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**"FASHION INDUSTRY: AN INNOVATIVE PATH TOWARDS  
SUSTAINABILITY"**

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AI – Artificial Intelligence .....	99
B2B – Business to Business .....	100
B2C – Business to Consumer .....	93
BM – Business Model .....	23
BMI – Business Model Innovation.....	67
C2C – Consumer to Consumer .....	93
CAGR – Compound Annual Growth Rate .....	17
CBD – Convention on Biological Diversity .....	41
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CBMI – Circular Business Model Innovation .....	82
CE – Circular Economy .....	47
CEAP – Circular Economy Action Plan.....	48
CEO – Chief Executive Officer .....	57
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CSD – Commission on Sustainable Development .....	41
CSR – Corporate Social Responsibility.....	55
DIT – Do It Together .....	97
DIY – Do It Yourself.....	91
EC – European Commission.....	46
ECOSOC – United Nations Economic and Social Council .....	39
EP&L – Environmental Profit & Losses .....	57
EU – European Union.....	46
FI – Fashion Industry.....	16
FSC – Forestry Stewardship Council .....	78
GDP – Gross Domestic Product .....	48
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HLPF – United Nations High-level Political Forum on Sustainable Development .....	42
ICT – Information and Communication Technology .....	49
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LCA – Life Cycle Assessment/Analysis .....	57
LCI – Life Cycle Inventory .....	59
LCIA – Life Cycle Impact Assessment.....	59

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OECD – Organization for Economic Co-operation and Development .....	67
R&D – Research and Development(al) .....	68
RTR – Rent the Runway.....	105
SBM – Sustainable Business Model.....	67
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SCM – Supply Chain Management .....	27
SDGs – Sustainable Development Goals .....	39
T&C – Textile and Clothing.....	16
TBL – Triple Bottom Line.....	55
UN – United Nations .....	39
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## **Introduction**

The world has rapidly changed over the last decades. Economic growth and the spread of well-being have improved life conditions of billions of people, but mostly at the expense of the Earth's health. The harmful alterations to environmental ecosystems caused by the processes of human industrialization and development and the prevailing consumerist lifestyle have been known for more than fifty years, as evidenced by the numerous conferences organized by the United Nations to discuss how to address the related problems, but policymakers, businesses, entrepreneurs, and end consumers have overlooked them. At least until today. Indeed, nowadays climate change and its extreme natural manifestations have become part of the everyday life and the news, the availability of finite material and energy resources have begun to shrink critically, and alternative 'green' solutions are not yet so widespread and developed as to replace them, but above all, the linear 'make-take-waste' economic model, based on an excessive exploitation of resources, overproduction, mismanagement of waste, and aimed essentially at profit generation, has reached an unsustainable pace, as have people's mindsets, habits, and (over)consumption behaviours. Academics, researchers, environmental and social activists, pioneering entrepreneurs and companies, and conscious and concerned consumers believe that the unique solution, or rather, alternative to a linear model is the circular economy. The fundamental idea underlying this model is that every industry value chain (from raw materials extraction to goods disposal) should reduce resource use and eliminate, or at least minimize, waste generation, so that when products arrive at the 'end-of-life' stage, instead of becoming waste destined for landfills or incinerators, they are introduced back into the chain as 'new' inputs. In a short, the life cycle of products is extended through processes that allow them to 'live' other two, three, four (ideally infinite) more times without generating waste and without resorting to new virgin resources.

In 2014, the European Environmental Agency ranked 'Clothing, Textiles and Footwear' fourth on its list of industries that mostly impact the environment. The Fashion Industry has enormous reach and relevance worldwide because everyone has to interact with it to fulfil a basic human need that is rather considered as a way through which people express their being, emotions, and ideas. Therefore, this industry is not excluded from the linear economic system because it employs huge amounts of natural, man-made, energy-intensive and polluting resources and materials, thus being the cause of many water, air, and soil pollution issues; for this reason, its shift to more sustainable practices would give a strong boost to the global transition to a circular economy and way of life. Innovation constitutes the fundamental means by which fashion companies may begin to consider sustainability as the core value that guides all strategies, decisions making and operational processes. Particularly, in addition to product and processes

innovations, textile and apparel companies should look to innovation through sustainable and circular business models to embrace a deeper, comprehensive, and effective transition.

In this paper, the Fashion Industry, sustainability, innovation, and the reconciliation of the three aspects in the industry in question are the macro themes described in the following chapters.

Chapter 1 provides an overview of the today's fashion industry to better understand its complex structure and global relevance. It includes recent data and forecasts on apparel industry revenues and volumes, with a focus on the difference between two key segments such as luxury and fast fashion. The concepts of supply chain and business model are then explained, what they consist of and how they operate in the current dominant linear model of the Fashion Industry, highlighting the negative impacts that they are having on the environment and its resources, and will continue to have without an immediate change of course.

Chapter 2 focuses on clarifying the meaning of the concept of sustainability. It reports the globally recognized definition of sustainable development provided by the Brundtland Commission in 1987, recalling the long journey and efforts made over the years by the United Nations and the European Union to emphasize the growing importance of putting sustainability intended in all its three dimensions (environmental, social, and economic) at the centre/heart of every political, corporate, and personal decision. It is precisely these three dimensions that are also described in the Triple Bottom Line (TBL) approach in which they form the theoretical foundation on which the same TBL tool, considered crucial for companies to understand and drive change in the way they do business, is based. Finally, there are two sections, one dedicated to some of the tools that fashion companies themselves, or external certification organisations, use to assess their level of sustainability (Environmental Profit & Losses, Life Cycle Assessment, B Corp Certification), and another on how consumers (a key figure in the value chain of any firm or network) are also affected by sustainability.

Chapter 3 contains the Organization for Economic Co-operation and Development's (OECD) definitions of product and business process innovation. However, the focus is on another type of 'emerging' innovation, namely business model innovation. It goes beyond product, process, and strictly technological innovations, but at the same time also comprises them, with the aim of delivering value by changing organization's value proposition and underlying operating model. The combination of this branch of innovation and the three-dimensional concept of sustainability gives rise to sustainable and circular business models, whose objective is to generate competitive advantage by striking a balance with a (fashion) company's impacts on the environment and society.

Chapter 4 begins by pointing out how the Fashion Industry's negative influence on the planet is approaching a point of no return but adds that the circular economy probably represents the

unique available and attainable opportunity to try to make this industry more environmentally, socially, and even economically sustainable in the near future. After explaining what is meant by circular economy, the chapter continues by suggesting how the innovative solution of circular business models constitutes the point of departure of the textile and clothing industry's urgent transition. Resale, rental, repair, and remaking, and the recycling process, are the circular business models resulting from the application of business model innovation to the Fashion Industry with the goal of achieving sustainability. To conclude, are reported four examples of fashion companies that have successfully adopted circular business models.



# **1. The Fashion Industry**

## **1.1. Market overview**

### **1.1.1. Global apparel industry**

The Fashion Industry (FI) is a multibillion-dollar global enterprise devoted to the business of making and selling clothes (Major & Steele, 2023). However, institutions and organizations, which collect national and international data providing reports and statistics, consider the term ‘fashion industry’ to be too much wide therefore resort to some more specific nouns such as Textile and Clothing (T&C), Apparel, Garment, or Clothing, all of which are going to be used as synonyms throughout the following work.

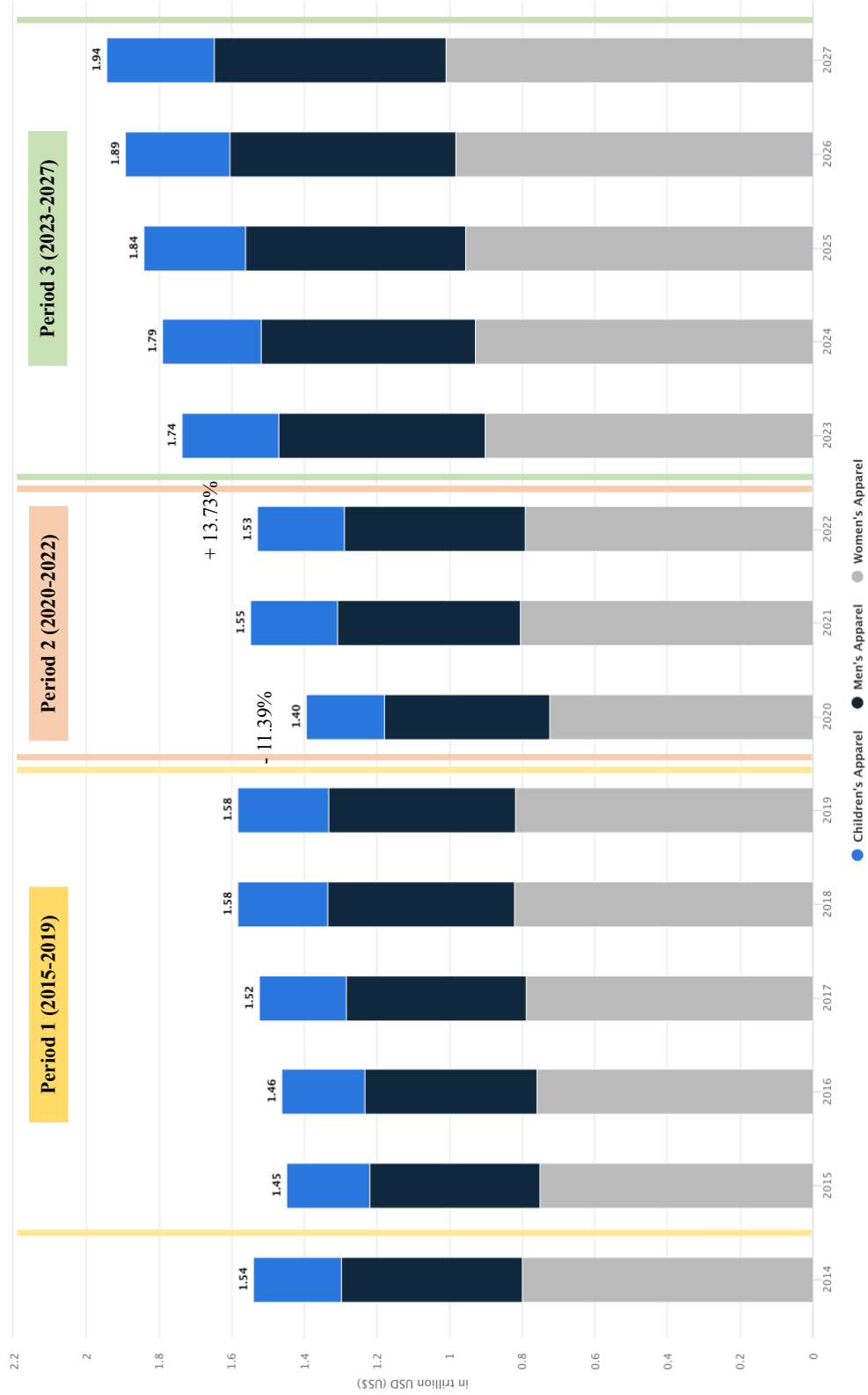
According to Statista the apparel market encompasses every kind of clothing, from sportswear to businesswear, from value clothing to statement luxury pieces, therefore counting separately Footwear, that is the second most important fashion segment within the retail business just behind Apparel (Smith, 2023a; Statista, 2022) and is not going to be included in this work. Statista divides the market in three main segments: Women’s Apparel market, Men’s Apparel market and Children’s Apparel market (clothes for girls and boys up to the age of 14), whose subcategories are shown in detail in Appendix A. Instead, from the data collection are excluded Work clothes, Handbags, Watches and Jewellery, Ski suits, and Umbrellas (Statista Market Forecast, 2023a).

In 2023 the revenue of the global apparel market is estimated to be worth 1.74 trillion (tn) U.S. dollars, registering a notable 13.73% accretion over the previous year and marking the beginning of a new period forecasted as thriving. Indeed, observing Figure 1., over the time lapse 2015-2027, it is possible to pinpoint three different periods that are spotted by two turning points: the first at the turn of 2019 and 2020, indicating a 11,39% drop in the global turnover, and the second at the turn of 2022 and 2023, showing the just-mentioned increase and the achievement of levels higher than the ones pre-downturn. The 2020 abrupt setback of the worldwide apparel revenue amounted to 180 billion USD and was essentially due to the coronavirus (COVID-19) pandemic and the unprecedented national and international measures to counteract and shrink its negative health, social and economic effects. Starting from China, proceeding in Italy, European Union, United States, Brazil, until involving all the countries around the world, Governments imposed numerous and of different intensity economic and social restrictions: plants and shops’ shutdowns, social distance and lockdowns, stoppage or slowdown of people and freight movement and trade via road and ship transport, railway, airway; all of this caused the entry into crisis of most industries and business activities obviously without sparing a sector based on social interactions and visibility like the apparel



and clothing industry. In 2021 occurred a rapid and significant recovery which brought the market to an overall value of 1.55 tn USD by overcoming the 1.52 tn USD registered in 2017. This outcome was probably obtained in the wake of following a general enthusiasm and willingness to renovate and change that engaged the entire planet that was gradually exiting from a state-of-emergency situation. Not surprisingly, in 2022 the clothing market recorded a slight decline by standing at 1.53 tn USD; however, it was not just a ‘natural’ slackening after a great boom yet was basically attributable to the global inflation that is estimated to have reached 8.75% in 2022, recording the highest annual increase in inflation since 1996. This novel challenge, though showed up precisely when the outbreak was becoming a memory of the recent past, was a direct consequence of the impact of pandemic-caused supply chain delays and a series of compounding and unfolding issues such as Russia-Ukraine war, the rise in energy and food prices, countries’ fiscal and political instability, environmental climate change damages (O’Neill, 2023). In a nutshell, even the clothing market witnessed the increase of the cost of production and the fall of consumer confidence. The interactive Figure 1. on Statista platform also provides information on how global revenues are distributed among the three above stated categories. In 2022 the Women’s Apparel segment generated 0.79 trillion USD by confirming itself as the most profitable one with a 51.7% market share. The Men’s Apparel and Children’s Apparel segments stood respectively at 32.7% and 15.6% market shares, and at 0.50 tn and 0.24 tn USD total revenues. This distribution remains almost the same throughout all the years of the indicated time frame 2014-2027 (Statista Market Forecast, 2023a). To recapitulate, Table 1. delves into data regarding the three periods of the worldwide garment market highlighted in Figure 1. Period 1 runs from 2015 to 2019 presenting a positive CAGR of 2.24% that is a comprehensive 134 billion dollars growth over the five years [on purpose the year 2014 was excluded in order to have both Period 1 and Period 3 made of five years, and because it exhibits too much high revenues not in line with the first period’s increasing trend]. As mentioned above, Period 2 runs from 2019 to 2022, three years characterized by instability and consecutive partially overlapped hurdles, whose exceptionality is perfectly described by an odd 4.66% CAGR. Indeed, market analysts expect a more ordinary and blooming Period 3 with a 2.84% CAGR between 2023 and 2027: five years, marked by new challenges but also interesting opportunities deriving from potentially introducible sustainable practices, out of which better than pre-pandemic results are considered achievable.

**Figure 1.** Revenue of the global apparel market from 2014 to 2027 (in trillion USD) [2023-2027 data are estimated].



Source: Statista (2022) with an elaboration of the author

**Table 1.** Data on worldwide apparel market 2015-2027.

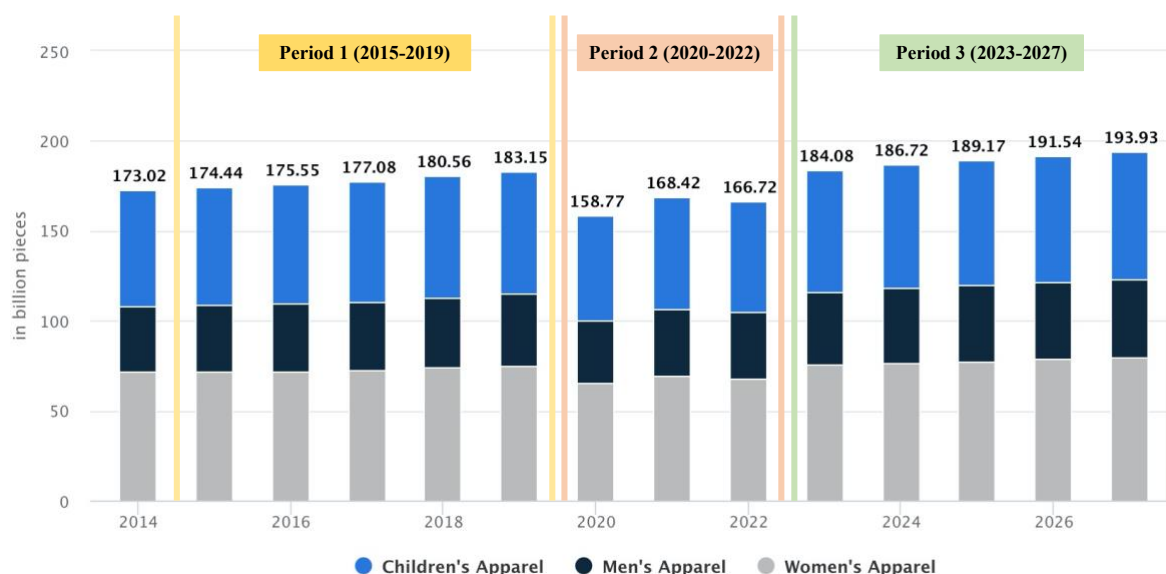
<b>Apparel market worldwide revenue*</b>						
<i>Period 1</i>						
<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>CAGR**</b>	<b>2020/2019</b>
1,448	1,463	1,524	1,584	1,582	2,24%	-11,76%
<i>Period 2</i>						
<b>2020</b>	<b>2021</b>	<b>2022</b>			<b>CAGR</b>	<b>2023/2022</b>
1,396	1,547	1,529			4,66%	13,67%
<i>Period 3</i>						
<b>2023E***</b>	<b>2024E</b>	<b>2025E</b>	<b>2026E</b>	<b>2027E</b>	<b>CAGR</b>	<b>2023/2019</b>
1,738	1,792	1,843	1,893	1,944	2,84%	9,86%
* in trillion USD						
** Compound Annual Growth Rate						
*** E means 'estimated' that is based on forecasts						

Source: elaboration of the author

An additional criterion of measurement to describe the size of the apparel market at global level is in terms of volume. Figure 2. shows the number in billions of clothes and accessories' pieces sold over Period 1, Period 2, and Period 3, where the light but steady positive trends during the first and third periods are clearly visible and where sticks out the shrinkage of the production caused by COVID-19 pandemic and the joined demand drop to satisfy the need of garment during the second one. The same conclusions regarding the market's evolution are available in a more detailed way in Table 2.: here, it is displayed that the 2020 sharp reduction amounted to 24.38 billion pieces less than 2019 (in percentage, -13.31%), whereas the 2022-2023 recovery tipping point is estimated to have had a volume of 17.36 billion pieces (in percentage, +10.41%). By the 2027 the apparel market is expected to have a volume of 193.93 bn pieces, which means beyond than 20 billion more goods compared to 2014 alone, when the quantity in circulation was 173.02 billion (recalling that these volume numbers are not cumulative, therefore each year billions of clothing items are issued ex novo). To a partial extent, this impressive difference is supported by the fast world population increase that is and is going to unfold until 2027: from 7,041 billion people in 2014 to 7,937 in 2027, about a billion more human beings on the same planet (Statista Market Forecast, 2023a). Another interesting fact concerning the number of items sold in the three segments is given by the Table 3. Taking 2019 as base year, because it is the last one before extraordinary years and whose data are close to those forecasted for 2023, Women's Apparel is the segment that inputs the highest number of clothes (75.10 bn) in the global market, probably due to the wider variety of types of garments made for the female gender; followed by the Children's Apparel with 68.20 bn pieces, a notable quantity considered that the slice of population is restricted to girls and boys in the 0-14 age

range [1,244 out of 7,436 bn people, that is 16.73% of the total population in 2019 (Statista Market Forecast, 2023a)]; and, finally, the Men's Apparel with 39.85 bn pieces, which is clearly inferior compared to the other two categories. However, the Men's Apparel confirms itself as the most profitable segment as a matter of fact, keeping 2019 as base year and dividing the global revenue of Figure 1. by the global number of pieces sold/purchased of Figure 2., it results that Revenue/unit (or Price/unit) is equal to 12.90 US\$.

**Figure 2.** Volume of the global apparel market from 2014 to 2027 (in billion pieces) [2023-2027 data are estimated].



Source: Statista (2022) with an elaboration of the author

**Table 2.** Data on volume by segment of the global apparel market 2014-2027.

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023E*	2024E	2025E	2026E	2027E
	<i>in billion pieces</i>													
<b>Children's Apparel</b>	65,36	65,75	66,01	66,38	67,47	68,20	58,50	61,82	61,99	68,00	68,74	69,40	70,03	70,67
<b>Men's Apparel</b>	36,25	36,81	37,40	38,01	39,05	39,85	34,78	37,05	36,71	40,65	41,44	42,18	42,91	43,64
<b>Women's Apparel</b>	71,41	71,88	72,14	72,69	74,04	75,10	65,49	69,55	68,02	75,43	76,54	77,59	78,60	79,62
<b>Total</b>	173,02	174,44	175,55	177,08	180,56	183,15	158,77	168,42	166,72	184,08	186,72	189,17	191,54	193,93
<b>Volume Change</b>		1,42	1,11	1,53	3,48	2,59	-24,38	9,65	-1,70	17,36	2,64	2,45	2,37	2,39
<b>Volume Change (%)</b>		0,82%	0,64%	0,87%	1,97%	1,43%	-13,31%	6,08%	-1,01%	10,41%	1,43%	1,31%	1,25%	1,25%
<b>Average</b>		178,16					164,64			189,09				

\* E means 'estimated' that is based on forecasts

Source: an elaboration of the author

**Table 3.** Apparel market' segments profitability in 2019.

2019	Revenue	Pieces	Revenue/unit
	<i>in bn US\$</i>	<i>in bn</i>	<i>US\$</i>
<b>Children's Apparel</b>	249	68,20	3,65
<b>Men's Apparel</b>	514	39,85	12,90
<b>Women's Apparel</b>	819	75,10	10,91
<b>Total</b>	1,582	183,15	

Source: elaboration of the author

After having observed the enormous quantity of garments yearly traded in the apparel market and the mean revenue from a single clothing item, irrespective of the segment it belongs to, it begs the question why the average price of an apparel item is so extremely low. On one hand, part of the answer might be given by the fact that data referring to the entire world, that is developed, developing and poor countries; on the other hand, another part lays on the existence of further numerous divisions, many of which overlap in the classification, recognizable within the apparel industry, among them the Second-hand apparel industry, the Luxury, and the Fast fashion market (Smith, 2023a).

### **1.1.2. Luxury fashion**

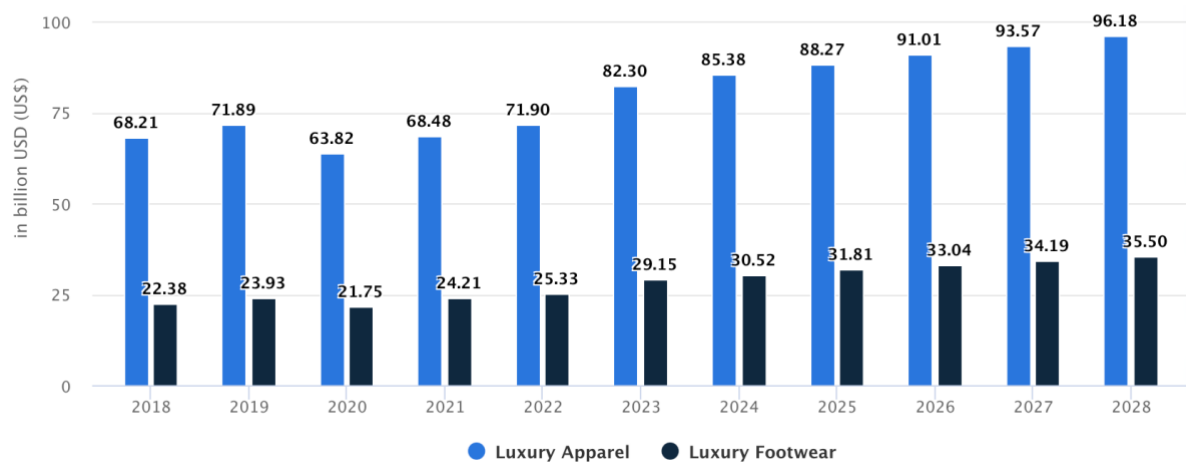
Although, as occurred with ‘fashion industry’, it is not straightforward to find a unanimous and clear definition of ‘luxury fashion’, since already luxury and fashion alone are two conceptually challenging terms, the most uncomplicated way to define luxury fashion would be designer fashion at high prices (Serdari, 2020). But it is something more, according to Jonathan Faiers the combination of luxury and fashion “implies cost, exclusivity, indulgence, and excess, and is typically understood as being constructed from the finest materials, involving a high level of craftsmanship, laborious production, and often originating from a specific manufacturing location.”. The fashion scholar adds that “today luxury fashion is being consumed and produced on an unprecedented scale [...] and, in an age where super brands dominate the luxury fashion landscape, it might seem that as long as there are enough prominently displayed logos and the most expensive materials are used the term ‘luxury’ can be attached to any piece of clothing” (Faiers, 2017). This is the reason why luxury fashion brands are used to deliver through some type of remarkable experience (Serdari, 2020) and through a limited distribution with an high level of service their items made of high-grade materials, which render a garment wearable several years after purchase and still get admiring glances (Loeb, 2022). Academics and professionals usually agree also with Eunju Ko’s description of luxury brands’ products and services, based on a thorough review of the existing literature, from a consumer perspective (Ko et al., 2019):

1. be of high quality.
2. offer authentic value via desired benefits, whether functional or emotional.
3. have a prestigious image within the market built on qualities such as artisanship or craftsmanship or service quality.
4. be worthy of commanding a premium price.
5. be capable of inspiring a deep connection, or resonance, with the consumer.

However, this list misses one essential element of luxury: the timelessness. All five elements may be activated within a brand without it being capable of holding the consumers' attention through time. Hence, Thomai Serdari states that a luxury brand is a well-delivered promise of value in the future (not just today) dependent on the products and services' extraordinariness, itself a component of intangible concepts and ideas, which explains the scarce numbers of luxury brands with lasting value in the market.

According to Statista, the Luxury Fashion segment includes Luxury Apparel and Luxury Footwear (as done for the general apparel market, Footwear is not taken into consideration in this work, unless made explicit). Following data regard only sales of luxury brands belonging to more than 100 of the biggest luxury companies in the world (data exclude mass-market products) and they are expressed at retail value, which contains markups for retail distribution and sales taxes. To be more precise, leather goods (bags and luggage) and artisanal and small-scale production unaffiliated with the covered companies are out-of-scope of this collection, while clothing accessories (such as gloves, neckwear, belts, hats and caps, etc.) are in-of-scope. The most notable companies and holdings are LVMH (with brands such as Louis Vuitton, Fendi or Loro Piana), Kering (Gucci, Balenciaga, Saint Laurent and other brands), Ralph Lauren and PVH (Calvin Klein, Tommy Hilfiger) (Statista Market Forecast, 2023b). Figure 3. provides luxury fashion worldwide revenue from 2018 to 2028, in spite of the different timeframe compared to previous Figures, it is evident the healthy growth outlook over the next five years. Focusing on Luxury Apparel, in 2022 the revenues were equal to 71.90 billion USD, thus reaching and overcoming the outcome of 2019 (71.89 bn USD) notwithstanding the difficult conditions beforehand listed commenting Figure 1. It is expected that a sizeable overall 24.28 billion accretion is going to take place between 2022 and 2028 in the luxury apparel (+ 33.77%):

**Figure 3.** Revenue of the global luxury fashion from 2018 to 2028 (in billion USD) [2023-2028 data are estimated].



Source: Statista (2023)

the increase is going to be gradual and is also confirmed by the 2023-2027 CAGR equal to 3.26%, which is moderately higher than the 2.84% CAGR relating the total apparel market during the same period [see above, Table 1.]. Data about the analysed decade 2018-2028 worldwide revenue and related CAGRs concerning the luxury fashion's Apparel and Footwear markets are reported below in Table 4.

