constant inflow of new products and their low prices fuels the over-consumeristic attitude of consumers that, as presented in section 4.1.2.1., defines the related growth in the negative impacts of the FI.

Developing alternative business models (to fast fashion): current business models characterize a overproducing system, which also contribute to overconsumption habits. It becomes crucial to develop solid and more sustainable alternatives, to both stimulate greener manufacturing and promote more conscious purchases.

EU Pact for skills: Promote the up- and re-skilling, as well as the acquisition and transfer of green and digital abilities, including knowledge on life cycle and value chain assessment.

Already in place, yet it requires voluntary participation (European Commission, DG for Employment, Social Affairs and Inclusion, 2023). Thus, implementation and effects depend on the engagements of actors from the textile industry, which is not a public information.

Transition Pathway for the Textiles Ecosystem: engage stakeholders to facilitate the scaling up of resource-efficient production processes, and promote the adoption of processes, reuse, repair activities and other circular business models

As of May 2023, the Pathway has not been published yet. According to European Commission (2022a), included actions target specifically the textile industry and will be applied immediately; yet, sound implementation depends on the individual interventions in the Pathway and companies adopting them.

Structural problem and negative externality (market failure) - Overconsumption: current business models, in particular the fast-fashion industry, are enabled fast and cheap availability of new products, that got consumers accustomed to such variety and stimulated their ever-increasing demand, as seen in in section 4.1.2.2.. This trend enters a vicious cycle with overproduction, in a spiral that only contributes to un-sustainability of the industry.

Sustainable Consumption Pledge: Promote transition under the motto #Re-FashionNow, putting quality, durability, longer use, repair and reuse at the core

It was launched in January 2021, still open to new applications, only 8 participants as of May 2023. Requires commitment to fulfil at least two of the four objectives (three of which focused on the environmental perspective) (European Commission, DG Communication, 2023).

Ban destruction of products: current products are designed with a linear perspective. The Commission instead favors more

Transition Pathway for the Textiles Ecosystem: engage stakeholders to facilitate the scaling up of resource-efficient production processes, and promote the adoption of processes, reuse, repair activities and other circular business models

As of May 2023, the Pathway has not been published yet. According to European Commission (2022a), included actions target specifically the textile industry and will be applied immediately; yet, sound implementation depends on the individual interventions in the Pathway and companies adopting them.

<p>Structural problem - High quantities of non-recycled products: other activities rather than recycling still occupy a large share of disposal initiatives of MSs and companies, as presented in section 4.1.2.4., resulting in a loss of material products and potential additional negative impacts on the environment and societies, as listed in section 2.2.2.3..</p>	<p>circular and sustainable goods.</p>	<p><i>Ecodesign for Sustainable Products Regulation:</i> include requirements on firms to disclose amount of discarded and destroyed products extend the life of textile products, by increasing their durability and recyclability.</p>	<p>The 2022 update on 2009 Directive enlarges the set of criteria, beyond those of energy efficiency. It includes the transition from directive to regulation, which is still under revision of EU legislative bodies (European Commission, DG Communication, 2022). The regulation would be more binding than 2009 directive but its content is not published yet.</p>
<p>Circularity of products: current products are designed with a linear perspective. The Commission instead favors more circular and sustainable goods.</p>	<p>Circularity of products: current products are designed with a linear perspective. The Commission instead favors more circular and sustainable goods.</p>	<p><i>Ecodesign for Sustainable Products Regulation:</i> include ecodesign requirements extend the life of textile products, by increasing their durability and recyclability.</p>	<p>Tool still under development, planned publishing in 2024 (European Health and Digital Executive Agency, 2023).</p>
<p>Stimulating reuse and recycling: circularity of products can be achieved also thanks to the promotion of alternatives to disposal and destruction.</p>	<p>Stimulating reuse and recycling: circularity of products can be achieved also thanks to the promotion of alternatives to disposal and destruction.</p>	<p><i>Ecodesign for Sustainable Products Regulation:</i> include ecodesign requirements extend the life of textile products, by increasing their durability and recyclability.</p>	<p>The 2022 update on 2009 Directive enlarges the set of criteria, beyond those of energy efficiency. It includes the transition from directive to regulation, which is still under revision of EU legislative bodies (European Commission, DG Communication, 2022). The regulation would be more binding than 2009 directive but its content is not published yet.</p>
<p>Negative Externality (market failure) - Negatively contribute to the achievement SDGs at</p>	<p>Accountability of producers: manufactures and</p>	<p><i>Waste Framework Directive:</i> more harmonized EPR framework and mandatory targets will be included, as well as guidelines on ideal measures.</p>	<p>The 2023 planned update of the 2008 Directive is not available yet. It would set out goals, that MSs should implement individual interventions within their boarders to achieve stated objectives. Yearly or bi-annual reports have to be issued by MSs to demonstrate their progress (European Commission, DG Environment, 2022b).</p>

