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**"MULTINATIONAL FIRMS AND THEIR ABILITY TO SUPPORT
SUSTAINABILITY ALONG THEIR GLOBAL VALUE CHAINS"**

**RELATORE:
CH.MA PROF.SSA DE MARCHI VALENTINA**

LAUREANDO/A: GEREMIA ELISA

MATRICOLA N. 2007714

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LIST OF ABBREVIATIONS

BAU	Business-As-Usual
CATI	Corporate Climate Action Transparency Index
CITI	Corporate Information Transparency Index
CMT	Cut-Make-Trim
CO2	Carbon dioxide
CS	Corporate Sustainability
CSR	Corporate Social Responsibility
EPZs	Export Processing Zones
FOB	Free On Board
GHG	Greenhouse Gas
GVC	Global Value Chain
IPE	Institute of Public & Environmental Affairs
MFA	Multi-Fiber Arrangement
NGOs	Non-Governmental Organizations
NRDC	Natural Resources Defense Council
OEM	Original Equipment Manufacturing
ODM	Original Design Manufacturing
SD	Sustainable Development
SDGs	Sustainable Development Goals
SDSN	Sustainable Development Solutions Network
TBL	Triple Bottom Line
T&A GVC	Textile & Apparel GVC
WCED	World Commission on Environment and Development
WTO	World Trade Organization

ABSTRACT

The aim of this thesis is to investigate the Global Value Chain (GVC) framework as applied to the textile and clothing sector and systematically examine how corporate sustainability behaves based on the geographical distribution of fashion companies and the categories that make up the sector under analysis. Sustainability in the context of the fashion industry is still a constantly evolving field in which both environmental and social dynamics play a significant role, with a view to improving Sustainable Development. This paper first offers a systematic review of current literature to understand the structures, processes, and dynamics within the realm of Sustainability and Global Value Chains. It then presents a GVC framework applied to the fashion sector and a statistical analysis of the corporate sustainability of such companies. A mixed methodology is employed, encompassing both qualitative and quantitative analysis. The integration of sustainability into fashion brands is a process that still requires significant efforts, as evidenced by the prevalence of relatively low sustainability levels. Geographical location does not appear to play a significant role in influencing these sustainability levels, except for the Chinese region. Additionally, belonging in one subcategory over another does not receive as much attention as one might expect. This study also highlights the primary sustainable actions taken by companies, distinguishing them by region to identify potential differences among European, American, and Chinese regions.

INTRODUCTION

“The emphasis on environmental sustainability is growing” (Di Maria, 2012, p. 5) and to date is a key issue and one that should be at the centre of every company's interest given the continuing environmental damage. Technological and economic progress have encouraged the increased focus on sustainability (Di Maria, 2012). A boost has also been given at the regulatory level (Di Maria, 2012), as more precise and detailed legislation on environmental compliance than a few decades ago.

Accordingly, it is no longer possible nowadays to ignore environmental issues when talking about economic growth. In fact, increased knowledge and awareness on the subject have led society, understood as a collective of individuals and business activities, to recognize that environmental sustainability must also be considered when striving for economic growth. Reasoning purely in terms of economic growth without looking at the environmental aspect is no longer sufficient nowadays given the significant changes in climate. If we look at environmental sustainability, we notice that the issue is complex due to the increase in the number and intensity of severe weather events, longer heat waves and droughts, continued desertification, and loss of biodiversity as species are unable to adapt to an altered environment with more flooding. In fact, fish stocks are being depleted, biodiversity is being reduced, forest cover is being removed, water is being polluted, and climate is being changed, all at rates that exceed the Earth's ability to clean and regenerate (Matthew & Hammill, 2009). This itself presents a great challenge, even more if jointly considered is also the fact of trying to avoid environmental worsening (whether local or global).

In the past, economic policy often neglected environmental concerns, especially those with long-term consequences. However, it is now essential that these issues are given due importance and consideration in policymaking (Beckerman, 1994). The future of our planet is of great concern (Duran et al., 2015). Some of the situations of greatest concern are already a reality, as described above, with climate change leading to rising temperatures, and the situation will worsen on all these aspects. An additional concern is that global warming may push ecosystems beyond critical thresholds, causing dramatic and unforeseen ripple effects such as sudden gas releases, rapid ice ages, or unprecedented microbial explosions (Matthew & Hammill, 2009). In both cases, there is a need to study the benefits and costs that people face as a result of global warming such as longer summer seasons in some regions versus a mass migration from marginal or hostile lands (Matthew & Hammill, 2009).

Sustainable Development (SD) has therefore become a recognized goal for human society due to the deterioration of environmental conditions in many parts of the world, and thus, today we are compelled to pay more attention to the environment, especially since the industrial

component demands an even greater burden on nature (Duran et al., 2015). Today, it is indeed imperative to prioritize SD, a process that concurrently considers economic, social, and environmental aspects, rather than mere economic growth. Consider, on a global level, how the collective presence of all business entities can have a significantly positive impact on the environment if they adopt effective and enduring sustainable practices in their production processes, or conversely, a considerably negative effect if they choose not to weigh the issue of sustainability along the supply chain.

The concept of SD represents the suitable approach to address environmental degradation and other "interconnected crises" such as poverty and population growth (Matthew & Hammill, 2009, p. 1118). Furthermore, the concept of SD plays a vital role in the economy and resource conservation (Duran et al., 2015). As argued by Matthew & Hammill (2009), SD should progress at the same rate as economic growth, which is equally important for businesses seeking sustainable growth. However, implementing SD in a highly advanced world where economic well-being takes precedence over environmental concerns can sometimes prove challenging. Nonetheless, in recent times, the significance of this aspect and the need for economic growth to take environmental factors into account have been recognized. While numerous improvements are still required to follow this path, as businesses and the population increasingly engage in behavioural change and become more aware of environmental dynamics, we must commit to greater consideration and respect for these dynamics.

Following the recent period of economic growth, global-scale ecological disasters have emerged, such as climate change, biodiversity loss, pollution, and deforestation. These events underscore the urgent need to adopt sustainable practices to preserve the environment and ensure the long-term well-being of society and future generations. However, despite awareness of environmental issues, the necessary changes are often not being implemented institutionally, programmatically, or behaviourally to genuinely embrace sustainability. This may be attributed to various factors, including short-term economic interests, lack of awareness or urgency in the population, and challenges in achieving global consensus to address environmental challenges (Matthew & Hammill, 2009). SD emphasizes the importance of adopting a long-term perspective and acting responsibly to mitigate negative environmental impacts and promote a sustainable society.

On the production level, assuming that this reasoning is applied on a global scale, the consideration or not considering the environmental decline can have significant effects on the ecosystem. Until now, companies have not been particularly concerned about the long-term harmful effects of unsustainable production even though their productions are highly

polluting. For example, it is worth noting that, according to a statistic conducted by the European Parliament (2023), greenhouse gas emissions in the EU by sector amount to 77% for energy (one-third of which is attributable to the transport sector), while industrial processes account for 9.10% of greenhouse gas emissions.

The current pollution's consequences raise significant concerns; we can no longer ignore them. It is crucial to act now to rectify past mistakes, establish a model to follow, and generate lasting benefits in the long run. A consideration in this regard, as stated by Di Maria (2012), is that a transformation has occurred in the relationship between business and the environment: overall, disregarding the environmental dimension in production impact can constrain growth. Indeed, being oriented towards environmental sustainability can enhance competitiveness (Martins et al., 2019), it can create growth opportunities in both domestic and international markets depending on the position within national/regional or global/delocalized supply chains and can also serve as a source of strengthened competitive advantage (Di Maria, 2012). Companies that aim to remain competitive in the long term by adopting a sustainable approach to addressing environmental and social challenges cannot, however, confine their operations solely within the boundaries of their organizations, as environmental and social issues are not "the sole responsibility of one organization" (Seuring et al., 2008, p. 1550); however, individual companies still maintain their responsibility for their social actions and their approach to environmental matters (Ashby et al., 2012). In today's business landscape, there is a strong interconnectedness among companies, and therefore, it is imperative to consider such responsibility throughout the entire supply chain. This is crucial because businesses do not operate in isolation but are part of intricate networks involving various stakeholders, both upstream and downstream. Supply chains, indeed, can wield a significant impact on environmental concerns, and it is essential to note that, depending on how companies manage these chains, this can lead to a high added value along the supply and also to different environmental outcomes. When a company adopts effective sustainable practices, it results in enhanced operational efficiency and a reduction in waste, among other benefits, within the supply chain. Effective collaboration among companies, irrespective of their position in the supply chain, whether they are primary enterprises, second-tier suppliers, or intermediaries, is thus pivotal for successfully addressing environmental challenges.

This perspective once again underscores the complexity of the current economic, environmental and social landscape, emphasizing the need for a holistic approach to effectively tackle the issue of sustainability.

This master's thesis aims to contribute to academic research by exploring how manufacturing companies in the fashion industry address the challenge of environmental sustainability. The

focal point of this dissertation is the economic actors involved in the Global Value Chains, namely businesses, and the analysis of their interactions across various stages of the value chain with the objective of promoting progressive improvements in environmental sustainability.

The structure of this work is organized as follows: in the first section, the necessary theoretical foundations are laid out to provide context. The theoretical concepts of Sustainable Development and the conceptual framework of Global Value Chains are explored, thus delineating the scope of the research. The second section, on the other hand, focuses on empirical investigation, employing a mixed research approach.

Through qualitative analysis, relevant phases and governance models within the fashion sector are examined, establishing an illustrative example of the value chain in this industry. In parallel, through a quantitative research approach, the sustainability of multinational corporations operating in the textile industry is examined, along with the sustainable actions undertaken by the companies under study and an assessment of their level of sustainability along the supply chain in China. This section thus offers a substantial empirical contribution to the discourse on the applicability of sustainability in the textile sector.

Finally, the thesis concludes with a summary of the results derived from the conducted analyses, highlighting the most significant findings, and discussing the limitations of the study as well as potential avenues for future research.

1. UNDERSTANDING SUSTAINABILITY IN FIRMS

1.1 A PRESSING ISSUE

Over these decades, economic and technological progress have caused the deterioration and depletion of natural resource systems (Duran et al., 2015) and the current course of the world poses a threat to every corner of the globe (Sustainable Development Solutions Network, 2013). Today, human impact is leading to environmental degradation, and examples of this include the decimation of forests and loss of biodiversity, reduction of arable land, dwindling drinking water resources, climate change with global warming, melting of glaciers and extinction of many animal and plant species, and changes in the integrity of the biosphere (Duran et al., 2015). As a result, the global economy now relies primarily on non-renewable resources, with significant impacts on the environment that exceed the capacity of various ecosystems to sustain such exploitation (Duran et al., 2015). All of this also has significant impacts on people, especially poor people, and future generations (Landrum, 2017). Also, to be considered are the changes expected in the next 5 years (Sustainable Development Solutions Network, 2013) including: a drastically increased human impact on the Earth's physical environment, a rapid technological change particularly in information and communication technologies, an increase in inequality, and an increasing spread and complexity of governance that will require greater coordination.

Therefore, a radical shift is imperative to address these pressing global issues effectively; in fact, the world urgently needs a transformative Sustainable Development framework to divert from Business-as-Usual (BAU) trajectory and move towards a path of SD (Sustainable Development Solutions Network, 2013). The need for a more sustainable world is the best response to a perceived imminent damages: our collective behaviour will determine not only the quality of life of future generations, but even the survival of humanity as we know it (Valera, 2012) otherwise, without significant changes, many countries of the world, especially the undeveloped ones, will struggle to provide opportunities and make adequate and sustainable progress (Sustainable Development Solutions Network, 2013).

An interconnected global economy that does not fail of sufficient oversight and collaboration can effectively confront environmental challenges, particularly climate change. It also improves on assisting vulnerable regions, eradicating extreme poverty, bridging the gap between skilled and unskilled workers, and ensuring a prosperous beginning for children (Sustainable Development Solutions Network, 2013).

SD is essential to ensure environmental protection and safeguarding it (Duran et al., 2015). In the current context, addressing global environmental challenges requires a new approach that

considers the environmental impacts and socio-economic consequences of these issues (Duran et al., 2015). In this endeavour, the concept of SD guides us, as the BAU approach has demonstrated, among other things such as a lack of international coordination and cooperation and inadequate policies in both developed and developing countries, an ineffective response to SD challenges (Sustainable Development Solutions Network, 2013).

The undeniable need for ongoing economic and social progress is paralleled by the fundamental need to protect and enhance the environment. Only through the latter can well-being be secured for both the present and future generations; moreover, this balance is crucial to ensure the SD of society as a whole, which constitutes the key aspect of the concept of SD (Duran et al., 2015). In this scenario, the concept of SD holds greatest relevance as it advocates for the utilization of renewable resources without exceeding their replenishment rate: emphasis is placed on safeguarding natural resources in an ecologically oriented approach and natural resources are valued intrinsically, irrespective of their utility to humans (Duran et al., 2015).

To emphasize the importance of SD, the Sustainable Development Solutions Network (SDSN) was established, a global initiative of the United Nations aimed at mobilizing experts, academics, professionals, institutions, and societies to collaboratively address the challenges of SD and to support the implementation of the 2030 Agenda for Sustainable Development and the 169 Sustainable Development Goals (SDGs) adopted in September 2015 (Prakash et al., 2017). These goals establish measurable objectives in the social, economic, and environmental realms of SD to be achieved by 2030 (Sustainable Development Solutions Network, 2013; Prakash et al., 2017). In this sense, the primary objective of the SD is to promote collaboration among various stakeholders and the sharing of knowledge, experiences, and innovative solutions to achieve the SDGs by 2030, and to provide evidence-based practical solutions to address the aforementioned global challenges (Sustainable Development Solutions Network, 2013).