**Table 4.** Data on worldwide fashion luxury revenue 2018-2028.

Luxury fashion worldwide revenue*								
	2018	2019					CAGR**	
Apparel	68,21	71,89					5,40%	
Footwear	22,38	23,93					6,93%	
Total	90,59	95,82						
	2020	2021	2022				CAGR	
Apparel	63,82	68,48	71,9				6,14%	
Footwear	21,75	24,21	25,33				7,92%	
Total	85,57	92,69	97,23				6,60%	
	2023E***	2024E	2025E	2026E	2027E	2028E	CAGR	CAGR 2023-2027
Apparel	82,30	85,38	88,27	91,01	93,57	96,18	3,17%	3,26%
Footwear	29,15	30,52	31,81	33,04	34,19	35,50	4,02%	4,07%
Total	111,45	115,90	120,08	124,05	127,76	131,68	3,39%	3,47%

\* in billion USD  
\*\* Compound Annual Growth Rate  
\*\*\* E means 'estimated' that is based on forecasts

Source: elaboration of the author

### 1.1.3. Fast fashion

On a hypothetical continuum, at the opposite end of the luxury fashion spectrum is generally the Fast Fashion market. Nevertheless, the two industries are connected because luxury creates trends and styles, launched through Fashion Weeks runway shows, wearing celebrities during events, or collaborating with popular influencers, while fast fashion floods quickly the market by offering mainstream consumers the tempting chance to purchase the new hot looks and the next big thing at very affordable prices. In a nutshell, fast fashion is an industry that produces stylish clothes at a low cost by adopting a business model of mass-producing (MasterClass, 2023). Underlying fast fashion's growing success, spread, and profits there are the groundbreaking business model (BM), supply chain and related management, which enable the rapid movement of garments from design to retail stores and end consumers, especially to young people, who are led by the increasing purchasing power and consequent indulgence of instant-gratification desires (Hayes, 2022). Once instead shopping for clothing was considered an event in which clothes were purchased to be worn several times (even by different persons over the years) before the eventual disposal. In fact, consumers would save up to get to buy at yearly seasonal changes one or more new garments, that is items belonged to collections shoppers had previewed in magazines and on television months before their availability in brick-and-mortar

stores. But it began to change in the late 1990s, as shopping became a form of entertainment and discretionary spending on clothing scaled up (Hayes, 2022), feeding the burst of fast fashion companies. If the defining element of fashion luxury was the timeless quality, for fast fashion it was the speed (as the name itself suggests) in both production and consumer clothing demand and use. To better understand the concept, the traditional clothing industry model operates substantially throughout four seasons (i.e., spring/summer, fall/winter, pre-spring, pre-fall), instead fast fashion labels produce about 52 “micro-seasons” a year, that is one new “collection” a week of clothes meant to be worn immediately instead of months later (Stanton, 2023) as happened in the past or still occurs today in a non-fast fashion context. To summarize, fast fashion brands share some universal traits that a customer can swiftly identify in-store or by reading the garment details online (MasterClass, 2023), yet without forgetting the risk of being misled by the greenwashing phenomenon present in labels, merchandising and in other marketing activities:

- cheap materials, which most of the times are low-quality, synthetic fabrics like acrylic, polyester, nylon, and spandex. These fabrics contain plastic that is released in the form of microplastics into waterways both some manufacturing phases and during washing at home.
- manufactured out of country. Countries, such as Bangladesh, China, Vietnam, and Indonesia, are preferred because the cost of living and labour is lower (Will Media, 2022) and institutional oversight is minimal.
- low prices. Fast fashion companies’ goal is to generate high profits by selling huge quantities of inexpensive garments, whose manufacturing cost is made lower by the raw materials, the economies of scale, and the cost-efficient supply chain management.
- many styles. The store contains hundreds of clothing items of varying styles, all of which fall under current fashion trends promoted by designers and influencers.
- rapid production and shipping methods, backed up by a dynamic and complex, but consolidated, supply chain.

However, besides boasting some advantages such as making available stylish clothing to everyone at low cost and above all generating high profits for brands, fast fashion implies dramatic downsides, often unseen or underrated by end consumers, which might be summed up as follows (MasterClass, 2023):

- environmental impact, cheap synthetic fabrics are usually derived from fossil fuel, contributing to increase carbon emissions and global warming. Then, land clearing is implemented to guarantee the massive amounts of cotton required by the industry, but it leads to drought risks, poor soil quality, and reduced animal biodiversity. Lastly,



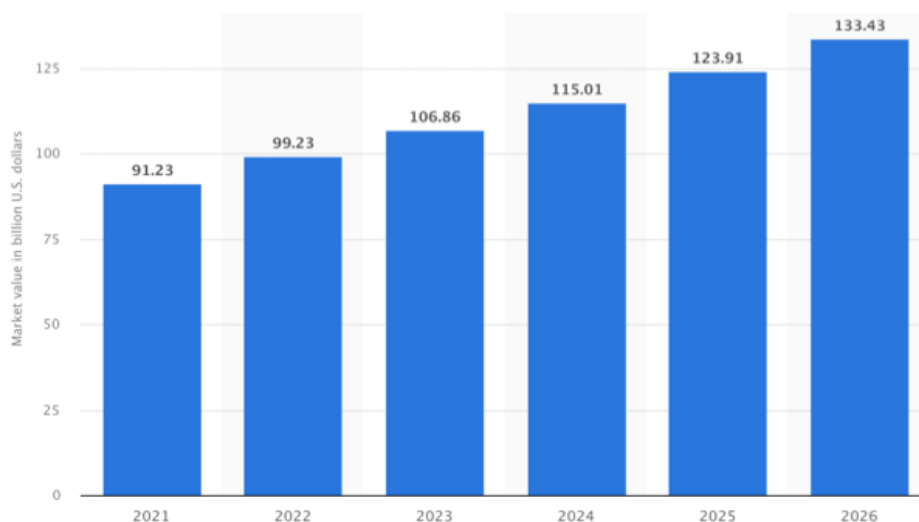
chemicals from dyeing leached into wastewater, and landfills are overflowed with textile waste, unsold merchandise, or worn-once-or-few-times garments [see infra, Section 1.3.].

- exploitative labour practices. Behind fast fashion low prices are not just great business models' solutions, but also human rights abuses. In the apparel factories called 'sweatshop' (Will Media, 2022) workers, most of whom are women and illegally underage people, are paid less than minimum wage to toil long hours in poor and unsafe working conditions.
- negative consumer impact. The fast fashion apparel industry persuades consumers that they need to follow trends, creating a never-ending cycle of buying and disposing of clothing that soon will not be able to meet desires or will be ruined or worn out.

Among the major players within the fast fashion market there are Inditex Group (Zara, Stradivarius, Bershka, Pull and Bear, etc.), H&M Group, Shein, UNIQLO, GAP, Forever 21, Topshop, Esprit, Primark, Fashion Nova, and New Look, many of which are both retailers and manufacturers (Hayes, 2022).

According to Statista and Research and Markets, in 2021 the value of the fast fashion worldwide was estimated to be worth 91.23 billion US dollars [Figure 4.] and a remarkable comprehensive increase equal to 42.20 billion USD is expected to unfold by 2026, thus achieving a 133.43 bn USD market value. In other terms, the computed CAGR for the forecast period from 2021 to 2026 is equal to 7,90%. The historical fast fashion brands H&M and Zara have jostled for position as the market leader in recent years, with the title for highest brand value changing hands on several occasions; but in 2022 Zara won the race with a value of approximately 15

**Figure 4.** Fast fashion market value forecast worldwide from 2021 to 2026 (in billion USD) [2022-2026 data are estimated].



Source: Research and Markets; Statista; PR Newswire

billion USD. However, both two brands have faced a rising competition from online retailers, in particular from Shein, a Chinese fast fashion company (Smith, 2023b) boomed on social media like Tik Tok and Instagram.

## **1.2. Supply chain and business model**

From a theoretical point of view, supply chain and business model are two separate concepts, although both are involved in the intertwined set of decisions that entrepreneurs and managers have to make at the beginning and ongoing to develop and preserve a functioning, profitable and successful business activity operating in any sector or industry, hence the fashion industry.

### **1.2.1. Supply chain concept**

A supply chain is a network of producers, vendors, warehouses, transportation companies, distribution centres, and retailers, who are involved in creating or offering and delivering a good or a service to the end customer (Hayes, 2023). Indeed, some functions of these actors are product development, marketing, operations, distribution, finance, and customer service.

The key steps in a supply chain might be briefly sum up as follows (Hayes, 2023):

1. planning the inventory and manufacturing processes to ensure that supply and demand are adequately balanced.
2. sourcing, moving, organizing, and manufacturing of raw materials and labour needed to create or offer the final product or service.
3. assembling parts and testing the product.
4. packaging the product for shipment or holding in inventory until a later date.
5. transporting and delivering the finished product to a distributor (wholesaling), a retail store (retailing), or a final consumer (selling/purchasing).
6. providing customer service support for returned items.

The combination of these, and others, steps can give rise to numerous different supply chain models that companies are used to select on the basis of its structure and specific needs. Below are three examples (Hayes, 2023):

- continuous flow model, a traditional model that works well for companies that produce the same products with little variation (high demand and no redesign). Crucial points encompass inventory control and raw materials replenishment to prevent production bottlenecks.
- fast chain model, it works best for firms that sell products based on the latest trends (e.g., fast fashion industry). A crucial point is the rapid movement from idea to prototype to production to consumer.

- flexible model, it works with enterprises that manufacture seasonal or holiday merchandise. The focal point consists of the alternation of surges and dearth that ask for accurate forecasts for raw materials, inventory, and labour.

The whole and coordinated supply chain' stewardship is called 'supply chain management' (SCM): an holistic approach to managing in a smoothly way the relationships and flows (both downstream and upstream, or circular) realized across the companies' 'string' (or chain) of operations and processes that produce value in the form of products and services to the ultimate consumer (Slack & Brandon-Jones, 2019). In other terms, SCM is oversight and (centralized) control of all activities required to convert raw material into finished goods for end-users (Hayes, 2023). Two dimensions are particularly important with respect to the management of this set of relationships: what the company chooses to outsource, and who is chosen to supply products and services. Suppliers' reliability is an essential factor to achieve the supply chain management's goal of improving efficiency through the coordination of the efforts of the various entities belonging to the supply chain. An efficient company's supply chain may result in a concrete competitive advantage over rivals or in an enhanced quality of tendered products and services, both of which able to generate higher sales and revenues (Hayes, 2023).

The terms 'supply chain management' and 'supply network' are often mistakenly used interchangeably. But a supply network comprises all the operations that are linked together to provide products and services through to end customers, and in large supply networks there can be many hundreds of supply chains of linked operations passing through a single operation (Slack & Brandon-Jones, 2019). The objective of any supply network is to meet the requirements of end customers by supplying appropriate products and services through its many supply chains when they are needed at a competitive cost. Doing this requires the supply network to achieve appropriate levels of the five general operations performance objectives:

- quality – product or service quality is a function of the quality performance of every operation in the chain, implying that errors in each stage can multiply in their effect on end customer service, and that each stage must take some responsibility for its own and its suppliers' performance.
- speed – it is the time elapsed between a customer requesting a product or service and receiving it in full or, alternatively, the time taken for goods and services to move through the chain.
- dependability – it is similar to speed concept, but it is usually met in 'on time, in full' deliveries.
- flexibility - the supply chain's ability to cope with changes and disturbances.

- cost – whole transaction costs deriving from each operation in a chain doing business with each other.

A sixth possible supply chain's objective, unfortunately not yet widely shared, regards sustainability (or 'sustainable procurement') that is organizations' subscription to environmentally responsible practices by "meeting their needs for goods, services, works and utilities in a way that achieves value for money on a whole life basis in term of generating benefits not only to the organization, but also to the society and the economy, while minimizing damage to the environment" (Slack & Brandon-Jones, 2019).

### **1.2.2. Business model concept**

All firms, either explicitly or implicitly, employ a particular business model, yet business models have only been catapulted into public consciousness starting from around early 2000s. Driving factors include the emerging knowledge economy, the growth of the Internet and e-commerce (other than computers that allowed lower cost in financial statement modelling and an exploration of alternative assumptions about revenues and costs), the outsourcing and offshoring of many business activities, and the restructuring of the financial services industry around the world (Teece, 2010).

Firstly, a business model describes the design or architecture of the value creation, delivery and capture mechanisms employed. The essence of a business model is that it crystallizes customer needs and ability to pay, defines how the business enterprise responds to and delivers value to customers, entices customers to pay for value, and converts their payments to profit through a proper design and operation of the various elements of the value chain. Put differently, a business model reflects management's hypothesis about what customers want, how they want it and what they will pay, and how an enterprise can organize to best meet customer needs, and get paid well for doing so (Teece, 2010).

Secondly, a business model describes the value proposition for customers and other stakeholders in the value network, the set of activities that generate the value, and the associated cost and revenue structures. It is better explained through three interrelated components: value creation (what is offered and how value is created with a focus on the chosen customer segment, its needs' meeting and problems' solutions), value configuration (how different interdependent resources and activities in the value chain drive the value proposition), and value appropriation (cost structure of the activities' resources, the revenue stream derived from customers and other stakeholders, the allocation of value between enterprise and involved participants) (Johnson et al., 2017).

Thirdly, a business model is the plan that is implemented by a company to generate value and make a profit. It includes the various parts and organizational functions of the business, as well as the revenues it generates and the expenses it incurs. In other words, what a company does and how it makes money from doing it. It often includes such elements as: the value proposition of what is offered to the market; the target customer segments addressed by the value proposition; the distribution channels to reach customers; the core capabilities needed to make the business model possible; and the revenue streams generated by the business model (Slack & Brandon-Jones, 2019).

Despite the three above stated alternative, and at the same time complementary, definitions, business models are still considered an interdisciplinary topic whose study has been always neglected by the academic world: for it has not been found an acceptable intellectual home neither in economic theory, organizational and strategic studies, or in marketing science (Teece, 2010). The paradox lies on the fact that most of scholars and professionals agree upon that a clearer understanding of the essence and scientific position of business models would help understanding a variety of subjects including market behaviour, competition, innovation, strategy, and competitive advantage. To be a source of competitive advantage, a business model must be something more than just a good logical way of doing business, and entrepreneurs and managers should primarily be good listeners and fast learners (Teece, 2010), especially during the crucial design and implementation phases. Indeed, business model choices define the architecture of the business and above all, once established, enterprises often encounter immense obstacles in changing adopted models, even if they should evolve over time as markets, technologies and legal structures dictate and/or allow it. Moreover, an effective business model should be non-imitable in certain respects, either by being hard to replicate, or by being thorny to replicate for competitors because it would modify relationships with their existing customers, suppliers, or important alliance partners, etc. (Teece, 2010).

It does exist a great variety of business model types, yet to better understand the concept are reported below some examples (Kopp, 2023):

- manufacturer, responsible for sourcing raw materials and producing finished customized, highly replicated, or mass finished goods, by employing human labour, machineries, and equipment. Manufacturers can sell to distributors, retailers, or end-users (e.g., Inditex Group).
- retailer, the last entity along a supply chain which buys finished goods from manufacturers or distributors and sells them by directly interfacing with end consumers (e.g., Primark).

- subscription, the offer of products or services require ongoing payment, in return for a fixed duration of benefit. The final goal is attracting clients and establishing long-term relationships grounded on mutual loyalty (e.g., Rent the Runway).
- affiliate, a model based on marketing and the broad reach of a specific entity or person’s platform. These entities receive compensations to promote companies’ products or services (e.g., influencers such as Chiara Ferragni).

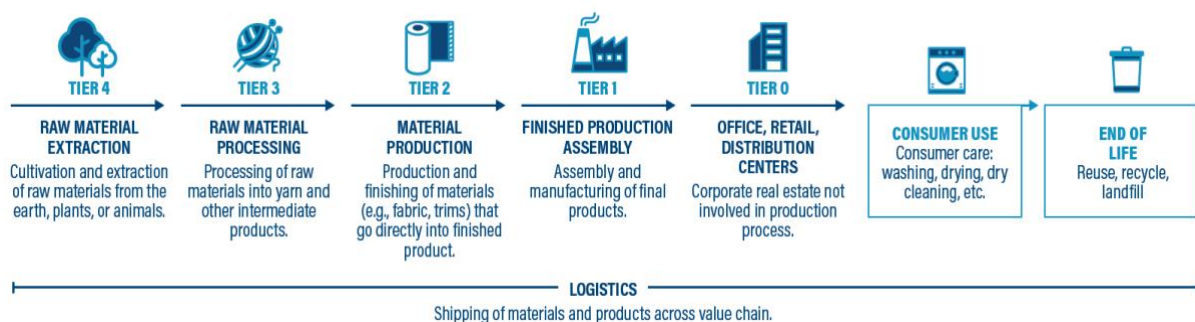
Since all the above reported business models are applicable to the fashion industry (as confirmed by examples in brackets), in the following section a focus on the covered industry.

### 1.2.3. Apparel supply chain and linear business model

Nowadays many supply chains are in global scale, and exactly the fashion industry is one of the principal realities that adopt business models which entail this complex international way of coordinating business phases with the aim to low costs and accelerate production cycles. However, it is not always the one just mentioned the final objective of every fashion company, see luxury brands that search for offering sophistication, accuracy, and exclusivity at premium prices. In general, the fashion industry consists of “four plus one” levels: the production of raw materials (fibres, textile, leather, fur); the production of fashion goods by designers, manufacturers, contractors, and others; retail sales (both at wholesale and retail level); and various forms of advertising and promotion (Major & Steele, 2023). While the fifth level includes end-consumers and their behaviour, varied demand for clothing and accessories, and satisfaction, that is nothing more than the final goal that all previous levels pursue, too.

A more industry-specific representation of the apparel supply chain is given by Figure 5. This becomes more intricate and compelling if it is taken into consideration that a single clothing item, accessory, or footwear is usually made of many different components (e.g., fabrics, zippers, trim, buttons, threads, etc.) supplied by many vendors (Hayes, 2023), who have most of the times their own supply chains and participate with what they bid to the value chain of

**Figure 5.** Apparel supply chain.



Source: Sadowski et al. (2019)

many different fashion companies. Although supply chains are often described as an interconnection of ‘organizations’, this does not necessarily mean that these ‘organizations’ are distinctly separate entities belonging to and managed by different owners (Slack & Brandon-Jones, 2019): this model is called vertical integration and is adopted by those fashion brands that want to enhance the control over the entire value chain’ stages, participants and flow. As implicitly suggested by the one-way direction of the arrows on Figure 5., the predominant business model in the apparel industry is the linear business model, also known as the ‘take-make-waste’ business model, that follows the progression of extracting raw materials inputs (take) and manufacturing same materials into clothes and accessories (make), which then are used and lastly discarded as waste (waste) (Drew et al., 2020). In this section, the end life of apparel is limited to those waste-and-pollution-generating options embraced by most producers and consumers, who mutually foster their shared negatively affecting mindset and way of acting; hence, reuse and recycle alternatives are going to be tackled later in this work’s chapters. Observing and combing illustrations depicted by Sadowski et al. (2019) [Figure 5.], Segura (2017), H&M Group (2023), and Regeneration.org (2023), is resulted the following brief description of a traditional linear textile & clothing supply chain. Commencing from scratch, apparel supply chain begins in all over the world located cultivations, breeding farms, and oilfields (i.e., plants, animals, and Earth’s resources) that constitute the basic sources from which raw materials (principally cotton, flax, silk, wool, cellulose, hemp, furs, leathers, and oil) are extracted (Tier 4). Then those inputs continue their course through the ginning and the conversion into natural or synthetic fibres, where the latter are directly obtained from the countless types of fossil-based plastic derived from petroleum. The successive two steps are instead oriented to the production of those materials at the basis of every garment’s creation (Tier 3 & 2): first, the spinning or processing of yarns and other intermediate products; second, the knitting or weaving of previous phase’s outputs to obtain fabrics and textiles of every kind. Then, follows the set of steps that mark the fashion industry: fabrics and yarns’ dyeing, printing, cutting, sewing, trimming (Major & Steele, 2023) to realize all the various parts that in turn are washed, dyed, cut, sewed to finally be assembled into finished garments and accessories (Tier 1). The last so-called ‘finishing process’ comprises the addition of decorative elements (embroidery, beading); buttons and buttonholes, hooks and eyes, snaps, zippers, and other fasteners; hems and cuffs; and brand-name labels and other labels (often legally required) specifying fibres content, laundry instructions, and country of manufacture (Major & Steele, 2023). Despite in these production phases technological innovation, including the development of computer-guided machinery, have been resulted in the automation of some operations of garment assembly, the fundamental sewing process remains labour-intensive (Major & Steele,

2023). In the next step, all the finished products are pressed, packed, and stocked in apparel manufacturers' or fashion labels' warehouses ready for shipment, allocated to distribution centres, and consigned to retail stores composing the fashion company's selling network over the target geographical markets (Tier 0) (e-commerce and sales through online or digital channels are not contemplated in this traditional supply chain's description). Although merchandise's journey could be considered ended after retailing and final consumers' purchasing, actually garments and accessories life proceeds at consumer's home where they are undergone to cyclical wearing, cleaning, washing, drying, a phase otherwise known as 'consumer care' stage. The last step is the disposal through different ways that lead alternatively to the end, the extension, the new cycle, or the renew life of merchandise. Unfortunately, this stage occurs too much frequently already before or after the retailing step because of unsold, defective or for many other reasons making unsellable fashion goods. In Figure 5. it is also indicated logistics that deals with the planning and control of the movement and storage of raw materials, intermediate products, goods and services, packages along the entire supply chain until the final destination (end consumers and eventual disposal), by ensuring no delays along each step and a delivery in good condition that should permit a cumulative decrease in costs (Hayes, 2023). Logistics, irrespective of being carried out by carriers, couriers or privately managed firms' means via truck, train, ship (containers), or airfreight, is substantially the common thread that allows the stages to be connected, the participants to work, and the supply chain itself to exist by guaranteeing a (possibly) smooth goods, services, and information's flow. However, Figure 5. lacks a primary and crucial step for the entire value chain: textile and fashion design. The former refers to the choice of which colours, textures, forms, materials, qualities must have fabrics and other finishing elements (Major & Steele, 2023); while the latter refers substantially to the job done by stylists and fashion design, that is creating or reformulating fashion items' models and styles, regardless they are working for haute couture, high-fashion, premium, moderate-priced, or budget fashion brands. Looking at the representation given by Segura (2017) of the 'traditional supply chain operations in fashion', it is visible the different position occupied by design in standard fashion houses (e.g., Burberry, Louis Vuitton, Versace) and private labels (e.g., Macy's – Charter Club, Maison Jules; El Corte Inglés – Emidio Tucci, Fórmula Joven; Zalando – Anna Field, KIOMI) and in fast fashion brands (e.g., Zara, Primark, Shein). In standard fashion houses (i.e., luxury), design is the first stage of the supply chain, here stylists express their art and ideas sketching models and drafts that will guide procurements, supplies and operations along the entire value chain, and will create and inspire the trends of the next year' spring/summer and fall/winter seasons as well as the future consumer demand. On the other hand, in fast fashion' supply chains the first stage is



again hold by design, but this time integrated with end-consumers' behaviour because, as explained in Section 1.1.3., these companies aim at chase fast-shifting consumers' demand that asks for stylish and low-cost looks similar to those just launched by high-fashion and premium labels. In a nutshell, luxury creates fashion trends and fast-fashion copies these trends by offering an inexpensive version: the former's supply chain employs almost one year to be completed, instead the latter just 25 days as in the revolutionary and leading case of Zara (CB Insights, 2018).

The 'Apparel supply chain worldwide' report by (Statista, 2023) refers the share of respondents in agreement (a panel made up of senior fashion executives and fashion experts) concerning which leading issues will significantly impact the supply chain in the fashion industry worldwide beyond 2022: rising cost or raw materials (85%), increase in shipping costs (82%), port delays and disruptions (74%), availability of transport capacity (77%), temporary vendor shutdowns (e.g., COVID – 51%), availability of raw materials (77%), consumer demand volatility (64%), international trade tensions (66%), changes in consumer preferences (63%), permanent vendor shutdowns (49%), and increased risk of geopolitical conflict (58%).

To conclude, it occurs frequently in the fashion industry that both luxury and fast fashion companies comprehend and resort to the outsourcing (or the offshoring) of some supply chain' stages as well as to a vertically integrated business model, even though, respectively, they pursue diverse competitive advantages' sources: luxury aims to control over unique craftsmanship, know-how and materials to guarantee the highest and most exclusive quality; whereas, fast fashion aims to control over speed and cost-efficiency to achieve the lowest costs and to offer attracting low prices. Unfortunately, luxury and fast fashion industry share also a negatively affecting fact: so far almost no companies have considered to put the social, environmental, and economic sustainability at the basis, or centre, of their own decision-making process, that is making sustainability the business' guiding core value.

### **1.3. Environmental impacts**

In 2014 the European Environmental Agency has ranked 'Clothing, Textiles and Footwear' fourth in the list of industries by impact on the environment, after Housing, Transport, Travel and Food (Pal & Gander, 2018). Textile and clothing industry has a huge reach and relevance: it touches everyday life of almost every person on the planet; provides people in all countries with a variety of categories of necessities and luxuries, garments for function and self-expression (Drew et al., 2020); and, as sector, holds an important role in the global economy (as shown also by data reported in Section 1.1.) by employing over 300 million people along its value chains (Ellen MacArthur Foundation, 2017). Economic development and 'fast fashion'

trends, along with new technologies that are accelerating e-commerce, are changing the pace and scale of clothing production and consumption (Drew et al., 2020). Apparel production has approximately doubled between 2000 and 2015, meanwhile the number of times a garment is worn before it is thrown away declined by 36 percent during the same period (Ellen MacArthur Foundation, 2017). This increasing pace of consumption and production, in turn, puts a heavier pressure on actors, communities, natural environment and its ecosystems involved in apparel supply chains by rendering the dominant traditional linear business model one of most air-, waste-, water- and soil-polluting at local, regional, and global scales (Drew et al., 2020).

Gas emissions are the principal cause of climate change and rising sea level and the clothing industry plays an important role during its various processing steps (Eder-Hansen et al., 2017), from the production of raw materials to the use of apparel by consumers. In fact, the fashion industry (comprising both apparel and footwear sectors) accounted for around 4% of emissions globally in 2018, equivalent to the combined annual greenhouse gas (GHG) emissions of France, Germany, and the United Kingdom. These comprehensive data on emissions are probably even more alarming if the 17 tonnes of CO<sub>2</sub> equivalent needed to produce 1 tonne of textile are compared with the 3.5 tonnes necessary for 1 tonne of plastic or the less than 1 tonne for 1 tonne of paper. Instead, regarding the consumer phase, washing and drying clothing alone are estimated to account for 120 million tons of CO<sub>2</sub> equivalent (Ellen MacArthur Foundation, 2017). The 2,106 million tonnes of CO<sub>2</sub> equivalent emitted in 2018 are divisible as follows: more than 70% come from upstream activities, particularly energy-intensive raw material production (38%), preparation (yarn and fabric preparation, 8% and 6%) and processing (wet processes 15%, cut-make-trim 4%). The remaining 30% is generated by downstream activities such as transport (3%), packaging and retail operations (3%), usage (20%) and end-of-use (3%) (Berg et al., 2020). Under the current growing path of fashion industry (drew in by the controversial fast fashion) and without further abatement actions beyond one already taking place, emissions will rise by around a third to nearly 2.7 billion tonnes in 2030 (Berg et al., 2020), the equivalent of emissions produced by around 230 million passenger vehicles driven for a year, assuming average driving patterns (Eder-Hansen et al. 2017).

The textiles industry does not limit itself to emit an impressive quantity of greenhouse gas, it is also highly reliant on a large use of non-renewable resources across all stages of the value chain: 98 million tonnes in total of non-renewable resources per year including oil to produce synthetic fibres, fertilisers to grow cotton, and chemicals to produce, dye, and finish fibres and textiles. Producing plastic-based fibres for textiles utilizes an estimated 342 million barrels of oil every year, and the production of cotton is estimated to require 200,000 tonnes of pesticides and 8 million tonnes of fertilisers annually. Chemicals used in the manufacturing processes, such as

dying or finishing treatments, also account for a significant amount of around 43 million tonnes in total (Ellen MacArthur Foundation, 2017). Although data are not the most recent, looking at an Ellen MacArthur Foundation (2017) effective and explicative illustration, the global material flows for clothing in 2015 consisted of more than 97% of virgin feedstock (plastic-based 63%, cotton 26%, other 11%), 25% of recycled feedstock from other industries, and less than 1% was material from closed-loop recycling (i.e., recycling of apparel into the same or similar quality applications). All this feedstock was equal to 53 million tonnes of annual fibre production for clothing, whose 12% resulted in losses in production including factory offcuts and overstock liquidation. Another sizeable leakage occurred during the so-called consumer care phase inasmuch 0.5 million tonnes of plastic microfibres (equivalent to more than 50 billion plastic bottles) were shed through the washing of all textiles and released into the ocean. Finally, 73% of clothing were destined for landfills or incinerators, whereas 2% of the remainder was lost during collection and processing stages, 12% was part of a ‘cascaded’ recycling process (where discarded apparel is employed in lower-value applications such as insulation material, wiping cloths, or mattress stuffing, all of which are difficult to recapture and therefore constitute the final use), 1% fell within the above mentioned closed-loop recycling process, and as previously stated 12% has been lost before throughout production.

After reconstructing the clothing materials flow, it is needed to point out that in 2015 the fashion industry generated during production and end-of-use stages solid waste for 92 million tons having a 460 billion USD value (Choudhary et al., 2022; Eder-Hansen et al., 2017; Ellen MacArthur Foundation, 2017). The Pulse of the Fashion Industry 2017 report by Global Fashion Agenda and the Boston Consulting Group predicted an increase of 62% by 2030, that is an additional 57 million tons of waste per year. By dividing the total forecasted level of fashion waste in 2030 (149 million tons) for the global population estimated for the same year (8.5 billion people) results an annual waste of clothing equal to nearly 17.5 kg per capita across the planet. Hence, the main environmental issue related to waste from discarded clothes (pre- and post-consumer) is constituted by where they end up when their utilisation, emotional or fashionable value fall to zero: burnt in polluting incinerators or sat in huge landfills. To better understand, every minute 60 trucks full of garments are burnt (Will Media, 2023), whereas clothes made from non-biodegradable fabrics (e.g., nylon, polyester, acrylic, elastane) can stay for 200 years on landfills (Drew et al., 2020). In which way efforts and production and consumption habits of every fashion industry value chain’s participant may contribute to the reduction of garment and accessories waste, it is the main objective pursued through some innovative sustainable and circular business models reported in Chapter 4.