<p>local and global level: the European fails to contribute to the achievement of SDGs at local and global level, in all groups of goals but especially at environmental level.</p>	<p>buyers should be made accountable for their unsustainable behavior, whether against the environment or individuals.</p>	<p><i>Corporate Sustainability Due Diligence Directive:</i> Introduce horizontal due diligence initiatives for companies to address and make them accountable for actual or potential violation of human rights and impact on environment.</p>	<p>The proposal was presented in February 2022, for approval by Parliament and Council in 2023. Once adopted, MSs have two years to transpose into national law (European Commission, DG Communication, 2022a); therefore, implementation will depend on the transposition of each government.</p>
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TABLE 35 COMPARISON BETWEEN FAILURES AND INTERVENTIONS.

Source: Sections 4.1.5.3. and 4.2.5..

Based on the comparison and the comments made in Table 35, we can further discuss the coverage of the policy and its accuracy in fostering the sustainability transition.

5.2. Interpretation of findings

From Section 5.1, we can conclude that the European Strategy for Sustainable and Circular Textile offers a quite complete set of interventions to address the market failures of the European apparel sector.

The strategy has captured almost all the market failures that we have identified in section 4.1.5.3.; the ones that have not been tackled will be more extensively discussed in this section. For those that have been included, the issues are well-understood and addressed from a set of different perspectives, with the implementation or application of dedicated measures. These range from new acts to including and updating existing body of legislation, by taking advantage of the structured system of European policy instruments. Some of the latest instruments have not been developed yet, as highlighted in table 32; future studies could focus on observing their development and actual coverage, as we are stating in section 6.4.

As stated in table 35, **we did not identify any consistent intervention to address (i) Structural problem - EU is a net importer of apparel products; decreasing resilience of the European market and (ii) Structural problem and market failure, negative externality and asymmetric information - Overconsumption.** We will now present the observations that led us to this conclusion, together with some suggestions for possible measures to be implemented and additional observations.

Structural problem - EU is a net importer of apparel products; decreasing resilience of the European market: as observed from the market description, the EU is a net importer of clothing products (Section 4.1.2.2.). This makes the Union reliant on third parties to fulfil its (enormous) demand; in addition, it makes the internal market more sensitive to disruptions that do not directly affect the Union itself, as explained in section 2.1.4.. The strategy does not address this

point directly. It rather focuses in strengthening the existing European manufacturing system, but mostly from a technological and sustainability perspective (Section 4.1.3.b.). This aims mostly at improving the sustainability of the local manufacturing, but we cannot see a direct connection with the identified problem. As we will also present in the next point, at the current state of the market described in section 4.1.2., the European production would have to increase its output to replace reduced imports and succeed in fulfilling the internal demand. Therefore, section 4.1.3.b. does not constitute a consistent solution to this structural problem.