A path of SD is also based on a global framework that encourages cooperation to address the dimensions of SD, namely economic, social, environmental, with also encompass governance, peace and security (Sustainable Development Solutions Network, 2013). To achieve this, SD must be based on the following normative concepts (Sustainable Development Solutions Network, 2013): all nations must pursue diverse and sustainable paths of growth, as each country, as declared, has the right to development and should have access to the benefits of modern technologies and economic progress; equal opportunities for participation in progress must be provided to all individuals, as a crucial objective of SD is to uphold long-recognized human rights and promote social inclusion; the framework of SD aims to foster prosperity and

growth in all regions of the world, rather than excluding certain countries from economic progress and reducing the gap between wealthy and poor nations; shared responsibilities and opportunities are essential, as all countries should actively contribute to promoting SD.

1.2 DEFINING SUSTAINABLE DEVELOPMENT

SD may seem like a straightforward concept at first glance (Berke & Manta, 1999): it involves the efforts of current and future generations to attain equitable material well-being while operating within the constraints of natural systems. Therefore, Berke and Manta (1999, p. 3) have developed their definition, purely operational, of SD and they state that Sustainable Development is "a dynamic process in which communities anticipate and accommodate the needs of current and future generations in ways that reproduce and balance local social, economic, and ecological systems, and link local actions to global concerns".

Literally, SD is a juxtaposition of two words, namely 'development' and 'sustainable': sustainability is the ability to meet the current needs of people without compromising the ability of future generations to meet their own needs, while the term 'development' aims to expand or build potential, gradually moving towards a more complete, larger, or better state (Duran et al., 2015).

The emergence of the concept of SD dates back to the early 1970s when the need arose to limit Western development, which was growing exponentially and already showing the first negative impacts on the environment (Ruggerio, 2021). During that period, the ecological aspect was not prioritized in the dominant economic model.

The first definition of SD stems from the Brundtland Report. The report *Our Common Future*, commonly known as the Brundtland Report, was published by the World Commission on Environment and Development in 1987 and defines SD as the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987; Ruggerio, 2021, p. 3; Beckerman 1994, p. 195; Berke & Manta, 1999, p. 2). This definition underscores the importance of finding a balance between present needs and the necessity to preserve resources and the environment for future generations. In other words, SD aims to ensure current social and economic well-being without endangering natural resources and the environment, thereby enabling future generations to enjoy the same opportunities and quality of life (Silvestri, 2015). This is the initial understanding of SD and represents a classical conception that assumes the carrying capacity, that is the ability to utilize the planet's natural resources in a way that satisfies the needs of current generations without compromising the possibilities of future generations to meet their own (Silvestri, 2015).

Duran et al. (2015), through a thorough literature examination, then analyse various definitions of SD and present the evolution of the concept of SD from 1987 to the present day. However, despite its apparent simplicity and setting aside the various debates in literature about finding a suitable modern definition of SD and the different stances taken by critics in this context, even if there is no unanimous consensus on how to put this concept into practical application, efforts are emerging with a focus on applying the concept to planning practice (Berke & Manta, 1999). Therefore, the precise meaning of SD is not immediately evident (Berke & Manta, 1999). To aid in its understanding, we note that most definitions incorporate many elements related to development, such as expansion, growth, progress, and satisfaction (Duran et al., 2015).

Another common element in all the definitions analysed by Duran et al. (2015) is the existence of a direct correlation between economic growth and population satisfaction. Thus, SD, as also defined by Martins et al. (2019), is a process that aims for the rational use of natural resources while remaining true to the principles of eco-efficiency, equity, and social justice. According to these definitions of SD, the foundations of the concept are, as with sustainability, intergenerational equity, which involves ensuring that future generations have the same resources and opportunities as current ones (ASVIS, 2023; Silvestri, 2015), and intragenerational equity (Ruggerio, 2021), which focuses on fairness among individuals within the same generation and people currently alive, with a particular emphasis on nation's most susceptible to environmental challenges.

The concept of SD recognized the importance and urgency of addressing the issue of environmental degradation and considered the connections between environmental degradation and economic growth. SD seeks to address these issues in an integrated manner, striving to promote economic well-being without causing excessive harm to the ecosystem (Matthew & Hammill, 2009). Consequently, the purpose of SD is to find a balance between the economic, social, and environmental aspects of sustainability, in order to meet the needs of current generations without compromising the opportunities of future generations. In fact, as reported by Olawumi & Chan (2018), SD is seen as a collective social process that involves a wide range of actors, and this collective engagement is essential to address the complex challenges of sustainability, allowing a synergistic approach to achieving common goals. The three dimensions of SD, interconnected and not easily analysed separately (Zanato Orlandini, 2013), are environmental, social, and economic sustainability; and these components must be harmonized to pursue a holistic approach to SD (Olawumi & Chan, 2018).

The goal of economic development is therefore to maximize income through rational and efficient use of resources, especially scarce ones (Duran et al., 2015): in order to promote economic development, is required quantitative, structural, and qualitative transformations in the economy, research and production technologies, organizational structures, and people's thoughts and behaviours.

The concept of SD represents a paradigm shift, where sustainability is considered in connection with other areas, especially those involving economic activity (Duran et al., 2015). In this approach, the main emphasis is on how countries develop their economies (Duran et al., 2015). Nowadays, SD is widely adopted as a growth strategy in the built environment and used as a guiding principle for planning (Berke & Manta, 1999), as societies increasingly recognize the importance of balancing environmental conservation with socio-economic development to ensure a certain sustainable quality of life for present and future generations (Olawumi & Chan, 2018), while simultaneously allowing for economic progress.

Therefore, development is a multidimensional process that requires significant changes in social structures, people's attitudes, and national institutions, aiming to accelerate economic growth, to reduce inequalities, and to address the problem of poverty (Duran et al., 2015). However, it has been demonstrated that rapid economic growth, while bringing significant benefits, can heavily strain the planet's capacity to sustain such impacts, especially for developing countries (Duran et al., 2015). In terms of SD, economic growth should be controlled to reduce the negative impact on the environment (Duran et al., 2015).

1.3 SUSTAINABLE DEVELOPMENT AND SUSTAINABILITY

Scientific research dealing with the environment uses the concept of SD as a reference. Since it was used in the Brundtland Report in 1987, it has been used extensively in a variety of areas, from international and national legal treaties to business, urban, agricultural, industrial, and manufacturing practices (Ruggerio, 2021; WCED, 1987). SD has also become a reference and conceptual foundation for theoretical approaches such as the green economy and circular economy (Ruggerio, 2021). In addition, the concept of SD is often associated with the concept of sustainability and thus, especially in jargon but also in academic and scientific fields, they are used as synonyms despite differences in meaning between the two terminologies are recognized (Ruggerio, 2021). Again, the debate on both concepts is still accessed, which highlights the need to deepen their meanings (Ruggerio, 2021) given their importance as well.

We now define the concept of sustainability, analysing the different theoretical definitions found in the literature. And again, the clear definition of the concept of sustainable

development, its meaning, and its significance now allows us to shift our focus towards another crucial aspect, namely (corporate) sustainability.

The question of what sustainability means is very broad. Moreover, sustainability is a current topic and is still widely discussed due to its complexity.

Finding a single definition for sustainability proves challenging, as the meaning attributed to the term can vary based on the context and the conceptual framework of the individual using it (Zanato Orlandini, 2013). In fact, the term sustainability applies to various domains; by its nature, it is a generic term that requires specifications and therefore, the term often takes on a specific meaning depending on the context of reference (Lotti et al., 2017), such as environmental, social, economic, cultural, and institutional sustainability, to comprehend and define the scope.

From a critical of the literature review over this concept, has emerged that sustainability has been described in various ways by different authors. According to Sartori et al. (2014; see Olawumi & Chan, 2018), sustainability is defined as a process and mechanism aimed at achieving the envisioned SD; on the other hand, according to Dovers and Handmer (1992; see Olawumi & Chan, 2018, p. 232), it represents a process of "intentional change and improvement". As stated by Osorio et al. (2005, p. 508; see Valera, 2012, p. 41), the concept of sustainability refers to the "capacity to maintain a state" of a particular system through the actions of social and organizational actors. Lotti et al. (2017) add a temporal element to the definition of sustainability: sustainability refers to a process or state that can be maintained at a certain level indefinitely over time. However, it is not established for how long a specific state needs to be sustained, but it is automatically understood that sustainability incorporates the capacity to preserve a state for as long as possible, ideally for an indefinite and infinite period (Valera, 2012).

This diversity of meanings reflects the breadth of the scientific approach to this expression, originally connected to environmental issues and subsequently extended to various and diverse areas of study and action (Zanato Orlandini, 2013).

This concept is seen as a general moral obligation, and it is about ensuring the possibility of well-being so that future generations have the same well-being opportunity that we enjoy (Valera, 2012): sustainability requires not satisfying our needs at the expense of the impoverishment of future generations. Therefore, sustainability is a holistic and global approach that requires deep understanding and long-term commitment to address the ecological, social, and economic challenges of our time, and it follows that equity is the central theme related to sustainability, both intergenerational and intragenerational, bearing in

mind that sustainability is a call for the future and equity is a concern for the present (Valera, 2012).

The terms "sustainability" and "SD" are often used interchangeably, although the two concepts are quite distinct (Olawumi & Chan, 2018): sustainability is seen as a political vision of society with the main purpose of preventing the depletion of natural resources and promoting responsible and lasting use of resources to ensure the continuity of future generations, whereas SD helps achieve a balance between ecosystem preservation and human needs satisfaction by placing limits on otherwise unlimited economic growth (Olawumi & Chan, 2018).

As long as sustainability or SD are seen only as "an attempt to connect the environment with development" (Kemp & Martens, 2007, p. 7), any call for sustainability may seem paradoxical or contradictory (Valera, 2012). The conceptual ambiguity of sustainability arises precisely because it tries to reconcile aspects that seem inherently irreconcilable, as their goals are divergent: the maintenance of a state and its simultaneous development (Valera, 2012). However, to overcome this ambiguity, it is necessary to understand sustainability in a broader sense, which leads us to recognize the need to integrate economic, social, and environmental aspects into a holistic vision of progress, moving beyond the simple connection between environment and development (Valera, 2012). Only then we can address current and future challenges with a consistent and harmonious approach towards a truly sustainable world. SD is referred to not only as a long-term goal to be achieved but as a path for which the processes and pathways to achieve it must also be considered. In this context, Berke and Manta (1999) have formulated a specific operational definition of SD: SD is the "long-term ability of a system to reproduce" (Berke and Manta, 1999, p. 3). As a result, advocates of development, for it to be sustainable, must plan and influence the scope and direction of future development, recognize current and emerging needs, and devise strategies to ensure these needs are met, promoting the ability of communities to continue thriving and renewing (Berke & Manta, 1999). According to this definition, ecosystems improve and become cleaner; economic development aligns better with local needs rather than favouring the gains of those in power, and the benefits of improved environmental and economic conditions are distributed more equitably (Berke & Manta, 1999).

1.4 THE 3 DIMENSIONS OF SUSTAINABILITY

Sustainability, as mentioned earlier, is an interdisciplinary concept that encompasses both aspects related to nature and those related to society (Brink et al., 2020). This characteristic is

also evident in the definition of sustainability following the Triple Bottom Line (TBL) framework, which includes environmental, social, and economic dimensions (Brink et al., 2020; Kuhlman & Farrington, 2010; Silvestri, 2015; Martins et al., 2019). Thus, it refers to an integrated approach that simultaneously considers both environmental needs and the necessity to create economic wealth (United Nations, n.d.). As stated by Berke and Manta (1999, p. 3), the "balance" between environmental, economic, and social values is fundamental: for a company, in order to promote sustainability, plans must reflect an adequate balance among these three aspects. Again, the concept of the TBL, introduced by Elkington, is useful for a comprehensive and a practical understanding of (corporate) sustainability and reinforces the multidimensional concept of it (Martins et al., 2019). Thus, a company can be considered sustainable only if it considers these social, economic, and environmental impacts when undertaking its actions and these aspects are interconnected and must be considered synergistically, not separated or at the expense of each other (Ruggerio, 2021).

Gill et al. (2008) indeed assert that for a company to be recognized as sustainable by its stakeholders, it must collectively embrace and meet society's expectations, eliminate, or at least reduce, negative climate impacts, and continue to maintain optimal economic and financial performance for its survival. For example, if environmental values are neglected, the essential life-supporting capacity on which a community depends cannot be maintained; if values related to economic development are not represented, the primary source of community change and improvement cannot be implemented; and if social values are not reflected in the plan, areas that do not meet the living and working needs of local people will be created, disproportionately serving certain interest groups (Berke & Manta, 1999).

Now we proceed with an analysis of these three aspects coming from the concept of the Triple Bottom Line, focusing specifically on aspects that primarily concern the company itself.

1.3.1 ENVIRONMENTAL COMPONENT

The ecological dimension of sustainability refers to aspects related to the natural environment and the biosphere. In particular, the ecological dimension or environmental sustainability encompasses various aspects, such as biodiversity, ecosystem resilience, natural resource use, and pollution (Ruggerio, 2021). Environmental sustainability implies constraining companies' activity within the limits of the carrying capacity of the predominant ecosystem in the area, such as materials, energy, land, water, and so on (Olawumi & Chan, 2018).