Another planet's resource deeply affected and polluted by the fashion industry is water. The most water intensive stage of textile and clothing supply chain is the production of raw materials, yet many other textile processes and the end consumer use and care actions are water intensive, too (Eder-Hansen et al., 2017). The volume of water consumed by the fashion industry in 2015 was nearly 79 billion cubic meters (enough to fill around 32 million Olympic-size swimming pools) and it is anticipated to increase by 50% by 2030 (118 billion cubic meters) according to the authors of the report Pulse of the Fashion Industry 2017 (Eder-Hansen et al., 2017). This is a critical situation especially for the principal cotton-producing countries (such as China and India) having areas that already suffering from high or medium levels of water stress; if water scarcity will become more extreme, cotton-growing nations and the fashion industry may face the dilemma of choosing between cotton production and securing clean drinking water to living beings. Hence it is not surprising to know that, according to the United Nations Commission for Europe, the fashion industry contributes twenty percent of wastewater (MasterClass, 2023). But unfortunately, water is not just wasted, it is also contaminated by chemical substances. The fashion industry damages the environment by discharging through waterways organic and inorganic toxic substances (such as mercury and arsenic) stemming from manufacturing plants (Eder-Hansen et al., 2017). For instance, the denim industry claims the title of second-largest polluter of fresh water in the world (MasterClass, 2023). Hence, poisonous chemicals-issue lies in the fact that an excessive use of these substances can lead to runoff from the land into waterways. Therefore even the soil is not spared by the negative effects of cotton farming because, although areas covered by plantations are only 3% of the planet's agricultural land, its production employs an estimated 16% of all insecticides and 7% of all herbicides (Eder-Hansen et al., 2017). The level of biochemical flows, represented by the flow of phosphorus from fertilizers to erodible soils, already in 2015 exceeded the 'safe operating space' by more than 220%, confirming the fashion industry as a large user of fertilizers particularly in cotton production that alone consumes 4% of total nitrogen fertilizers and phosphorous at global level (Eder-Hansen et al., 2017).

Continuing to treat the relationship between clothing industry and soil, generally it happens that to leave space for various agricultural, rearing, or industrial uses, vast areas of forested land have been cleared until overcoming, already in 2015, the 'safe operating space' by 17% (Eder-Hansen et al., 2017). By 2030 it is predicted a worsening as regards the fashion industry that will probably use 35% more soil for cotton, forest for cellulosic fibres, and grassland for livestock, for a total of over 115 million hectares that could be alternatively used to grow crops for an increasing and more demanding population or left unchanged, or better safeguarded, to preserve forest (reminding that in 2015 world population was 7.405 billion, while in 2030 is

estimated to be 8.5 billion). But this population growth of around 15% over fifteen years is going to require an increase in agricultural production to adequately feed everyone therefore posing a similar dilemma to that which arose when discussing about water shortage and usage: employing available land to produce raw materials for textile or to grow food for an increasing population (Eder-Hansen et al., 2017).

The economic value of all above listed negative externalities is difficult to quantify, however, a report estimated that the overall benefit to the world economy could be about 192 billion USD in 2030 if the fashion industry were to address the environmental and societal fallout of the current status quo (Drew et al., 2020; Eder-Hansen et al., 2017). There is also plentiful evidence that many fashion brands are aware of their negative environmental impact and ready to engage further at many stages of the value chain. But it has been demonstrated as well, that over 50 percent of the industry, especially small and medium-sized players have not started to take preventing or neutralizing actions yet (Eder-Hansen et al., 2017).

To conclude, underlying the fashion industry's environment-polluting and -damaging practices there is essentially the final objective of making profits. This is also the reason behind the prevalent choice of exploiting human and natural resources of those countries (Turkey, China, India, Pakistan, Bangladesh, Cambodia, Vietnam, Thailand, in Eastern Europe or in North Africa) (Eder-Hansen et al., 2017) where social and environmental issues related to labour and in use business model's ethic (i.e., compensation, working hours, worker treatment, worker rights, gender equality, child labour, environment and resources protection, community health, etc.) (Eder-Hansen et al., 2017) are, or were used to be, all of secondary importance. Hence, this scenario outlines and confirms how the fashion industry is currently managing environmental, social, and economic dimensions in an unsustainable way. In fact, in the sustainability concept [see *infra*, Chapter 2.] coexist these same three dimensions, yet sustainability aims to the simultaneous pursuit of all three by looking at all involved stakeholders' long-term-welfare and -success, minimizing negative externalities and generating mostly positive ones.



## **2. Sustainability**

### **2.1. Definition**

The current widely accepted idea of sustainability commenced spreading in the 1980s when the World Commission on Environment and Development (WCED) of the United Nations (UN) officially adopted for the first time the following definition to describe the concept of sustainable development: “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. In this final report, named *Our Common Future*, are contained two further key concepts (Brundtland, 1987):

- the concept of ‘needs’, in particular the essential needs of the world's poor, to which overriding priority should be given; and
- the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

Despite the term sustainability is served as synonym for sustainable development (Meadowcroft, 2023), the former is considered a general concept while the latter a policy or an organizing principle, which focuses mainly on human well-being (Harrington, 2016). In other words, sustainability is the challenging long-term goal and sustainable development comprises all numerous pathways and processes available to achieve the first one (i.e., objective and mean).

### **2.2. Sustainable development at international level**

#### **2.2.1. United Nations**

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, and its throbbing seventeen Sustainable Development Goals (SDGs) [see *infra*, Table 5.] (United Nations, n.d.-e) are just the last rendered and still in the making outcomes of a path begun over fifty years ago and summarized thereafter.

- In 1968 the United Nations Economic and Social Council (ECOSOC) decided to support the idea of having a UN conference focused on human interactions with the environment. UN noticed unprecedented arising opportunities stemming from the profound changes that the relationship between man and his environment was undergoing in the wake of modern scientific and technological developments of that time. Unfortunately, these opportunities were emerging also from a continuing and accelerating impairment of the quality of human environment caused by such factors as air and water pollution, erosion and other forms of soil deterioration, noise, waste, and the secondary effects of biocides, phenomenon accentuated by the rapid increasing of population and the accelerated urbanization. Hence, the concerns about the consequent effects on the condition of man convinced the United

Nations General Assembly (UNGA) of the need for an intensified action at the national, regional and international level, concluding to convene a conference in 1972, and taking up the Government of Sweden's offer to host the event (ECOSOC, 1968; UNGA, 1969).

- During 5-16 June 1972 was held the first United Nations Conference on the Human Environment in Stockholm (Sweden). The 109 participating States agreed upon several resolutions, in particular on the Stockholm Declaration's 26 principles, which placed for the first-time environmental issues at the forefront of international concerns marking the start of a dialogue between industrialized and developing countries on the link between economic growth, the pollution of the air, water, and oceans and the well-being of people around the world; and on the related Action Plan for the Human Environment. This Action Plan consisted of 109 recommendations divided among three main categories: a) Global Environmental Assessment Programme, b) Environmental management activities, c) International measures to support assessment and management activities carried out at the national and international levels (United Nations, n.d.-i, 1973). Another fundamental purpose of this Conference was the creation of the United Nations Environment Programme (UNEP) that still today is the leading global environmental authority of the UN system and works on the monitoring and management of environmental aspects such as greenhouse gases (GHGs) inventory and mitigation, waste management, water usage, energy usage, virtual and sustainable meetings and staff sensitization on environmental matters (UNEP, 2017).
- In 1980 the UNEP, the International Union for Conservation of Nature (IUCN) and the World Wildlife Fund (WWF, today World Wide Fund for Nature) commissioned the World Conservation Strategy (WCS), which aimed to explain the contribution of living resources conservation to human survival and to sustainable development; to identify the priority conservation issues and the main requirements for dealing with them; and, to propose effective ways for achieving the Strategy's objective by resorting especially to government policy makers and their advisers, conservationists and other practitioners directly concerned with living resources and development (agencies, industry and commerce, trade unions) (IUCN et al., 1980).
- In 1983 the United Nations instituted the WCED, chaired by the Norwegian Prime Minister of the time, Gro Harlem Brundtland, who four years later would release the above mentioned Our Common Future report.
- Despite the institutional accomplishments and the establishment of UNEP, the failure to implement most of the actions declared at the Stockholm Conference prompted the UN to have follow-up conferences (Linnér & Selin, 2013). Hence, during 3-14 June 1992 was



held in Rio de Janeiro (Brazil) the landmark United Nations Conference on Environment and Development (UNCED), also known as Rio Conference or 'Earth Summit'. At the same time and in the same city was occurring the 'Global Forum' of non-governmental organization (NGOs) that allows to bring together an unprecedented number of NGO representatives (who exhibited their vision of the world's future in relation to the environment and socio-economic development) and political leaders, diplomats, scientists, and media from 179 countries. The Rio Conference highlighted difficulties of individual UN Member States to address sustainability, because of the interdependence and joint evolution between social, economic, and environmental factors, and how the success in one sector would require actions also in other sectors to be maintained over time. The 'Earth Summit' expressly recognized for the first time environmental, social, and economic dimensions [see infra, Section 2.3.] and their necessity to be integrated and balanced asking for new models of production and consumption, new interpretations of people's way to live and work, as well as the way decisions are made in every possible field. This three-dimensional concept was revolutionary for its time and triggered a lively debate within governments and between governments and their citizens on how to ensure sustainability for development through an integrate approach, since that the UNCED Conference itself concluded that a sustainable development was an attainable goal, but one that requires an active contribution from every person or organization irrespective of the level (individual, local, regional, national, international) it operates (United Nations, n.d.-g).

Taking this into account, the primary objective of the Rio Conference was to provide a broad agenda and a new blueprint for international action on environmental and developmental matters that would help guiding a global cooperation on these topics in the twenty-first century. The principal documents produced were the Rio Declaration on Environment and Development containing 27 universal principles and the non-binding program Agenda 21 with its recommendations, ranging from new methods of education to new ways of preserving natural resources and new ways of participating in a sustainable economy system; and the Declaration on the Principles of Forest Management. Moreover, the following Conventions were formed: the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD), and the United Nations Convention to Combat Diversification (UNCCD) (UNCED, 1993; United Nations, n.d.-g). Finally, the 'Earth Summit' led to the creation of the Commission on Sustainable Development (CSD), a functional commission of the ECOSOC, designated to oversee the advances on Agenda 21 action plan. In 2013 the CSD was replaced by the

United Nations High-level Political Forum on Sustainable Development (HLPF) (UNGA, 1993).

- During 23-27 June 1997 took place the 19<sup>th</sup> Special Session of the General Assembly in New York (USA). This special meeting, also known as ‘Rio+5’ or ‘Earth Summit+5’, meant to review and appraise the five-year progresses realized by countries, international organizations and civil society in implementing the Agenda 21 set challenges (UNGA, n.d.-b). Through the Resolution A/RES/S-19/2, the UNGA published a new list of actions for the next five years having a special consideration for the increasing influence of the globalization phenomenon (UNGA, 1997).
- During 6-8 September 2000 was held the Millennium Summit at UN Headquarters in New York. A symbolic event to celebrate the entry in the third millennium that gathered the largest number of heads of states and governments so far at that time, and that gave the opportunity to underline the UN guiding principle for the 21<sup>st</sup> century “we must put people at the centre of everything we do” (UN Secretary-General, 2000; United Nations, n.d.-c). The 189 Member States also adopted the Millennium Declaration that set out the eight Millennium Development Goals (MDGs) of which quoting particularly the 7<sup>th</sup> and the 8<sup>th</sup> ones: ‘Ensure environmental sustainability’ and ‘Develop a global partnership for development’ (United Nations, n.d.-c).
- From 26 August to 4 September 2002 was held the World Summit on Sustainable Development (WSSD) in Johannesburg (South Africa). This meeting is also known as ‘Earth Summit 2002’ or ‘Rio+10’ because it substantially dug up and strengthened topics and intentions already tackled ten years before (United Nations, n.d.-l).
- During 14-16 September 2005 took place the 2005 World Summit at UN Headquarters in New York, a five-years-later follow-up meeting of the Millennium Summit, whose agenda focused mostly on human beings and populations’ security and protection, yet also on the achievement of MDGs by 2015 pledging additional funds (United Nations, n.d.-k).
- During 22-25 September 2008 the UN Secretary-General and the UNGA President convened a High-Level Meeting on Achieving the MDGs at UN Headquarters in New York. Being at half of the time available before the 2015 MDGs deadline, it was noted that significant progress had fulfilled, but stakeholders needed to accelerate their pace, identifying gaps, committing to take concrete actions, and finding necessary resources and mechanisms, in order to complete Goals in time (United Nations, n.d.-a).
- During 20-22 September 2010 was held the Millennium Development Goals Summit in New York. Another follow-up forum concluded with the adoption of a Global Plan of

Action entitled Keeping the Promise: United to Achieve the Millennium Development Goals (United Nations, n.d.-b).

- During 20-22 June 2012, on the anniversary of Stockholm 1972 and Rio de Janeiro 1992, took place the United Nations Conference on Sustainable Development once again in Rio de Janeiro and for this reason known as Rio+20 (United Nations, n.d.-h). The outcome document The future we want (United Nations, 2012) opened by stating:

“We, the Heads of State and Government and high-level representatives, [...] with the full participation of civil society, renew our commitment to sustainable development and to ensuring the promotion of an economically, socially and environmentally sustainable future for our planet and for present and future generations.”,

thus, remarking the three characterizing tangled dimensions of sustainability. This document contained clear and practical steps for the actualization of sustainable development comprising strategies for financing the pathway, innovative guidelines on Green Economy (GE) policies, and a 10-years framework of programmes on sustainable consumption and production patterns. The Conference also laid the foundations for the process aimed to develop the Sustainable Development Goals included in the post-2015 agenda (United Nations, n.d.-h).

- On 25 September 2013, the UNGA President organized in New York a Special Event towards Achieving the Millennium Development Goals, where Member States reaffirmed their commitment on completing the MDGs by 2015 (UNGA, n.d.-a).
- During 25-27 September 2015, was held the United Nations Summit on Sustainable Development at the UN Headquarters in New York, where more than 150 world leaders formally approved the new ambitious agenda for sustainable development, called Transforming Our World: The 2030 Agenda for Sustainable Development, with its renowned 17 SDGs [Table 5.] and annexed 169 targets. The general goal of this still active plan was to find new ways to improve the lives of the world’s people, to eradicate poverty, to promote prosperity and well-being for all, to protect the environment, and to fight against climate change (United Nations, n.d.-j).
- From 30 November to 12 December 2015 took place the 2015 United Nations Climate Change Conference, also known as COP 21 or CMP 11, which led to the signing of the Paris Agreement and its subsequent ratification by 194 Parties (193 States plus the European

**Table 5.** The 2030 Agenda Sustainable Development Goals (SDGs).

<b>Sustainable Development Goals</b>	
Goal 1.	End poverty in all its forms everywhere
Goal 2.	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3.	Ensure healthy lives and promote well-being for all at all ages
Goal 4.	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5.	Achieve gender equality and empower all women and girls
Goal 6.	Ensure availability and sustainable management of water and sanitation for all
Goal 7.	Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 8.	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9.	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Goal 10.	Reduce inequality within and among countries
Goal 11.	Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12.	Ensure sustainable consumption and production patterns
Goal 13.	Take urgent action to combat climate change and its impacts*
Goal 14.	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Goal 15.	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 16.	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
Goal 17.	Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

\* Acknowledging that the United Nations Framework Convention on Climate Change is the primary international, intergovernmental forum for negotiating the global response to climate change.

Source: UNGA Resolution A/RES/70/1

Union) (United Nations, n.d.-f, n.d.-j). The historic Paris Agreement is a legally binding international treaty to combat the global emergency of climate change that goes beyond national borders, requiring international cooperation and coordinated solutions at all levels.

The Agreement sets three general long-term objectives:

- a) holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and

impacts of climate change [Article 2, Paris Agreement, (UNGA, 2015)]. In other terms, reducing global greenhouse gas emissions to limit the global temperature increase.

b) reviewing countries' commitments every five years.

c) providing financing to developing countries to mitigate climate change, strengthen resilience and enhance abilities to adapt to climate impacts.

It marked the beginning of a shift towards an ultimate net-zero emissions world reachable chasing the fixed Sustainable Development Goals (United Nations, n.d.-f).

- During 2-3 June 2022, five decades after the UN Conference on the Human Environment, was held UN Conference Stockholm+50 (Sweden). The name of the final report Stockholm+50: a Healthy Planet for the Prosperity of All – our Responsibility, our Opportunity briefly recapitulate the essence of this forum: recognize the importance of multilateralism in facing the current Earth's triple planetary crisis (climate, nature, and pollution). Stockholm+50 was interpreted as a springboard to accelerate the implementation of the UN Decade of Action (2020) to deliver the SDGs (2015), encompassing the 2030 Agenda (2015), the Paris Agreement (2015) on climate change, the post-2020 global Biodiversity Framework (2021), and encouraging the adoption of green post-COVID-19 recovery plans (United Nations, n.d.-d, 2022).

To conclude, in 1968 the UN found in the first signals of a negative human impact on environment the opportunity to transform these challenging changes in an innovative way to face development. Therefore, in 1972 the environmental issues and their assessment were put for the first time under the international attention: waste management, water and soil pollution and usage, greenhouse gases are among the matters submitted at that time, but that nowadays are still recurrent and unresolved, if not degenerated. Although, the 1987 Brundtland definition emphasized a guiding forward-looking gaze, in 1992 emerged the UN awareness that the situation was getting worse and even increasingly complex and globalized: for the first time it was affirmed that sustainability was made up of three overlapped dimensions [see infra Section 2.3.] and that the climate change was a real common problem, but simultaneously an effective and concrete global cooperation aiming to the sustainable development was still contemplated as attainable. Over the years, the UN system has renewed its commitment by enacting and carrying out different plans (Agenda 21, MDGs), until another turning point: the 2007-2008 financial and consequent prolonged economic crises, which represented another opportunity toward a more sustainable and 'green' change of course which at that time was not yet considered a priority for most States, people, and companies. Quite the opposite, in those years academics and scholars started lots of studies and projects concerning different sustainability's forms, explanation theories and frameworks, potential assessment and measurement methods,

greener production patterns and consumption behaviours, etc. by progressively feeding and reinforcing the pertaining early-stage literature vein. In 2015 were laid the foundations of the 17 SDGs and the ideal net-zero emissions world, which still today are guiding the United Nations' initiatives and efforts. Finally, during the last years a series of momentous events have been occurred marking the history of human beings: the worldwide COVID-19 pandemic and its linked restrictions and measures to limit the diffusion; the outbreak of wars (e.g., the Russian-Ukrainian conflict) and civil rebellions (e.g., Iran); the escalation of political and social tensions in and between States; and the increasingly frequent natural disasters and extreme unprecedented environmental conditions (e.g., melting glaciers, fires, floods, soil dryness, rising temperatures). A critical situation affecting the entire planet, interpretable as another opportunity given to all involved stakeholders to start from scratch by undertaking a real sustainable attitude and translated by the United Nations in 2022 with a new bottom line report containing clearer directions for the near future, whose name encloses the act of gravely holding own responsibilities: a Healthy Planet for the Prosperity of All – our Responsibility, our Opportunity.

### **2.2.2. European Union**

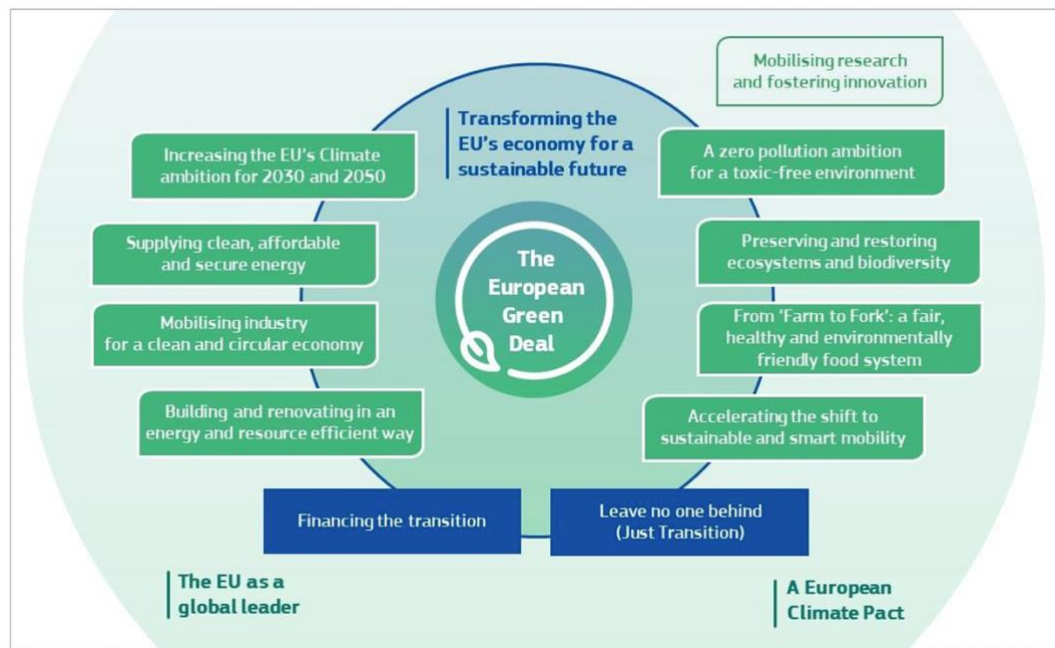
In 2015, the United Nations General Assembly established the Sustainable Development Goals (SDGs or Global Goals) highlighting seventeen interconnected objectives [see above, Table 5.] to create a “blueprint to achieve a better and more sustainable future for all” (Lojacono & Ru Yun Pan, 2021), from which the European Union (EU) clearly has not shirked. Indeed, the European Commission (EC) means to remain committed to the 2030 Agenda and, under the leadership of President Ursula von der Leyen, has presented an ambitious policy programme to deliver on sustainability in the EU and beyond (European Commission, n.d.-b). A full implementation of the UN's Global Goals is crucial to strengthen resilience and prepare the world for future shocks (as recent past and present teach), therefore the EU and its Member States decided to start this journey by embarking on green and digital transitions. The SDGs are as a result an intrinsic part of all cross-sectorial proposals, policies, and strategies promoted or enacted by the current Commission for the period 2019-2024, citing among them the followings ones: the European Green Deal, the Annual Sustainable Growth Strategy 2020, the new Circular Economy Action Plan, the EU Biodiversity Strategy for 2030, the European Skills Agenda for sustainable competitiveness and social fairness and resilience, the Stepping up Europe's 2030 climate ambition: Investing in a climate-neutral future for the benefit of our people, and the Chemicals Strategy for sustainability (European Commission, n.d.-b).

The European Green Deal is a response to climate- and environmental-related challenges presented by the European Commission in 2019. It is a new growth strategy that aims at transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there will not be net emissions of greenhouse gases in 2050 (environmental dimension) and where economic growth will be decoupled from resources use (economic dimension) (European Commission, 2019). In other terms, it aims to protect, conserve, and enhance the EU's natural capital, and to protect the health and well-being of citizens from environmental-related risks and impacts. And, at the same time, it seeks to ensure that this transition is just and inclusive (social dimension) (European Commission, 2019). Keeping the focus strictly on the environmental standpoint of the Green Deal, three key figures can be underlined (European Commission, n.d.-a):

- becoming the first climate-neutral continent by 2050.
- reducing net GHG emissions by at least 55%, compared to 1990 levels, by 2030.
- planting 3 billion additional trees in the European Union by 2030.

Essentially, through the Green Deal and its other political guidelines, the European Commission is trying to put the sustainable development and the deriving well-being of citizens at the centre of EU's policymaking and actions, that is nothing more than what every single company (and individual) should do in order to achieve and have a sustainable future. To better understand, an overall view concerning the various macro elements composing the Green Deal, the general areas towards which actions are oriented, is reported in Figure 6. Particularly relevant, in relation to the topics debated throughout this work, is the point named 'mobilising industry for clean and circular economy': theoretically, to be accomplished, it would require the full mobilisation of industry and considering that to transform an industrial sector and its value chains would need 25 years (a generation), institutional decisions and actions should be taken before 2025 in order to be completed in 2050. The EU's industry has started the shift but still accounts for 20% of the EU's GHG emissions. It remains too 'linear', and dependent on a throughput of new materials extracted, traded and processed into goods, and finally disposed of as waste or emissions. Indeed, only 12% of the materials industry uses come from recycling (European Commission, 2019). This transition represents an opportunity to expand sustainable and job-intensive economic activity [see *infra*, example of figure of Head Sustainability Officer in Kering Group in Section 2.4.1.]. There is significant potential in global markets for low-emission technologies, sustainable products, and services. Likewise, the Circular Economy (CE) [see *infra*, Section 4.1.] offers great potential for new activities and jobs; but again, this passage is happening at a too slow pace with progress neither widespread nor uniform in industry or in any specific single sector. In March 2020 the European Commission adopted the

**Figure 6.** The European Green Deal macro elements.



Source: The European Green Deal (COM/2019/640 final)

new Circular Economy Action Plan (CEAP), one of the main building blocks of the European Green Deal, that announces initiatives along the entire life cycle of products targeting how products are designed, promoting CE processes, encouraging sustainable consumption, and aiming to ensure that waste is prevented, and the resources used are kept in the EU economy loop for as long as possible. Scaling up the circular economy from front-runners to the mainstream economic players will make a decisive contribution to achieving the yearning climate neutrality by 2050 and decoupling economic growth from resource use, while ensuring the long-term competitiveness of the EU and leaving no one behind (European Commission, 2020). From a more economic point of view, a recent study estimates that applying circular economy principles across the EU economy would have the potential to increase EU GDP (Gross Domestic Product) by an additional 0.5% by 2030 creating around 700,000 new jobs. While, from individual companies' stance, since manufacturing firms in the EU spend on average about 40% on materials, closed loop models could increase their profitability, while sheltering them from resource price fluctuations (European Commission, 2020). Innovative models based on a closer relationship with customers, mass customisation, the sharing and collaborative economy, and powered by digital technologies will not only accelerate circularity but also the dematerialisation of European economy and make EU less dependent on primary materials. For citizens, the circular economy will provide high-quality, functional, and safe products, which are efficient and affordable, last longer and are designed for reuse, repair, and high-quality recycling [see *infra*, Sections 4.1. and 4.2.]. A whole new range of sustainable



services, product-as-service models and digital solutions will bring about a better quality of life, innovative jobs and upgraded knowledge and skills (European Commission, 2020). Since up to 80% of products' environmental impacts are determined at the design phase with, as consequence, many products that break down too quickly, cannot be easily reused, repaired or recycled, or made for single use only, the EU aims also to widen the existing Ecodesign Directive (2009) through a renovated legislative initiative counters the linear pattern of 'take-make-use-dispose', a model that at the moment does not provide producers with sufficient incentives to make their products more circular. To recapitulate, some aspects the EC intends to regulate forcing, integrating or recommending sustainability principles are (European Commission, 2020):

- enhance recycled content in products, while ensuring their performance and safety.
- enable remanufacturing and high-quality recycling.
- improve product durability, reusability, upgradability, and reparability, addressing the presence of hazardous chemicals in products, and increasing their energy and resource efficiency.
- reduce carbon and environmental footprints.
- introduce a ban on the destruction of unsold durable goods.
- restrict single-use and opposing to premature obsolescence.

These and any other complementary, regulatory, or voluntary approaches are developed in a way to ameliorate the coherence with existing instruments managing products along various stages of their life cycle. Although actions proposed so far regard principally the upstream actors, the role of end consumers is in the same way crucial; indeed, to reinforce the participation of consumers in the circular economy, the Commission intends to propose a revision of EU consumer law to ensure that consumers receive trustworthy and relevant information on products at the point of sale, including their lifespan and the availability of repair services, spare parts, and repair manuals. The EC also is considering further strengthening consumer protection against greenwashing and premature obsolescence, setting minimum requirements for sustainability labels and logos and for information tools (European Commission, 2020).

Thus, not surprisingly, the CEPA pledges a special attention to some key products and components employed in value chains of different industries, such as electronics and ICT, batteries and vehicles, packaging, plastics, construction, and building, yet also textiles. Marking again that textile and clothing industry is the fourth highest-pressure category for the use of primary raw materials and water, fifth for GHG emissions, and that worldwide less than 1% of all textiles are recycled into new textiles, the Commission proposed a strategy that aims at

strengthening industrial competitiveness and innovation in the sector, boosting the EU market for sustainable and circular textiles (including the market for textile reuse), addressing fast fashion and driving new business models. All considering also that around 60% by value of clothing in the EU is produced outside the boundaries, thus underlying the complexity of the international textile value chain of the European apparel and accessories companies (European Commission, 2020). This strategy is named EU strategy for sustainable and circular textiles (or, Textiles strategy) and its importance is increasing in EU considering that almost 9 out of 10 Europeans (88%) think that clothing should be made to last longer, about 5.8 million tons of textiles are discarded every year (equivalent to 11.3 kg per person), and that an average of 20 to 35 jobs are created for every 1.000 tons of textiles collected for reuse, such as selling them in the second-hand market (European Commission, 2022). The actions that can be carried out in a potential circular fashion industry are numerous, but the ambitious ones included in the set promoted by the Commission's Textiles strategy are (European Commission, 2022):

- setting design requirements for textiles to make them last longer, easier to repair and recycle, as well as requirements on minimum recycled content.
- introducing clearer information and a Digital Product Passport in order to provide traceability of materials and products along the entire supply chain, as well as, if possible, information about safe and fairly paid working conditions of all workers involved in the process.
- tackling greenwashing to empower consumers and raise awareness about sustainable fashion world by ensuring the accuracy of companies' green claims. In relation to this point, in March 2023 the Commission adopted a proposal for a Directive on Green Claims, contemplating that nowadays 53% of 'green' claims give vague, misleading or unfounded information, 40% of claims have no supporting evidence, half of all 'green' labels offer weak or non-existent verification, and exist 230 sustainability labels and 100 green energy labels in the EU with vastly different levels of transparency (European Commission, n.d.-d).
- reversing both overproduction and overconsumption, and discouraging the destruction of unsold or returned textiles, clothes, and accessories.
- addressing the unintentional release of microplastics from synthetic textiles.
- incentivising Circular Business Models (CBMs) including reuse and repair sectors.
- proposing mandatory Extended Producer Responsibility for textiles with eco-modulation of fees.

- restricting the export of textile waste towards extra-European countries [see infra, Atacama Desert example in Section 2.3.] and promoting sustainable practices in textile and apparel at global level.
- publishing a transition pathway to encourage both field-specific operating firms and Member States in supporting the above listed objectives of the Textiles strategy.