The strategy also aims at reducing the trend of overconsumption, not only to reduce the environmental impact but also probably to reduce the dependency of the Union from import. In fact, reduced demand for products could result in reduced need for non-EU goods. This conclusion holds if it assumes that consumers would opt for more sustainable behaviors, like the ones presented in section 2.1.3., or have preferred for locally and more sustainably produced clothing, manufactured in the improved industry resulting from section 4.1.3.b.. Further observations on the addressing overconsumption are presented now.

(ii) Structural problem and market failure, negative externality and asymmetric information - Overconsumption: as we have seen in section 4.1.2.3., the Union but also the world in general, are consuming huge quantities of apparel products, which result in large environmental and social impacts. Scholars and non-profit organizations, have agreed that among all the causes of this issue, fast fashion plays a major role. As we have presented in section 2.1.3., the trend offers to consumers a fast and access to a large amount of cheap products. On the side of production, this business model is based on usage of chemical products and cheaper labor force, in Eastern Asian locations mostly (Bick et al., 2018).

The strategy references directly to this issue only on the point about the implementation and application of the Sustainable Consumption Pledge, at the end of section 4.2.3.2.II.. By then having a deeper look at the content of the instrument presented by European Commission, DG Communication (2023), it comes that it focuses mostly on manufacturing processes than on the attitudes of consumers. In addition, as of now, it counts only a handful of participants and is still slowly getting the favor of the FI. Undoubtedly, it is vital that products are manufactured in a way that they are more durable - both in material and trendy terms -, easy to repair or to recycle. Yet, we argue that a shift in the mindset of consumers is also needed; therefore, we suggest it is important to raise awareness and educate consumers on the implications of their purchases, as also to reduce their demand. On page 9 of European Commission (2022a), the strategy references to a set of initiatives, such as the #ReFashionNow but are not explained at all in the text. From a deeper research in European Commission, DG Environment (n.d.), it came out that the project only comprises a marketing and social campaign with small producers and activists but not on a dedicated page but outsourced to the ambassadors. It represents a good starting point, even though it is not yet that popular. Indeed, it needs to be complemented with a more pervasive intervention focused on the education on the impact of uninformed overconsumption and promotion of more sustainable behaviors.

We would like to emphasize that the two issues that have not been fully included in the strategy are actually intrinsic structural problems of the market and not just market failures caused by some of its participants. Considering the wider extent of the problems of imports and overconsumptions just highlighted, we would like to suggest that the framework of the strategy may not be enough to offer an effective intervention. In fact, they may require a more consistent set of actions, shared also with other industries that are experiencing the same issues.

Overall, as mentioned before, except these cases, the strategy covers the weak points of the market and addresses them with dedicated interventions.

5.3. Suggestions for future actions

While both improving local manufacturing and addressing overconsumption are important and valuable activities, they do not represent a concrete action to address this structural problem. We are now proposing a few alternative solutions for additional interventions.

Restrictions to imports: the Union could consider additional limitations to imports, whether in the form of tariffs or quotas. By definition, a tariff is “[...] a customs duty or tax levied on imports of merchandise goods. [...] (It) raise(s) revenue for the government and increase the prices of imported products, thus giving domestically produced products a price advantage” (European Commission, DG for Trade, n.d.). Quotas instead set the limit, in terms of quantities, of the amount of products that can be imported. Specifically in the context of the FI and in the light of the sustainability transition, different ranges for quotas and percentages of taxes could be set, based on the levels of environmental and social hazard. That is, the more exploitative a product is, the higher the tax or the lower the amount that could be imported. It comes that these kinds of interventions would push companies to provide more information on their performances, as to get affected less by such restrictions. At the same time, it will also work as an additional control on the quality and characteristics of imported products.

Clearly, this brings up the question on the reliability of companies’ statements, as well as of the functioning of the monitoring and border customs systems. In this perspective, the food and agriculture sector represent a valuable role model, as it includes a consolidated control system implemented with precise and detailed conditions imposed on imported products (European Commission, DG for Health and Food Safety, n.d.).