Environmental progress can be described as the ability to preserve the three fundamental functions of the environment: resource provision, waste absorption, and direct utility for humanity (Wardle & Giller, 1996; see Duran et al., 2015). So, in the context of ecological

sustainability, the asset to be preserved is the environment; sustainability, oriented towards ecosystem preservation, places particular emphasis on natural biological processes and maintaining its constant productivity and functioning (Valera, 2012). Environmental protection aims to preserve the stability of ecosystems and natural systems by maintaining their health and minimizing the negative impact of company's activities.

Applied to the firm context, this dimension also refers to the impact of business operational activities on the environment, which can be either positive or negative depending on how they reduce or increase environmental damage (Martins et al., 2019).

The authors Da Silva Batista and De Francisco (2018) identify sustainability-related practices within the environmental category that companies can integrate into their Corporate Sustainability (CS) strategy implementation. Specifically, they categorize the identified sustainable practices, as outlined (Da Silva Batista and De Francisco, 2018):

- In the materials category, approaches such as anti-corruption programs, risk management strategies, and the satisfaction of customers and workers are included.
- In the energy and water category, practices are suggested such as investments in new technologies or the upgrading of existing ones, as well as maintenance of infrastructure to reduce energy and water consumption during production processes.
- Within the waste category, actions encompass the implementation of reverse logistics, separate waste collection, and proper disposal of waste materials.
- In the transportation domain, recommended practices include favouring virtual meetings over in-person ones and monitoring carbon emissions from vehicles used in the industry.
- Lastly, in terms of emissions, practices like adhering to and complying with the GHG Protocol and international certifications are suggested to ensure adherence to established standards for reducing CO₂ (carbon) emissions.

Therefore, Da Silva Batista and De Francisco (2018) highlight the business strategies that can be implemented, from the perspective of companies, in order to minimize environmental impact since to date human activities must be in balance with the surrounding environment and do not jeopardize Earth's ability to support life and its natural processes (Duran et al., 2015) according also to the fact that the main goal of ecological sustainability is to meet humanity's practical long-term needs, ensuring the conservation and regeneration of natural resources and the planet's ecosystems. In fact, companies are responsible for the environmental solutions they develop and implement (Da Silva Batista & De Francisco, 2018). Additionally, environmental sustainability is not limited exclusively to the production

aspect of a company. Sustainable practices should be integrated from the raw material sourcing phase and continue through all stages, including the proper recycling of the finished product.

In this regard, the focal company must carefully select its suppliers and partners with whom to engage. These choices can prove to be strategic in making the value chain, in which the focal company is embedded, more sustainable. Furthermore, the proper selection of suppliers offers advantages both to the supplier, by enhancing their performance, and to the company itself, which can enhance its image and reputation. If these business partners adopt environmentally friendly practices and demonstrate ecologically responsible behaviour, this is immediately reflected positively in the brand's image in the eyes of all stakeholders (Li et al., 2014). Conversely, potential missteps by the principal company in its role as the coordinator of the supply chain, such as the selection of suppliers neglecting environmental or ethical concerns, could lead to criticisms regarding its social and environmental responsibilities (Li et al., 2014; Straka et al., 2021). Additionally, if a dominant principal company demonstrates a genuine interest in implementing sustainability, it can exert considerable influence in promoting sustainability governance. For instance, it could establish specific standards or practices to be followed along the supply chain, thereby encouraging its partners to adopt a more sustainable approach (Li et al., 2014) and incentivizing them to enhance their sustainability performance.

1.3.2 ECONOMIC COMPONENT

The economic dimension of sustainability embraces the concepts of a firm's efficiency, growth, and stability (Ruggerio, 2021). It concerns the company's ability to be efficient and to achieve profits and profitability in the medium to long term (Martins et al., 2019). Indeed, economic sustainability focuses on the optimal use and efficient utilization of available resources and capital in order to maximize operating profit, maximize market value, and stimulate economic growth (Olawumi & Chan, 2018). In this sense, the goal of economic development is to maximize income through the rational and efficient use of resources, especially scarce resources (Duran et al., 2015).

In this approach, the main emphasis is on how countries develop their economies and how they succeed in responding to significant changes in social structures, people's attitudes, and national institutions, aiming to accelerate economic growth, reduce inequality, and address poverty required by SD (Duran et al., 2015). In this context, the concept of SD represents a paradigm shift, where sustainability is considered in connection with other areas, especially those involving economic activity (Duran et al., 2015).

On the one hand, the economic aspect therefore focuses on ensuring a balanced and sustainable economic environment through the continuous production of goods and services by avoiding extreme sectoral imbalances and promoting the diversification of industrial production and attraction of investment (Duran et al., 2015) to stimulate economic growth and create development opportunities. On the other hand, the achievement of economic goals can be hindered by economic problems in other countries, which can negatively affect the future (Duran et al., 2015). Furthermore, it has been shown that rapid economic growth, while bringing significant benefits, can place a heavy burden on the planet's ability to sustain such impacts especially for developing countries (Duran et al., 2015). Thus, in terms of SD, economic growth should be controlled to reduce the negative impact on the environment, and it is important that common goals are shared internationally to achieve effective results (Duran et al., 2015).

In the context of SD, given that economic growth is inevitable, it is essential to consider economic progress in harmony with the principles of sustainability, and for an action to be considered economically sustainable, it is necessary that the benefits obtained exceed or at least equal the costs associated with them (Valera, 2012). It follows that the concept of economic sustainability is closely linked to the availability and costs of resources, the efficiency of extracting and processing those resources, and the demand for the product or service (Valera, 2012). Economic sustainability is thus associated with the maintenance and implementation of capital, focusing on managing natural and human resources in a way that ensures benefits exceed or equal costs (Valera, 2012).

The economic dimension evaluates the financial effectiveness and profitability of the enterprise. Furthermore, it gauges the company's role in advancing the broader economy and fostering industry growth, but for there to be any talk of sustainable economic growth, it is important that this approach considers ecological sustainability, within an ecosystem as fundamental to our very existence (Valera, 2012), and its practical operations.

1.3.3 SOCIAL COMPONENT

The social dimension includes the phenomena of poverty, empowerment, and culture (Ruggerio, 2021), and it focuses on the social interactions, relationships, behavioural patterns, and values of humanity (Dempsey et al., 2011; see Duran et al., 2015) that a firm is able to embrace. Generally, the concept of social sustainability is thus associated with the fulfilment of human needs, and it is seen as maintaining the level of human well-being so that it can grow without deteriorating; this implies the continuous satisfaction of basic needs such as

food, water, and shelter, as well as higher social and cultural needs such as security, freedom, employment, and recreation (Valera, 2012).

The firm's perspective of this dimension is primarily based on optimizing employee well-being and satisfaction (Valera, 2012) within and between the organization itself. Social sustainability also implies that the organization takes responsibility for the well-being of stakeholders, so to be considered socially sustainable, companies must care for the well-being of employees, customers, suppliers, and communities that interact with the organization (Martins et al., 2019).

Social sustainability places a focus also on community well-being, seeking to balance individual needs with collective needs (equity). This is achieved by promoting public awareness and cohesion, fostering active participation and utilization of local resources in terms of both labour and business (Olawumi & Chan, 2018). So, in the business context, it is possible to influence the aspect related to social sustainability through the implementation of initiatives aimed at ensuring health and safety in the workplace. An example of this is ensuring a good quality of working life, optimal ergonomic conditions, and promoting educational campaigns to encourage regular physical activity (Da Silva Batista & De Francisco, 2018). Additional actions that companies can take to promote dignified work include providing training and education to their employees through initiatives such as Corporate Universities and learning paths; furthermore, they can ensure to offer adequate salaries and gender pay equality (Da Silva Batista & De Francisco, 2018), as well as implementing company benefit programs such as cafeteria services or fuel vouchers.

Companies have the opportunity to contribute to the promotion of social sustainability, both within their organizational structure and in the surrounding environment in which they operate (Da Silva Batista & De Francisco, 2018). For example, they can develop contingency plans in response to emergency or social disaster situations, or they can foster collaborations with suppliers that adopt specific social policies and maintain transparency about them, aiming to reduce child labour and simultaneously contribute to the well-being of local communities (Da Silva Batista & De Francisco, 2018). Examples of operations that businesses can undertake, as identified by Da Silva Batista & De Francisco (2018) for the purpose of supporting communities, include sponsoring educational, cultural, and sporting projects, promoting financial education for both young and adult individuals, establishing volunteer programs, and making charitable financial donations. These goals enable society as a whole to achieve increasingly high standards of quality of life (Kuhlman & Farrington, 2010). Again, cleaner production, greater social responsibility, and eco-innovation are some of the activities that contribute to meeting social needs (Martins, et al., 2019).

Recognizing the need for continued social development without harming the environment is essential to protect and to improve the state of the environment to ensure the well-being of present and future generations, and this balance is the crucial factor for the harmonious development of society (Duran et al., 2015) as increased awareness to environmental issues, natural resource use, and eco-sustainable consumption allow for a more sustainable future (Martins, et al., 2019).

Considering these three aspects, companies are enabled to generate economic, social, and environmental value and to generate also long-term value for themselves while also being mindful of the effects of their operations on society and the environment.

1.5 CORPORATE SUSTANABILITY

As we have already shown, the journey toward SD involves key actors such as countries, governments, businesses, and civil society (Sustainable Development Solutions Network, 2013). Companies are the fundamental actor among them all since they play a key role in the SD process. In fact, businesses are essential for economic growth and job creation and can drive innovation for SD (Sustainable Development Solutions Network, 2013). Their commitment to work under compatible values and sustainable incentives is crucial for the success of living in a more sustainable world and it is important for the companies themselves to have a clear and defined strategy to act and achieve better sustainability performance, encompassing social, economic, and environmental aspects. For the purpose of consistent and uniform implementation of Corporate Sustainability (CS) practices in business activities (Pazienza et al., 2022), it is crucial, first of all, that companies have a clear understanding of the concept of Corporate Sustainability. Recently, there has been a significant increase in studies addressing sustainability-related topics. These studies encompass various related aspects, such as Corporate Sustainability, Sustainable Development, and Corporate Social Responsibility (Pazienza et al., 2022). Concurrently, a situation has arisen in which researchers and industry practitioners have encountered ambiguity regarding the true nature of Corporate Sustainability, as highlighted by Meuer et al. (2020), who contribute to dispelling this uncertainty and bringing clarity to the concept.

Providing a comprehensive clarification of the CS concept is of great significance due to two primary reasons. Firstly, this concept holds global relevance as it spans diverse economies and sectors, necessitating precise theoretical guidance to coordinate the efforts of all stakeholders; secondly, the lack of clarity surrounding this concept leads to varying

interpretations, which has been recognized in the literature as the source of practices adopted by businesses that are ineffective and arbitrary (Pazienza et al., 2022).

Meuer et al. (2020) present a rigorous definition of CS considering three fundamental elements: level of ambition, level of integration, and the specificity of SD. At the conclusion of their analysis, the authors assert that, for advancing the academic depth of CS and curbing the ambiguity of this concept among scholars and professionals, the following definition of Corporate Sustainability can assist companies in more effectively contributing to SD: "a bound of activities fully integrated into a firm's overall strategy that contributes effectively to the welfare of the current and future generation through protecting and enhancing the resilience of the biosphere, social equity and cohesion and economic prosperity" (Meuer et al., 2020, p. 330). Consequently, Pazienza et al. (2022) refer to CS as the application of the Sustainable Development concept within the corporate context, encompassing economic, environmental, and social aspects in both short and long terms. In other words, the authors state that CS can be viewed as the transition of the SD concept to the business context, which additionally provides an organization with long-term value in terms of financial, social, environmental, and ethical considerations.

For businesses, CS plays a crucial role, enabling them to develop and implement practical strategies for sustainability. This concept, along with that of SD, transcends abstract or generalized terms, is becoming a tangible tool for shaping effective approaches. These notions are pivotal in understanding the opportunities and responsibilities of companies, as well as cities and governments, with our current focus primarily aimed at comprehending the role of businesses. In this regard, an inclusive approach to Corporate Sustainability comes to our aid, envisioning CS as a holistic approach and considering it as a global perspective, encompassed within the TBL framework (Pazienza et al., 2022) already yet analysed.

In addition to the actions already mentioned in paragraph 1.4, some of the Corporate Sustainability activities that a company can adopt for greater sustainability performance are also provided by Zimek and Baumgartner (2017). The authors find that assessed CS strategies can involve maximizing resource and energy efficiency (such as practices related to material substitution or dematerialization for resource efficiency; and the use of alternative fuels or energy conservation and renewable energy for efficient energy usage), waste management to create value through efficient waste management (related to the concept of the circular economy), replacing traditional processes with green, renewable, and natural ones (for example, through green chemistry), as well as utilizing green technologies and sustainable innovations, and last but not least, through strategies for the preservation of the natural

environment and the welfare of society. Therefore, through CS aimed at advancing sustainable activities related to resource, energy, and process efficiency, cleaner production can be achieved (Zimek and Baumgartner, 2017), benefiting not only the companies themselves but also all the systems that operate alongside them.

1.5.1 CHALLENGES TO ACHIEVE CORPORATE SUSTAINABILITY

Today we find ourselves facing an environmental paradox: a paradox that exists between CS and environmental degradation. This paradox is defined by Landrum (2017, p. 287) as a “the big disconnect”: more and more companies adopt and commit to CS, yet the environment continues to suffer from economic and human activities and the steps taken towards sustainability seem insufficient for real climate change. As Landrum (2017) states, companies are increasingly adopting sustainability-oriented practices, but despite this, the environment continues to deteriorate.