In practice, some of these actions overlap with the more general ones presented in the CEAP, after all the EU strategy for sustainable and circular textiles is an initiative created to figure out the CEAP, and both are instrument enacted to concretely realize Green Deal's macro goals.

### **2.3. The three dimensions of sustainability and the Triple Bottom Line**

The idea of sustainability with three dimensions (environmental, social and economic, as already mentioned in this work beforehand) is a dominant interpretation in the nowadays academic literature and, to better understand its meaning, it is important to know that this concept was expressly and officially pointed out for the first time in the UN's action plan Agenda 21 outcoming from the Earth Summit of 1992 (UNCED, 1993):

“Countries could develop systems for monitoring and evaluation of progress towards achieving sustainable development by adopting indicators that measure changes across economic, social and environmental dimensions.”

Although these three interconnected sustainability's dimensions, pillars, components, stool legs, aspects, or perspectives (Purvis et al., 2019) were not supported by a conceptual justification or framework in the same UN document, over the years the dichotomy has been acknowledged by the majority of scholars and increasingly also by entrepreneurs, executives, investors, and common people's language. However, as often happens while dealing with a topic that affects everyone, there are also academics who prefer to revert to the original sense in which the concept was intended by the Brundtland Commission (1987), where sustainability is concerned with the well-being of future generations and with the irreplaceability of natural resources (as opposed to the gratification of present needs, that is the 'well-being'). In other simpler words, the Brundtland report referred to two concerns that should be reconciled: development and environment, also interpretable as needs versus resources, or as the short versus the long term (Kuhlman & Farrington, 2010). Therefore, according to these academics needs to be found a balance between well-being (that substantially corresponds to the social and economic dimensions of sustainability) and sustainability (interpreted as a set of artificial and natural resources), yet not by pretending they are three sides of the same coin (Kuhlman & Farrington, 2010). Separating the needs of the present from the needs of generations will come after is a sensible way to analyse scenarios, assess policies' impact, and clarify the choices that

need to be made. Regarding sustainability, it is interesting the distinction between ‘weak’ and ‘strong’ sustainability: the first consists of the stock of wealth, comprising man-made assets and environmental assets, that the next generation should inherit and that should not be lower than the amount inherited by the previous generation; whereas, the second consists of the stock of environmental assets that the next generation should inherit and that should not be lower than the one inherited by the previous generation (Kuhlman & Farrington, 2010). Two examples are proposed by these scholars’ vein to better understand the difference. On one hand, the depletion of fossil fuels as an issue of weak sustainability because, if other sources of energy are developed and provided, the current generation is not obliged to leave its descendants an undiminished stock of petroleum, thus here ‘weak’ stands for those environmental amenities, natural resources or ecosystems services that are in principle substitutable for others. On the other hand, an extinct species that cannot be recovered and must be considered a loss of strong sustainability, where thus ‘strong’ indicates a series of thresholds that must not be crossed when (human) actions and interventions’ impacts are being assessed (Kuhlman & Farrington, 2010). Kuhlman & Farrington (2010) also claim that the care for environment is fundamental, not because of its intrinsic value, but rather to preserve resources for tomorrow’s children (another time is marked the willingness to preserve for future generations defined by the Brundtland Commission). Hence, as many other publications state, the environmental dimension is considered the most important dimension (Bosselmann, 2010; Kotzé et al., 2022) or, at least, the adhesive which connects all the three interdependent and mutually reinforcing components of sustainable development (Kuhlman & Farrington, 2010). A potential explanation for the predominance of the environmental dimension over the social and economic ones lies in the more immediate and tangibly visible understanding of what environment’s safeguard or disregard by human being means, irrespective of how mankind acts, individually or organized in organizations of each possible type. In a nutshell, all over the world are occurring, under different forms and intensities, sensible and touchable changes in everyone’s surrounding environment and ecosystem, phenomenon that take the name of ‘climate change’: drought, unproductive soils, floods, sea level and temperature rise, enduring forest fires, anomalous seasonal temperatures and rainfalls, polluted rivers, lakes and seas, huge landfill located in hostile-to-human-life places, floating island of waste on the oceans, altered animals and plants’ migrations and lifecycles, unbreathable or detrimental (cities) air, deforestation, violent tornados, etc. These are not only written on paper, but they constitute the today Earth’s reality, as following instances shown:

- in 2018 the Great Pacific Garbage Patch, the major ocean plastic accumulation zone formed in subtropical waters between California and Hawaii, extended over 1.6 million

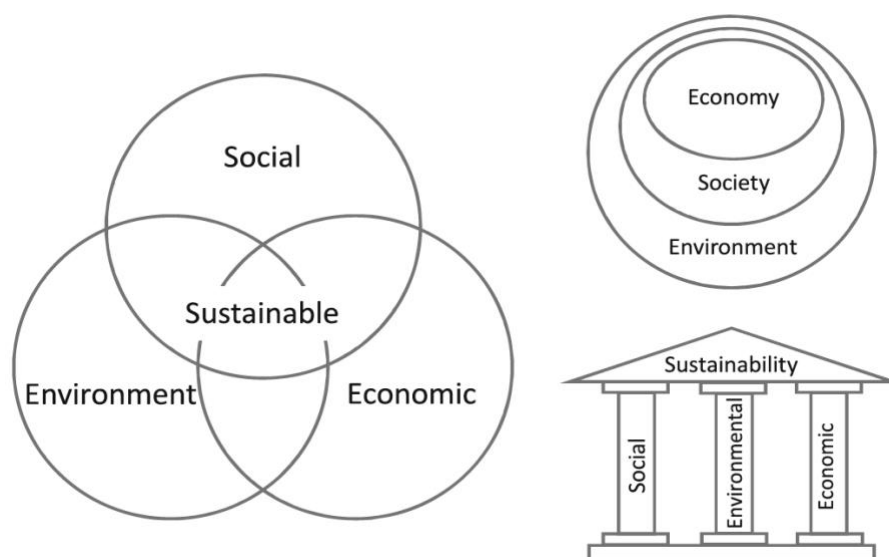
km<sup>2</sup> and estimated to be made of at least 79 (45-129) thousands of tons of floating ocean plastic (Lebreton et al., 2018).

- in July 2021 Germany experienced one of the deadliest floods in its history. The same flood has affected 11 other European countries, specifically Belgium. Meanwhile, on the other side of the world, China's Henan region suffered one of the most catastrophic flood, caused by what is known as the heaviest rain in 1000 years (Pan, 2021).
- in the barren Atacama Desert, more precisely in Alto Hospicio, Iquique, Chile, it does exist an open-air textile and unwanted clothes landfill where every year 39,000 tons of clothing are dumped by rich countries (Hale, 2022).
- the Australian Black Summer of 2019-2020 was an extreme fire season that burnt a globally unprecedented percentage of continental forest biome, produced the largest forest fires recorded in recent history and exposed Australian ecosystems to an unprecedented extent of high-severity fire with smoke columns reaching 30 km in height (Nolan et al., 2021).
- the Italian drought has made marked the lowest level of rivers and lakes, as well as of rainfalls, during the first months of 2023. Wide percentage of territories of regions such as Piemonte (53%), Liguria (46%), and Sicilia (49%) are suffering various problems related to the water shortage. The issue is concerning other European countries (Spain, Portugal, Cyprus, Germany, Bulgaria, etc.) even registering worse data (Saporiti, 2023).

Environmental pollution is not a new phenomenon, but it has been a local or regional concern for most of human history: awareness of the problem's global extension made its way through everyone life only starting from the 1960s and 1970s. Finally, to achieve sustainability the environmental impacts must be reduced but, at the same time, this dimension sets limits to economic and social development (Bosselmann, 2010). Not being the focus of this work, the economic and social dimensions are summarized in a nutshell as follows. The former is controversial (Purvis et al., 2019) and interpretable in different ways, but its final goal consists in the challenge to expand economic activities while reducing their environmental impacts, reaching societal progress through economic development and without excessive pressure on the environment (Wikipedia, 2023). Instead, the latter might be seen as reaching a high degree of social sustainability through livable communities with a good quality of life (being fair, diverse, connected and democratic) (Wikipedia, 2023). The three dimensions' interdependence, that reconciles environmental, social, and economic growths, has been conceptualized through different illustrations over the last decades, as reported in Figure 7. The top right representation is the one that better shows the idea of environment's prevalence over society and economy by stressing a hierarchy among dimensions: three nested concentric ellipses where the environment

includes society that, in turn, includes economic conditions. Society embraces the multitude of human actions and interactions that make up human life. Without society, humans would not survive as existence, in both evolutionary and present terms, is based on social interaction. Human activity takes place within the environment by depending and having unavoidable impacts on it. Human material needs, heat, light, food, medicines, clothing, as well as modern consumers goods are made with materials and energy that come from Earth (Giddings et al., 2002). Most of human interactions occurs within an ‘artificial’ place created by mankind to better manage all types of exchange and relationships: the economy. Hence, human society depends on environment, which would continue without society, while economy depends on the society (and the environment), which for most people would continue existing even without the economy (Giddings et al., 2002). In the bottom right corner, it is depicted the ‘three-pillars’ conception of sustainability that is typically realised as the balancing of trade-offs between seemingly equal desirable goals within these three categorisations, although uses vary (Purvis et al., 2019). Although this alternative had no clear and grounded theoretical origins, as early as 2001 it was presented as a ‘common view’ of sustainable development (Giddings et al., 2002) which, being considered a commonplace, did not seem to require any verified references (Purvis et al., 2019). The three-pillars approach was substantially broadly acknowledged because it encompasses the simple idea that only if social, environmental, and economic pillars develop themselves by coexisting in harmony, the achievement of sustainability and its steadiness as final objective will be guaranteed. Lastly, in the left side the tripartite description is presented in the form of three intersecting circles of society, environment, and economy, with

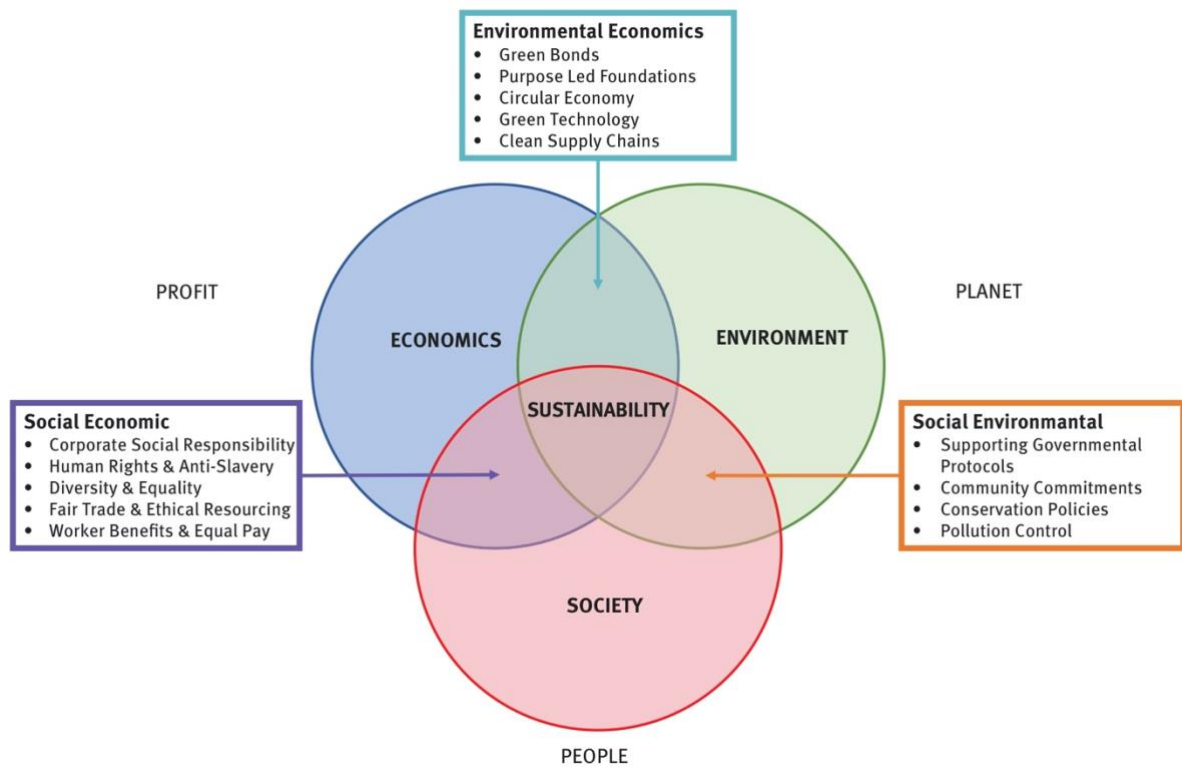
**Figure 7.** Three typical representations of sustainability.



Source: Purvis et al. (2019)

sustainability being placed at the intersection (Purvis et al., 2019). This graphic is found in various forms as a descriptor of ‘sustainability’ within academic literature, policy documentation, business literature, and online (Purvis et al., 2019), and it essentially corresponds to the framework used to explain the Triple Bottom Line (TBL) business concept [Figure 8.] coined by Elkington during the same years (1990s), together with three-dimensions sustainability idea. As the term ‘bottom line’ suggests, it originates from the world of management science and is intended as a way to operationalize Corporate Social Responsibility (CSR) (Elkington, 1994; Kuhlman & Farrington, 2010). According to Miller (2020) one common way to understand business’ sustainability efforts is using the TBL concept that posits firms should commit to measuring their social and environmental impact, in addition to their financial performance, rather than solely focusing on generating profit (i.e., the standard ‘bottom line’). TBL can be broken down into ‘three Ps’: Profit, People, and Planet (almost identical to the three dimensions just discussed above). Profit, or economic bottom line, includes the value of organizations in terms of their financial, physical, human, and intellectual capital (Fischer et al., 2020), other than all those strategic planning initiatives and key business decisions generally carefully designed to maximize profits while reducing costs and mitigating risks (shareholders’ interests) (Miller, 2020). People, or social bottom line, covers human capital in terms of public health, skills, and education, but also society’s health in general (Fischer et al., 2020), since companies should shift their focus toward creating value for all stakeholders impacted by business decisions, including customers, employees, and community members (Miller, 2020). Lastly, Planet, or environmental bottom line, refers to natural capital in its broader sense, which can be distinguished into critical natural capital and renewable, replaceable, or substitutable capital (Fischer et al., 2020). While businesses have historically been the greatest contributors to climate change, they also hold the keys and responsibility to drive positive change: adjustments like using ethically sourced materials or cutting down on energy consumption are steps in the right (sustainable) direction (Miller, 2020). Adopting the Triple Bottom Line approach may seem idealistic (and unrealistic) in a world that emphasizes profit over purpose. However, innovative companies are showing time and again that it is possible “in many situations, to do the right thing and make money at the same time” as says Harvard Business School Professor Rebecca Henderson (Miller, 2020). Hence, to achieve success by pursuing sustainability firms should implement some, or all, actions reported in Figure 8. This diagram draws attention to the so-called ‘shear zones’ resulting from the overlapping of the three main bottom lines, where arise both opportunities and challenges for businesses (Fischer et al., 2020).

**Figure 8.** Triple Bottom Line Diagram.



Source: Lojacono & Ru Yun Pan (2021)

The interlinkage named environmental economics (or eco-efficiency for Fischer et al., 2020) comprises the following potential sustainable actions (Lojacono & Ru Yun Pan, 2021):

- connecting environmental impacts with financial performance (Green Bonds).
- establishing purpose-led foundations.
- orienting towards circular economy and waste reduction guiding principles.
- investing in green technology.
- fostering and implementing clean supply chains.
- prioritizing renewable energy sources.

Instead, the meeting of environmental and social bottom lines generates a ‘shear zone’ that includes actions such as (Lojacono & Ru Yun Pan, 2021):

- supporting governmental environmental protocols.
- backing community commitments.
- adopting conservation policies.
- having a health, safety & environmental focus.
- controlling over pollution and toxicity.
- adhering to animal welfare and protection programs.



Finally, the third wedge concerns social-economic actions (Lojacono & Ru Yun Pan, 2021):

- looking at Corporate Social Responsibility (CSR) perspective.
- safeguarding diversity and equality.
- carrying out fair trade and ethical resourcing.
- recognizing benefits and equal pay to workers.
- enacting human rights and anti-slavery acts.
- financing human capital training and development.

As indicated in Figure 8., sustainability is achieved when all three factors (Profit, People, and Planet) intersect with one another. However, it is inevitable that companies find themselves struggling to reach a perfect balance, therefore they will try to formulate multiple goals which come close to fulfilling the ideal ‘total sustainability’ (Lojacono & Ru Yun Pan, 2021). A leader in developing sustainability in fashion luxury industries is Kering Group [see infra, Section 2.4.1.], which has established multiple simultaneous actions to address the three intersecting factors of sustainability (its Triple Bottom Line), thus is not achievable by applying one simple solution, but only employing multifaceted approaches (Lojacono & Ru Yun Pan, 2021).

## **2.4. Assessing sustainability in the Fashion Industry**

As stated, numerous times beforehand, sustainability should become the core value that leads decision-making process at all layers of an organization or a company. However, at the same time its complex and intertwined multidimensionality renders demanding the accomplishment. The serious environmental damages and impacts caused by the detrimental ways of thinking and doing business of fashion industry does not exclude, on the contrary pushes, this sector from the pressing need to shift to a more sustainable vision that tries to preserve survival of this industry, Earth’s living beings, resources, and ecosystems. Again, environmental dimension prevails and acts often as a springboard towards a ‘total sustainability’ objective, being the most understandable, workable and urgent to change dimension, and Environmental Profit and Losses (EP&L), Life Cycle Assessment (LCA), and B Corp Certification are just some examples of assessment tools that also fashion firms have started to use in order to put sustainability at the basis of each action.

### **2.4.1. Sustainability reporting: Environmental Profit and Losses**

In the last ten years, François Henri-Pinault, Chairman and CEO of the Kering Group (Gucci, Bottega Veneta, Saint Laurent, Alexander McQueen, DoDo, Puma are some fashion brands owned by the holding), has invested heavily in transforming his company into a beacon of sustainability for the world of luxury (Lojacono & Ru Yun Pan, 2021). In 2012, he appointed Marie-Claire Daveu as Head Sustainability Officer (former principal private secretary for

France's Ministry of Ecology and Sustainable Development) (see above actions of TBL diagram in Figure 8., Training & Development), and upon the company began to adopt various measurable sustainability goals, which were acknowledged for accountability purposes. One of the most significant projects was exactly the introduction of the Kering Environmental Profit & Losses (EP&L) in 2018. A framework created to measure and quantify the environmental impact of Kering's activities and connect them to the group's financial performance (see above TBL actions: Green Bonds; Health, Safety & Environmental Focus; and Pollution & Toxicity) (Lojacono & Ru Yun Pan, 2021). EP&L measures six factors within the group's supply chain (raw materials, processing, manufacturing, assembly, operations & retail, Pan, 2021): greenhouse gases emissions, water consumption, air and water pollution, land use, and waste production (see above TBL diagram, Circular Economy & Waste Reduction; Green Technology; Clean Supply Chains; Renewable Energy Sources). Through this innovative accounting tool, Kering is able to use this information and make environmental footprint visible, quantifiable, and comparable, thereby converting them into monetary values that allow the group to compute the cost involved in current use of natural resources (Lojacono & Ru Yun Pan, 2021). The translation into monetary value is relevant because allows to compare Kering's environmental performance in different areas of the business, between internal different impacts, and obviously over time. Moreover, the results expressed in currency are easier to read for executives and stakeholders, show where is better to implement initiatives, and highlight where progresses have been made and corporate's footprint can be decreased (Pan, 2021). There are many general valuable reasons behind the choice to develop and use the EP&L framework: understand where impacts are, develop a knowledgeable decision-making process, strengthen Kering's business and risks management for the future, steer group's business strategy responsibly, and be transparent with all stakeholders (Pan, 2021) (see above in TBL diagram CSR perspective). It could be claimed that the path towards sustainability is easier for a prosperous and wealthy holding like Kering, yet it should be considered also the global size and the structural fragmentation that make more compelling new actions' management and oversight. Nevertheless, what really matters is that some enterprises (small, medium, or large) demonstrates that sustainable principles can be successfully incorporated into current businesses.

#### **2.4.2. Life Cycle Assessment**

Many business associations and companies in diverse industries already use the life-cycle approach in the area of sustainability (European Commission, n.d.-c). In fact, Life Cycle assessment, or analysis (LCA), has been in existence since the 1960s, when it was first used to

regulate the rationing of raw materials and energy resources. Scientists at that time believed that the Earth's rising population would eventually deplete its natural resources, and that it was critical to understand the cost and environmental implications of future consumption (Lojacono & Ru Yun Pan, 2021). LCA is a process of evaluating the effects that a product (or a service), or the function the product is designed to perform, has on the environment over the entire period of its life. It consists of identifying and quantifying the environmental loads involved, evaluating the potential environmental impacts of these loads, and assessing the options available for reducing these impacts (UNEP, n.d.). The principal benefit of LCA is that it provides a single tool that supplies insights into upstream and downstream trade-offs associated with environmental pressures, human health, and the consumption of resources (European Commission, n.d.-c). Not by chance, this tool is largely integrated in the implementation of the European Union's thematic strategy on the sustainable use of natural resources and the one on prevention and recycling of waste. However, it is important to keep in mind that the LCA is merely a decision supporting instrument, rather than a decision-making instrument, because it has a specific focus that tends to exclude economic and social impacts, as well as the consideration of more local environmental issues. For this reason, it is utilised in conjunction with other complementing tools that assist in identifying areas of potential improvement (European Commission, n.d.-c). Life Cycle Inventory (LCI) and Life Cycle Impact Assessment (LCIA) are consecutive parts of a LCA, where the former comprises the collection and analysis of environmental interventions data (e.g., emissions to air or water, waste production, resource consumption) which are associated with a product (or service) from the extraction of raw materials through manufacturing and use to final disposal, including recycling, reuse, and energy recovery. Instead, the latter provides for the estimation of indicators of the environmental pressures (e.g., in terms of climate change, summer smog, resource depletion, acidification, human health effects) associated with the environmental interventions attributable to the life-cycle of a product (or service) (European Commission, n.d.-c).

LCA may also be defined as a circular model that generally follows a five-stage lifespan: raw materials extraction ('cradle'), manufacturing and processing, transportation, retail and usage, and waste disposal ('grave') (Pan, 2021). A company may perform various measurements of impact at any of these five stages, and decide which include in its environmental footprint estimations; in other terms, a firm may decide to categorize a good or a service in one of the following typical life cycle models (Nickel, 2023) [Figure 9.]:

- Cradle to Grave (linear life cycle) – it includes all 5 life cycle stages in the measurements by giving a complete firm's environmental footprint, from start to end (stages 1-5). Occasionally, the timeline of this model can be extended through recycling, reuse, or

repurpose [see *infra*, Sections 4.1. and 4.2.]. However, eventually the product will no longer be able to serve its purpose and will end up as waste (Lojacono & Ru Yun Pan, 2021).

- Cradle to Cradle (circular life cycle) – it is a variation of Cradle to Grave which exchanges the waste stage with a recycling or upcycling process that makes materials or components reusable for another product. In a nutshell, it is called ‘closing the loop’ process (stages 1-5, with 5 being another product’s stage 1).
- Cradle to Gate (partial linear life cycle) – it is not a whole product life cycle because the lifespan begins with raw materials and ends at the point where it is sold to a third party (Lojacono & Ru Yun Pan, 2021). In other words, this model is a good starting point for the appraisal, but it includes only 2/3 out of 5 stages: raw materials extraction, transport of the raw materials, and production processes, stopping before the finished product is transported anywhere leaving factory’s ‘gate’.

Clearly, though not so recently, also the fashion industry players with their sharp environmental footprint joined the use of LCA, about which Lojacono & Ru Yun Pan (2021) report a simple general explicative example concerning the life cycle of a cotton t-shirt [Figure 10.]:

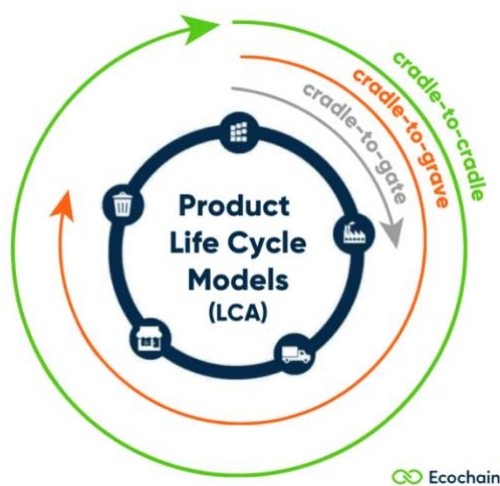
1. Raw materials. The journey begins with the shirt’s necessary raw materials: land for farming, fertilizer and pesticides used in cotton plantations, and farmers, as well as energy, water, and time input to grow the crops.
2. A – Processing. The harvesting phase in which farmers pick the cotton and send it to a processing plant where the fibres are ginned, cleaned, and turned into yarn. On average, it takes 1000 litres of water to produce 1 kg of cotton from which are obtained four cotton t-shirts (250g cotton = 1 t-shirt or 800g cotton = 1 pair of jeans (Pan, 2021)).  
B – Manufacturing. Some of the yarns produced are then dyed with natural or artificial dyes before being knit into the fabric that will constitute the t-shirts. As previously said, the dyeing process is one of the most polluting in fashion supply chain through the discharging of heavy metals and toxic chemicals in the environment. Moreover, manufacturing needs high amounts of energy, water, and human capital (still largely labour-intensive operations), where the last one opens a window onto ethical labour and workers’ safety topics (social dimension).  
C – Packaging. Once the t-shirt is finished, it is packaged (either in a bundle or individually) in most of the times single-use plastic and packed to be shipped.
3. Use. Often consumers do not know that also the use phase can be a highly polluting stage in a t-shirt’s (or in any apparel or accessory) life cycle: how often it is worn, how

long it lasts, and how often and in which way it is washed all affect the impact of its life cycle.

4. Recycle/Repurpose/Repair/Dispose. The decision a consumer makes at the end of a product's life affects how circular or linear its life cycle is. In most cases, t-shirts are disposed of rather than recycled or repurposed. In 2017, the US Environmental Protection Agency estimated that over 80% of textile waste (almost 11 million tons) ended up in landfills.
5. Transportation. Finally, transportation takes place throughout the entire life cycle of a product, therefore shortening the supply chain is preferable when trying to reduce impact. Recall that further is distance to travel, higher is carbon footprint.

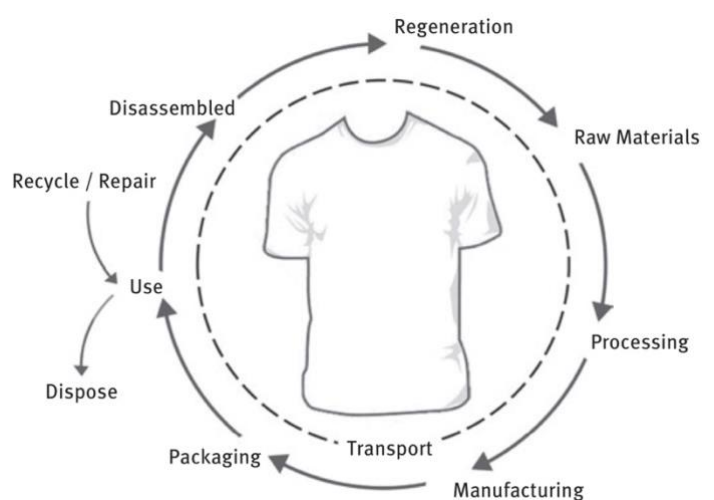
The Life Cycle Assessment, as any other tool that calculates data, is most effective when there are sufficient thorough data available along the entire value chain, and traces both the footprint and the cost of a product's production cycle (Lojacono & Ru Yun Pan, 2021).

**Figure 9.** Life Cycle models.



Source: Nickel & Ecochain.com (2023)

**Figure 10.** Life Cycle of a cotton t-shirt.



Source: Lojacono & Ru Yun Pan (2021)

### 2.4.3. B Corp Certification

B Lab is a non-profit organization founded in 2006 in Berwyn, Pennsylvania (USA) and financially supported by philanthropic funders and foundations, governmental agencies, individuals, and corporations. It aims to foster its international network of (mainly profit-oriented) organizations that guides economic systems change to support the participants' shared vision of an inclusive, equitable, and regenerative economy (B Lab, n.d.-b). According to B Lab a different kind of economy is not only possible, but necessary, and businesses could lead the way towards a new stakeholder-driven model. B Lab creates standards, policies, tools, and

programs that want to shift the behaviour, culture, and structural underpinning of capitalism, to mobilize communities towards collective action to address society's most critical challenges, and to help firms and corporations balancing profit with purpose (B Lab, n.d.-b). The model proposed by B Lab aspires to pass from a global accepted system that profits few to one that benefits all, in other terms from concentrating wealth and power to ensuring equity, from extraction to generation of sources and resources, and from prioritizing individualism to embracing interdependence. The non-profit organization has become known for certifying B Corporations, which are companies that meet high standards of social and environmental performance, accountability, and transparency (B Lab, n.d.-b). The process to accomplish the B Corp Certification grades companies on a points framework that measures essentially five areas: governance, workers/employees, environment, customers and (local) communities (Pan, 2021). In order to achieve the Certification, a company must (B Lab, n.d.-a):

- demonstrate high social and environmental performance by achieving a B Impact Assessment score of eighty or above passing the B Lab's risk review. Multinational corporations are not excluded from meeting baseline requirement standards.
- make a legal commitment by changing its corporate governance structure to be accountable to all stakeholders, not just to shareholders.
- exhibit transparency by allowing information about its performance measured against B Lab' standards to be publicly available on company's B Corp profile on B Lab's website.