However, the weakness in this proposal lies in how the Union would be able to fulfil its demand, when imports are limited. This gets back to the point made in section 5.2. about the need to reduce consumption.

Reversing outsourced production: lastly, we would suggest the re-placement or re-location of outsourced manufacturing processes within the borders of the Union. As we have seen in section 4.1.2.1. and 4.1.2.2., local production has decreased in favor of imports, suggesting that probably such activities have been moved to more economically and socially convenient locations. Clearly, this reverse moving implies large investments in monetary terms, and will not be implemented in a short period. In general, this process requires a larger scale intervention,

even beyond the limits of the textile and/or apparel sector. Additionally, the transfer could work in the opposite way as the points made in section 2.3.1., by damaging the economic and social system of producing locations, as a whole negatively contributing to the SDGs at global level.

To conclude, we would still stress a few more points arose in table 32 and 33. These also constitute structural problems of the market, but also of the whole European system, for which the presented strategy would have not been a solution. Yet, they are interesting topics that need to be considered when developing future interventions or updating established ones.

Heterogeneity of the market: as before, the PESTLE Analysis in section 4.1.5.2. highlighted an intrinsic heterogeneity of the Union: a group of 27 countries naturally has its own differences, such as in terms of market performances or attitudes of consumers, as seen in 4.1.2.. Yet, it is not really an issue that can be addressed, also because such characteristics define, to some extent, the different identities of each MS. As a consequence, some interventions should be able to adapt to the characteristics of such market, for instance the type or quality of production. In this perspective, adopting non-binding legislation as suggested in the strategy, and presented in section 4.2.5, is a good approach. At the same time, it is important to identify which areas can be left to the discretion of MSs but under the guidance of the EC and which ones have to be controlled under a unique strict framework. Such distinction is fundamental as to ensure that cultural and social heterogeneity across EU countries does not act as a barrier to the implementation of policies. In fact, it may only emphasize differences between countries and result in negative consequences for the market itself, the environment and societies.

This issue may be considered as a structural problem of both the market and the governance system. As we have presented, there is no concrete intervention that could be taken to address this problem. Instead, it is important to exercise carefulness when selecting which type of legislation to adopt. Decisions in this respect should be based on the intended output and whether differences between MSs could work as a barrier or would enable a more effective implementation of instruments. This suggestion could guide the drafting of future updates of the strategy or of included instruments.

Lag in the implementation of the strategy: as anticipated in the PESTLE Analysis in section 4.1.5.2., policies and legislations require some time to be developed, in respect to when the issue starts arising. This is an characteristics of reactive instruments and governance; as the name suggested, they start getting developed once the issue has already manifested (Kaur, 2021). This phenomena presents itself also in the strategy. As we presented in section 4.2.5., quite some measures or updates have not been drawn nor implemented yet, more than a year after the publishing of the overarching strategy. To some extent, this is also a structural problem of the whole governance system, not only of the strategy.

Undoubtedly, as seen in the market description section 4.1.1., it is now too late to adopt preventive measures as identified issues are already visible; therefore, only reactive solutions are feasible. For this reason, it is important that implemented policies are developed and imple-

mented in the shortest period, yet in the most accurate way possible. As a consequence of this point, we question the decision of the Commission to publish the strategy already in the beginning of 2022. Back then, but also as of now, the majority of the instruments included, such as the Transition Pathway, are under development, as presented in section 4.2.3.2.. Missing some of the most important measures included in the instrument minimizes the understanding of the actual coverage of the published policy. As we pointed out in section 5.1. and 5.2., this affected the considerations made in this paper. Therefore, we would suggest, for upcoming updates and or any other strategy of the EC, to released documents with either more details on the future content of included instruments or to publish them only when the most important instruments are ready to be implemented.

This point concludes the interpretation of the findings of this analysis, and the related observations and suggestions for future development. We will now summaries again the points made in chapter 4 and 5, as to answer the research questions presented in section 3.1.2..