The reason for this paradoxical situation can be attributed to the presence of multiple obstacles that have hindered SD, that can be both at macro and at micro level. The rational impeding the achievement of sustainable development can lie at the technological, political, and bureaucratic levels. Technology has an ambiguous effect: it's a double-edged sword that, on one hand, promotes progress and, on the other hand, hinders it by exploiting poor workers and shifting pollution towards areas inhabited by the less fortunate; moreover, they contributed to the migration of the poor, pushing some people towards violence and criminal activities (Matthew & Hammill, 2009). Regarding political causes, Collier (see Matthew & Hammill, 2009) has identified a series of reasons that have led to the lack of growth in poor countries: they have often been trapped in violent conflicts and civil wars, victims of an abundance of extractable natural resources like oil or diamonds, and subject to dominant countries that have asserted themselves and taken advantage of their economic, political, and social instabilities. Additionally, the ecosystem's inability to handle human carbon footprint contributes to this (Olawumi & Chan, 2018). Bureaucratic barriers instead block the SD due to the complexity of designing and implementing SD policies limits progress, as well as the difficulty in promoting freedom and justice (Matthew & Hammill, 2009). Another possible difficulty to SD lies in the attempt to adopt a universal model for all countries, which is not realistic; having a single approach to SD for each country or region proves ineffective in achieving sustainable goals (Olawumi & Chan, 2018) since countries and regions have different socio-economic, environmental, and cultural conditions, and environmental, social,

and economic challenges can vary greatly from one place to another. Therefore, a SD model that works well in one context might not be suitable or effective in another.

We now shift away from the macro perspective to turn our attention to the side of businesses, namely the challenges they face in truly being sustainable. Both micro and macro perspectives of sustainability are aimed at promoting a sustainable future for the environment, society, and the economy, but they must be effective in order to overcome this paradox.

One cause at micro level of this paradox is found in the lack of clarity regarding the term (corporate) sustainability, as already shown, especially in the business context, and the inability to integrate actions and measures at individual and local levels and at a global and larger systems level (Landrum, 2017).

The lack of clarity regarding the concept of corporate sustainability, which translates at the corporate level as a lack of consensus at the CEO level (Giunipero et al., 2012), results in the adoption of sustainability within companies varies based on the meaning attributed to it, and consequently, companies implement different sustainability practices and strategies depending on their view of sustainability and how they believe it can benefit their business (Landrum, 2017), without keeping a shared global objective in mind.

Matthew & Hammill (2009) argue that many negative forms of environmental change are linked to unsustainable production (and consumption) practices of developed countries. Companies face difficulties in changing their traditional production processes and the negative environmental impacts of their behaviour are often projected onto future generations or shifted onto the immediate environment of the world's poor, whose livelihoods often depend on direct access to natural resources (Matthew & Hammill, 2009). One possible reason why companies may struggle to effectively adopt CS could be due to the fact that companies, in embarking on the journey towards greater sustainability, require significant financial resources and expenses (Giunipero et al, 2012) to adopt environmentally friendly practices within their operations. The required investments, for instance, for the adoption of new technologies, the enhancement of existing ones, and the replacement of unsustainable ones are substantial, forcing businesses to commit to significant financial investments. The costs associated with sustainability also arise from the need to source environmentally friendly materials, which tend to be more expensive than traditional ones, and from the requirement to make structural changes within industrial processes, such as the adoption of machinery that facilitates energy savings and reduces water consumption. These modifications necessitate a certain level of financial capacity. However, these investments might not yield an immediate financial return, as the transition process towards sustainability is gradual, and furthermore, the external market might not always immediately recognize its

value. For such companies, adopting sustainable practices may require significant investments, profound organizational changes, and a new corporate mindset (Todeschini et al., 2017), which is not as immediate as the need to transition to a more sustainable world.

In addition, it's not always guaranteed that companies possess the necessary knowledge and skills to manage this transition process from BAU to the new trajectory. The lack of expertise or experience can emerge as a barrier, and to overcome such challenges, companies need to make substantial efforts, such as investing in training and development of personnel, as well as making investments to acquire new capabilities, skills, and talent internally. Therefore, managing the organizational change required for the implementation of a sustainable business model is not always straightforward: developing organizational dynamic capabilities and managerial talent for sustainable business (Lenssen & Smith, 2018) that steer towards Sustainable Development can be challenging.

Another sustainability challenge for businesses is that for a product to be eco-friendly, it's desirable that this characteristic is integrated from its design phase. However, developing and creating a sustainable product from its conceptualization is not an easy task to accomplish. Another important factor to consider is that in today's globalized economy, which involves the need to cooperate and establish connections with numerous partners, this fragmentation of the business economic network complicates the ability to monitor whether these partners themselves adopt sustainable sourcing criteria for raw materials. The lack of standards and appropriate regulations for sustainability along the value chain increases the complexity of green procurement management (Giunipero et al., 2012). Due to these difficulties, and many others, companies tend to implement a level of sustainability that could be considered superficial or marginal, often resulting in inadequacy to resolve the environmental paradox or to progress towards SD.

1.5.2 DRIVERS OF CORPORATE SUSTAINABILITY

Becoming sustainable is not easy but might be providing important returns to companies (other than to the environment).

Firstly, the company can internally implement sustainable initiatives to enhance its strategic competitiveness and gain competitive advantages, such as cost reduction, increased profitability, improved corporate image and reputation, the ability to retain talented employees, and effective risk management (Landrum, 2017). The attainment of these advantages stems from the fact that for a company to be sustainable, it must develop and acquire internal capabilities and technologies that enable it to build internal strategic capabilities, which, in turn, enable sustainable performance. Therefore, firm's strategic

capabilities enable the firm to attain a competitive advantage and, in terms of the environment, to have productions that minimize gas emissions, waste generation, and overall environmental impacts linked to the firm's growth and development (Tate and Bals, 2016). Furthermore, the positive correlation between CS and the financial performance of the company, as demonstrated by empirical studies in the literature (Li et al., 2014), renders sustainability a pivotal factor propelling businesses toward broader adoption of sustainable practices. For instance, companies engaged in addressing ecological concerns gain economic opportunities by achieving enhanced market performance and cost savings related to environmental impacts, including fines and regulatory penalties. Additionally, streamlining production processes reduces input materials and mitigates material waste, thus contributing to waste reduction. All of this is accompanied by an improved environmental image and reputation, enabling the company to increase its revenues, as it instils confidence among both existing and potential customers, thereby boosting sales. Therefore, an escalation of ecological responsibility initiatives can lead to an enhancement in financial performance (Li et al., 2014). Giunipero et al. (2012) also identify competitive advantage and financial benefits as drivers CS. Additionally, the authors identify other common drivers of sustainability, including top management involvement, government regulation, and consumer demand. The commitment of top management to identify the role and position that the company plays within an interconnected system of various social and environmental actors is of paramount importance, as it establishes corporate leadership in managing the social and ecological environment in which it operates. Furthermore, legislation is a crucial factor in boosting sustainability: regulatory forces, although moderated by the type of industry and the geographical location of the company, are the primary impetus for corporate ecological responsibility, as both incentives and fines influence rule compliance (Giunipero et al., 2012). After all, companies operate within a regulatory and political context that sets rules and obligations to promote and support sustainability. These regulations may include laws, regulations, guidelines, and public policies aimed at ensuring that business activities are conducted sustainably, considering environmental, social, and economic aspects (Landrum, 2017). Finally, today, the aspect of consumer demand cannot be overlooked. Due to increasing consumer awareness of environmental issues, consumers are increasingly seeking sustainable products and services, and companies must respect and meet their needs (Giunipero et al., 2012).

Enumerating all the reasons why a company might opt for sustainability as part of its organizational strategy is complex, as each enterprise may have various motivations based on its specific objectives. The reasons mentioned above are among the most commonly

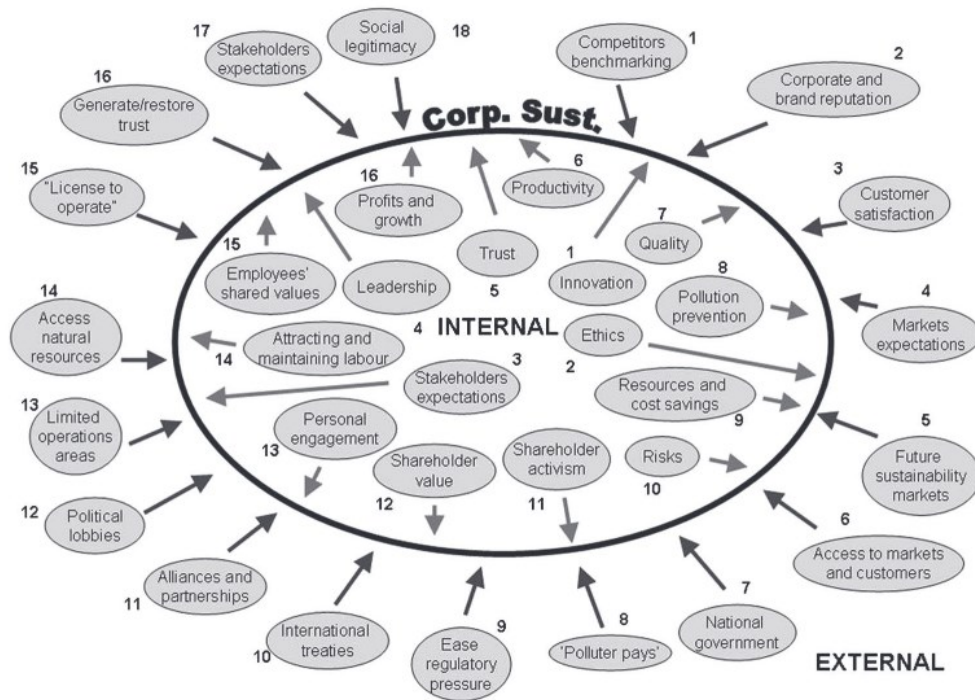
encountered. To gain a deeper understanding of the factors driving companies to engage in CS, one can refer to Figure 1, which divides motivations into internal reasons related to managing operations within the company and external motivations stemming from interactions with external stakeholders (Lozano, 2013).

So, through CS a company is able to create value for various stakeholders. Through their internal capabilities, technologies, and actions taken to achieve greater sustainability, firms are capable of generating shared value among various stakeholders (Tate and Bals, 2016). In particular, companies can create values for shareholders, as they can gain competitive advantage through cost differentiation, thus creating value for the company's investors, preventing competitors from attaining a market advantage, and positioning themselves favourably for the future (Tate and Bals, 2016), acquiring a market-leading position and thereby deriving long-term economic benefits. Furthermore, with the aim of enhancing strategic competitiveness and corporate performance, the company, through the adoption of sustainable practices, invests in innovative technological solutions (such as biotechnology, sustainable chemicals, and eco-efficiency), positioning itself as a pioneer in eco-innovation and thus advancing its industry while concurrently achieving sustainable objectives (Landrum, 2017, p. 302).

By acting in accordance with the principles derived from the Triple Bottom Line, firms also create value at the environmental level through their environmental performance (i.e., reducing environmental issues through the implementation of strategies, some of which were previously discussed), as well as creating value for social stakeholders, including local communities, for example through the implementation of operations already analysed in section 1.3.3, including promoting greater access to education and contributing to poverty reduction (Tate and Bals, 2016). The importance of creating value within the context of SD is also reiterated by Porter and Kramer (see Lenssen & Smith, 2018, p. 326), who state that “the concept of shared value, in contrast, recognizes that societal needs, not just conventional economic needs, define markets”.

More precisely, building on the TBL concept, through the simultaneous provision of economic, social, and environmental benefits, a firm, through the appropriate strategies and business practices analysed earlier, is not only capable of generating shared value among its stakeholders but is also able to create shared sustainable value (Hart & Milstein, 2003). In order to be considered sustainable, companies must create economic, social, and environmental value and the creation of sustainable value thus accelerates the journey towards increasing Sustainable Development.

Figure 1: Corporate Sustainability internal and external drivers.



Source: Lozano, 2013, p. 31

To this end, it is implied but highly important to consider firms not as individual actors but as participants within a cohesive, integrated, and interconnected system. For businesses, given their significance in contributing to SD, it is essential to therefore consider their relevant value chain and their role within it, and begin to address the environmental impacts they have on the chain.

1.6 GLOBAL VALUE CHAINS

Firms striving for Sustainable Development must look beyond the individual interests of their companies when planning for the future. They must not only confine their actions within the perimeter of their company but also consider them within a broader perspective of a large global system. Businesses, indeed, do not operate solely within a local or regional context; with globalization, they now operate within a global context that encompasses both local and global environmental, economic, and social systems (Berke & Manta, 1999). Consequently, any social actor should not act solely for their own interests but, when making any decisions, should also consider their impact among the community, the region, and the world (Berke & Manta, 1999).

As seen throughout the course of this chapter, sustainability is a complex and multidimensional concept that cannot be addressed by a single action of a single firm (Hart & Milstein, 2003). Corporate sustainability thus concerns a broader vision that encompasses

actions and policies adopted at the global, national, and community levels to ensure the sustainability of the entire economic, social, and ecological system (Landrum, 2017).

The collaboration of all businesses is necessary to achieve global sustainability, particularly considering that companies interlace relationships among themselves even when geographically distant, and the choices of one can influence the decisions of another. This intricate and fragmented economic network (De Marchi et al., 2020) has led us to an era where the production and circulation of goods and services have reached global proportions: from the supply of raw materials to the trade of finished products, physical movements span across the world, carrying with them the embedded environmental impacts (Balkau & Sonnemann, 2010).