In case of Certification's issuance, the verification process must be undergone to companies every three years with the aim to recertify the B Corporation, which in this way focuses on a continuous improvement leading to long-term resiliency (B Lab, n.d.-a). The process to achieve and maintain the B Corp Certification is rigorous and requires engaging teams and departments across the entire examined company, other than taking into account firm's size and profile, verifying documentation about adopted business model, operations, structure and work processes, reviewing potential public complaints, and being scrutinised through site visits (B Lab, n.d.-a). The process also highlights a company's weaknesses, offering a roadmap to more positive and sustainable business practices (Pan, 2021). Although the pathway to Certification has the same final objective for every company decides to undertake it, B Lab employs different approaches based on factors, such as sector, industry, scoring, and ownership structure (B Lab, n.d.-a). To conclude, at the moment all over the world there are 6,778 Certified B Corporations, operating in 161 industries and employing around 595,000 workers scattered in 90 different countries, which are certified to meet just mentioned rigorous standards for environmental and social responsibility, as well as transparency and accountability, and thus aim to create a new

kind of business that balances purpose and profit, and that use the power of business to solve these social and environmental problems (Blasi & Sedita, 2022).

## **2.5. Sustainability's influence on consumers purchasing behaviour**

If sustainability represents the future core value of businesses, it is also due to the increasing pressure coming from the consumers: a 'pull' force grown together with the academic literature but burst particularly with the mid-2000s. These years saw a number of economic and political crises that made social inequalities obvious to everyone, and sustainability moved to agendas of activist groups (e.g., PETA, Greenpeace) into political mainstream (Lojacono & Ru Yun Pan, 2021). Therefore, over the years consumers, above all Millennials and Gen Z, have been become more and more concerned about the uncertainty of their future. They have been bombarded by scientific information about climate change, are now experiencing frequent environmental disasters and the dreadful threat of extinction first hand. As a result, these younger generations nowadays are much more inclined to make ethically and environmentally driven choices than predecessors (Lojacono & Ru Yun Pan, 2021). The report entitled 'Consumer Products and Retail: How sustainability is fundamentally changing consumer preferences' (Capgemini Research Institute, 2020) highlighted how consumers (7,500 people from all over the world interviewed by the Institute) are increasingly giving importance to sustainability: 79% of them is changing their purchasing preferences based on criteria such as social responsibility, inclusiveness, and environmental impact. Moreover, although only a few months had passed since the outbreak of the pandemic when the report was released, it referred that COVID-19 has enhanced consumer awareness of and commitment to more sustainable purchases: 67% says they will pay more attention to the scarcity of resources, while 65% states that will be mindful of the footprint of their consumption. According to the report the sustainability concept in all its numerous nuances is influencing over half of global population, indeed 53% of consumers and 57% of people aged between 18 and 24 years old (Gen Z) have begun buying products of less-known but more sustainable brands (Capgemini Research Institute, 2020). From a more consumer sentiment side, over half of respondents (52%) states to have created an emotional bond with goods (and services) or companies they consider sustainability-centred, whereas 64% claims that purchasing or receiving sustainable products or services makes them feel better reaching percentage as high as 72% in the 25-35 age group (Millennials). However, at the same time, 49% of consumers says that they do not have available information to rely on to verify products and services' sustainability parameters and 44% does not trust on this information though they are provided by vendors or producers (Capgemini Research Institute, 2020). Indeed, nearly one in two shoppers either do not know

what commitments businesses have made that they can trust or simply do not trust businesses on climate change and sustainability issues (Deloitte UK, 2022). Moreover, only one in four consumers consider a product being labelled as responsibly sourced or manufactured as a sign that is sustainable, and only one in five rate labelling as very important when considering a purchase (Deloitte UK, 2022).

Another recent report confirms again that the figure of consumer is one of the driving forces behind increased sustainability efforts within the global retail and consumer goods industry. Globally more and more shoppers are becoming concerned about climate change and contemporary related issues, thus choosing to change their habits for the environment's benefit. The following are data about shares of consumers more concerned about sustainability in 2022 than a year before: 77% in Italy, 70% in Germany, 74% in France, 76% in the United Kingdom, 67% in the USA, and 80% in China (Sabanoglu et al., 2022). Despite these significant numbers, this does not imply that consumers are able or willing to do everything in their power to make that happen: goodwill and motivation only take the average person until a certain point, as the cost of living also need to be considered. Indeed, while strides have been made to render eco-friendly product and service alternatives accessible and wallet-friendly, they are typically still more expensive than traditional buying options (Sabanoglu et al., 2022). Since early 2022, the entire world has been experiencing a spike in inflation and, for this and other current economic reasons, around two-thirds of worldwide consumers are preventing them from living a more sustainable lifestyle. These are some countries' percentages of consumers who feel the heavy burden of the growing cost of living: 57% in Germany, 65% in France, 66% in Spain, 60% in the UK, 59% in the USA, 53% in China, 67% in Singapore, 72% in India, 75% in Brazil, and in average 64% at global level (Sabanoglu et al., 2022).

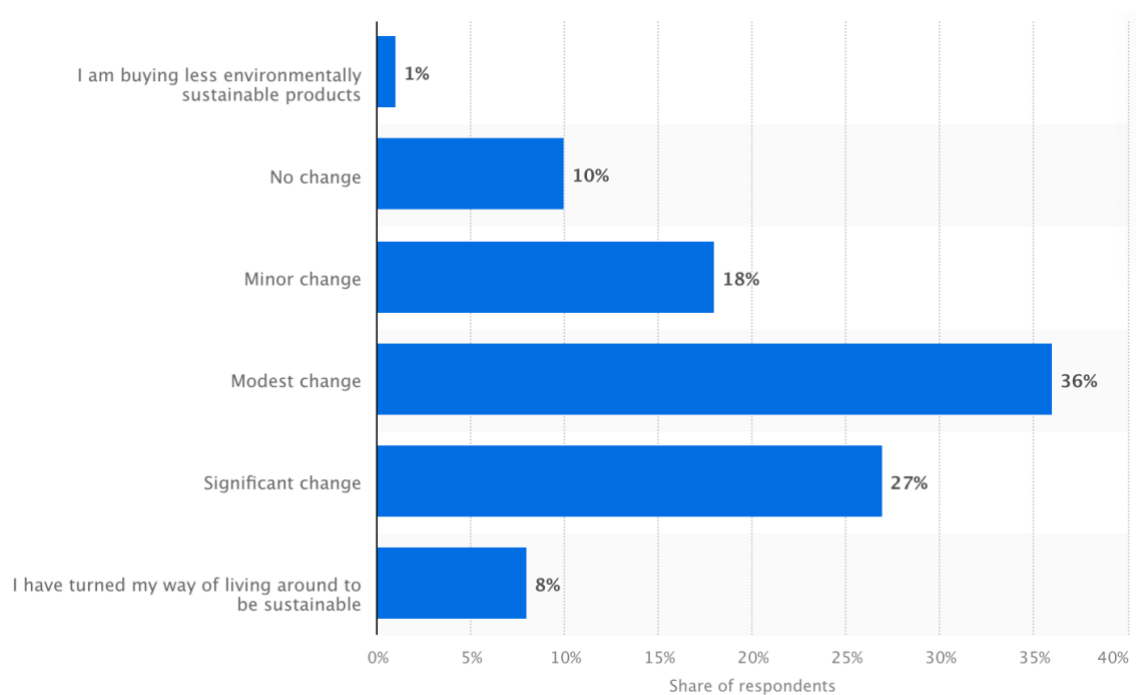
But keeping the focus on the positive shifting towards more sustainable purchasing behaviours, in 2022 the vast majority of consumers across the globe noticed that their buying habits have become at least a little more environmentally friendly compared to five years earlier (Tighe, 2023). These changes are summed up in Figure 11. [a graph elaborated by Simon-Kucher & Partners (2022) and based on a worldwide survey involving 11,711 respondents] where emerges that over a third of shoppers (36%) has faced a modest change, whereas 27% has embraced a significant sustainable change in its purchasing's behaviour and consumption choices. Hence, more than half of the interviewees (63%) has actually begun to consider more central the sustainable aspect in consumer goods' buying decisions, instead just a small share (8%) has radically turned the way of living around to be sustainable. Unfortunately, the opposite category, that is those who have not change or not even have bought less environmentally



sustainable products over the previous five years, is still wider comprising the 11% of consumers.

To conclude, the fashion industry is not excluded by this transformation of shoppers' consumption habits, indeed consumers have become more environmentally and socially conscious also when purchasing apparel and footwear, reducing the number of new clothing items they buy, fixing clothes, buying second hand or refurbished clothes and accessories, and choosing brands based on their sustainability and ethical practices (Deloitte UK, 2022). The role of and the push from consumers is crucial also in the innovative business models, which are at the basis of the circular economy, and that will be treated in the next two chapters.

**Figure 11.** Degree to which consumers' purchasing behaviour and choices shifted towards buying more sustainable products over the past five years worldwide in 2022.



Source: Simon-Kucher & Partners (2022)



### **3. Innovation**

Throughout this paper, it has been repeatedly stressed that in order to achieve environmentally, socially, and economically sustainable actions and results, sustainability must become the guiding core value of every decision made by a company (and beyond). And what is the best comprehensive way to incorporate this tenet other than to improve oneself by changing the current business model through innovation. Hence, before seeing in chapter 4 how the fashion industry is trying to reconcile innovation and sustainability, it is necessary to better define theoretically ‘innovation’ and other related concepts such as sustainable innovation, Business Model Innovation (BMI), and Sustainable and Circular Business Models (SBMs and CBMs).

#### **3.1. The OECD Taxonomy**

In 2018 the Organization for Economic Co-operation and Development (OECD) and Eurostat, the statistical office of the European Union, jointly published the fourth edition of the Oslo Manual, which provides guidelines for collecting, reporting, using and interpreting data on innovation. According to these two organizations a manual for measuring innovation is needed because innovation is central to improvements in living standards and can affect individuals, institutions, entire economic sectors, and countries in multiple ways (OECD & Eurostat, 2018). Sound measurements of innovation and the use of related data in research can help policy makers to better understand economic and social changes, assess the contribution (positive or negative) of innovation to social, economic, and environmental goals, and monitor and evaluate the effectiveness and efficiency of their conceived policies. Another important objective of these guidelines is to facilitate international comparability through formal statistical standards, advice on best practices, proposals for extending into new domains, or alternative uses of existing and new tools (OECD & Eurostat, 2018). Although the concept of innovation is inherently subjective, its application is rendered fairly objective and comparable by applying common reference points for novelty and utility, thus allowing to analyse innovation and related activities in firms belonging to different countries and industries, of different sizes and structures, ranging from small single-product firms to large multinational corporations that produce a wide array of goods or services. Therefore, the general definition of ‘innovation’ supplied by the Oslo Manual is the following one (OECD & Eurostat, 2018):

“An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product innovation) or brought into use by the unit (process innovation).”

Here, ‘unit’ denotes the actor responsible for innovations in any sector, including households and their individual members. Hence, the term ‘innovation’ can be used in different contexts to refer to either a process or an outcome, which are respectively labelled by the manual as follows:

- ‘innovation activities’ (process) include all developmental, financial, and commercial activities undertaken by a firm that are intended to result in an innovation for the firm.
- ‘business innovation’ (outcome) consists of a new or improved product or business process (or combination thereof) that differs significantly from the firm’s previous products or business processes and that has been introduced on the market or brought into use by the firm.

The latter definition, compared to the one reported in the third edition of the manual (2005), has been reduced in the complexity of the previous list-based description of four types of innovations (that were product, process, organizational and marketing) to only two main types: product innovations and business process innovations. The revised definition also diminishes the ambiguity of the requirement for a “significant” change by comparing both new and improved innovations to the firm’s existing products or business processes (OECD & Eurostat, 2018). Nevertheless, the boundary between a change that is an innovation and one that is not an innovation is unavoidably subjective being relative to each firm’s context, capabilities, and requirements. For instance, an improvement to an online service could represent a minor change for a large firm in a so-called research and experimental development (R&D)-intensive industry, while it could be a significant difference for a small firm in a less R&D-intensive industry. Moreover, many innovations are based on purchasing, imitating, or modifying products, business process equipment, or business methods (models) that are already in use by other companies or organizations. Consequently, many businesses do not develop all of the concepts, prototypes or designs that underpin their innovations thus sometimes deriving similar innovations from a single concept or technology (OECD & Eurostat, 2018). Finally, the supplied definition of innovation does not comprise the fact that it has to create a positive value for society or a positive benefit for the firm.

### **3.1.1. Product innovation**

A ‘product innovation’ consists of a new or improved good or service that differs significantly from the firm’s previous good or service and that has been introduced on the market, where introduction means that the good or service is made available for use by its intended costumers, but not necessary it has to generate sales (OECD & Eurostat, 2018). Despite the dividing line between goods and services may sometimes result blurred because some products have

characteristics of both categories, following is an explanation that attempts to distinguish the two items potentially subjected to innovation in a firm (OECD & Eurostat, 2018):

- ‘goods’ include tangible objects and some knowledge-capturing products over which ownership rights can be established and whose ownership can be transferred through market transactions.
- ‘services’ are instead intangible activities that are offered and consumed simultaneously and that change the conditions (e.g., physical, psychological, etc.) of users. The engagement of consumers through their time, availability, attention, transmission of information, or effort is often a necessary condition that leads to the co-production of services by consumers themselves and the firm. This implies that attributes or experience of a service can depend on users’ input.

Product innovations aim to provide significant improvements to one or more characteristics or performance specifications, including the addition of new functions, or upgrades to existing functions or user utility. To better understand, some examples of functional characteristics are quality, technical specifications, reliability, durability, economic efficiency during usage, affordability, convenience, usability, and user-friendliness (OECD & Eurostat, 2018). Another characteristic of both goods and services that deserves a particular attention, since it may influence usability or utility, is product design. New designs or revised design features can influence the appearance or “look” of a product and consequently enhance the customer’s utility, as it happens with a substantial (not a minor) design change that generates a positive emotional response. Product innovations do not need to improve all functions or performance specifications: an upgrade or an addition can also be combined with a loss of other functions or a decline in some performance specifications (OECD & Eurostat, 2018).

### **3.1.2. Business process innovation**

A ‘business process innovation’ encompasses a new or improved business process for one or more business functions that differs significantly from the firm’s previous business process and that has been brought into use by the firm (OECD & Eurostat, 2018). In other wider terms, all business functions can be object of innovation activity: business processes may extend themselves and involve both core business functions of producing and offering goods or services, and supporting (or ancillary) functions such as distribution and logistics; marketing; sales and after-sales services; information and communication technology (ICT) services to the firm; administrative and management functions; engineering and related technical services; and product and business process development (OECD & Eurostat, 2018). Business processes therefore can be considered as services for which the firm itself is the customer, besides the fact

that they can be delivered in-house or procured from external sources. The relevant characteristics of an improved business function are related to those for an improved product, in particular to services that can be delivered to business customers, some examples are greater efficacy, resource efficiency, reliability and resilience, affordability, convenience, and usability. Both new and improved business processes may be motivated by goals to implement business strategies, reduce costs, ameliorate product quality or working conditions, or to meet regulatory requirements. Moreover, business process innovation can involve enhancements and upgrades to one or more aspects of a single business function or to a combination of different business functions, and these improvements are considered implemented by the firm only when are used in internal or outward-facing operations (OECD & Eurostat, 2018).

Essentially business processes are the components of what has been described as a business model (BM) beforehand. Indeed, according to the Oslo Manual, a business model includes all core business processes in use as well as the main products that a company sells, currently or in the future, to achieve its strategic goals and objectives. A firm can use a single business model or several business models at the same time (for instance for different products lines or markets) and can decide to innovate part of a business model, that is only affecting either a firm's products or business functions, or a comprehensive business model, that is involving both products and business functions (OECD & Eurostat, 2018). Despite it is still largely recognized a lack of clarity in outlining the business model innovation's boundaries, the just mentioned comprehensive business model innovations are considered of great interest because they have substantial effects on supply chains and economic production, transforming markets and potentially creating new ones. In existing firms, it is possible to encounter three types of comprehensive business model innovations:

- 1) a company that intends to extend its business to include completely new kinds of products and markets, which require new business processes to deliver.
- 2) a company that ceases its previous activities and commences new types of products and markets, which require new business processes.
- 3) a company that changes the business model for its existing products.

Hence, to conclude, innovations in business model's field can influence how a company creates utility for users (product innovation) and how goods and services are produced and offered, brought to market, or priced (business process innovation).

### **3.2. Business Model Innovation for sustainability**

Another common given definition of innovation is the development of new products, production processes, business practices, or forms of organization (Jin & Shin, 2020).

Innovation can be an outcome, a process, or a mindset (Kahn, 2018), but also incremental, radical, or disruptive by employing other classification terms. Unlike incremental innovation, disruptive innovation challenges the status quo and radically reshapes supply and demand (Assink, 2006). Notably Business Model Innovation (BMI) is different from other types of innovation in that it creates value by making changes to an organization's value propositions and to its underlying operating model. Recall that a value proposition is concerned with what a firm offers and to whom, whereas an operating model deals with how the offering can be delivered profitably, that is reconfiguring value chain, cost mode, and organizational structure (Jin & Shin, 2020). In contrast to other disruptive innovations, business model innovations do not require new technologies or brand-new markets, yet they can be disruptive enough to change the game in an industry due to their unique value propositions and operating models (Girotra & Netessine, 2014; Jin & Shin, 2020). It is important to point out that business model innovations are different from technological innovations. The main difference is that BMIs often grow significantly enough to be noticed by the established companies but do not entirely supplant the incumbent structure. In other words, a business model innovation can coexist with traditional companies instead of completely replacing them: an example could be the one regarding low-cost airlines (e.g., Ryanair) and traditional airlines (e.g., Lufthansa) (Jin & Shin, 2020). Studies on business models, innovation, and technology management have asserted that technological innovation is important for firms, but it might not suffice to guarantee firm success (Zott et al., 2011). This is because technology per se has no inherent value, besides embedding it in attractive products and services, a firm needs a good business model design and implementation, coupled with careful strategic analysis, to succeed commercially (Teece, 2010). Another interesting categorisation, proposed by Schaltegger, Hansen and Lüdeke-Freund, discerns business model innovations in defensive, accommodative, and proactive. Defensive strategies (adjustment) encompass incremental business model adjustments to protect current business models focusing on risk and cost reduction often driven by the need for compliance. Then, accommodative strategies (improvement, integration) are modifications of internal processes and include some consideration of environmental and social objectives. Finally, proactive strategies (full integration) concern the redesign of the core business logic of the firm for sustainable development. To underline that, despite all BMIs delivering sustainability are welcomed, proactive innovation strategies are usually the most impactful (Schaltegger et al., 2012). All these different classifications strengthen the idea that business model has developed and is developing as a 'emerging' subject of innovation which involves new forms of cooperation and collaboration (Zott et al., 2011) among various stakeholders. It is therefore a 'new' type of innovation that companies should seek to implement and consider

at all times, thus preventing this change is dictated by external events (Teece, 2010) such as may be climate change, although it is challenging and complex on an on-going basis. However, external events have prevailed and current global environmental, social and economic dynamics have anyway led to the rise of an interrelationship between business models and sustainable innovations (or eco-innovations or clean(er) technologies, i.e., those innovations that have a superior ecological performance) (Boons & Lüdeke-Freund, 2013). If, on one hand, the business model concept has been already treated in Section 1.2.2., on the other hand, providing a clear overview of ‘sustainable innovation’ is hampered by a lack of literature’s conceptual consensus, yet all researchers, who have studied sustainable innovation in different disciplines, share the focal point on innovation related to the ecological impact of a product or service (Boons & Lüdeke-Freund, 2013). Sustainable innovation can be examined both at organizational level, that is individual firms and their innovative capacities and obtained results applied within internal functions, and at inter-organizational level (e.g., supply chain’s interactions or networks of actors who contribute to innovation processes), that is fundamental because, without a successful diffusion in society, eco-innovations are meaningless (Boons & Lüdeke-Freund, 2013). As can be easily guessed by the adjective in the name, sustainable innovation is connected with sustainable development, the broad process where ecological, economic and social values are balanced in continuous action (Boons & Lüdeke-Freund, 2013; Lélé, 1991). Hence, a business model change, albeit it is an important instrument to support sustainability-oriented companies, is not an end itself and needs to be linked to approaches of sustainable innovation to create the desired sustainable value. Boons and Lüdeke-Freund (2013) have unified the two themes by identifying what business model’s elements should do to meet successfully marketing sustainable innovations, therefore unfolding the included sustainability potential:

- the value proposition, what is embedded in the product or service offered by the firm, has to provide measurable environmental and/or social value in concert with economic value generated by the participants of existing or new production and consumption systems.
- the supply chain, how company’s upstream relationships are structured and managed, and its actors have to be engaged by the firm into the sustainable supply chain management.
- the customer interface, how company’s downstream relationships are structured and managed, consists of the firm which has to motivate its customers to take responsibility for a more sustainable consumption.



- the financial model has to reflect an appropriate distribution of economic costs and benefits, stemming from the other three listed elements, among actors involved in the business model and has to account for the firm's ecological and social impacts.

Hence, sustainable business models (SBMs) are among the achievements that can be obtained from the combination of sustainability and innovation, evidently in the form of business model innovation. Again, Boons and Lüdeke-Freund (2013) have pinpointed three different, but not necessarily separated, streams of sustainable business models: technological, organizational, and social innovation. In the first, the business model acts as a mediator between how technological artifacts are made, the artifacts themselves, and how they are used in the end; and three combinations of business model and technology innovation are possible: a new BM can employ given technologies; an existing BM can take up new technologies; and a new BM can be triggered by new technologies (and vice versa). In the second, academics see SBMs as an expression of organizational and cultural changes in business practices and attitudes that integrate needs and aspirations of sustainable development as defined by Brundtland Commission. Finally, in the third stream is emphasized the role of innovations with a social purpose and all supporting managerial or entrepreneurial activities. Social innovation (as the environmental one) is considered a key to creating and transforming markets towards sustainable development and this is where the transformative power of business models comes into play (Boons & Lüdeke-Freund, 2013).

### **3.2.1. Sustainable and Circular Business Models**

A sustainable business model (SBM) is a simplified representation of the elements, the interrelation between these elements, and the interactions with its stakeholders that an organisational unit uses to create, deliver, capture, and exchange sustainable value for, and in collaboration with, a broad range of stakeholders (Geissdoerfer et al., 2016). In a nutshell, the main idea of the SBM concept is to modify conventional business model by embedding sustainability into the value chains of an organisation (Geissdoerfer, Morioka, et al., 2018). The application of SBMs implies new challenges, innovation, and adaptation of new aspects of sustainability which, being intertwined with triple bottom line factors, results more multifaceted than the conventional, or traditional, business models. The transition towards SBM requires companies and entrepreneurs to look beyond the entity of the organization resorting to innovation activities to create sustainable values for the stakeholders (Goni et al., 2021). SBMs have three unique features that render them different from traditional business models, which instead concentrates mainly on profit (Goni et al., 2021):

1. the objective is to generate value for multiple stakeholders, society, and the environment.
2. the SBM field envisages non-financial forms of value, such as the usual social and environmental values.
3. the SBM field, other than value creation, contemplates value destroyed to realise the negative effect on society and environment (e.g., depletion of resources), and value uncaptured (e.g., reusable components of damaged tools).

It is also argued that traditional business model thought would eventually be replaced by the increasingly central and widespread SBM concept, just as sustainable competitive advantage had replaced the concept of competitive advantage (Goni et al., 2021). Moreover, nine key elements [Appendix B.] are identified as the most important aspects that need to be considered when sustainable business models are analysed, designed or implemented in a comprehensive way by corporations, entrepreneurs and practitioners (Goni et al., 2021):

- sustainability – SBM needs to incorporate all aspects of sustainability creating a competitive advantage and maintaining a healthy balance among the environmental, social, and economic impacts of its activities.
- circular economy – an essential component of sustainability that whether integrated into a corporate business model aims to uncover new ways of providing value to stakeholders and systematically explore value throughout the product life cycle to increase efficiency and effectiveness of resources involved [see infra, Section 4.1.].
- value chains – a series of activities carried out by companies operating in certain industries to provide valuable products or services to the market.
- value creation – a focus on value creation forces the firm to embrace a long-term strategy and align all its resources with future goals.
- information technology – it provides a crucial support during implementation of SBM by innovating through technologies, methods, and tools able to manage significant quantities of data and information using new data processing and applications.
- core values – they refer to the fundamental beliefs of an individual in an organisation and help firms to determine the right path to fulfil business goals.
- organizational values – they are identified to create a standard for decision-making and strategic planning and to guide and stimulate design and plan of the corporate strategy.
- performance management – an essential aspect to assess the performance of SBM implementation, which results optimized when resources are managed to ensure not only short-term efficacy but also long-term efficacy.

- stakeholder engagement – development and deployment of a SBM requires the firm's involvement of internal and external people and organisations who influence decisions about business operations.

Therefore, sustainable business models are crucial in driving and implementing corporate innovation for sustainability, can help embed sustainability into business purpose and processes, and serve as a key driver of competitive advantage (Bocken et al., 2014). Indeed, with a careful business model redesign it is possible for mainstream businesses to more promptly integrate sustainability into companies and for new start-ups to design and pursue sustainable business from the outset and business model innovation can support a systematic, on-going formation of business cases for sustainability (Bocken et al., 2014). Not surprisingly, Sustainable Business Model Innovation (SMBI) is described as the creation of modified and completely new business models that can help develop integrative and competitive solutions by either radically reducing negative and/or creating positive external effects for the natural environment and society (Schaltegger et al., 2016). According to Bocken et al. (2014), business model innovations for sustainability occurs through changes in the way the organisation and its value-network create, deliver, and capture value (i.e., create economic value) or change their value propositions. This type of innovation goes beyond changing the product and service offering for the customer: it touches 'the way you do business', rather than 'what you do', and concentrates on seizing on economic, social and environmental value for a wide range of stakeholders (Bocken et al., 2014). As mentioned above, Sustainable Business Model Innovation (SBMI) relies on more and more formal and informal forms of collaboration and cooperation between companies and their stakeholders because of the growing global sustainability pressures. At this point, probably the most important Bocken and other academics' contribution comes to the rescue by providing eight sustainable business model archetypes [Figure 12.]. These archetypes are developed from examples of existing and proven innovations for sustainability and grouped into technological, social, and organisational [see above, Section 3.2. and the three streams proposed by Boons and Lüdeke-Freund (2013)] based on the dominant innovation component, albeit they are often paired with other innovations. Their aim is to provide assistance in transforming current business models into more sustainable ones, exploring new way to create and deliver positive sustainable value, stimulate creativity and facilitate innovation (Hvass, 2015). Although each can be applied in isolation, real innovation for sustainability almost certainly demands combinations of archetypes (Hvass, 2015). Listed below are the eight SBMs accompanied by explanations (Bocken et al., 2014), especially those archetypes that will be found most frequently in the examples related to the

fashion industry in Chapter 4. In addition, a careful reading of Figure 12. is suggested in order to have a clearer and wider overview of the topic.

1. Maximise material productivity and energy efficiency ('efficiency archetype'): doing more with fewer resources, generating less waste, emissions, and pollution. This archetype is distinct from mere process innovation because it should run through the entire business and subsequently enhance the value proposition (e.g., price reductions), and nowadays its use is likely to increase seen growing resources constraints and energy prices. It is pretty common in manufacturing industry and comprises concepts such as eco-efficiency, cleaner production approaches, and lean. Particularly, in the successful case of 'lean' practices, in waste are not only included materials waste and energy waste, but also over-production, materials handling, over-processing, inventory, defects and rework.
2. Create value from waste ('value in waste'): the concept of waste is eliminated by turning waste streams into useful and valuable input to other production and by making better use of under-utilised capacity. Unlike the 'efficiency archetype', rather than seeking to reduce waste to a minimum, this seeks to identify and generate new value from what is currently perceived as (potential) waste. Applying this SBM is possible to reduce demand for primary extraction and resource depletion and waste to landfill and emissions; however, to achieve greater system-level impacts, similarly the speed of new product introductions needs to decrease. Among the examples, there is the 'closed-loop business model' where products and business processes are designed in a manner that enables at the end of use phase of an item to be employed to create new value. Or the 'cradle-to-cradle concept' which incorporates the closed-loop cycle recognizing that not always is possible to recapture materials lost during the various product's life stages but aiming to make benign to the environment these waste streams and emissions. Another instance seeks to re-capture the form of wasted value comprised in the 'under-utilised assets and capabilities' through sharing (that is, shared ownership and collaborative consumption approaches) as happens in peer-to-peer car sharing or in local community peer-to-peer electrical power tool sharing schemes.
3. Substitute with renewable and natural processes: reducing environmental impacts and enhancing business resilience by addressing resource constraints 'limits to growth' associated with non-renewable resources and current production systems. In this SBM are included well-known concepts like 'blue economy' (related to the preservation of marine and freshwater environments), 'zero emissions', and notably the broad area of innovation regarding environmentally benign materials and production processes,

where, for example, it is studied how to replace chemical dyes with organic/benign dyes in textile production, or where is fostered the ‘green chemistry’ that tries to utilise naturally occurring processes in place of traditional industrial processes such as replicating the exceptional spiders weaving action using only organic material and ambient pressure and temperatures, rather than polluting machineries and through damaging acids and chemicals.