5.4. Answering the research questions

After comparing the identified market failures and making some observations, we are now ready to offer complete and direct answers to our research questions, presented in Section 3.1.2.. We would like to start from the sub-questions, as they contribute to the development of a sound answer for the overarching research question.

SQ 1: Which stages of the supply chain are targeted by the EU Strategy for Sustainable and Circular Textiles?

Almost all stages of the supply chain are targeted. Each one is subject to dedicated interventions, as presented in table 32 under each policy objective and summarized here.

Policy objectives like “accountability of producers” or “developing alternative business models” [section 4.2.5, table 32] tackle manufacturing level and before [section 4.2.5]. In these cases great attention has been paid to sustainable manufacturing processes, to ensure that they are respectful toward the depending societies and the environment, both when such processes occur within and outside the EU. Objective “reduce chemical input usage” [section 4.2.5, table 32] instead target chemical inputs, again in products manufactured inside and outside the EU.

As we have presented in section 5.2., the volume of imports are not really addresses. Yet, we have concluded that there are some additional measures that could be taken, but their implementation and impact have to be more extensively discussed. Anyhow, with actions such as the REACH4TEXTILE [section 4.2.5, table 32], the strategy is at least focusing on ensuring that imported products actually respect the standards required also to EU products.

Placing in the market and consumers' purchases are also considered, by offering them the opportunity to performed informed purchased with more transparent labels and certifications, thanks to the policy objective “targeting greenwashing” [section 4.2.5, table 32]. Yet, in section

5.2., we have observed a lower attention to stimulating consumers to shop less and adopting more conscious behaviors. This could be a good starting point for future actions (section 5.2.)

Lastly, for the end of the life of products, recycling is extensively discussed and planned to take a major role. In objective “stimulating reuse and recycling” and “circularity of products” (section 4.2.5, table 32), reuse and repaired are preferred and emphasized, while recycling is the best alternative between the disposal activities. Destruction is no longer tolerated, as stated in objective “Ban destruction of products” [section 4.2.5, table 32], both inside and outside the Union. For this reason, additional controls have been placed on the export of textile waste to non-OECD countries, as presented in section 4.2.3.3..

SQ 2: To what extent (other) policies can be implemented in the fashion industry to reduce the usage of hazardous chemicals and virgin materials in production?

On these topics, the strategy mostly references to a set of laws and legislations that are external to the textile and fashion industry, as seen in table 32 [section 4.2.5.].

As for virgin materials, the Ecodesign for Sustainable Products Regulation, common to almost all categories of physical goods placed on the EU market, except alimentary products (European Commission, DG Communication, 2022). It plans to include requirements on a wide set of topics, including minimum levels of recycled content and other standards to ensure remanufacturing and recycling [section 4.2.3.2.].

On the side of chemicals, the biggest body of legislation in place is the REACH Regulation. It plays a major role in defining the accepted chemicals and related information (European Commission, DG Environment, 2022a). Section 4.2.3.1.I. presents how regulation will be extended to include dedicated criteria for the FI. On the other hand, the Chemical Strategy for Sustainability and the Best Available Techniques documents also contribute to setting out the conditions and tools to substitute or reduce as much as possible the presence of chemicals in textile products (European Commission, 2022a p.4).

SQ 3: How do policies impact on the recycling of textile fibers?

Closed-loop textile recycling, as introduced in section 2.2.2.1., is the preferred disposal activity among the available ones. According to the Strategy, it is not only a matter of the quality of products, but also in terms of accountability of agents involved (European Commission, 2022a; p.6, 7).

Within the Ecodesign for Sustainable Products, policies act on recycling at different stages: firstly, they encourage the design of products to ensure that the largest amount of inputs can actually be recycled, if not even substituted as to extend product life (European Commission, DG Communication, 2022).