With the onset of globalization, companies today are internationally dispersed, and it is pertinent for them to comprehend their role within the value chain they belong to, just as crucial as considering their impacts within it. The phenomenon characterizing the organization of diverse industries on a global scale, delving into both the global economy and the impacts arising from implemented corporate strategies, is known as Global Value Chains. This concept also examines the creation and distribution of value along the entire chain, composed of various functionally interconnected yet internationally dispersed companies (De Marchi et al., 2020) but what plays a fundamental role for companies in participating in these structures is their compliance with sustainability.

The establishment of environmentally responsible value chains can play a crucial role in promoting climate-friendly growth, supporting economic development, and generating employment in a sustainable and resilient manner, thereby fostering the growth of greener sectors (ILO, 2021). Indeed, firms with environment-related objectives can promote growth, development, and employment in a green sector, improve the environmental sustainability of a sector while also enhancing its capacity to address climate change, and support sectoral growth without negative impacts (ILO, 2021).

But how can firms effectively also ensure the activities of their suppliers are or become green(er)? What are the constraints or the opportunities to be aware about, when it comes to ensure the whole value chain become sustainable? The Global Value Chain Framework that will be presented in next chapter is a powerful tool for this purpose.

2. ENVIRONMENTAL UPGRADING AND GLOBAL VALUE CHAINS

2.1 THE RELEVANCE OF THE GLOBAL VALUE CHAIN FRAMEWORK

Due to globalization, the expansion of industrial capabilities in various developing nations, and the decentralization of operations by multinational corporations (which are reevaluating their core activities and competencies to focus on activities such as innovation, product strategy, marketing, and high-value segments of production and services, while simultaneously reducing direct control over "non-core" functions, like generic services and mass production, a fertile ground has been created for various forms of network governance emerging from trade relations between autonomous and loosely connected parties on one side and large vertically integrated companies on the other (Gereffi et al., 2005, p. 79).

The global economy is increasingly assuming a structure centered around the concept of Global Value Chains (Global Value Chains, 2022), which are progressively becoming a more significant part of international trade, global Gross Domestic Product (GDP), and employment (Gereffi & Fernandez-Stark, 2016).

The concept of GVCs provides a lens through which to examine the organization of global industries by analyzing the structure and flow of actors involved in a specific sector (Gereffi & Fernandez-Stark, 2016). GVCs are a driving force of globalization and have a significant impact on the participation of all countries in the chain (Global Value Chains, 2022).

In an increasingly interconnected global economic context, characterized by complex sectoral interactions, the GVC approach is a valuable tool for tracing developments in production and exchange patterns on a global scale (Gereffi & Fernandez-Stark, 2016). It allows for connecting geographically dispersed activities and actors within a particular sector and identifying the roles they play in both advanced and developing nations (Gereffi & Fernandez-Stark, 2016). Furthermore, a deep analysis of how GVCs operate is essential for understanding economic, social, and environmental dynamics (Global Value Chains, 2022) and for elucidating the complex interactions between the global and local levels within the chain (Gereffi & Fernandez-Stark, 2016).

For a developing country, the presence of Global Value Chains has a direct impact on opportunities to access the global economy, increase job opportunities, promote the introduction of new products, and expand export activities (Global Value Chains, 2022). GVCs constitute a crucial foundation for businesses and the workforce in these countries to participate in the global economy (Gereffi & Fernandez-Stark, 2016; Global Value Chains, 2022). However, to fully benefit from GVCs, it is essential for them to integrate effectively into these chains, a fundamental condition for their development (Gereffi & Fernandez-Stark,

2016; Global Value Chains, 2022). This ability allows them to compete successfully and leverage the opportunities offered by the global context, promoting national economic development, enhancing their production capabilities, and generating higher-quality employment, thereby contributing to the reduction of unemployment and poverty (Global Value Chains, 2022).

The importance of GVCs is not limited to opportunities for developing countries but is equally relevant for developed economies. The latter must identify new sectors they can enter, capitalizing on existing resources or creating specialized employment in established sectors (Global Value Chains, 2022). Furthermore, they must intervene to improve economic, social, and environmental aspects to promote overall and sustainable well-being throughout the value chain in which they operate. Moreover, the analysis of GVCs is of crucial importance because it provides policymakers with a more detailed perspective for addressing development-related issues (Gereffi & Fernandez-Stark, 2016). This analysis allows them to fully understand the advantages and disadvantages associated with the specific GVC under study (Global Value Chains, 2022). For example, through the analysis of GVCs, policymakers can gain an in-depth understanding and a broader view of how and why some countries progress while others encounter difficulties in the global economy (Gereffi et al., 2005). The analysis of global value chains and policy development allows policymakers to understand the various ways in which global production and distribution systems are interconnected and the potential for businesses in developing countries to improve their position in global markets (Gereffi et al., 2005). This enables policymakers to create new programs and strategies aimed at promoting sustainable economic development (Gereffi & Fernandez-Stark, 2016), while also taking into account social inclusion. This means that it is very important to ensure a fair representation and opportunities for groups that may be disadvantaged due to their size or cultural norms, such as small and medium-sized enterprises or women, and, in addition, this contributes to promote also employment growth (Global Value Chains, 2022). So, in this sense, the analyses of GVCs can be valuable for the formulation of effective policy tools that foster industrial advancement, economic development, job creation, and poverty reduction (Gereffi et al., 2005).

2.2 DEFINING GLOBAL VALUE CHAINS

A GVC is also defined as the process encompassing the entire series of interconnected activities required to bring a product from its conceptualization to its final and finished realization (Global Value Chains, 2022).

The GVC framework focuses on its realization and describes sequences, also called activities, of value-added within an industry, performed by companies and workers to guide the product from its conception through production to final use and beyond (Gereffi & Fernandez-Stark, 2016; Global Value Chains, 2022). GVC studies concentrate on the generation and transfer of value within the system as a result of companies' efforts to optimize production networks and on how the value distribution structure influences the choice of the organizational form of international production networks (Inomata, 2017), as GVCs involve the movement of goods or services across geographical and economic boundaries and require a certain degree of coordination between buyers and suppliers (Global Value Chains, 2022).

Some distinctive aspects of GVCs are (Global Value Chains, 2022):

- Inclusion of all products and by-products involved as well as the companies participating in this process, from firms involved in raw material production to the retail distribution of finished products to end consumers.
- Encompassing service activities like design and marketing, which are phases associated with high-value processes and require entry barriers to access.
- Division among different companies and geographical regions, implying the need for some level of coordination among the various actors operating along the entire GVC.
- Each GVC is specific to its industry or product, just as the modes of interaction between buyers and suppliers are unique, giving each global value chain its own distinct character.

The primary goal of GVC research is to explore the interaction between value distribution mechanisms and the organization of cross-border production-consumption links, aiming to understand the type of governance characterizing international networks (Inomata, 2017). These studies also analyze “job descriptions, technologies, standards, regulations, products, processes, and markets” in specific sectors and contexts, offering a comprehensive view of businesses from both top-down and bottom-up perspectives (Gereffi & Fernandez-Stark, 2016, p. 6; Global Value Chains, 2022).

In the context of globalization, activities constituting a value chain are generally performed in inter-firm networks on a global scale; thus, the activities composing a value chain are primarily divided among different companies (Gereffi & Fernandez-Stark, 2016). This fragmentation of activities within a GVC tends to generate bilateral relationships between buyers and their suppliers, resulting in varying degrees of power asymmetry between the parties; although less frequent, the model of vertical integration is not excluded, where the externalization of activities within the GVC is not feasible (Inomata, 2017). In this case, the type of relationship established between the focal company and its subsidiaries is hierarchical,

as we will see in more detail later, developed through constant monitoring and control of the activities and performance of subsidiaries by the headquarters to ensure alignment with the top management's strategies (Inomata, 2017). To gain a deeper understanding of these structures and relationships, GVC studies pay attention to the various forms of transactions, both formal and informal, among the involved actors (Inomata, 2017), which will be discussed further.

Furthermore, by focusing on the sequences of activities that generate tangible and intangible value, from initial idea to production and final use, GVC analysis provides a comprehensive view of global industries through an approach that develops both from top to bottom, examining how major companies "govern" their networks of subsidiaries and suppliers globally, and from bottom to top, investigating how these corporate decisions influence the path of economic and social "upgrading" or "downgrading" in specific countries and regions (Gereffi & Fernandez-Stark, 2016, p. 7), especially in developing ones.

To achieve this goal, GVCs also involve defining the participants involved, the rules governing their interactions, whether they involve collaboration or competition, and the winning opportunities emerging from these dynamics (Inomata, 2017). The elements that allow the analysis of GVCs through a top-down and bottom-up approach are divided into global and local elements, six in total, and these are the fundamental dimensions explored by the GVC methodology (Gereffi & Fernandez-Stark, 2016). Specifically, the first group of characteristics refers to internationally scoped aspects, which are influenced by the global dynamics of the industry, and these dimensions include the Input-Output structure of a GVC, geographical extension, and the governance structure (Lead Firms and Sectoral Organization) that constitute the global dimension. On the other hand, the local dimension includes upgrading, the local institutional context, and industry stakeholders, explaining how individual countries participate in GVCs (Gereffi & Fernandez-Stark, 2016).

In summary, the global value chain approach examines the global economy from two contrasting perspectives, "top-down" or global and "bottom-up" or local (Gereffi & Fernandez-Stark, 2016, p. 7). This is because the way transactions occur reflects the structure of power relations among the involved parties, ultimately determining the scope and breadth of value distributions within the GVC (Inomata, 2017).

2.3 DIMENSIONS OF GVC ANALYSIS

2.3.1 INPUT-OUTPUT STRUCTURE

According to the definition by Gereffi & Fernandez-Stark (2011), the input-output structure of a GVC is described as the process of converting a product from its raw materials into finished products ready for consumption. The authors emphasize the importance of initially identifying the key activities and segments comprising a specific GVC to understand the input-output flow that takes a product or service from its initial phase to delivery to the end consumer.

The Value Chain Reference Model (VCRM), devised by Stacy Frederick in 2010 and 2014 (Lin et al., 2019), provides a comprehensive view of the value chain ecosystem, divided into four components: value generation activities, the supply network, end-use markets, and the corporate support environment.

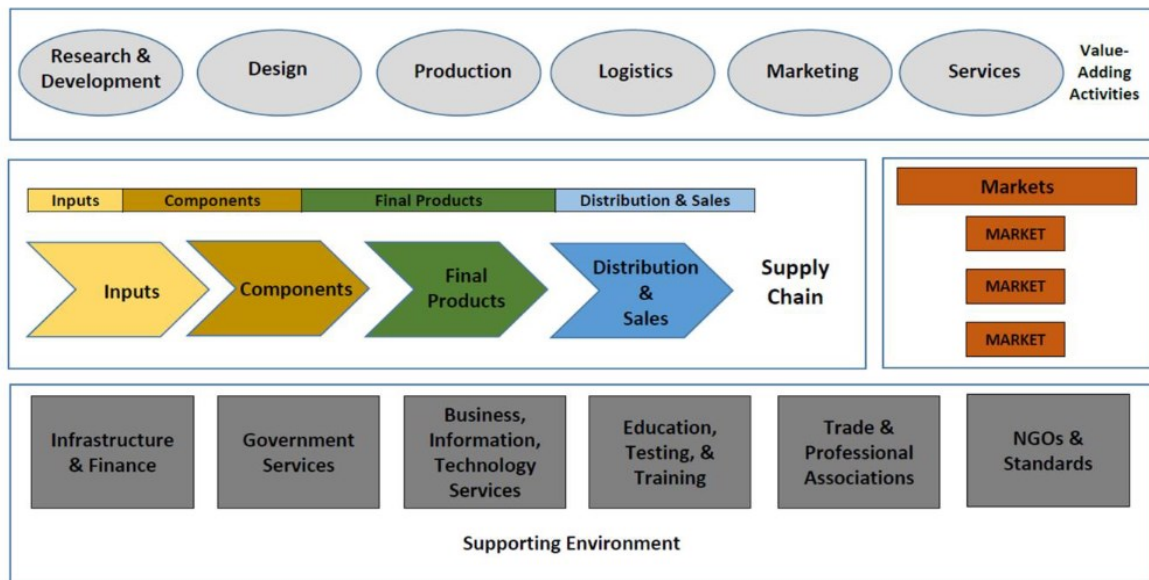
The fundamental categories within a GVC vary depending on the industry context, but they can generally be grouped as follows: research and development activities, design phase, production process, distribution, marketing, and sales activities (Lin et al., 2019), and in some cases, even the recycling of products at the end of their use (Gereffi & Fernandez-Stark, 2016). The supply chain instead delineates the input-output process through four fundamental phases (raw materials, components, and other parts, finished products, and distribution and sales) that constitute the intrinsic links in the production process within the value chain and allow mapping of participants in the value chain (Lin et al., 2019). These input-output relationships also substantially vary for different industries or for each specific product as they are unique and specific depending on the object of study.

Commonly, the input-output layout is illustrated as an assortment of blocks in the value chain (see figure 2), connected by arrows indicating the movement of tangible and intangible goods and services, crucial for mapping added value at various stages of the chain (Gereffi & Fernandez-Stark, 2016).

2.3.2 GEOGRAPHIC SCOPE

Geographic analysis primarily relies on the analysis of global supply and demand (Gereffi & Fernandez-Stark, 2016). This process is carried out by analyzing trade flows in each phase of the value chain, using databases of international trade statistics such as the United Nations' Comtrade and data from second-level business information sources, sector publications, and interviews with industry experts (Gereffi & Fernandez-Stark, 2016).