4. Deliver functionality, rather than ownership: providing services that satisfy users’ needs without having to own physical products. This archetype concerns with how companies can shift the BM from offering a manufactured product to offering a combination of products and services (the final ideal goal would be the ‘pure service model’, that is delivering functionality on a pay-per-use basis, rather than selling ownership). The product is still important, but customer experiences accrete value proposition. The literature suggests among potential benefits of this approach: breaking the link between profit and production volume (but probably not usage volume); reducing resource consumption; increasing use efficiency; enhancing product longevity/durability; and reusing of materials. Therefore, this SBM has the potential to change consumption

**Figure 12.** Sustainable business model archetypes.

Groupings	Technological			Social			Organisational	
	Archetypes	Archetypes	Archetypes	Archetypes	Archetypes	Archetypes	Archetypes	Archetypes
	Maximise material and energy efficiency	Create value from waste	Substitute with renewables and natural processes	Deliver functionality rather than ownership	Adopt a stewardship role	Encourage sufficiency	Repurpose for society/ environment	Develop scale up solutions
Examples	Low carbon manufacturing/ solutions	Circular economy, closed loop	Move from non-renewable to renewable energy sources	Product-oriented PSS - maintenance, extended warranty	Biodiversity protection	Consumer Education (models); communication and awareness	Not for profit	Collaborative approaches (sourcing, production, lobbying)
	Lean manufacturing	Cradle-2-Cradle	Solar and wind-power based energy innovations	Use oriented PSS- Rental, lease, shared	Consumer care - promote consumer health and well-being	Demand management (including cap & trade)	Hybrid businesses, Social enterprise (for profit)	Incubators and Entrepreneur support models
	Additive manufacturing	Industrial symbiosis	Zero emissions initiative	Result-oriented PSS- Pay per use	Ethical trade (fair trade)	Slow fashion	Alternative ownership: cooperative, mutual, (farmers) collectives	Licensing, Franchising
	De-materialisation (of products/ packaging)	Reuse, recycle, re-manufacture	Blue Economy	Private Finance Initiative (PFI)	Choice editing by retailers	Product longevity	Social and biodiversity regeneration initiatives ('net positive')	Open innovation (platforms)
	Increased functionality (to reduce total number of products required)	Take back management	Biomimicry	Design, Build, Finance, Operate (DBFO)	Radical transparency about environmental/ societal impacts	Premium branding/ limited availability	Base of pyramid solutions	Crowd sourcing/ funding
		Use excess capacity	The Natural Step	Chemical Management Services (CMS)	Resource stewardship	Frugal business	Localisation	"Patient / slow capital" collaborations
		Sharing assets (shared ownership and collaborative consumption)	Slow manufacturing			Responsible product distribution/ promotion	Home based, flexible working	
		Extended producer responsibility	Green chemistry					

Source: Bocken et al. (2014)

patterns and to incentivise manufacturers to develop products that last longer and design for upgradability and reparability, potentially reducing resource use. In addition, it should be contemplated together with ‘efficiency’ and ‘value in waste’ SBMs, and volume usage should be mitigated to reach a greater system-level impact.

5. Adopt a stewardship role: proactively engaging with all stakeholders (included society and the environment) to ensure their long-term health and well-being. A widely-known example of upstream stewardship are supplier accreditation programmes (e.g., FSC – Forestry Stewardship Council, or Better Cotton Initiative) that drive more ethical or sustainable business practices at the grass-roots level and for which consumers are available to pay a price premium to fund benefits along the supply chain. Even this SBM would benefit from a combination with other archetypes such as ‘value in waste’.
6. Encourage sufficiency: solutions that actively look for reducing consumption and production. A growing strand of academics and NGOs asserts that radical reduction in consumption and fundamental changes in Western economic models are the only solution for a sustainable future. Some product’s features such as durability and longevity boost this SBM, indeed redesign can slow product replacement cycles. This technique, which in fashion field is called ‘Slow Fashion’, in concert with a change in the culture of fast fashion, could significantly reduce excessive consumption and premature disposal of still useful items. Another related example is ‘marketplaces for second-hand goods’ that create an incentive for owners to take more care of products to ensure higher second-hand value (e.g., Patagonia clothing established its own second-hand online platform). Likewise, manufacturers and retailers can also foster sufficiency in the consumer use phase by providing information on how to minimise usage impacts (e.g., clothes repairing kits or instructions for home washing). However, all these types of business models are not yet so widespread.
7. Re-purpose the business for society/environment: prioritizing delivery of social and environmental benefits rather than economic profit maximisation (i.e., shareholder value) through close integration between the firm and local communities and other stakeholder groups. Hence, the traditional business model where the customer is the primary beneficiary may shift towards one where is found a balance (or a compromise) between all stakeholders.
8. Develop scale-up solutions: delivering sustainable solutions at a large scale to maximise benefits for society and the environment. This archetype is like a bottom line introduced to consider the scale-up and widespread presence of business models for sustainability. In fact, most of implemented sustainable business cases are using a mix of above-

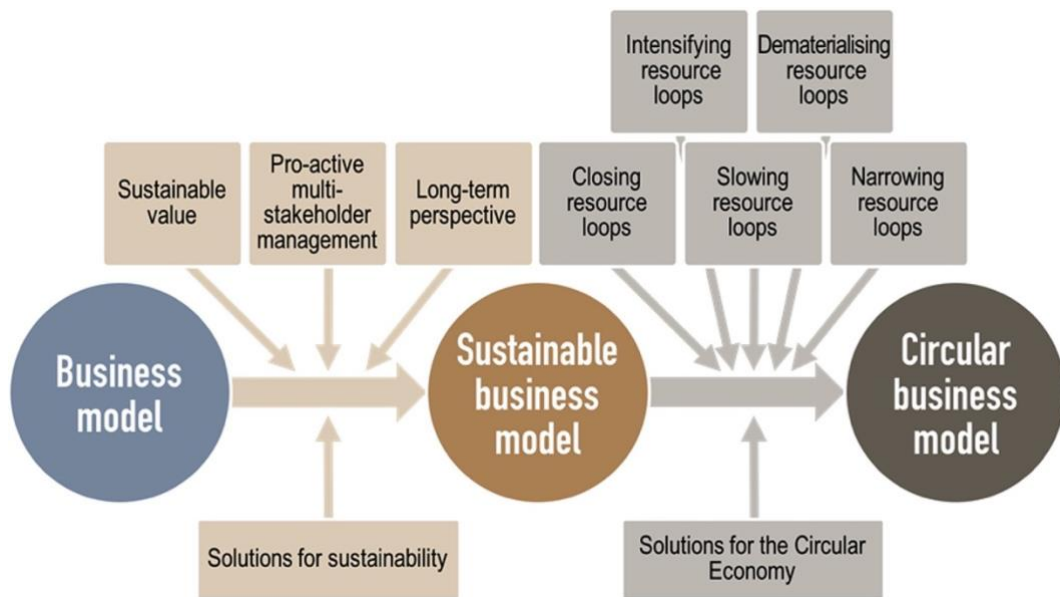
mentioned archetypes, but in small scale, because sustainability principles may limit their attraction to mainstream investors and inhibit aggressive growth strategies. Therefore, achieving scale dimension represents the challenge to make a significant environmental and social difference at global level, and, although large multinationals may be better placed to drive sustainability at scale and influence the market dynamics, are start-ups and small firms that undertake the most radical innovations which need extending strategies. For instance, collaborative models (e.g., peer-to-peer models), crowdsourcing, open innovation, the Internet, social media, are all powerful tools to spread these new innovative scale-up approaches.

As already mentioned throughout the list, firms may use one or a selection of business model archetypes for shaping their own transformation, which aim to provide assistance in exploring new ways to create and deliver sustainable value and developing the BM structure necessary to realise the new emerging opportunities (Bocken et al., 2014). On one hand, literature's sustainable business model's definitions are tied by a commonality: they see SMBs as a modification of the conventional business model concept with certain characteristics and goals added to it; and they either incorporate concepts, principles, or goals that aim at sustainability, or integrate sustainability into their value proposition, value creation and delivery activities, and/or value capture mechanisms (Geissdoerfer, Vladimirova, et al., 2018). On the other hand, literature agrees on the main challenges for innovation towards sustainable business models (Evans et al., 2017):

- Triple Bottom Line – co-creating profits, social and environmental benefits, and a balance among them.
- mind-set – business rules, guidelines, behavioural norms and performance metrics override mind-set of firms and inhibit the introduction of new sustainable BMs.
- resources – reluctance to allocate resources to (sustainable) business model innovation and reconfigure resources and processes for new SBMs.
- technology innovation – integrating technology innovation with business model innovation is multidimensional and complex.
- external relations – engaging in extensive interactions with external stakeholders and business environment requires extra efforts.
- methods and tools – existing business modelling methods and tools are few and rarely sustainability driven thus mirroring the general demanding and intertwined situation.

Finally, from Figure 13. it is extractable another interesting description of SBMs, that is “business models that incorporate a pro-active multi-stakeholder management, the creation of monetary and non-monetary value for a broad range of stakeholders and hold a long-term

**Figure 13.** Comparison of traditional, sustainable, and circular business models.



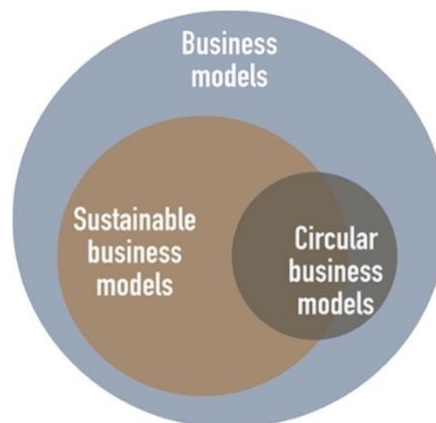
Source: Geissdoerfer et al. (2018)

perspective” (Geissdoerfer, Vladimirova, et al., 2018). But the most important aspect of Figure 13. is how it simply shows the subsequent passages from a conventional business model to a Circular Business Model (CBM). Being circular economy considered a tenet and a way of making business belonging to the sustainable development world, accordingly CBMs are viewed as a subcategory of SBMs. CBMs are probably the business models that best encompass and harmoniously manage the greatest number of sustainable principles, tools, approaches and practices, closing, slowing, intensifying, dematerialising and narrowing resource loops (Geissdoerfer, Vladimirova, et al., 2018). However, because of potential trade-offs between these additional characteristics of CBMs and the ones that already qualify a sustainable business model, there may be cases where CBMs represent a subcategory without being also a SBMs [Figure 14.]. This could, for instance, be caused by efficiency gains of a new technology that exceed the environmental benefits of closing the loop for an old technology, or negative consequences of going circular for the working conditions of employees. This design-implementation gap of sustainable business model innovation is outlined as the set of challenges that prevent organisations from successfully innovating their business model, due to insufficient follow-up on ideas, lack of implementation of concepts, and failure of businesses in the market (Geissdoerfer, Vladimirova, et al., 2018).

An alternative way to achieve the same circular business model concept is by combining the challenge of putting circular economy into reality and the practice-oriented approach of business model innovation. The circular economy is based on the idea of pushing private business into the service of the transition to a more sustainable system. As companies have the



**Figure 14.** Imperfect overlap of sustainable business model concept and its subcategories such as circular business models.

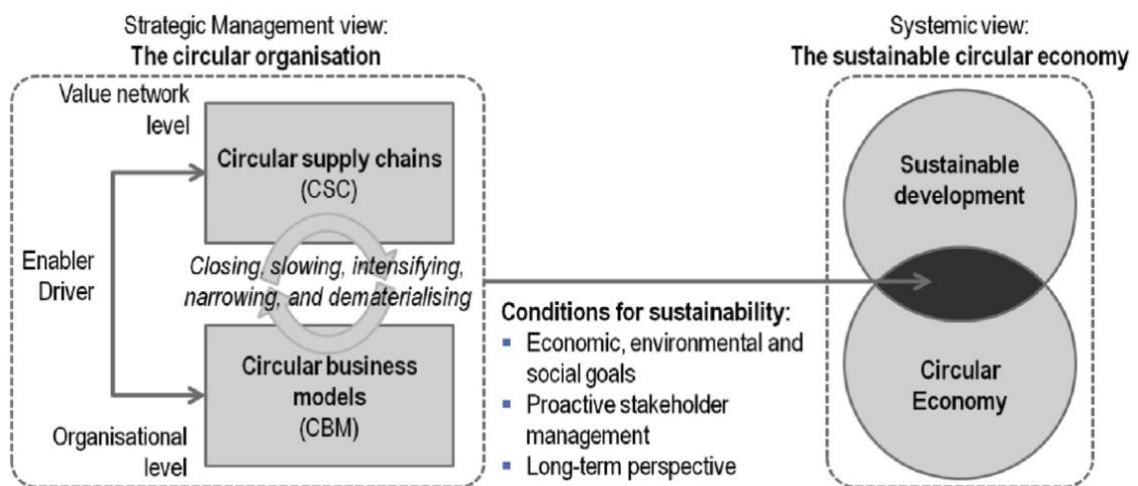


Source: Geissdoerfer, Vladimirova, et al. (2018)

most resources and capabilities, they could considerably advance this transition by creating additional value with an extended and more proactively managed stakeholder network (Geissdoerfer, Morioka, et al., 2018). Highlighting the relevance of networks within the ‘circularity context’, it is inevitable to mention supply networks, supply chain management [see above, Section 1.2.1.] and the equivalent Circular Supply Chain Management (CSCM). CSCM consists of the configuration and coordination of the organizational functions (marketing, sales, R&D, production, logistics, IT, finance, and customer service) within and across business units and organizations to close, slow, intensify, narrow, and dematerialize material and energy loops to minimize resource input into and waste and emission leakage out of the system, improve their operative effectiveness and efficiency and generate competitive advantages (Geissdoerfer, Morioka, et al., 2018). To better understand, closing, narrowing, and slowing loops refer to the biological and technical nutrition cycles of the circular economy that comprises recycling measures (closing), efficiency improvements (narrowing), and use phase extensions (slowing and extending); then, despite originally included in the slowing loop concept, a special attention is saved to a more intense use phase (intensifying) and it is also add the substitution of product utility by service and software solutions (dematerializing). The goal to convert linear business paradigms into circular ones, especially adapting firm’s supply chains and customers’ purchasing processes, is endorsed by the alignment between CBM, Circular Supply Chain (CSC) and CSCM. To conclude, Figure 15. proposes an explicative framework that summarizes and combines sustainable development, circular economy, circular supply chain management and circular business models. On the left side of the illustration, it is emphasized the dependency between a single organization (a specific CBM) and its value network (as a CSC), then the two circular arrows indicate the contribution of CSCM in closing, slowing, narrowing

the loop and in intensifying and dematerializing efforts. On the right side, instead, are reported the three main conditions for sustainability and circularity: environmental, economic, and social goals; proactive stakeholder management; and long-term perspective. This point underlines that the triple bottom line approach with its three dimensions is relevant, but not sufficient for both SBMs and CBMs, therefore the presence of the other two crucial factors that go beyond short-term perspective and objectives. Finally, Geissdoerfer, Morioka, Monteiro de Carvalho, and Evans meant that sustainable development and circular economy are pursued together in the overlapping area on the right side of Figure 15., but at the same time sustainable development remains a broad and intangible concept while the circular economy (as well as being one possible way to reach sustainable development itself) could be considered as a more tangible

**Figure 15.** Framework which combines sustainable development, circular economy, circular supply chain management and circular business models concepts.



Source: Geissdoerfer, Morioka, et al. (2018)

way to organize society and economy. In conclusion, having previously covered the SBMI, it is important to also provide a definition of Circular Business Model Innovation (CBMI): the conceptualization and implementation of circular business models, which comprises the creation of circular start-ups, the diversification into circular business models, the acquisition of circular business models, or the transformation of a business model into a circle one. This can affect the entire business model or more of its elements, the interrelations between the same elements, and the value network (Geissdoerfer et al., 2020). The four different types of CBMI identified in the literature are better explained below and graphically summarized in Figure 16. (Geissdoerfer et al., 2020):

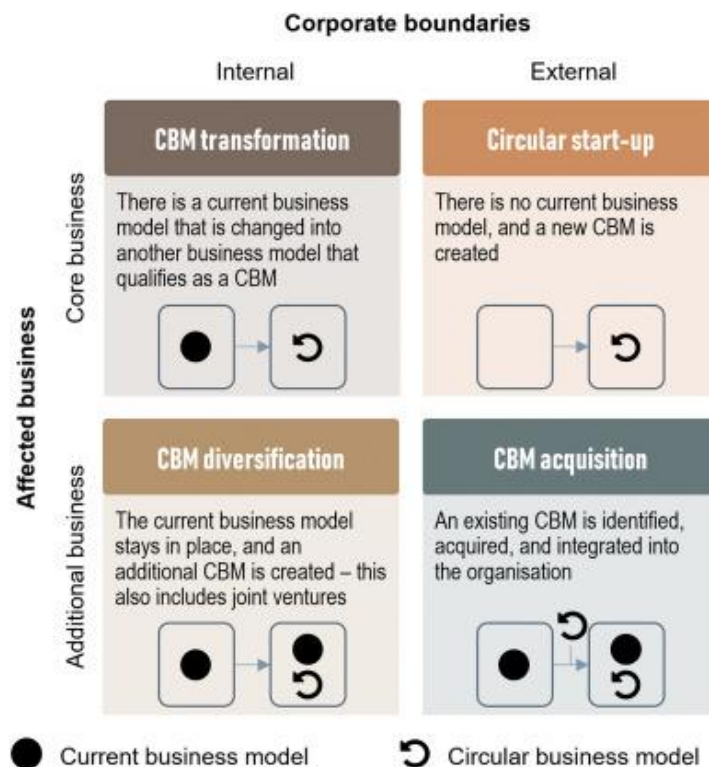
1. circular start-ups refer to the creation of new business model that incorporate circular economy strategies (i.e., cycling, extending, intensifying, and/or dematerialising

resource loops) outside of an existing company, thus with their own brand, employees, and resources, yet they can be supported by non-independent institutions, such as incubators or accelerators.

2. CBM diversification implies the development of new business models that incorporate circular economy strategies from within an existing organisation, thus using its resources and network. In this way, the in-use BM of the parent company stays in place, whereas the new BMs are either integrated into parent as new businesses or spun-off as subsidiaries. Joint business model innovation projects with other external organisations are possible and comprised in this category.
3. CBM acquisition describes merger and acquisition activities that target business models incorporating circular economy strategies. This type of CBMI includes the identification, acquisition, and integration (to various extent) of new CBMs.
4. CBM transformation involves the modification of an existing BM, while the initial business model can be either conventional or circular the resulting BM will incorporate circular economy strategies.

Circular economy, circular business models and the innovation through them are concepts and values crucial for the integration and achievement of sustainable development: a necessary change from which even the fashion industry cannot withdraw.

**Figure 16.** Four types of Circular Business Model Innovation (CBMI).



Source: Geissdoerfer et al. (2020)



## **4. An innovative Fashion Industry embracing the sustainable development's principles**

From the guiding business and consumption principles of the linear economy to those of the recycling economy or, better yet, the circular economy: a crucial and urgent transition that finds sustainability (or sustainable development) as its underlying and steering "path-mate." This change is addressed to all sectors of industry and services and strongly advocated by scholars, experts, NGOs, human rights protesters and environmentalists, who are increasingly aware of and concerned about the problems associated to the current difficult global environmental and societal situation, and who are reaching out to those who first should actually deal with and carry out the necessary changes: political institutions, large, medium or small businesses or enterprises, and end consumers. Notably, the textile and clothing industry is among the most under-scrutinized and criticized industries, because of its enormous economic and societal relevance, but also because of its well-known deeply damaging and polluting impacts on the environment and its poor mismanagement of workers, employees, and materials/goods throughout the whole value chain. And as is always the case in the early stages of complex, and probably revolutionary changes, there are pioneers who begin the transition process by experimenting and showing the possibility of making it a feasible reality. In fact, this fourth chapter reports on what is meant by circular economy and how it can be applied to the fashion industry using old and, at the same time, innovative sustainable strategies and practices and circular business models. There are still many obstacles and limitations to a scalable and widespread implementation, but some concrete examples of fashion companies that have embraced sustainability are the proof that more and more can be done.

### **4.1. Circular Economy and Circular Business Models in the Fashion Industry**

During the last years fashion industry impact on environment worsened and profit margins declined: from 2016 to 2019 profit margins of the world's leading apparel retailers fell by an average of 40% (Morgan Stanley, 2019). These environmental and economic trends are expected to persist if fashion continues doing business-as usual in a linear way. By 2030 the global apparel production is projected to rise by 63%, from 62 million tonnes today to 102 million tonnes, equivalent to more than 500 billion additional t-shirts (Eder-Hansen et al., 2017), and to emit around 2.7 billion tonnes of GHG emissions a year (Berg et al., 2020).

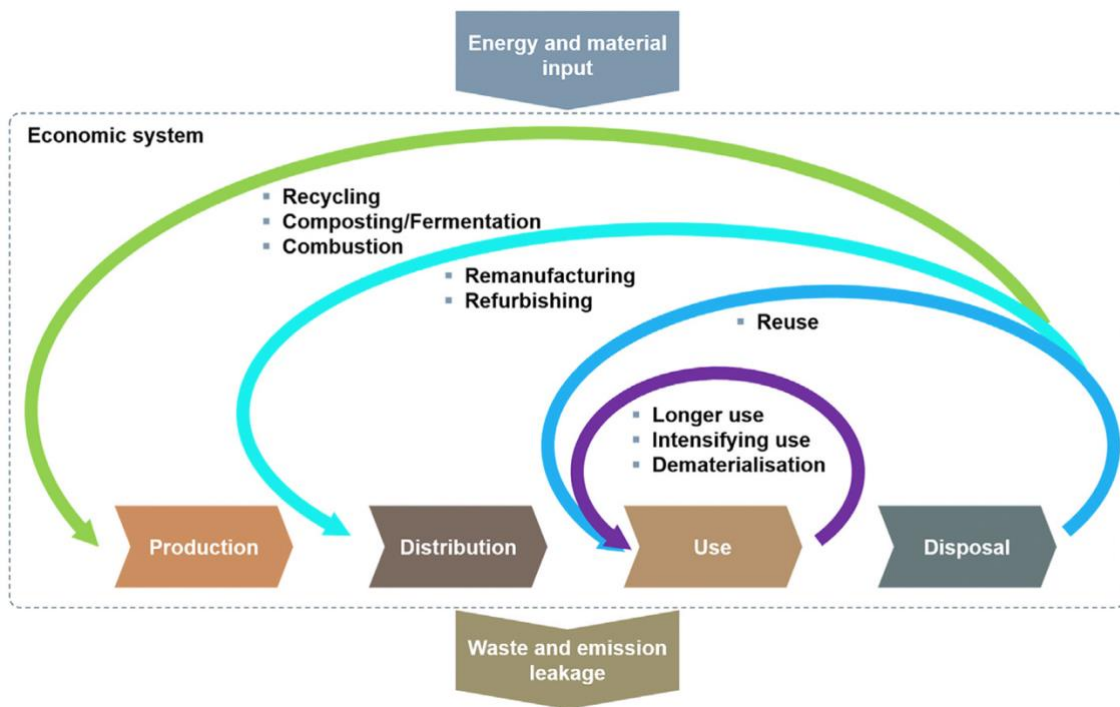
But in the past fashion used to be sustainable. About 300 years ago, before the Industrial Revolution in the late 1700s, apparel and textiles were localized, made only from natural materials and grew at a pace aligned with the planet's natural resources. Since the Industrial Revolution, the garment industry has created non-natural materials that were no longer able to

be absorbed into the natural environment; has developed supply chains that have exploited labour globally in a rush to drive down prices; and has grown the scale in which apparel is produced, creating harmful side effects of pollution and overproduction (Bassett, 2021). When products were more valuable, humankind managed them differently: jars, clothing, and tools were attended to with care and used repeatedly until there was no more useful life in the product. Only then products were recycled into something new, and the ability to recycle was easier because these items were made from a single material (cotton, wool, steel, wood, glass, etc.). For example, clothing was made of either wool or cotton, so it could be cut into smaller pieces, used as rags or even used to spin new yarns; and at the end of its life, that material could be composted (Bassett, 2021) [see *infra*, Section 4.2.1.]. The enormous and inescapable advances made by humankind make impossible going back through the centuries to how clothing and accessories were produced and to the way fashion was conceived. However, being inspired by and extracting some techniques and concepts from the 'fashion industry' (or better craftsmanship) of the past may prove crucial for the today environmental, social, and economic challenges and the near future of the industry and the planet. Indeed, as seen in the previous chapter, nowadays business model innovation draws down on strategies that have characterized the past: narrowing, slowing, and closing the resource flow [see above, Section 3.2.1.] are three of them purposed to reduce natural resource usage and lessen environmental damage in the textile and apparel industry. First, 'narrowing' the resource loop means increasing the efficiency of the production process so that fewer natural resources are used. The objective here is to downsize the number of resources (both material and energetic) used during the design, manufacture, distribution, use and disposal of fashion items. Studies suggest that nearly seven out of every ten fashion companies do not focus on managing environment and resources, such as water and cotton, along their supply chain (Pal & Gander, 2018). Second, 'slowing' the resource flow involves the reuse and extension/repair of products to decrease overall environmental damage. Strategies for slowing down, reducing overall natural resource usage and environmental damage, include creating longer-life clothing thus extending the period the product is used and thereby decreasing overall demand for the product by the final consumers. Most commonly in this industry slowing refers to what has been termed 'slow fashion' (Fletcher, 2010). An approach which can be practiced in many ways, for example by designing systems of sharing fashion products, or explicitly designing apparel to increase its durability and ease of repair (Pal & Gander, 2018). There are two main obstacles that hinder the widespread adoption of slow fashion logic based business models. The first comprises the well-known difficulties in reducing the consumer consumption in larger fashion sectors (i.e., fast fashion and medium-low price retailers and brands), thus remaining confined only to the 'small'

haute couture, luxury or other niche segments of fashion industry. The second consists in the fact that the fundamental premise of slow fashion is in direct opposition to the dynamic and meaning of common idea of fashion that includes styles changing with social and political trends and broader cultural movements. Designing for longevity is also achieved by creating apparel that can be modified and introducing a more evolving and personal relationship between the owner and their fashion items. Organizations exploring such design-led approaches to extending the longevity of garments use a variety of modular, multifunctional or incremental garment construction and ornamentation (Pal & Gander, 2018). Third, strategies for attempting to ‘close’ resource flows comprehend a range of social and technological resource recovery activities. The realization of a closed cycle of resources comes in different forms, from the chemical or mechanical processes that recover part or the entire material loop (simply by reclaiming the garments and reselling them as they are) to remanufacturing by upcycling or reworking the products. A ‘socialized’ approach to closing the loop involves setting up and promoting shared or collaborative forms of consumption that aim to replace ownership with access (e.g., clothing and accessories renting through online platforms or subscription models). Closing is linked to the wider movement of circular economy and refers to the switch in logic from viewing production and consumption as separate ends of a pipe to attempting to connect them together to form a loop where resources cycle. The more closed the loop is, the more efficient the use of resources will be and consequently less damage to the environment will be caused (Pal & Gander, 2018).

Narrowing, slowing, closing, but also intensifying and dematerialising [see above, Section 3.2.1.] are just some of the strategies behind the development and implementation of a crucial ‘element’ for sustainable change in the fashion industry, or any other industry: the circular economy. Not coincidentally, this is not the first-time the circular economy has been cited in this work; as a matter of fact, it has already been mentioned when discussing the European Union's sustainability policies [see above, Section 2.2.2.], or dealing with the Triple Bottom Line [see above, Section 2.3.] and some of the sustainability assessment tools currently employed in the fashion industry [see above, Section 2.4.], or explaining the today innovative role of sustainable and circular business models [see above, Section 3.2.1.]. The illustration in Figure 17. graphically summarizes how operate some known practices that shape a circular economic system and also provides a useful overview to clearer understand the following general definition of circular economy. A circular economy is a production and consumption model which involves sharing, leasing, reusing, repairing, refurbishing, and recycling existing materials and products with the goal of extending their life cycle as long as possible (European Parliament, 2023). In a circular economic system, the main objective is to reduce to a minimum

**Figure 17.** The circular economic system.



Source: Geissdoerfer et al. (2020)

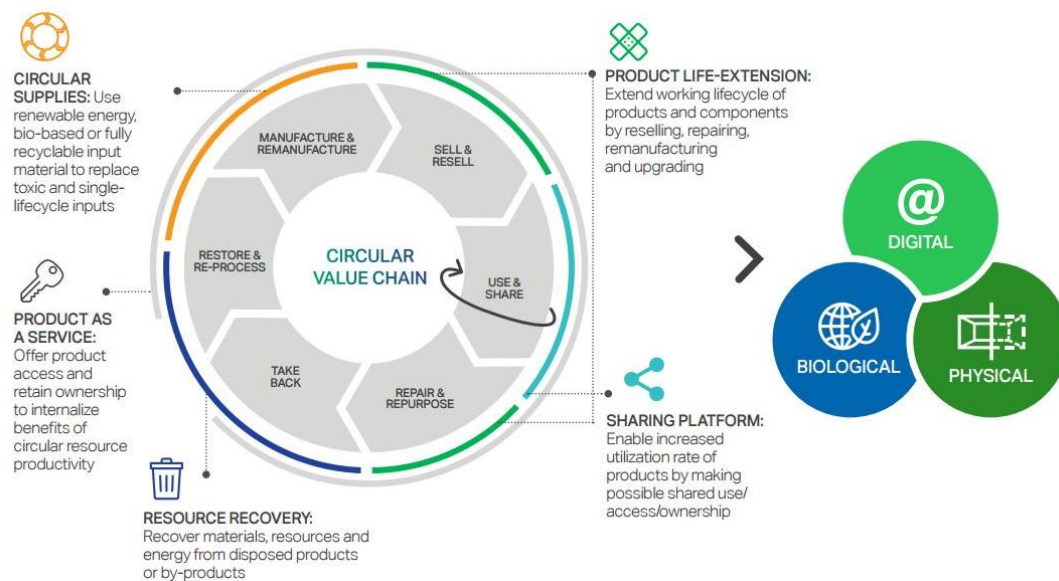
waste, resources use, emissions and energy leakage by slowing down, closing, and narrowing the energy and materials loops (Goni et al., 2021) and by acting at micro level (products, companies, consumers), meso-level (eco-industrial parks) and macro level (cities, regions, nations and beyond), thus accomplishing sustainable development through the creation of environmental quality, economic prosperity and social equity for current and future generations (Kirchherr et al., 2017). Hence, a circular economic system based on circular business models can be attained through the integration of durable design, maintenance, repair, reuse, remanufacturing, refurbishment and recycling in both production/distribution and consumption processes (Goni et al., 2021; Kirchherr et al., 2017). This regenerative approach represents the substantial departure from the traditional linear economic model that is based on a take-make-consume-throw away pattern, and that most of the times relies on the use of large quantities of cheap and easily accessible materials and energy. Switching to a circular economy is necessary to protect the environment, indeed reusing and recycling products would slow down the use of natural resources, reduce landscape and habitat disruption, help to limit biodiversity loss and decrease total annual greenhouse gas emissions (European Parliament, 2023). In addition of decreasing the amount of waste generated, the circular transition is also critical to reduce raw materials dependence: recycling finite resources would mitigate the risks associated with supply, such as price volatility, availability and import dependency. Moreover, circular economy could increase competitiveness, stimulate innovation, boost economic growth, and



create jobs across different sectors of the economy. Finally, consumers would be provided with more durable and innovative products that are able to enhance the quality of life and save them money in the long term (European Parliament, 2023). It is not a coincidence that the term ‘circular economy’ has its origins and appears for the first time in the 1990s, exactly in the meantime the world and the United Nations have begun to set some goals to render concrete the sustainable development. Indeed, circular economy tries to tackle the root causes of global challenges, such as climate change, biodiversity loss, and pollution, while creating opportunities for a better and sustainable growth. Numerous Sustainable Development Goals [see above, Table 5.] are easily discernible in the explanation of circular economy just provided, of which those most closely related to the fashion industry and its operational functioning, social and labour influence, environmental impacts and economic relevance are reported: Goal 3 (People Good Health and Well-being), Goal 6 (Clean Water and Sanitation), Goal 8 (Decent Work and Economic Growth), Goal 9 (Industry, Innovation and Infrastructure), Goal 12 (Responsible Consumption and Production), Goal 13 (Climate Action), Goal 14 (Life below Water), Goal 15 (Life on Land), and Goal 17 (Partnerships for the Goals) (United Nations, n.d.-e). Particularly, the SDGs that deal with building resilient infrastructure, promoting inclusive and sustainable industrialization and fostering innovation, ensuring more sustainable consumption and production patterns, and taking urgent actions to combat climate change and its impacts, cover critical topics that will emerge frequently in the following parts, where will be treated circular solutions that are currently known and within reach of fashion companies and sharable by consumers’ mindsets, behaviours and lifestyles.