According to the strategy as presented in section 4.2.5., consumers will be informed on the appropriate actions to take for disposal of products. This would be possible thanks to clear la-

bels on components with the Digital Product Passport (European Health and Digital Executive Agency, 2023) and Textile Labelling Regulation (Your Europe, 2023). In this respect, the strategy operates within the framework of the Empowering Consumers for the Green to inform about processes and opportunities (European Commission, 2022a; p.6).

Lastly, the Waste Framework Directive would hold companies accountable for their inappropriate behaviors, when not favoring recycling activity (European Commission, DG Environment, 2022b). In addition, in the case of export, the EU rules on the shipment of waste will ensure that waste get a sustainable treatment in destination countries and that no improper labelling has occurred, to avoid European limitations on product treatment (European Parliament, Press Room, 2023).

RQ: How accurate are EU policies in tackling the un-sustainability of the fashion industry?

As presented in section 5.1. and 5.2., we are more than satisfied with the content of the Strategy and the Commission's intended action to address the un-sustainability of the apparel (and textile) industry. It is a long way, but this policy intervention sets a clear guideline on the optimal direction to follow, listed in section 4.2.5.. A few more actions could and will be taken, as seen in section 5.3.. However, this is common observation for almost all policy instruments.

The European Commission (2022a) recognizes importance of the sector in the European and global economy, as well as its weak points but also the role it can have in positively contribute to the achievement of SDGs world-wide.

As presented in sections 5.1., the strategy has demonstrated to take into consideration different fashion market failures, ranging from low transparency to negative environmental impact from improper disposal, all the way through to high percentages of chemical inputs in products. These failures are understood in their entirety and addressed at multiple levels. Included interventions imply either the development of dedicated instruments, or the extension of measures in common with other markets, all operating within a bigger set of measures for the textile industry [section 4.2.5]. There are only two issues for which we could not find a reactive initiative, as state in section 5.2.: (i) Structural problem - EU is a net importer of apparel products; decreasing resilience of the European market and (ii) Structural problem and market failure, negative externality and asymmetric information - Overconsumption. After analyzing such failures more in details [section 5.2.] and providing some hypothetical further measures [section 5.3.], we concluded that the instances have deeper implications in the global social and economic systems, that interventions may need to go beyond the borders of the textile and fashion industry.

6. CONCLUSIONS

6.1. Summary

As observed in the market description [section 4.1.], even though the FI is a solid and profitable sector, it also represents a heavy negative burden on the planet. For this reason, it has to undergo a radical transition toward a more sustainable supply chain, also more circular.

As companies seem to not have yet found the motivation to start such shift by themselves, it is in the best interests of government and international institutions to exercise some pressure and offer optimal condition for it to happen, also with dedicated policies. In the European context, this role has been taken by the European Commission which has already established its plan for a more sustainable textile and fashion industry with its "European Strategy for Sustainable and Circular Textile".

According to multiple policy theory frameworks, such instruments have to be based on the clear understanding of the issues they would like to address (Weiss, 2000 in section 2.3.4.3.). Once the policy has been issued, its perspective toward the problem is represented by the intended objective goals. It is therefore interesting to observe whether the EC's understanding of the failures of the market aligns with that of non-institutional observers, such as the one resulting from this study. In fact, section 4.1. dissected market performances and characteristics with the ultimate goal of identifying which aspects are the most negative and need external interventions. The ones that have been observed are: (i) EU as net importer of apparel products, (ii) Low control and transparency of imported products, (iii) Large amount of exported waste, for unknown disposal treatment, (iv) Large usage of chemical input, (v) Overproduction, (vi) Overconsumption, (vii) Negatively contribute to the achievement SDGs at local and global level, (viii) High quantities of non-recycled products.