Figure 2: General Input-Output structure



Source: Lin et al., 2019, p. 4

It's important to note that GVCs influence approximately 70% of global trade, involving services, primary resources, parts, and components crossing international borders (OECD, 2023). Therefore, geographic analysis is of paramount importance because it explains how the industry is globally dispersed and in which countries the various GVC activities are carried out (Gereffi & Fernandez-Stark, 2016).

Increasingly, the strategic decisions of leading companies are driving trade through targeted investments and activities in areas where expertise and essential materials are available at competitive costs and with a high standard of quality (OECD, 2023). The intricate interactions of exports and imports between countries contribute to the understanding that there are currently numerous exchange flows between companies and workers located in distant geographic locations (globalvaluechains.org, 2011; see Gereffi & Fernandez-Stark, 2016). In the global economic context, various nations participate in the industry based on their competitive capabilities linked to available resources (Gereffi & Fernandez-Stark, 2016). Currently, supply networks extend globally, and various operational phases are typically allocated in different regions of the world. Often, developing nations contribute low-cost labor and material resources, while more advanced economies with highly skilled expertise are involved in activities like Research and Development (R&D) and product design (Gereffi & Fernandez-Stark, 2016). Major lead firms focus also on other intangible and high-value-added activities, such as product development, design, marketing, branding, and management (Fernandez-Stark et al., 2022; Cattaneo et al., 2010) and these activities are typically carried

out at the headquarters of these companies, primarily located in the United States and Western Europe (Fernandez-Stark et al., 2022).

2.3.3 GOVERNANCE

Focal companies exercise significant control over when, where, and how production takes place, as well as how much profit they will gain from each phase (Fernandez-Stark et al., 2022). Essentially, they have control over how the key activities contributing to value are distributed throughout the entire value chain (Fernandez-Stark et al., 2022). In fact, the main difference between lead and non-lead firms lies in their control over crucial resources (such as product design, new technologies, brands, or consumer demand) that generate higher profits (Gereffi & Memedovic, 2003).

The governance structure explains how the value chain is controlled and coordinated by firms when some actors in the chain have more power than others, and it is a key concept from a top-down perspective, primarily focusing on lead firms and the organization of industries on an international scale (Gereffi & Fernandez-Stark, 2016). Understanding governance and how control is exercised within a value chain is equally advantageous for facilitating the entry of new firms into GVCs and for fostering development within global industries (Gereffi & Fernandez-Stark, 2016).

Initially, the concept of governance was introduced by Gereffi (1994; see Gereffi & Fernandez-Stark) as the complex dynamics of authority and power that regulate the allocation and flow of financial, material, and human resources within a value chain. This concept was originally categorized into two broad categories, namely "buyer-driven" or "producer-driven" (Gereffi & Fernandez-Stark, 2016, p. 10; Gereffi and Memedovic, 2003, p. 3). These two variants of GVs have emerged in the context of global expansion.

In practice, governance analysis involves identifying lead firms within the industry, their geographical location, and how they interact with the supply chain, as well as their ability to exert influence and control over it, such as through setting standards (Gereffi & Fernandez-Stark, 2016). So, the first element of the governance analysis is to identify the most powerful actor, the lead firm, and to understand which type of lead firm it is. In detail, these two categories of international economic networks can be defined as follows:

- Producer-driven GVCs are led by larger manufacturing companies, often transnational, take central roles in organizing and coordinating production networks (Gereffi and Memedovic, 2003). Indeed, in producer-driven chains, there is more vertical integration extending across all segments of the supply chain, capitalizing on

the benefits from advanced technologies or the economies of scale from internally integrated suppliers (Gereffi & Fernandez-Stark, 2016). This is characteristic of industries requiring substantial capital investment and technology, such as the automotive, aerospace, IT, semiconductor, and heavy machinery industries, and generally, the leading companies in these value chains are part of international oligopolies (Gereffi and Memedovic, 2003).

In such value chain structures, major economic players are advanced goods producers, playing a pivotal role both in terms of profits and the power to influence relationships with raw material and component suppliers in the preceding phase and with distributors and retailers in the subsequent phase (Gereffi and Memedovic, 2003).

- In buyer-driven chain, instead, buyers are instead large retailers, marketing operators, and brand manufacturers, who play a key role in establishing decentralized production networks in various exporting countries, often located in developing territories that engage in producing finished goods on behalf of major buyers who control the production process (Gereffi and Memedovic, 2003).

This trade-based industrialization approach has become prevalent in industries requiring significant labor and focusing on consumer goods, such as apparel, footwear, toys, handicrafts, and consumer electronics (Gereffi and Memedovic, 2003).

The analysis of buyer-driven value chains highlights the dominant role of large retailers and successful brands, influencing product specifications (Gereffi and Memedovic, 2003) and setting requirements for suppliers to meet certain standards and protocols (Gereffi & Fernandez-Stark, 2016). Additionally, companies that develop and market branded products exert significant control over when, where, and how production will occur and which entity will generate profits at each stage (Gereffi and Memedovic, 2003). Those firms are essentially non-owning producers of production facilities, where the physical production phase of goods is outsourced and clearly separated from the design and marketing phase (Gereffi and Memedovic, 2003).

In producer-driven value chains, large manufacturers dominate control up to the production phase, while in buyer-driven value chains, marketers and traders have influencing power primarily exercised in the design and retail sales phases. Unlike producer-driven value chains, where profits come from factors like production scale, volume, and technological innovation, in buyer-driven value chains, profits stem from a combination of activities such as research, design, sales, marketing, and high-value financial services (Gereffi and Memedovic, 2003).


Furthermore, it is important to understand how lead firms interact with their suppliers, i.e. which forms of governance are adopted. In the GVC literature, five governance structures have been identified: markets, modular, relational, captive, and hierarchy (Gereffi & Fernandez-Stark, 2016).

Three elements play a substantial role in determining variations in governance structures (Li et al., 2014), and to define the configuration of these five structures, it's essential to first consider these three parameters (Gereffi et al., 2005; Gereffi & Fernandez-Stark, 2016; Li et al., 2014) (see Figure 3). These are commonly referred to as the "3 Cs" model (Inomata, 2017, p. 19), namely Complexity, Codifiability, and Capability:

- Transaction Complexity, which refers to the difficulty of transferring the information and knowledge needed to facilitate a specific transaction, especially regarding detailed product and process specifications (Gereffi et al., 2005).
- The ability to Codify transactions, which is about the complexity of information shared among various actors within the chain, such as whether production-related information can be easily codified or is complex (Gereffi & Fernandez-Stark, 2016), and whether specific investments are required by different parties involved in the transaction (Gereffi et al., 2005).
- Supplier Capability, measured in terms of their procurement ability (Gereffi & Fernandez-Stark, 2016; Li et al., 2014) and in relation to the specific requirements of the transaction (Gereffi et al., 2005).

These three factors are allowed only two values, high or low, resulting in five governance combinations (Gereffi et al., 2005; Li et al., 2014) for which an analysis of each governance model is provided in more detail.

Figure 3: Governance types of models

Governance type	Complexity of transactions	Ability to codify transactions	Capabilities in the supply-base	Degree of explicit coordination and power asymmetry
Market	Low	High	High	Low
Modular	High	High	High	
Relational	High	Low	High	
Captive	High	High	Low	
Hierarchy	High	Low	Low	

Source: Gereffi et al., 2005, p. 87

Market governance involves relatively simple transactions and easy transmission of information about product specifics (Gereffi & Fernandez-Stark, 2016; Li et al., 2014).

Suppliers can produce products with minimal involvement from buyers, and the price is used as the key governance mechanism instead of relying on lead company (Gereffi & Fernandez-Stark, 2016). These exchanges require little or no formal cooperation among actors, and the cost of switching to new partners is low for both producers and buyers (Gereffi et al., 2005). Furthermore, suppliers demonstrate significant procurement competence (Li et al., 2014).

The modular governance configuration arises when connections (or relationships) are stronger than in simple markets because there is a high volume of information, and interactions between buyers and suppliers can become intricate (Gereffi & Fernandez-Stark, 2016). However, thanks to the significant procurement capability of suppliers, complex transactional information can be codified and managed (Li et al., 2014). Transactions are therefore complex but relatively easy to codify (Gereffi & Fernandez-Stark, 2016), as activities are encoded through the adoption of shared industry tools and criteria (Li et al., 2014).

Information technology and standards for information exchange play a fundamental role in the functioning of modular governance (Gereffi et al., 2005; Gereffi & Fernandez-Stark, 2016). In modular chain contexts, suppliers produce products in compliance with customer specifications and requirements (Gereffi & Fernandez-Stark, 2016; Li et al., 2014). In cases where they offer "turnkey services" they take on the entire process technology using standard equipment (Gereffi et al., 2005, p. 84; Gereffi & Fernandez-Stark, 2016, p. 10), thus spreading specific investments across a broad range of customers (Gereffi & Fernandez-Stark, 2016). Costs associated with changing suppliers are low, limiting specific investments made by suppliers for the transaction (Gereffi & Fernandez-Stark, 2016).

Relational governance comes into play when complex information exchanges occur between buyers and sellers (Gereffi et al., 2005; Li et al., 2014) that cannot be easily transmitted or learned (Gereffi & Fernandez-Stark, 2016).

This scenario involves frequent interactions and knowledge sharing among involved parties, where lead firms specify in detail the specifics of what they want, thus exerting a certain level of control over suppliers (Gereffi & Fernandez-Stark, 2016). Therefore, manufacturers in these relational chains provide differentiated products based on quality, geographical origin, or other unique characteristics (Gereffi & Fernandez-Stark, 2016). These connections are built on trust and generate mutual dependence, regulated through reputation, family, and ethnic ties, as well as similar factors like social and spatial proximity (Gereffi & Fernandez-Stark, 2016). However, it's important to note that trust and reputation can also effectively function in networks that are geographically distant (Gereffi et al., 2005) thanks to improved transportation and telecommunications infrastructure (Gereffi & Fernandez-Stark, 2016). Building relational ties requires a considerable amount of time (Gereffi et al., 2005), and since

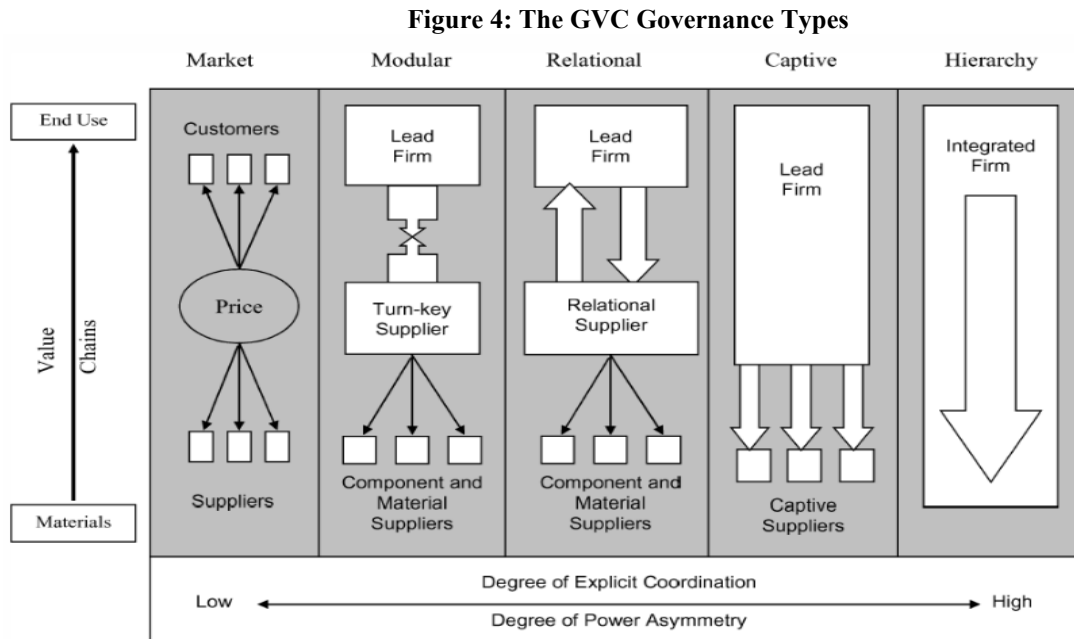
the assets involved are highly specific (Li et al., 2014), transitioning to a new partner typically involves high costs and significant challenges (Gereffi & Fernandez-Stark, 2016).

In captive chains, small suppliers depend on one or a few buyers who often hold considerable power (Gereffi et al., 2005; Gereffi & Fernandez-Stark, 2016). In these networks, there is a high level of monitoring, supervision, and control exercised by the lead firm (Gereffi et al., 2005; Gereffi & Fernandez-Stark, 2016; Li et al., 2014). The power asymmetry in captive networks forces suppliers to comply with the conditions set by their buyer, often specific to that particular buyer (Gereffi & Fernandez-Stark, 2016). Suppliers are thus "locked in" (Gereffi et al., 2005, p. 84) and highly dependent on these lead companies (Li et al., 2014). This leads to close ties and high costs in the event of a partner change, both for suppliers and buyers (Gereffi & Fernandez-Stark, 2016). Bound suppliers are often confined to a limited set of responsibilities, such as mainly engaging in basic assembly activities; they rely on the lead firm for complementary activities like design, logistics, component procurement, and process technology upgrades (Gereffi et al., 2005) because the core competence of lead companies often lies in these areas (Gereffi & Fernandez-Stark, 2016). To achieve this, lead companies should support their suppliers in optimizing their production capabilities, even if it's not their core competence; this effort is still beneficial for the lead company as it contributes to improving the efficiency of the entire supply chain (Gereffi & Fernandez-Stark, 2016). Ethical leadership is also essential to ensure that suppliers receive fair treatment and a fair share of the market price while providing them with the necessary resources and adequate market access (Gereffi & Fernandez-Stark, 2016). This approach also aims to make it less appealing for subordinate firms to exit the supply chain, maintaining control over potential opportunism by these firms (Gereffi et al., 2005).