For the fashion industry, therefore, the opportunity is circular (Bassett, 2021). The World Business Council for Sustainable Development has developed tools for CEOs (WBCSD, 2019) so that corporate officers (but also entrepreneurs and managers of small and medium sized companies may take advantage of this scheme) can innovate their businesses inside the circular economy. Notably, in Figure 18. are reported five circular business models that apparel and textile companies can look at for an inspiration as they decide to undertake the transition from the linear models they are reliant on nowadays (Bassett, 2021). Figure 18. shows how in a circular value chain by applying the latest biological, digital, and physical technologies into CBMs, named circular supplies, product-life extension, sharing platform, resource recovery, product as a service, all value chain’s phases are protracted, until trying to achieve the ideal ‘never ending life’ for products and materials. As such, in the WBCSD scheme to manufacturing is added remanufacturing, selling is followed by reselling, as well as use is incentivised sharing, repairing, and repurposing are inserted, or alternatively take-back and consequent restore or reprocess are assumed.

**Figure 18.** Five circular business models and three disruptive technologies.



Source: WBCSD (2019)

Jules Lennon, in explaining how the shift towards a circular economy and circular business models in the fashion industry is crucial, says “The fashion system is broken. And today lot of businesses have taken actions to try to address some of these: they have looked at reducing CO<sub>2</sub> emissions or water usage. These efforts are essential, however if we want to create a thriving nature positive fashion industry, we need to fundamentally transform the way we design, make and use products, and for that we need a circular economy” (Ellen MacArthur Foundation, 2023). As it is estimated that more than 80% of a product’s environmental impact is determined during the design phase, beginning exactly from this first life stage would help to reduce energy and resource consumption (European Parliament, 2023). Circular economy is underpinned by three principles, all led by the design step: eliminate waste and pollution, keep products and materials in use or circulation at their highest value, and regenerate natural systems. For fashion industry, it is translated into ensuring that products (apparel, accessories, footwear) are used more, made to be made again, and made from safe and recycled or renewable inputs (Ellen MacArthur Foundation, 2020). In other words, garments, accessories, and footwear should be designed and manufactured to withstand a repeated and prolonged use, to be successively disassembled so collected, sorted, and then reused, remade, recycled, or safely composted (when maximum use and number of cycles have been achieved), and to be composed by materials free from hazardous substances which during production and consumption phases do not discharge polluting and damaging elements in the environment reaching natural ecosystems and life beings (Ellen MacArthur Foundation, 2020). To make this vision the new reality of the textile and apparel industry, circular business models must become mainstream and emphasize

the central role of design, which fosters the decoupling of revenue streams from production enabling to make more revenue from fewer new products, to reduce the need for raw materials and to low GHG emissions, pollution, and pressure on biodiversity. Ellen MacArthur Foundation was among the first organizations in trying to identify and classify the already tested and (enough) scaled CBMs within fashion industry. According to the Foundation CBMs can be designed to fall into one or all three following recognized categories. The first is called ‘more use per user’ and enables a user to wear a product more and for longer by designing items to be both physically and emotionally durable, that is providing services to support long-term use and empowering users to use their products more and for longer (e.g., tips for DIY, Do It Yourself, customisations). Then, the second is ‘more users per product’ and consists of designing and providing platforms and/or services that facilitate the movement of items, after any period (periodical or ‘one-off’) from user-to-user so the products can be used more. Lastly, the third named ‘beyond physical products’ contemplates the idea of designing and developing non-physical, digital products and/or services that replace, enhance, and complement users’ fashion needs and aspirations. Also led by this categorization, the Ellen MacArthur Foundation identified four main CBMs with feasible decoupling potential: resale, rental, repair, and remaking. In 2019 their market value was equal to USD 73 billion, where 80% of revenues come from mass market segment and 30% from luxury market segment. Resale had the largest proportion of revenues (USD 46 billion), making up around 63% of disputed CBMs, while rental occupied the second largest segment (USD 15 bn), accounting for around 20%. The remaining market value was divided between repair (USD 9 bn) with a 13% share and remaking (USD 3 bn) with a 4% share (Ellen MacArthur Foundation, 2021). Whereas the COVID-19 pandemic has impacted revenues of traditional business models (principally due to lockdowns, supply chain disruptions, and temporary or permanent changes in consumers’ mindset and shopping behaviour), rental and resale have been able to rebound quickly by demonstrating resilience and experiencing significant growth. Not by chance, since 2019 seven rental and resale platforms (Depop, Rent the Runway, The Real Real, Vinted, Poshmark, Vestiaire Collective, and thredUP) have reached valuations above USD 1 billion. These types of circular business models are expected to continue growing as customers increasingly will adopt new ways of accessing fashion, motivated by factors such as affordability, convenience, and environmental awareness (Ellen MacArthur Foundation, 2021). Resale, rental, repair, and remaking have the potential to grow from the today 3.5% share of the global fashion market to a 23% by 2030, representing a USD 691 billion opportunity in which CBMs’ market value and share are respectively: USD 476 bn (+1,035% compared to 2019) and 69% share for resale; USD 167 bn (+1,113% on 2019) and 24% share for rental; USD 32 bn (+356% on 2019) and

5% share for repair; and, USD 16 bn (+533% on 2019) and 25% share for remaking. The development of these four circular models is expected to be largely led by North America and Europe, with a joint potential market value of USD 430 billion by 2030, followed by the Asia Pacific region, with around USD 250 billion, and by the slowest growing Latin America (USD 5 bn) and Middle East & Africa (USD 4 bn). Moreover, from a strictly environmental impact standpoint, all together the CBMs have the potential to provide a third of the emission reduction necessary to out the fashion industry on a 1.5-degree pathway signed by many countries in the Paris Agreement. This would consist in a reduction of around 340 million tonnes of CO<sub>2</sub> equivalent annually by 2030, more than the annual GHG emissions of Thailand or France (Ellen MacArthur Foundation, 2021). As well as reducing GHG emissions, circular business models have also been shown to reduce pressure on biodiversity by cutting the amount of land needed for raw material production and the pollution associated with virgin fibre processing.

After seeing the potential of these four CBMs in the fashion industry in terms of current and estimated 2030 global market data, let try to see what they really consist of, keeping in mind that their distinction is often blurred with overlapping, or there could be different names for expressing the same concept or there may be various similar ‘sub-practices’. Resale (or recommerce) model includes online and offline peer-to-peer sale of second-hand items, third party marketplaces, and own-brand re-commerce and take-back systems. In practical terms, in recommerce model the merchant collects garments through various collection schemes, and the garments are sold again to a new consumer. So, ownership of and responsibility for the garment change hands (Drew et al., 2020). Resale’s largest global market share is principally due to the growing demand and adoption by younger generations (Millennials, but above all Gen Zs), especially in Europe and in the USA as data confirm, driven by a widen environmental awareness, an income opportunity, and lower prices’ influences. ThredUP’s (an US online marketplace for second hand clothing ) 2019 report claims that “if everyone bought one used item instead of new this year, we would save 5.7 billion pounds of CO<sub>2</sub> emissions, 11 billion kWh of energy, 25 billion gallons of water, and 449 million pounds of waste” (Drew et al., 2020; thredUP, 2019). In addition to quality and affordability edges, consumers can manifest their self-expression and individuality through resold clothes and accessories able to enclose a high emotional durability considered that many times they are one-of-a-kind remade or upcycled items, or no longer available from brands (Ellen MacArthur Foundation, 2021).

Instead, rental model comprises one-off peer-to-peer rentals by private owners, as well as large-scale rental and subscription models by multi-brand platforms or individual brands. Rental model is facing a slower growth compared to resale, but good news is coming from European and US final consumers’ habits because people have begun to rent (and lend) garments not just

for special occasions (e.g., wedding, proms, birthdays, anniversaries, etc.) but also for everyday life and occasions (Ellen MacArthur Foundation, 2021). During the last years numerous rental platforms from different countries have proliferated by focusing on fashion items' special categories, such as plus-size apparel, maternity wear, or luxury goods (especially bags and accessories) (Jin & Shin, 2020), thus satisfying necessities of probably more needing of clothes renting's consumer segments. Whether in rental model consumers hire a garment for a specified time period and then return it to the merchant, making it available to an additional consumer, and letting that ownership of and responsibility for the item are maintained by the merchant; instead, in the case of a clothing provision service model consumer pays for an apparel service or subscription for an extended amount of time or renews it at regular intervals (e.g., monthly), after which time garments are returned and provided to another service user (Drew et al., 2020). Another possible variation of rental is the lease model, where consumer and merchant stipulate an agreement to exchange ownership of and responsibility for the garment for an extended period, after which the consumer returns the garment to the merchant who leases it to a new consumer. Here, ownership of and responsibility for the garment are a mix between merchant and consumer (Drew et al., 2020). In all these types of reselling and renting CBMs is notably important the role of reverse logistics technologies to which should be addressed investments and innovation to improve automation of warehouse logistics. In the fashion industry resale peer-to-peer platforms, based on selling/purchasing, swapping, donating pre-owned and second-hand items, and rental service platforms represent two different forms of collaborative consumption. Typically, the former is consumer to consumer (C2C), while the former is business to consumer (B2C) (Jin & Shin, 2020).

Repair model consists of the operation by which a faulty or broken product or component is returned to a usable state. In this model consumers pay for a repair service or subscription at the point of garment sale or afterward to repair garments to as-new standards. Again, ownership of and responsibility for the garment are maintained by the consumer (Drew et al., 2020). An alternative practice is Do It Yourself (DIY), where customers are more involved in the care of their clothes and accessories because fashion retailers or producers provide the so-called DIY kit with necessary materials and instructions (Nosratabadi et al., 2019). Notably, repairing is a service increasingly valuable in luxury fashion goods sector where higher margins are obtainable thanks to better quality and durability of items (Ellen MacArthur Foundation, 2021), and to the fact that customers seek for exclusivity, unique experiences and services, and the best offer on the market considered the price paid. It is interesting to notice that until a few decades ago, there were not as many disposable products as there are today and the consumerist logic of 'I would rather buy it new than repair it myself or have someone repair it' had not yet

taken over. Repairing broken or damaged items was the most common and normal practice and solution and, in the case of clothing, accessories, and footwear, people went to tailors, specialized craftsmen, or shoemaker's shops. The transversal feature of this CBM makes it easily couplable with other models as rental and resale (Ellen MacArthur Foundation, 2020). Finally, as it is happening with repairing, also remaking is an old practice that recently have been brushed up because of the growing end-users' environmental and social consciousness related to fashion industry's impacts, in particular about the issues of over-production, over-consumption joined to clothing underutilisation, pre-consumer and post-consumer (end-of-life) waste management. Disassembling, re-dyeing, restyling and repurposing are just few operations comprised in the remaking model where a new product is created from existing products or components (Ellen MacArthur Foundation, 2021) and where resulting outcome is able to make trigger in consumers sole feelings and emotions through the injected creativity and extraordinary ability to reinvent, and in a certain philosophical sense, to be reborn. Therefore, remaking examples include taking pieces of complete fabric from used products and sewing them together to create a new product. At product-level a remaking operation can be refurbishment, that is bringing a product to an 'as-new' condition and including updates and improvements, while at component-level a remaking operation can be remanufacturing, that is bringing a component to 'as-new' condition and level of performance (Ellen MacArthur Foundation, 2020). In particular, one form of remaking has become a growing trend among fashion designers over the last decade: upcycling (Aus et al., 2021). It can be defined as a recycling approach where 'waste' (unwanted clothing and textiles, clothing leftovers from textile factories, or surplus garments or fabrics, known as deadstock, but also all components relate to the finishing process) (Sustainable Jungle, 2022) is used to create products with a higher retail value than traditional recycled products. As such, upcycling can be described as the opposite of downcycling, which downgrades the value of the material and discards the work and value invested in it (e.g., in fashion industry some mixed fibres fabrics can only be downcycled into industrial material like carpeting and insulation) (Aus et al., 2021; Sustainable Jungle, 2022). In downcycling cases, the value of the waste is reduced, its lifecycle is shortened, and the possibility of new uses for the product diminishes at each downcycling process (Veracura, 2021). Moreover, the term upcycling is often mistakenly interchanged with 'recycling'. Recycling consists of the industrial process of reducing a product back to its basic material level, reprocessing obtained materials, and using them in new products, components, or materials (Ellen MacArthur Foundation, 2020). This process can be done mechanically (e.g., Rifò company where cotton is shredded down and its fibres rewoven into a recycled cotton fabric) or chemically (e.g., Aquafil and its Econyl® regenerated nylon that is 100% recycled

polymers and yarns made of plastic waste such as fishing nets, fabric scraps and old carpets melted down and respun into polyester or nylon fibres) (Sandrini, 2021; Sustainable Jungle, 2022). Recycling is an undoubtedly fundamental and necessary part of the circular economy (irrespective of the industry in question), but they are two different concepts: recycling begins at the ‘end’ (‘get rid of’) stage of a product’s lifecycle and it is what people might call ‘end-of-pipe’, while a circular economy’s ‘upstream’ solutions address potential problems right at the source (Ellen MacArthur Foundation, n.d.). Back to upcycling, it is generally understood as a design-based circular fashion approach, where pre- and post-consumer textile waste material is repurposed to create new garments and a solution to those fashion brands that seek to the industry’s environmental impact and to offer socially and environmentally conscious choices to their customers. Implementing upcycling on the industrial level requires to understand the waste created in mass production, but there is a lack of data concerning the textile waste generated in the garment manufacturing, and to create designs that suite the production system and make it less wasteful, yet the design itself depends on the available stock of fabric leftovers that can vary in size and shape (Aus et al., 2021). Therefore, the starting point is always a detailed overview of the waste streams and identifying the type and quantity of available materials. One last benefit, and incentive, in adopting upcycling processes is that the textile waste can be manufactured in the existing production sites (where it probably already finds itself), utilising existing infrastructure without the need to invest into additional technologies (Aus et al., 2021).

Summarizing, resale, rental, and repair models can be grouped under a more comprehensive term such as reuse. Indeed, in reusing operations a product or a component is used repeatedly and for long periods of time, for its original purpose without being significantly modified, remade, or recycled. Products might need to be ‘prepared for reuse’, which often involves cleaning, repairs, or small modifications so that they can continue to be used throughout time and multiple users (Ellen MacArthur Foundation, 2020). Millennials and Gen Z, above all those living in urban areas, are expected to drive the demand for rental models in the next future, as already affirmed treating the resale model. Conversely, brands will be key players in driving remaking and upcycling as they innovate around overstock and deadstock. Similarly, the repair lever assumes the willingness of brands and retailers to introduce professional repair services in select products categories and that consumers will choose to repair products when supported to do so (Berg et al., 2020). To tangibly embrace and implement circular business models fashion companies oriented to rental and resale models should focus on develop new logistical capabilities (especially reverse logistics), while those aiming at repair and remaking models should deal with garment-making skills, either inhouse or outsourced. In any case, as demand

grows, fashion brands will need to implement CBMs in collaboration with retailers and upstream value chain players (if not already vertically integrated or controlled) or risk losing both control of their products and the additional value they hold after sale (Berg et al., 2020). However, unfortunately nowadays there are still several barriers to achieving the circular goal of decoupling between production and consumption (or between resources and use) that underlies the just seen four fashion industry's CBMs (plus one fundamental process, recycling). One barrier is performance indicators and associated customer incentives which currently are optimised for the predominant linear business model, that is to increase sales of products of virgin materials, thus incentivising customers to buy more and buy new. In this way, the current set-up discourages the uptake of CBMs and limits their ability to displace the production of new apparel and accessories (Ellen MacArthur Foundation, 2021); hence, unless a business' performance indicators and customers incentives are designed in such a form as to intentionally seek the transition of firm and its final consumers from linear to circular business model, resale, rental, repair and remaking will have restrained economic and environmental benefits. Another barrier hindering spread of CBMs is paradoxically product design which, as initially highlighted, is considered crucial to enable reusing, repairing, remaking, and recycling of products, but it is currently not yet so technologically advanced and feasible as to ensure sustained and lasting circulation of most fashion items offered within the various CBMs. The last barrier that hampers products' circulation is represented by supply chain technologies, warehousing, sorting, cleaning, packaging, and delivery that at the moment in fashion industry are all optimised for predictable one-way productions concentrated in specific countries (Ellen MacArthur Foundation, 2021). To maximize the profitability of CBMs, effective and cost-efficient reverse logistics infrastructure and skills would be needed at local level, but these are still lacking in many geographic areas all over the world. However, companies can collaborate to create new supply networks to develop these areas of the industry. Policymakers have a key role to play in overtaking these barriers and activating favourable conditions, but nowadays also comprehensive circular economy policy frameworks for fashion are still not so enacted and established even though, for example, in the European Union some changes are taking place [see above, Section 2.2.2.] (Ellen MacArthur Foundation, 2021).

Hence, starting from the just recognized main barriers, to maximise the positive economic and environmental outcomes of circular business models and to support the shift towards a better and sustainable growth model, fashion companies, supported by policymakers, may take an ambitious agenda made up of the following four key actions sets (Ellen MacArthur Foundation, 2021):

1. rethink performance indicators, customer incentives, and customer experiences.



2. design products that can be used more and for longer.
3. co-create supply networks able to circulate products locally as well as globally.
4. scale a wider range of CBMs.

Regarding the first set of actions, firms that fail to put CBMs at the centre of their strategy by tailoring improper performance indicators, risk not only underestimating the contribution these models can make to profit margins, but also undertaking business activities that perpetuate the linear model. Incentives and rewards should then encourage customers to engage in those business models that increase usage, as well as provide to fashion firms access to customer data and preferences then used to strengthen customer brand loyalty. In this way, fashion companies influence customer engagement and adoption in CBMs, which ultimately should succeed in replacing linear ones that produce new products using limited virgin resources. Finally, within this first set of actions, there are those aiming at making CBMs integral elements of the current culture and mainstream economy in which companies invest resources to position their products or services according to the ideals, aspirations and aesthetics of their customers, while at the same time trying to eliminate costumers' misconceptions and scepticism about CBMs themselves. Among the available tools to achieve this purpose there are the development of effective user experiences, the design of lifestyle community platforms, and the planning of marketing campaigns that, for instance, portray rental or second-hand as "cool" as habits promoted by traditional models (Ellen MacArthur Foundation, 2021). Another example (usable also in the next set of actions) is the Do It Together (DIT) design strategy that allows consumers to be both the designer and the producer of their own garment or accessory enjoying an unusual experience, or better, a workshop (Nosratabadi et al., 2019). The second set of actions concerns again product design. Its leading role in making circular the fashion industry and at the same time the technological and knowledge obstacles in doing it were already discussed. Here the focus is on durability, the product feature on which fashion designers and engineers should work on. Durability is the ability of a physical products to remain functional and relevant over time when faces with the challenges of normal operation. In particular, physical durability considers garment construction and component reinforcement in order to create items that can resist damage and wear (e.g., Lacoste introduced a product durability protocol throughout its textile chain to maximise its products lifespan), while emotional durability consists in the product's ability to stay relevant and desirable to the user, or multiple users, over time (e.g., Piquadro and the personalisation service of its accessories that make them unique for a buyer by increasing the desirability to wear it even over the years, or smaller realities like the Italian family business named flò-ra that customizes sustainable apparel and accessories by embroidering by hand) (Ellen MacArthur Foundation, 2020, 2021; flò-ra, 2023; Piquadro, n.d.).

Also remaking CBM is itself a successful way to improve emotional and physical durability: Hermès Petit H is an extremely creative fashion luxury example resulting from high-quality materials that Hermès métiers do not use (basically fabric' or leather' scraps and leftovers) and leave to other artisans, artists and designers to combine them realizing further new unique Hermès objects and accessories (Ellen MacArthur Foundation, 2020; Hermès, n.d.; Pan, 2021). Moreover, considering an application of design in the recycling process, for instance, integrating in the design of clothing and accessories mechanisms for transparency and traceability that support the identification of utilized materials across the whole value chain and improve the output quality of the recycling process (Ellen MacArthur Foundation, 2020). To be more clear, the term transparency refers to the ability to make information on product specifications, chemical inputs, materials used, and production practices available to all actors of the supply chain (including users), allowing common understanding, accessibility, comparability, and clarity. Whereas with traceability it is intended the ability to trace products, components, and materials, as well as the social and environmental conditions in which they were made, along the whole supply chain, including after use (Ellen MacArthur Foundation, 2020). Transparency and traceability are also two central themes for Rifò, a successful sustainable Italian fashion brand [see *infra*, Section 4.2.1.]. The company wants to create fair fashion clothes therefore has decided to give life to products at KM 0 (zero food miles), from the textile to the finished product: all it is used during the processing is near the main plant and waste's traceability is guaranteed by the GRS (Global Recycle Standard) certification for providers and by the origins of upcycled fabrics (Rifò, n.d.-c). The third set of actions considers an effective collaboration among all fashion industry actors to build a distributed (supply) network through the help coming from leverage technologies that are able to empower multi-way communication, tracking, and traceability, in other words some mutually beneficial partnerships. Building a highly connected network between all actors in a circular fashion system (i.e., raw materials suppliers, manufacturers, retailers, end-users, and collectors) means establish multi-way communication channels to proactively enhance product reuse at global level, where infrastructures are necessary to implement operations (e.g., handling e-commerce returns and incoming streams for resale and repair, sorting, and repackaging or redistribution) across different locations, until even achieving economies of scale thanks to structures shared among fashion industry players (Ellen MacArthur Foundation, 2021). CBMs that integrate these ways of acting are crucial seeing as how is firmly claimed that the linear model has brought in many countries to an increase of used products volume (mismanaged because of a lack of skills and infrastructures) and to an unsustainable, unethical and not eco-friendly solution such as exporting items to some specific countries (especially the developing or poorest

ones), themselves unable to face waste management challenges. A nice example, in a certain sense inspired to food delivery's principles, is Sojo: a mobile app that connects its users to local seamstress or tailoring businesses, picking up via bicycle only and delivering altered or repaired items after 3 or 5 working days. Today Sojo is also an in-store option in all Beyond Retro shops, a UK vintage retailer, permitting customers to get their vintage items tailored. While concerning the contribution of leveraging technologies, such as Artificial Intelligence (AI), blockchain, and cloud computing, they enable smooth exchanges between companies and service providers to manage processes, such as collection, cleaning, repair, and distribution, needed to make work CBMs (Ellen MacArthur Foundation, 2021). Collaborative technologies could also add new value to fashion consumers, for instance through personalised products or experiences, while businesses may benefit from insightful and actionable non-financial data, such as product use data or identification of 'timeless' styles. A practical implementation of these technologies is represented by Save Your Wardrobe, a wardrobe management platform that implies online receipts, computer vision, and AI to digitise consumers' wardrobes. Then the platform offers an ecosystem of aftercare services (e.g., eco-cleaning, repairs, alterations, end-of-life services like donation to help users extending garments' life), other than personalised insights and recommendations based on the uploaded users' wardrobe composition and communicated level and way of use. The fourth and last set of actions is a kind of invitation to extend the range of available circular business models for fashion industry by combining the four main ones available (resale, rental, repair, remaking) or even creating new ones from the scratch always keeping as guidelines the previously mentioned 'more use per user', 'more users per products', and 'beyond physical product' categories (Ellen MacArthur Foundation, 2021). Resale, rental, repair, and remaking models together can yearn for a 23% share of the global fashion market by 2030, which is still a small market share compared to that held by the dominant traditional linear model, and from this derives the need to find out new effective CBMs able to decouple revenue streams from production and resource use.

In conclusion, to have a complete overview on development and scaling of circular business models, it is fundamental that fashion companies take into consideration some overarching aspects, too. Building capabilities internally the business is essential to implement a CBM, as having available new or reconfigured existing physical and digital spaces to offer new services that keep products in circulation. Then, concerning apparel items and accessories, authenticity and traceability must be guaranteed (especially for premium and luxury goods) as well as product's hygiene obtained through innovative and scaled cleaning solutions that must be low-impact and safe for the environment. Staying in the environmental field, these types of CBMs, which usually involve multiple users and a single traded product, require investments in

solutions related to packaging, delivery practices, and pick-up or consignment points. All these services imply reverse logistics and processing costs that make the single highest handling cost for most of the CBMs, therefore businesses have to consider and choose among different profitable set-up options such as B2B partnerships or peer-to-peer models that externalise costs. Of course, product or service marketing and communication play another key role in a circular strategy because they should communicate effectively with users so that they understand how to best access and take advantage of these CBMs and the benefits these models offer them. Nowadays technology represents the common thread to make cost effective and efficient any circular business model: crucial are investments in technology machineries, methods and tools both already available and new or under research and development phase (Ellen MacArthur Foundation, 2021).

This last part of the section was focused on how textile and apparel companies can innovate themselves, through the adoption of circular business models, in order to achieve a circular fashion industry that supports a global sustainable development and a societal and economic growth. However, the role of end consumers has become increasingly crucial because of their direct request of a more sustainable fashion industry (a pull force), the latest collaborative technologies that inevitably include customers' involvement and collaboration, or because of the simple fact that final consumers constitute one ring of value chain which has to change becoming circular and no longer linear. To make this, consumers should decide to buy as less as possible without surrendering to consumerist injected needs, inform about and refer to more sustainable fashion brands, visit vintage stores or thrift shops, look at second hand and pre-owned peer-to-peer platforms to buy or sell apparel and accessories, or try the rental service for special occasions and, in case, even for everyday outfits. In addition to shopping and use behaviours, consumer may have a great impact on the environment and on the changing system by directly on their own taking care of their wardrobe, through repairing (rather than discarding), washing items less frequently, using gentle detergents and cold water, and avoiding dryer so preferring air-dry (MasterClass, 2023). In a nutshell, consumer should endeavour to embrace circular fashion principles.

#### **4.2. Examples of sustainable fashion companies**

Recycling, resale, rental, repair, remaking are just a part carried out by those fashion companies that decide to embrace the circular economy and sustainability in all its three dimensions (environmental, social, and economic) as the overarching guiding core values of all their short- and long-term decisions and strategies. As already stated, technological, structural, cultural, and economic obstacles are hampering and slowing down the sustainable transition of the huge

global fashion industry but, at the same time, consumers' attempts to change their mindsets and lifestyles are acting as a pull force towards a widespread sharing of this new circular way of doing business. For these reasons, concrete examples of companies that integrate these principles are still limited, however they constitute evidence that when sustainability is considered central and CBMs are adopted, leaving the virtuous circle, in which the company has entered and is operating successfully, to return to a linear model is no-longer convenient and ethically accepted. The examples below are categorized according to the prevailing circular business model (recycle and remaking, resale, rental, repair), but at the same time they demonstrate that (fashion) companies that enter the virtuous circle of the circular economy are able to generate even more value for themselves, customers, and other stakeholders, by combining multiple CBMs or implementing different circular practices simultaneously.