Based on the findings of this research presented in chapter 5, the strategy is based on a quite complete understanding of the listed issues, with the exception of (i) EU as net importer of apparel products and (vi) Overconsumption. Despite it acknowledges them as problems that need to be addresses in the European framework, it fails to provide consistent actions to do so. In section 5.2., we have provided an interpretation of the approach of the strategy toward this issues. We have observed how the tackling of in particular overconsumption could positively impacting on the reduction of imports, yet actions in this direction still have to be taken, especially in respect to consumers educations. In addition, we have to point out that some key instruments, such as the Transition Pathway for the Textiles Ecosystem, have not been developed yet. Therefore, we are not sure whether issues listed in 4.1.5.3., especially (i) EU as net importer of apparel products and (vi) Overconsumption, are more extensively tackled in there. As for the introduction or brief description provided in the strategy, this does not seem to be the case. For this reason, in section 5.2., we have complemented the interpretation with some suggestions on possible additional measures that could implemented to address. As for all other identified problems [listed in section 4.1.5.3.], the EC has a clear idea of the different charac-

tering features and how they have to be tackled, therefore we are satisfied with the content of the strategy and its accuracy in addressing existing failures of the apparel market.

6.2. Contribution to knowledge

As presented in the introduction in section 1.2., no research like this has been conducted before on the fashion industry and on the “European Strategy for Sustainable and Circular Textile”. Indeed, the findings presented here constitute an external independent perspective over the work of the EC and its plan for a greener and more sustainable apparel market.

In addition, considering its novelty, this research can be seen as an example of policy evaluation not based on its effects, but rather on its consistency with existing problems in the market. The methodology and structure of this paper is independent from the policy instrument analysed; therefore, such elements can be applied to any other policy and/or market.

6.3. Limitations

The first limitation that we have encountered is the enormous amount of information available. By relying on secondary data from public and private databases (listed in section 3.2.3), we gained access to an extensive and complete set of information. This situation required us to reflect on which figures could have been more relevant for the topic and the analysis we intended to conduct. The evaluation included the definition of criteria to apply to filter researches and avoid purposeless analysis and/or diverging too much from the scope of the research.

A similar limitation was encountered when navigating the European policies framework. The content of the strategy has been designed to include just brief introduction to each measure. In order to have a more complete understanding of each measure and their extent, we had to analyse almost of all them. Each instrument has its own dedicated website, explanatory document, database, or even all of those. This situation required us to read almost all information available to then extract the most relevant point for the fashion sector. No selection criteria or filter could have been applied.

Despite the large set of information on both market data and policy instruments, some of contents that could have positively contributed to the analysis were not available. In the case of market figures, released data focus almost exclusively for companies manufacturing in EU MSs; but also in these cases, we have identified some gaps or inconsistencies, such as in table 25b and 26. On the side of policies, the lack of information is due to the lag between the publishing of the strategy and the implementation of included measures. This results gaps in the present description of instruments, and therefore in a more negative evaluation or misalignment between the policy and the identified market failures.

6.4. Suggestions for future work

To build up on the last limitation described, it would be interesting to perform again the analysis, or a similar one, once all the instruments have been implemented or at least approved.

Such research would offer a more complete picture of the actual coverage of the policy, as finalised documents include the actual interventions encompassed in the strategy.

Alternatively, future research could focus on assessing the effects of the policy on the market, thus its efficacy in addressing the market failures and its actual role in fostering the transition. We were not able to conduct such evaluation for the following reasons: the strategy has been published slightly more than a year ago, which is not enough time to observe visible changes in the market. In addition, data on market performances are available up to a few years before the current date, therefore even before the strategy was established. Also, as mentioned before, some instruments have not been implemented yet, therefore there could be some areas that will be subject to more dedicated intervention, than the one presented in this paper.

Both researches could also include recommendations, based on their findings and compared with this document, on how to implement the strategy even more and develop more targeted and specific measures.

Lastly, we have decided to focus our attention on two main issues, chemical inputs and recycling, for a more in-depth analysis on those topics. Other studies could instead be dedicated on other subjects. Relevant could be, for instance, the usage of virgin inputs or transport from non-EU manufacturing locations.

Clearly, these are only a few of the possible future studies that related to our research.

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