Hierarchical governance represents a progression from a captive structure (Li et al., 2014). It describes chains characterized by vertical integration (Gereffi et al., 2005) and managerial control within lead firms responsible for product development and internal production (Gereffi & Fernandez-Stark, 2016). This situation mainly occurs when product specifications cannot be easily codified, when products are complex in nature, or when there are no highly competent suppliers (Gereffi et al., 2005; Gereffi & Fernandez-Stark, 2016). This form of governance is typically necessary to exchange tacit knowledge across different stages of the value chain and effectively manage intricate input and output interactions, as well as resource control, particularly intellectual property (Gereffi et al., 2005).

Therefore, governance models indeed span a wide spectrum from minimal levels of explicit coordination and power imbalance between buyers and suppliers, as in the case of markets, to high levels of explicit collaboration and communication and power asymmetry, typical of

hierarchical structures (Gereffi et al., 2005). A visual representation of these models is presented in Figure 4.



Source: Gereffi et al., 2005, p. 87

Governance configurations can change over the evolution and maturation of an industry (Gereffi & Fernandez-Stark, 2016). Consequently, due to changes in the business environment, an existing governance structure may be inadequate for effectively managing the supply chain (Li et al., 2014). For example, when transaction complexity in the market increases, a transition from a market-type GVC to a relational one can occur (Inomata, 2017). Another example may involve a shift from a relational GVC to a modular one, requiring an improvement in the ability to codify transactions (Inomata, 2017). Likewise, an improvement in the capabilities of the supply base can push value chains to transition from a captive configuration to a market-based one (Inomata, 2017). Moreover, an increase in overall supply chain efficiency and greater decision concentration within the lead firm can promote a transition from market-based coordination to a hierarchical structure (Li et al., 2014).

As a result, governance structures adapt over time to respond to changes in both the internal and external environment (Li et al., 2014). Changes in the configuration of the supply chain give rise to a dynamic process of change over the life cycle of the chain (Li et al., 2014), leading to a different balance between the advantages and risks of outsourcing (Gereffi et al., 2005).

Furthermore, recent studies have highlighted that many global value chains feature multiple interconnected governance structures, which play a role in bringing opportunities and

challenges for economic and social progress (Dolan & Humphrey, 2004; Gereffi, Lee, et al., 2009; see Gereffi & Fernandez-Stark, 2016).

Additionally, both governmental institutions and non-governmental organizations (NGOs) play a significant role in engaging in monitoring and guidance activities (Li et al., 2014). Therefore, the concept of monitoring, as a specific element of governance structures, is integrated into this context, where both governments and NGOs are considered as actors influencing governance (Li et al., 2014). In this perspective, Li et al. (2014, p. 829) propose an additional sixth governance model to traditional models, called "monitoring", which represents an extension of inter-firm governance and incorporates the role of external stakeholders. According to the authors, this structure takes into account the effect of government action and NGO activities on the evolution of governance structures. From an external perspective and in relation to stakeholders, three factors influence motivations and interest distribution among supply chain participants within a monitoring governance structure: government policies, NGO monitoring activity, and consumer choices (Li et al., 2014).

2.4 UPGRADING

Upgrading represents the dynamic process within the value chain that examines the movement of producers through different stages of the chain and is the central concept of the bottom-up perspective (Gereffi & Fernandez-Stark, 2016).

In essence, upgrading entails progress along the value scale, moving away from the "lower road" where competition is intense and entry barriers are few, a strategy that is not sustainable in the long term (Giuliani et al., 2005; see De Marchi et al., 2013, p. 65).

Being a "local" approach, this method focuses on the strategies adopted by nations, geographical areas, and other economic actors to improve, or at least maintain, their positions in the global economy (Gereffi & Fernandez-Stark, 2016, p. 7), and possibly to embark on an upward trajectory.

Economic upgrading, according to Gereffi's definition (2005), refers to the transition of businesses, nations, or regions towards higher-value activities within global value chains, with the aim of expanding the benefits derived from participating in global production. These benefits include aspects such as security, profits, added value, and capacity and skills. In the context of global value chains, Humphrey and Schmitz (2002; see Gereffi & Fernandez-Stark, 2016; De Marchi et al., 2013) have identified four categories of economic upgrading:

- Process upgrading. Such upgrading optimizes the transformation of inputs into outputs, improving process efficiency (De Marchi et al., 2013) by reorganizing the production system or adopting new or more advanced technologies (Gereffi & Fernandez-Stark, 2016). Improving production methods involves capital investments and enhancing workers' operational skills to use new machinery, but this strategy leads to benefits such as reduced production costs and increased flexibility (Fernandez-Stark et al., 2022).
- Product upgrading. This type implies transitioning to more sophisticated (Gereffi & Fernandez-Stark, 2016) and advanced product lines (De Marchi et al., 2013). To achieve this goal, a country must become more skilled in the industry by "learning" to produce more complex goods (Fernandez-Stark et al., 2022, p. 28) through the acquisition of new knowledge.
- Functional upgrading. This process involves taking on new functions (or abandoning existing ones) to increase and enhance the overall content of skills in activities (Gereffi & Fernandez-Stark, 2016; Fernandez-Stark et al., 2022) with high added value, such as marketing or logistics (De Marchi et al., 2013).
- Chain or inter-sectoral upgrading. It entails expanding businesses into often related industries (Gereffi & Fernandez-Stark, 2016) or those characterized by higher technological advancement (De Marchi et al., 2013).

In addition to these four types of economic upgrading, Fernandez Stark et al. (2014; see Gereffi & Fernandez-Stark, 2016) have identified alternative economic upgrading trajectories. For example, the authors identify entering the value chain for the first time as a very challenging path of upgrading. This occurs when companies newly participate in national, regional, or global value chains (Gereffi & Fernandez-Stark, 2016), thus having the opportunity to expand their horizons. Backward linkages upgrading, also identified by Gereffi & Fernandez-Stark (2016), is a different type of economic upgrading where national or foreign firms within an industry begin to offer resources or marketable services to companies, often multinational, operating in the country and already involved in a separate value chain. Diversifying the final market can also lead to a form of upgrading, characterized as a shift to more sophisticated markets that require compliance with stricter standards or a transition to larger markets that demand large-scale production and affordability (Gereffi & Fernandez-Stark, 2016). A significant benefit of upgrading the final market is the opportunity to reduce dependence on a particular market, thereby reducing the risks associated with dependence on

a single or a few buyers, while simultaneously increasing economic development opportunities (Fernandez-Stark et al., 2022).

However, upgrading models vary depending on the industry and the country, influenced by the structure of input-output interactions within the value chain and the institutional context of the individual country (Gereffi & Fernandez-Stark, 2016). For instance, some industries require sequential upgrading, where countries must acquire skills in a specific segment of the value chain before moving on to upgrading in the next segment (Gereffi & Fernandez-Stark, 2016).

Other than economic upgrading, other forms of upgrading have been identified. De Marchi et al. (2013, p. 65) define environmental upgrading as “the process by which economic actors move towards a production system that avoids or reduces the environmental damage from their products, processes, or managerial systems”. Certainly, environmental upgrading involves various areas in which businesses could improve to decrease their ecological impact. According to the authors, this could include aspects such as reducing greenhouse gas emissions and curbing land and resource consumption to levels below natural regeneration or production capacity. Practical examples of this kind of upgrading are “eco-labeling or marketing instruments that make consumers aware of their greening efforts” (De Marchi et al., 2013, p. 63). Environmental upgrading can take different forms and can be found in different stages of the value chain phases, such as in material sourcing, product design, production phase, distribution, and in the delivery of finished products (Onyango et al., 2014) but also encompass customer cooperation, life cycle assessment, supplier integration, green marketing, and waste management (Sarker et al., 2019). Companies are faced with the task of assuming accountability for their societal and environmental influence, extending beyond the primary company level to encompass their entire supply chain and all aspects associated with their production. It is important that companies therefore engage in more responsible and green behaviors with their practical actions. We can now describe the operations that companies can take for the going green process that enable an improvement in the overall sustainability.

First, when designing a product from a green perspective, it should be designed to be ecologically compatible, avoiding harm to the environment throughout its lifespan. The production phase should also be geared toward environmental sustainability. Therefore, the product should be engineered to possess characteristics compatible with efficiency, energy savings, minimal material waste, low environmental impact, and reduced production costs (Onyango et al., 2014). Some concrete examples that companies can adopt in the realm of green design, or eco-design, include using fewer materials and less energy, designing

biodegradable products or those that can be reused or recycled, as well as limiting the use of hazardous substances during product design (Sarker et al., 2019).

Also, environmental upgrading includes modifying the process to reduce emissions. In this context, the primary objective is to reduce waste generated during the production phases, employing renewable energy sources for lighting and heating, and utilizing eco-friendly packaging or packaging that can be reused or returned (Sarker et al., 2019). Such a focus also includes reduction of impacts in the logistics processes. Activities such as the use of green packaging and sustainable warehousing (Onyango et al., 2014), actions aimed at reducing CO₂ emissions using efficient transportation and order consolidation rather than favoring separate and smaller shipments, considering environmental effects in vehicle route planning (Sarker et al., 2019).

Other activities are aimed at closing the loops. Reverse logistics, as defined by Zheng and Zhang (see Onyango et al., 2014), is associated with recycling and waste management. It includes activities such as repairing defective or damaged items, collecting finished products that don't meet specifications, were damaged during transportation or malfunctioning, the use of biodegradable packaging, recycling raw materials during production, and reusing packaging materials (Onyango et al., 2014). Therefore, green logistics includes activities such as the use of green packaging and sustainable warehousing (Onyango et al., 2014, p. 2463), actions aimed at reducing CO₂ emissions using efficient transportation and order consolidation rather than favoring separate and smaller shipments, considering environmental effects in vehicle route planning (Sarker et al., 2019).

On the other hand, waste management activities involve categorizing solid waste generated during the production process, adequate planning for waste management, and the treatment of wastewater before dispersion into the environment (Sarker et al., 2019).

Collaboration with suppliers for environmental purposes is an equally relevant aspect in making the supply chain greener. This practice implies a partnership between the central company and its suppliers, involving intercompany business management with the latter (Sarker et al., 2019), and sharing knowledge and information aimed at improving overall company performance (Straka et al., 2021). Environmental supplier integration impacts company performance by influencing the accumulation of social capital, such as structural capital. This, in turn, affects the economic and environmental performance of leading firms, directly reflecting on overall company performance (Straka et al., 2021).

Other factors that enable a greener supply chain, according to Sarker et al. (2019), within the context of environmentally reduced procurement, include the selection of suppliers adopting the ISO 14001 certification system and the collaboration with suppliers to achieve shared

environmental goals. These aspects can be complemented by transmitting design specifications to suppliers, incorporating ecological requirements for purchased items. Furthermore, it's essential to assess environmental practices even among second-tier suppliers and conduct environmental audits to oversee the effectiveness of supplier internal management.

Also, integration of reduced environmental impact supply chain management with customer engagement refers to the degree of customer involvement in sustainable product development throughout the entire supply chain journey (Straka et al., 2021). Besides customer involvement in ecological innovation or product development, information sharing and direct collaboration with customers themselves are also involved, a concept known as "customer cooperation" (Sarker et al., 2019). The level of integration with sustainability-oriented customers also denotes the degree of connection between the organization and its customers (Straka et al., 2021).

And in the end, also life cycle assessment of a product is an important instrument to change toward greening. It conducts a detailed examination of the natural resource consumption of each product. It aims to use recycled materials during the production phase and considers environmental effects. It evaluates solid waste generation, water and energy use during production and consumption (Sarker et al., 2019). Through life cycle assessment, it's possible to assess environmental impacts throughout a product's entire life cycle, serving as a fundamental starting point for making the supply chain eco-friendly. This process enables the monitoring of areas where environmental impact is most significant, making it an essential tool for evaluating the overall environmental effect of a product, process, or service (Muthu, 2014).

3. RESEARCH QUESTIONS

The analysis reported so far suggests that reducing environmental impacts along the value chain is relevant, however that it is not necessarily straightforward nor that all firms will go the same way for it. Accordingly, in this thesis it is proposed to comprehensively investigate how firms, and especially lead firms are acting to reduce their environmental impacts and if any differences exist, across typologies of lead firms, in how they go in this direction.

In particular, the following research questions will be addressed.

RQ (1): What are the actions put in place by companies to reduce their environmental impacts and that of their value chains?

RQ (2): Are there variations in sustainability performance of firms and their value chains considering for their geographical location?

RQ (3): Which sustainable corporate actions along the value chain are predominantly implemented?

RQ (4): Are there variations in sustainability performance of firms considering for specific industry categories?