#### **4.2.1. Recycling & Remaking – Rifò**

Rifò S.r.l. was founded in 2017 in Prato (Tuscany, Italy) by a group of young guys whose mission is to create quality garments and accessories produced entirely in Prato and its surrounding with 100% recycled and recyclable fibres. The name itself expresses the final goal of the company, indeed 'Rifò' is a Tuscan inflection of the Italian verb 'rifare', meaning 'to remake' or 'to redo', and it is inspired by the local artisans called 'Cenciaioli' who, more than one hundred years ago, invented the recycling method of old clothes, the same collecting, selecting, processing and manufacturing's technics adopted (and adapted) nowadays in Rifò's activities (Rifò, n.d.-e). What Rifò is doing in the fashion field has been defined among scholars as retrovation, a novel concept in management of innovation, which refers to a specific form of innovation that utilizes largely forgotten past practices and products to address some current problems and market opportunities; in other words, history can be used as a resource, especially for designing more sustainable products, processes, and technologies (Sedita, 2023). A type of innovation like retrovation requires the existence of knowledge networks, which can be distinguished considering the strength of the relationships and the geography of the ties (Sedita, 2023). Particularly, in the Rifò case are strong the concept of 'geographic proximity', which is characterized by the presence of a strong relationship between actors operating in a network based on their geographical proximity, and the concept of 'embeddedness', which is instead characterized by the presence of a strong relationship among actors composing a valuable and essential knowledge network (Sedita, 2023). Indeed, Rifò is more than a company, it is a circular economy project, a bridge between different realities that care about the environment and about saving natural resources (Rifò, n.d.-e). The Italian firm collaborates with local companies that have been dealing with textile recycling for years to give individuals

(entrepreneurs, artisans, firms, and consumers) the opportunity to contribute to this ambitious, but attainable project. Essentially, Rifò embeds the social emergent and business deliberate dimensions of networks which can occur within an innovation ecosystem that is geographically bounded (Prato and its well-known textile industrial district extended throughout the province) and open to distant knowledge ties (potentially includable in Rifò's operations) thus fostering a regional (or district) innovation system and the learning at the boundaries processes (Belussi & Sedita, 2012).

Rifò is a B Corporation, one of the few fashion industry's companies to have this certification. It is a sustainable fashion brand that was born from the more and more apparent environmental global emergency: as a matter of fact, the underlying idea is that the linear system and related overproduction have already produced enough materials and transformed so many resources that it is now possible to take advantage of what already exists through recycling. For this reason, Rifò produces circular, versatile and quality garments and accessories for women, men and children, and accessories for everyday life and home (e.g., towels, blankets, table linen, cushions) with recyclable materials and through regenerated textile fibres (Rifò, n.d.-a). All the company's yarns are created through the learned ancient recycling process that starts with essentially manual (labour-intensive) collection and selection by material and colour of old garments and textile waste, which are frayed, transformed again into raw materials, spun, and then woven into new durable and quality garments, allowing to choose in most cases not to re-dye or over-dye the fibres. Hence, Rifò's 'second raw materials' mainly consist of recycled cashmere from old clothing (post-consumer waste) or from industrial waste (pre-consumer waste), recycled wool from old (post-consumer) clothing, carded wool cloth from industrial pre-consumer fabric waste, recycled cotton from textile waste, cotton recycled from old jeans to produce both fresh cotton and recycled denim fabric, recycled and organic cotton made for 50% of pre-consumer industrial cotton waste and for 50% of virgin but organic cotton, and recycled silk obtained from the processing of virgin mulberry silk waste. Of course also packaging for shipment and labels and (finishing) accessories necessary to complete a fashion items are made up of recycled and recyclable materials produced internally or bought from artisans or local companies in order to always guarantee materials' traceability (Rifò, n.d.-d). Data regarding Rifò say that on average the sustainable fashion brand is able to employ in its yearly clothing production 92% of fibres from recycled materials and only 8% of virgin fibres, as well as to considerably reduce the consumption of water (moreover, the efficient water management of the Prato district guarantees the purification and recovery of industrial water), pesticides and chemicals usually use during manufacturing phase (Rifò, n.d.-a). Ethical fashion is pursued by the firm also through the pre-sale mechanism in occasion of the launch of a new

product. Rifò puts the fashion item in pre-sale on its website shop (applying a small discount) in order to understand the potential future market demand: in this way generally overproduction is avoided, or at least limited, and control on production chain and quality is increased, respecting craftsmen's work, need and timetable, too. Overproduction fosters, and reciprocally, is fostered by overconsumption, therefore also consumers have to contribute and support the circular transition embracing a more sustainable mindset and behaviour. To help consumers making the right decision when they decide to dispose one garment, Rifò proposes a form of collaboration that benefit both the company and the involved individual. The 'Re-Think Your Jeans' project deals with the placement of collection boxes, in around 50 NaturaSi stores (a 'green' grocery chain) and 3 Muji stores (an international retailer) located in Italy, where for every collected pair of old jeans people receive a 2-years-valid 10 EUR discount voucher to spend on Rifò's online shop. The And Circular company verifies jeans composition, which must be from 95 to 100% blue denim cotton, frays and reduces to fibres the jeans and then Pinori Filati firm transforms fibres into new yarns used eventually to produce Rifò's garments. A similar collaborative system was activated by Rifò also for people's felted, unstitched, mothed or broken cashmere or wool garments: in this case, consumers have to check the 100% cashmere or 100% wool composition label to be able to recycle the apparel item, then resort to a collection point (boxes), to go personally to a post office or to choose the courier's at home pick-up service in order send the garments (the shipment cost will be charge on Rifò) (Rifò, n.d.-b). Rifò's efforts made towards a circular fashion system are confirmed also by data stated in its sustainability report for 2022 year: the company produced 78,889 garments by employing 85% of their recycled fibres, recycled 13.8 tonnes of old garments, minimized overproduction leaving only 5,572 garments in stock (7% out of the firm's 2022 total production and 6% less than in 2021) through the presale system, and involved in the production 20 artisan workshops all located on average 18 km from Rifò's office in Prato (Rifò, n.d.-e).

In conclusion, Rifò has made of circular economy and of sustainability in all its three dimensions is unique core value, its life reason. In Rifò there are the meeting of innovation and tradition, recycling and upcycling processes, collaborative models with all circular value chain's actors, materials quality and traceability, care for products and workers, without renouncing to fashion's beauty and emotions.

#### **4.2.2. Resale – A.N.G.E.L.O. Vintage**

A.N.G.E.L.O. Vintage is one of the largest vintage fashion stores and archives in Europe where, since 1978, the founder Angelo Caroli has been safeguarding scrupulously researched and selected all over the world clothes and accessories that synthesize excellence in design and

style, combining sustainability and refine aesthetic taste (ANGELO Vintage, n.d.-a). Initially, Angelo Caroli approached the second-hand sphere just following a passion, but soon he understands and embraces the strong and precise concepts of recovery and recycling espousing an ecological (life) ethic, many years before it becomes a necessity or a worldwide hot topic. In addition to some temporary pop-up stores in famous department stores or fairs in Milan, Rome, Florence, and Paris, or the rich online website and shop (through which are sold basic, luxury, upcycled, and vintage cult fashion items), A.N.G.E.L.O. Vintage has two historical sites in Emilia Romagna (Italy). In the so-called A.N.G.E.L.O. Vintage Palace in Lugo (Ravenna), on the ground floor, clients can find men, women, and children's garments, shoes, bags and other accessories for all budgets and tastes (sportswear, military wear, casual, recycled, or evergreen denim apparel) divided in decades 60s, 70s, 80s, 90s and 00s. On the first floor are held luxury and vintage cult pieces for him and for her: iconic designs and extravagant garments with unique tailoring cuts resulting from the genius, creativity and technical expertise of famous designers who have made the history of fashion. For sale there are original garments Chanel, Gucci, Hermès, Emilio Pucci, Valentino, Yves Saint Laurent, Roberta di Camerino, Prada, Versace, Gianfranco Ferré, Romeo Gigli, etc., and even a corner dedicated to vintage wedding dresses. Finally, in the Palace some rooms are reserved for the rental service of special occasions dresses, for instance, for themed parties or event in which a person desires to add a retro flavor or unicity's touch that only vintage is able to convey (ANGELO Vintage, n.d.-b). The other company's site is placed in Faenza (Ravenna) and is named A.N.G.E.L.O. Vintage Lab. Here, a space is dedicated to the (re)sale of a wide range of merchandise categories (denim, t-shirts, dresses, blazers, etc.) with a key focus on prices, so that everyone is able to integrate interesting and durable garments into their wardrobe at affordable prices. In addition, in the Lab is always present the sale-by-kilo formula, called 'Happy Kilo', where it is possible to do low-cost shopping with the fun of buying clothes by weight. In this 100 m<sup>2</sup> area customers find thoroughly cleaned and sterilized apparel and accessories but that may also have defects: indeed the ethical goal is to enrich one's personal style giving clothes a second life and starting a virtuous circle in which objects never die and continue to live with new potential. Each month, in the Lab also occurs the 'Mani nel sacco' event where participants can purchase a shopping bag worth 15, 25 or 35 EUR that will try to fill, without breaking it, with as much as possible items within 10 minutes time (ANGELO Vintage, n.d.-b). Lastly, in the Lab sometimes are organized events related to mending, embroidery, repair, garments and accessories decoration, in order to increasingly educate clients or curious people to circular economy's principles. Also customers can promote circular economy and a more conscious and sustainable fashion consumption by bringing vintage and luxury garments and accessories that they no longer use



and dated between 1900 and 2010 to the Lab. These will be assessed and in return will be provided vouchers usable at A.N.G.E.L.O. Vintage stores or, in case of high value items, will be directly purchased by A.N.G.E.L.O. Vintage (ANGELO Vintage, n.d.-b).

In conclusion, A.N.G.E.L.O. Vintage represents a small niche reality that acts as intermediary between open-minded, or potentially, final consumers and the emergent fashion circular economy that tries to come up beside and replace then the current dominant traditional one. A.N.G.E.L.O. Vintage seeks to teach people the importance of quality in the garments and accessories being it at basis of a fashion item's durability and possibility to be reused, repaired, and remade as many times as possible, thus prolonging its lifespan without forgetting the incomparable emotions and stories that fashion items like these can instill and enclose.

#### **4.2.3. Rental – Rent the Runway**

Rent the Runway (RTR) is fashion e-commerce platform founded by Jennifer Hyman and Jennifer Fleiss in New York in 2009. In the vision, founders describe RTR as the first 'Closet in the Cloud': a dream closet filled with an infinite selection of designer styles to rent, wear and return (or keep), where every trend, every colour, every print, everything women have ever wanted to wear, are available for a fraction of the current purchasing cost. RTR aims to save money, time and to have more fun in getting dressed its community, while contributing to a more sustainable future of fashion (Rent the Runway, n.d.-e). Data confirm this new approach to the fashion because RTR's customers wears RTR on average 83 days of the year, 89% buys fewer clothes than they used to, 92% experiments more with her personal style, and 98% of members discovers new brands (Rent the Runway, n.d.-f). Among the solutions offered by the rental service company there is the RTR membership. Membership includes many perks such as a full fashion service where all items arrived cleaned, pressed and ready-to-wear, getting first dibs on designer deals and exclusive discount on purchases, browsing thousand of members reviews, using the RTR personalized tool to find the right size, the possibility to pause or cancel the membership at any time for no extra cost, and a large flexibility in adding extra spots or shipments to the basic 5-items-at-a-shipment plan (Rent the Runway, n.d.-b). In membership formula do exist three different monthly plans among which to choose:

- 5 items per month plan, where occurs one single monthly shipment including 5 items.
- 10 items per month plan, where occur two shipments of 5 items each per month.
- 15 items per month plan, where occurs three shipments of 5 items each per month.

One advantage of RTR is that a customer can swap (that is, return an item and choose another) or keep whatever and for how long she wants, knowing that one item withheld occupies one spot of the plan so, for instance, with the basic plan the next month the customer will be able to

rent just four new items. Whether a client desires to ‘keep forever’ some fashion items, it is possible by simply buying them through the RTR site or app. Another incentive in trying Rent the Runway stems from the simple returning operations that each member has to carry out: indeed, the customer must only pack up apparel in the reusable garment bags (and accessories and handbags in their reusable dust bags or boxes) they came in, remove the prepaid return label from the inside pocket of the garment bag and insert it into the plastic pouch on the outside of the bag, zip it shut and bring it to the nearest consignment point (Rent the Runway, n.d.-c). In addition to membership, Rent the Runway tenders also the one-time rental service which is perfect for special occasions because it allows customers to reserve items in advance for specific dates for a rental period of 4 or 8 days. The risk of selecting the wrong size or model in this type of service is softened by the fact that every order come with one free backup size and a discounted second style for a reduced price, and in the case one or all of the styles in the order do not fit, the customer can get a replacement (if available, otherwise a credit on the RTR account) within the first 48 hours of the rental period by only paying shipping and tax costs (Rent the Runway, n.d.-d). Finally, in the Rent the Runway platform it is possible to buy pre-loved fashion items, whose authenticity is always guaranteed since they are directly purchased from brands (Rent the Runway, n.d.-a).

In conclusion, Rent the Runway and its subscription programs, à la carte rental and resale offerings are trying to disrupt the fashion industry by exploiting the opportunities given by Internet and electronic selling/purchasing systems, the efficient logistic coordination among the company, carriers and customers, and the high quality and long-lasting garments and accessories that ensure their ‘fashion performance’ even after repeated uses and cleansings.

#### **4.2.4. Repair – Patagonia**

In 1973 in Ventura (California, USA) Yvon Chouinard founded the company that today is known as Patagonia Inc. Before becoming a pioneering innovative entrepreneur, Chouinard was a climber and exactly from climbing gear he started his business. Over the last 50 years, Chouinard and his business partners, employees and friends have always kept up with a changing and challenging world without overlooking environmental and societal problems or urgent necessities. The first big environmental step the company took over the years was minimizing its initial unique piton business, because its gear was damaging the rock of mountains during both its placement and removal, by jeopardizing the firm itself but finally finding an alternative solution: aluminium chocks to be wedged in by hand rather than hammered in and out of cracks (Patagonia, 2023). Then, in the 70s and 80s the active company moved its attention mainly on outdoor apparel and technical underwear by conceiving

innovative effective designs and by grasping and investing in research and development of new efficient organic and synthetic fabrics (e.g., Synchilla®, Capilene®). Patagonia was still a fairly small company when started to devote time and money to the increasingly apparent environmental crisis. During business and leisure travels, Chouinard and Patagonia's employees personally saw what they began to read about global warming, the rapid loss of groundwater and topsoil, the cutting and burning of tropical forests, acid rain, etc. This allowed to the company to become aware that even uphill battles fought by small, dedicated groups of people to save patches of habitat could yield significant results, therefore, it commenced to make regular donations to smaller groups working to save or restore habitats. In 1986, the donating commitment was equal to 10% of yearly profits, later upped until 1% of total sales irrespective of the presence or not of a net profit in the financial statement (Patagonia, 2023). This initiative reached the peak in 2002, when Yvon Chouinard and Craig Mathews created a non-profit organization, named exactly '1% for the Planet', to encourage other businesses to do the same (Patagonia, n.d.-a). In addition to national and international environmental campaigns and collaborations with activists, Patagonia assumed its responsibilities regarding its role as corporate polluter in the fashion industry. As such, since the mid 80s it has been using recycled-content paper for its catalogs, working with Malden Mills company to develop recycled polyester from soda bottles for use in Synchilla® textile, and assessing the dyes employed and eliminated colours from the apparel line that required the use of toxic metals and sulphides. Concerning sustainability reporting, in 2007 the company launched the Footprint Chronicles through which makes public both good and bad efforts in this area. In 1994, commissioning an independent environmental impact assessment of four of its most-use fabrics in the supply chain, Patagonia found out that cotton was the one with the worst impact. Hence, it fixed the objective to take its cotton sportswear 100% organic by 1996 and to achieve it resorted to the few farmers who had come back to organic methods, persuaded ginners and spinners in modifying their practices, discussed with certifiers so that all the fibres could be traced back to the bale, and succeed (Patagonia, 2023). As this story shows, Patagonia does not own any of the factories that produce its items so the control on them is limited, but since 2014, in partnership with the non-profit organization Fair Trade USA, has been making clothes assuring through the Fair Trade Certified Sewing symbol that part of the money spent on a product is destined for its producers and stays in their local community (Patagonia, 2023).

Returning on circular business models, recycling has been already mentioned, but Patagonia has also a famous used clothing and repair program called 'Worn Wear'. Patagonia's Worn Wear line states that "buying used gear means one less new item that had to be made, lightening the load on our planet", and cites WRAP's statistic that "keeping our clothing in use just nine

extra months reduces the related water, waste and carbon footprints by 20% to 30% each” (Drew et al., 2020; Patagonia, n.d.-b). Worn Wear began in 2012 as a blog where people could share stories about their favourite Patagonia products and the badges of honour (rips, tears, patches, stains) that recall customers treasured outdoor memories: a tangible reminder of the value of durability over disposability. This blog pulled Patagonia to expand its humble repair service into the largest garment repair facility in North America (later extended to other geographical areas around the world), to construct a mobile repair truck out of reclaimed materials, to allow a small team travelling the country and repairing people’s clothing for free, other than to scale a used clothing business (Patagonia, 2023). In this way, it is born the Patagonia’s second-hand products platform known as Worn Wear. With the slogan ‘You’re done. Your gear isn’t.’ the company incentivizes customers to send back some kinds of clothing and, after an assessment of the conditions, they receive up to 50% of the resale price through a credit to use in Patagonia or Worn Wear brick-and-mortar stores or on the online shops (Patagonia, n.d.-d). Hence, Worn wear aims to constitute a collaborative relationship between Patagonia and its customers indeed, other than the second-hand shop, in the company’s website there is also a page named ‘Care & Repair’, where are available repair videos that explain how to improve a sweater condition, to apply tenacious tape, to fix a button, a zipper slider or a buckle, and DIY repair guides explaining how to iron a waterproof jacket, to repair a hole, to replace a jeans button, to darn a hole in a knitted garment, or to install a professor patch on a sweater. To accomplish DIY repairs it is also possible to resort to the customer service team in order to require necessary trims and spare parts and, if eventually the client is not able to solve the damage, it is available a firm professional repair service through a dedicated platform. Then, in the part dedicated to product care is described how to launder, eliminate stains, read and understand garments’ labels and symbols (Patagonia, n.d.-c). In addition to these online means, repair services and workshops often take place through moving stations or in Patagonia retail store. The last sustainable practice implemented by Patagonia include the opportunity to send an old product back for recycling. In fact, Patagonia adopts a strict zero-landfill policy therefore it will either recycle the ‘damaged beyond repair’ item right away or hold on it until the company will find a viable recycling or upcycling solution for it. Products can reach the Patagonia’s plants where they are stocked through two channels: being returned to one retail store or being sent with a free shipping label provided by the company (Patagonia, n.d.-d). In conclusion, Patagonia brand on one hand promotes sufficiency and quality, while simultaneously engaging in activities intended to moderate sale by organizing consumer marketing campaigns, offering limited or no sales incentives, and choice editing to help customers curate and select garments for longer use (Pal & Gander, 2018).



## Conclusions

The purpose of this work was to provide an overview of the Fashion Industry's position and responsibilities in relation to its environmental footprint and the use of natural and man-made resources and raw materials, as well as the efforts and innovative solutions it is implementing to combat these issues and foster a transition towards a more sustainable, or better, circular production and consumption system.

The rationale underlying the structure of the paper was intended to provide a preparatory, clear, and complete overview of the three interrelated and intertwined macro-themes (Fashion Industry, sustainability, and innovation) that underpin the work itself.

The Fashion Industry is thriving a multibillion-dollar global enterprise devoted to the business of making and selling clothing, accessories, and footwear. Data and forecasts for the fashion market, both in terms of revenue and volume or luxury and fast fashion segments, are expected to increase positively in the upcoming years, despite the difficulties associated to the recent cascading and interlinked economic, social, and environmental crises. The profits and growth of textile and clothing companies are highly dependent on the type of supply chain and business model (two distinct economic and managerial concepts that have been explained at length) that are adopted and implemented. Today, behind fashion items that end consumers purchase, there is a long supply chain linking actors from all over the world and the adoption of a linear business model, called 'take-make-use-dispose', by most apparel companies. On one hand, this traditional and consolidated linear model guarantees profit and satisfied consumers, on the other hand renders the garment industry one of the most water, air, soil polluting and resource-intensive industries. An unsustainable path that puts at risk the future of Earth, mankind and life beings and introduces the hot topic of sustainability blended with innovation aimed to counter it. The Fashion Industry must change to become more sustainable and the only means able to bring about this change is innovation.

Circular business models (CBMs) and the strategies proposed in this paperwork (resale, rental, repair, remaking, and recycling) constitutes the first innovative and sustainable step in the Fashion Industry's transition towards a circular economy in which the use of natural and artificial resources and waste generation are minimized. The implementation of CBMs is not just a theoretical solution, there are several pioneering fashion companies that are making it real while finding a balance between successful economic results with positive environmental and beneficial social impacts.

The Italian company Rifò is a true example of a business born to make the circular economy its sole raison d'être. Rifò has adopted an ancient local recycling methods of old clothes in which old garments and pre- and post-consumer industrial textile waste are manually collected and

sorted, frayed, transformed again into raw materials, spun, and then woven into ‘new’ recycled cashmere, wool, cotton, and silk yarns destined for the manufacturing of durable, quality, and trendy garments. According to Rifò the upbringing of end consumers is fundamental in a circular value chain, therefore it involves them by incentivizing the collection of their used denim jeans and wool or cashmere items in consignment boxes located in partner’s stores located throughout Italy.

A.N.G.E.L.O. Vintage perfectly embodies the circular business model of resale and reuse. In its two sites located in Emilia-Romagna (Italy), the firm exhibits and sells researched and selected second-hand and leftovers clothes and accessories for all budgets and tastes, coming from all over the world and from all the decades between 1900 and 2010. In addition, the company’s Lab handles the upcycling of garments and accessories and reserves a selection of pieces to rental service for special occasions. Even A.N.G.E.L.O. Vintage, like Rifò, believes in the education and involvement of final users, hence it organizes events to teach participants how to mend, embroider, repair, and decorate garments and accessories, or to discover the world of vintage and second-hand goods, experimenting with alternative and fun ways of buying by time or weight. Finally, the company encourages a circular fashion consumption by exchanging people’s used clothes for voucher or, in the case of luxury goods, for money. In short, A.N.G.E.L.O. Vintage promotes circularity and life extension of fashion items through repeated reuse among multiple people.

Rent the Runway (RTR), as the name suggests, instead adopts a rental circular business model. Exclusively through an e-commerce platform, RTR offers women a vast closet for everyday life and special events of clothes and accessories at a fraction of the cost that one would incur by buying them in a physical or online shop. Membership (a subscription program with different plans), one-off rental, and the purchase of pre-loved items are the three methods through which women can enjoy the platform. The strength of this American company lies in its knowledgeable and prepared customer service, broad flexibility, and efficient reverse logistics. Finally, the well-known American sustainable outdoor fashion brand Patagonia. In over fifty years of history, the company has always remarked its attention to the environment’s health and preservation and to its responsibilities as a fashion company. It has invested in the research and development of recycled organic and synthetic fabrics and has dealt with the importance of traceability in its upstream supply chain and the replacement of detrimental dyes during manufacturing processes. But what sets it apart are its unconventional campaigns such as ‘Don’t buy this jacket’, to combat overconsumption, and its ‘Worn Wear’ used clothing and repair program. This program includes videos and guides explaining how to repair the wear and tear on Patagonia’s high-quality items and how to care for the products during their lifetime (e.g.,

washing and drying), besides professional repair services at moving stations or retail stores. Lastly, Patagonia is still unable to recycle its garments ‘damaged beyond repair’ and adopts a zero-landfill policy, therefore it has decided to stock these items sent by its customers in its own plants until the company finds a viable solution for their recycling or upcycling.

In conclusion, the Fashion Industry innovative path towards sustainability, driven by the implementation of sustainable and circular business models, is slowed down by hurdles such as: limited technical knowledge, skills and methods for separating garment materials so facilitating recycling processes; the lack of appropriate materials and fashion items’ design suitable to undergo repeated (or even infinite) reuse, remake and recycling processes without losing their original properties or reducing value; a scarce availability of structures and infrastructures able to support reverse logistic; the ‘individualistic mentality’ belonging to all involved actors which does not favour the creation of a distributed, highly connected, traceable, and efficient supply network; and, particularly, the non-acceptance by fashion companies and consumers of the need of change the way of doing business, purchasing behaviour and waste habits respectively. However, as this paper was intended to show, there are examples of companies that are successfully embracing and implementing the principles of the circular economy. It is precisely these firms that are the pioneers of this early stage and that should be the subject of more in-depth studies and research, aimed at understanding how to overcome the obstacles just mentioned or to find new innovative solutions starting with what is missing, lacking, or simply not sufficiently developed.





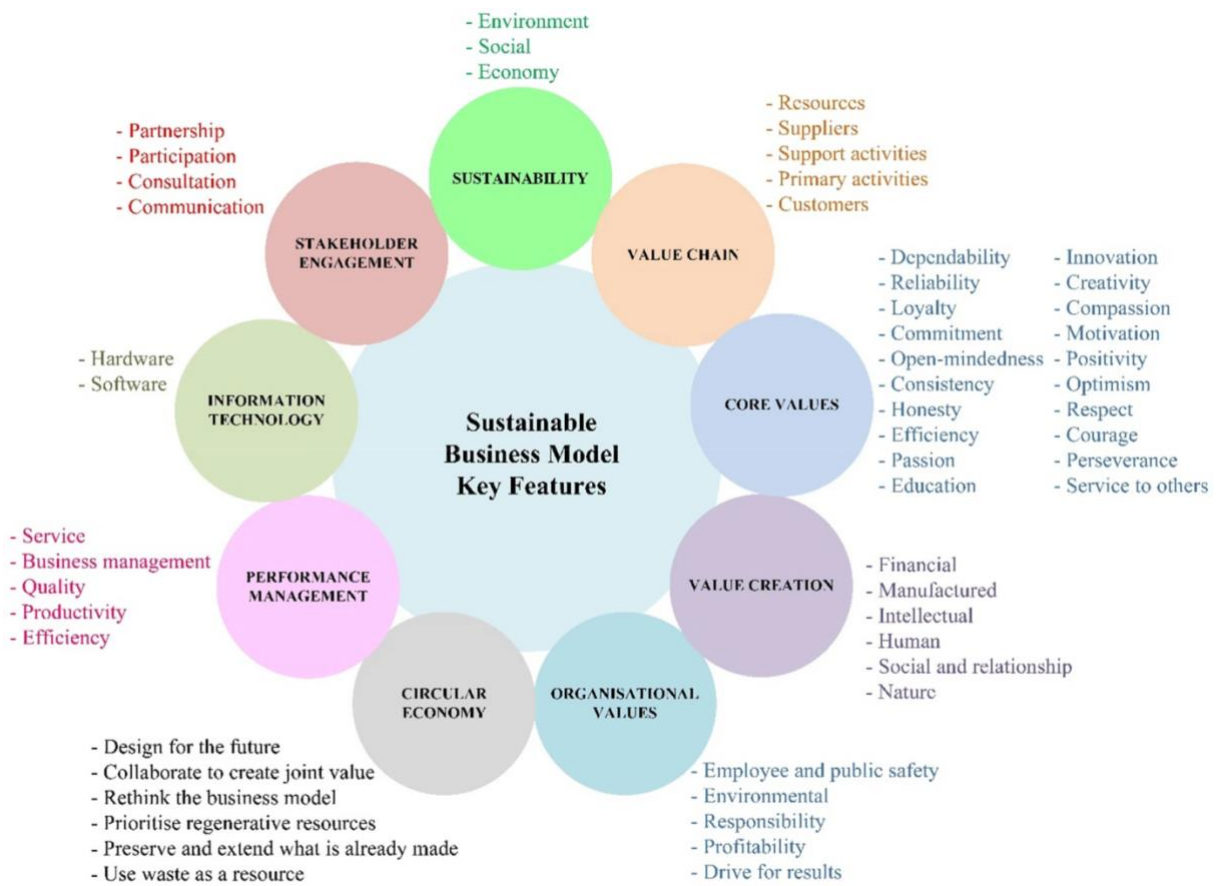
## Appendix

### Appendix A. Apparel market segmentation in detail.

Apparel Market		
Women	Men	Children
		<i>[0-14 years]</i>
Coats & Jackets	Coats & Jackets	Coats & Jackets
Blazers	Blazers	Blazers
Suits & Ensembles	Suits	Suits & Ensembles
Dresses & Skirts	Trousers	Dresses & Skirts
Trousers	Shirts	Trousers
Shirts & Blouses	Jerseys	Shirts & Blouses
Jerseys	Sweatshirts & Pullovers	Jerseys
Sweatshirts & Pullovers	Night & Underwear	Sweatshirts & Pullovers
Sports & Swimwear (Performance Apparel, Sports-Inspired Apparel, Swimwear)	Sports & Swimwear (Performance Apparel, Sports-Inspired Apparel, Swimwear)	Sports & Swimwear (Performance Apparel, Sports-Inspired Apparel, Swimwear)
Night & Underwear	T-Shirts	Night & Underwear
T-Shirts	Socks	T-Shirts
Tights & Leggings	Clothing Accessories & Other Clothes (Gloves, Shawls & Scarves, Belts, Hats & Caps, Ties & Bow Ties, Leather Clothes, Felt and Fur & Other Clothes)	Tights & Leggings
Socks		Baby Clothes
Clothing Accessories & Other Clothes (Gloves, Shawls & Scarves, Belts, Hats & Caps, Ties & Bow Ties, Leather Clothes, Felt and Fur & Other Clothes)		Clothing Accessories & Other Clothes (Gloves, Shawls & Scarves, Belts, Hats & Caps, Ties & Bow Ties, Leather Clothes, Felt and Fur & Other Clothes)

Source: elaboration of the author

**Appendix B.** The key features and elements of the SBM concept.



Source: Goni et al. (2021)





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