To address such research questions, it is decided to focus only on the textile and apparel sector. While analysing several industries at once could be difficult, as several factors could impact on firms' strategies, focusing on one industry only would allow a deeper. The choice to analyse the GVC of this sector stems from the fact that the impact of this industry on sustainability is considerable: in addition to the impacts that will be described in detail in the following paragraphs, it is believed that textile production contributes to approximately 20% of global pollution of all drinking water resources and has caused a carbon footprint of approximately 270 kg, due to the various production stages through which textile products are generated, emerging as one of the main sources of environmental degradation in 2020, particularly concerning the pollution of water resources and soil (Parlamento Europeo, 2023). As will be detailed in the following, both quantitative and qualitative analyses will be employed. The qualitative method is favoured for analysing the GVC of the textile sector, while the quantitative methodology is employed to address the research questions.

4. THE TEXTILE AND APPAREL VALUE CHAIN

4.1 UNDERSTANDING THE CONTEXT: THE GLOBAL CONTEXT OF THE TEXTILE AND APPAREL GLOBAL VALUE CHAIN

The global textile and apparel industry has experienced significant growth, with the industrialization and internationalization of the clothing sector beginning as early as the 1970s (Duke University, 2017; Yürek et al., 2019; Fernandez-Stark et al., 2022; Yu & Zhao, 2022) and, today, the apparel sector is part of an international supply chain (Yürek et al., 2019). The sector's globalization has led to clothing becoming a globally traded commodity (Duke University, 2017). In fact, clothing manufacturing is often recognized as a starting point for nations embarking on an export-focused industrialization process (Fernandez-Stark et al., 2022; Yu & Zhao, 2022). It is also seen as a driver of economic progress for developing countries, as entering the sector requires relatively low investment, as low fixed costs, and relatively basic technology, and it can absorb a substantial amount of unskilled labour (Gereffi & Memedovic, 2003; see Fernandez-Stark et al., 2022; Yu & Zhao, 2022).

Today, we talk about a global industry, with production facilities located in developing countries, benefiting from various competitive economic advantages, and gaining value across value chain stages such as design, marketing, distribution, and product sales. These stages are managed by powerful companies in contractual terms and through established retail chains (Duke University, 2017). Activities like fashion, branding, and the development of technical textile products generate value throughout the entire chain (Yürek et al., 2019).

Global companies dictate decisions about what to produce, where, by whom, and at what price (Fernandez-Stark et al., 2022). These major enterprises include retailers and brand owners, typically located in key market regions like Europe, Japan, and the United States (Fernandez-Stark et al., 2022).

The prevailing practice involves these companies' outsourcing production to a global network of manufacturers located in developing nations, offering competitive costs (Fernandez-Stark et al., 2022). These manufacturers have become more competitive in the production segment due to the gradual elimination of the Multi-Fiber Arrangement (MFA) by the World Trade Organization (WTO). The removal of quotas and preferential tariffs previously extended to exporting countries towards the United States and the European Union has made developing countries with their low-cost labour more competitive in the manufacturing segment of the industry (Duke University, 2017). Meanwhile, these companies and major retailers carry out the most strategic activities within the clothing value chain, such as design creation, branding,

distribution, product promotion, and sales, either near their local operations or in proximity to key global markets (Fernandez-Stark et al., 2022; Duke University, 2017).

With the evolution and increasing complexity of this global operational model, it has become increasingly common for highly skilled intermediaries to take on the role of coordinating these intricate networks (Fernandez-Stark et al., 2022). In the meantime, buyers oversee the entire production process (Fernandez-Stark et al., 2022), managing activities that yield higher added value. Therefore, it can be concluded that the multiple and distinct characteristics that outline this sector induce a high level of competition (Yu & Zhao, 2022).

4.1.1 PRODUCER GEOGRAPHY AND FAST FASHION

Despite cost-effective labour and skills being critical factors in the global sourcing process since 2005, contributing to the establishment of a predominant Asian supply chain, other aspects have come to the forefront in the 2010s (Fernandez-Stark et al., 2022). In recent years, two new elements have emerged that started to impact the global distribution of the industry: the concept of fast fashion and increased ethical and environmental awareness among buyers (Fernandez-Stark et al., 2022).

The evolution of the fast fashion business model and the growth of "fast fashion" brands such as Inditex (also known as Zara), Fast Retailing (Uniqlo, J. Brand), and Hennes & Mauritz (H&M) have begun to reshape the operational paradigm of the industry (Fernandez-Stark et al., 2022). These occurrences necessitated the adoption of a flexible production system capable of adapting to faster sales cycles and an increasing focus on ethical, social, and environmental issues related to clothing production (Fernandez-Stark et al., 2022).

The concept of fast fashion involves offering trendy clothing at affordable prices by introducing new designs to the market within a period of just two to six weeks, allowing the market itself to influence what needs to be produced (Fernandez-Stark et al., 2022). This dynamic demands a highly responsive supply chain that supports full integration between fabric production and clothing manufacturing, promoting geographical proximity while requiring a wide range of skills across various product categories (Fernandez-Stark et al., 2022). This type of production model favours locations with short shipping distances to the market (Fernandez-Stark et al., 2022). For example, the European fast fashion industry has significantly relied on Eastern European countries and the Middle East and North Africa regions, including Turkey, Morocco, Egypt, and Tunisia (Fernandez-Stark et al., 2022). Buyers in fact are seeking advantageous supply solutions that are geographically close, to

expedite delivery times, and adhere to ethical and environmental standards while also maintaining market access advantages (Fernandez-Stark et al., 2022).

The fast fashion business models allow for low inventory, mitigating inventory uncertainty and contributing to improved economic performance of brands (Arigo, 2016; Y. Li, Zhao, Shi, & Li, 2014; see Fernandez-Stark et al., 2022). However, so far, there is little evidence to support the idea that fast fashion has caused a realignment of the supply chain towards more environmentally friendly or geographically closer positions to the market (Fernandez-Stark et al., 2022).

Nevertheless, a growing interest is emerging among buyers to move some of the production to locations with vertically integrated and flexible supply chains to limit potential disruptions (Fernandez-Stark et al., 2022). However, identifying alternative locations that can ensure consistent supply remains a challenge (Fernandez-Stark et al., 2022). Some analysts suggest that regionalizing the supply could be the most effective strategy for brands (Fernandez-Stark et al., 2022). In the Western hemisphere, this could lead to Central America playing a more significant role in serving a larger share of the vast U.S. market (Fernandez-Stark et al., 2022).

4.2 KEY PRODUCERS

From a geographical perspective, the market is primarily divided into five regions: the United States (US) and the European Union (EU) as the main importers, while China, the South Asian region, and the Southeast Asian benchmark countries constitute the primary producing nations (Duke University, 2017).

Prominent industry players in terms of production include countries such as China, Bangladesh, and Vietnam. On the other hand, major multinational retail giants like Inditex, H&M, and Nike are decisive for importation and retail distribution (Duke University, 2017). Another significant portion of the industry's sales comes from department stores like Macy's and Walmart, with an increasing number of customers opting to purchase clothing online through platforms like Amazon and similar services (Duke University, 2017).

Let's now shift our focus to analysing the key producers and consumers on a country level.

4.2.1 THE RISE OF CHINA

Global supply patterns have undergone significant changes throughout the industry's evolution, driven by shifts in trade agreements and economic dynamics, as well as the entrance or exit of supplier nations: for instance, China's accession to the WTO brought about

sudden and notable changes in the geographical distribution of production (Fernandez-Stark et al., 2022). With the lifting of these restrictions, China greatly benefited and rapidly increased its share of the global market from 26% in 2005 to a peak of 41% in 2011 (Fernandez-Stark et al., 2022).

China's industrial dominance stems from factors such as low-cost labour, favourable land and energy costs, historical connections to the textile sector, and a favourable combination of economies of scale and efficient logistic services that have reduced production times (Fernandez-Stark et al., 2022). Today, the significant growth of export-oriented Chinese companies in the clothing sector is attributed to various factors beyond cost, including lax inspections of imported materials and exported products at customs, less enthusiastic implementation of environmental and labour regulations, and preferential trade agreements with other Asian regions (Yu & Zhao, 2022).

Furthermore, China has developed robust expertise in various product categories and across all textile segments (Fernandez-Stark et al., 2022). The success of East Asia has been driven by the transition from simple assembly of imported inputs, traditionally associated with Export Processing Zones (EPZs), to a more integrated and higher value-added form of exportation known as full-package or Original Equipment Manufacturing (OEM) (Gereffi & Memedovic, 2003). Due to its cost advantage and the aforementioned factors, China quickly became the leading exporting country in this field (Fernandez-Stark et al., 2022). Currently, the most prominent suppliers in the global industry are predominantly Asian, with China accounting for approximately 76% of the total global workforce in the sector (Fernandez-Stark et al., 2022).

4.2.2 OTHER MAJOR PRODUCING COUNTRIES

By 2011, Bangladesh and Vietnam had already established themselves as significant players among major exporting countries (Fernandez-Stark et al., 2022). Following China's rise within the WTO, they experienced considerable growth in both absolute clothing exports and their market share, further solidifying their position as key global actors in the clothing industry (Fernandez-Stark et al., 2022). Additionally, both Cambodia and Myanmar followed this trend, showcasing noteworthy export growth over the last decade (Fernandez-Stark et al., 2022).

Overall, these Asian nations have gained substantial advantages due to their low labour costs, which are even more competitive than China's, their proximity to China and regional material production, as well as a significant influx of foreign direct investment and supportive governmental policies (Lopez-Acevedo & Robertson, 2016; see Fernandez-Stark et al., 2022).

Moreover, other countries with cost-effective labour, such as Turkey and Pakistan, are increasingly participating in the production and export market (Fernandez-Stark et al., 2022). Although Mexico was one of the major exporting countries during the 2000s, its ability to compete with Asian suppliers gradually diminished starting in 2011 (Fernandez-Stark et al., 2022). Furthermore, over the past decade, no Latin American country has managed to secure a position among the top ten exporters in the industry (Fernandez-Stark et al., 2022).

4.2.3 THE TOP 10 INDUSTRY PLAYERS

According to research conducted by Duke University (2017), the ten leading clothing exporters in terms of monetary value in 2015 were China, the European Union, Bangladesh, Vietnam, Hong Kong (China), India, Turkey, Indonesia, Cambodia, and the United States. Among these top exporters mentioned above, we also find Europe and the United States. While they hold significance in exports, they are not clothing producers themselves: countries within EU, such as France, Germany, and Italy, primarily engage in exporting high-fashion apparel (e.g., Versace, Prada, Armani in Italy; Coco Chanel, Hermes, Louis Vuitton in France; and Adidas, PUMA, Hugo Boss in Germany) to countries with lower labour costs; these items are then re-exported at a higher price, turning these countries into intermediaries that add value to clothing (Duke University, 2017).

4.2.4 COMPETITIVENESS FACTORS

Competitiveness factors in the apparel sector led to continuous shifts in the localization of exporters and destination markets and, furthermore, the significance of these factors changes over time due to the evolution of the global production model and international trade policies (Fernandez-Stark et al., 2022).

Competitiveness factors are closely tied to the capabilities that buyers seek in their suppliers: leading companies take into consideration a range of factors in their sourcing decisions, specific to the country and supplier company (Abdulsamad et al., 2015). However, there are common trends relevant to the sourcing strategies of major global players, despite differences among different types of leading companies (Abdulsamad et al., 2015). The apparel value chain relies on international standards to coordinate supplier activities (Fernandez-Stark et al., 2011; Yu & Zhao, 2022).

Among them, within the textile supply chain, factors such as cost, quality, delivery time and punctuality, flexibility, and reliability, as well as adherence to social and environmental compliance, are included (Fernandez-Stark et al., 2022; Abdulsamad et al., 2015; Fernandez-

Stark et al., 2011; Yu & Zhao, 2022), including access to inputs and raw materials, offering complete services, and having a wide range of production skills (Fernandez-Stark et al., 2022, p. 31; Abdulsamad et al., 2015). Now we briefly analyse them below.

Access to markets without tariffs, both for apparel products and for sourcing textile inputs for production, and easy availability of materials and diverse inputs, are significant factors for the competitiveness of producing countries (Fernandez-Stark et al., 2022; Abdulsamad et al., 2015).

The importance of labour cost is implied; moreover, the relevance of this factor also arises from the fact that consumers are placing greater emphasis on price, thus pushing retailers and brand marketers to focus on cost reduction (Cattaneo et al., 2010) when possible. The textile industry has shifted to locations where labour is very cheap, such as Mexico, China, Vietnam, and Bangladesh, and now also in Cambodia and Ethiopia; while sub-Saharan Africa is viewed as the final frontier for cost-efficient manufacturing (Fernandez-Stark et al., 2022).

Despite underpaid labour, companies must provide quality along with low prices, flexible production, and services (Cattaneo et al., 2010). Buyers are thus seeking quality products, and consequently, labour skills are essential (Fernandez-Stark et al., 2022). As a result, the wider the range of available skills, the more competitive a location becomes; in this regard, Asia holds a significant advantage (Fernandez-Stark et al., 2022).

Furthermore, services offered as part of a "complete package" which go beyond production capabilities, such as material sourcing, financial services, product development (Abdulsamad et al., 2015), design, inventory management, and goods transportation, along with the adoption of suitable technologies to facilitate these operations (Cattaneo et al., 2010), represent significant factors considered by buyers. Also, efficiency and reliability in transportation infrastructure positively influence a production location: delivery times, quick access to textile inputs, and efficient logistics are more crucial than geographical proximity (Fernandez-Stark et al., 2022; Abdulsamad et al., 2015). The presence of local textile sectors can still benefit the supply chain (Fernandez-Stark et al., 2022).

Another critical factor for selecting supplier companies is their adherence to social and environmental policies in response to the pressure of Corporate Social Responsibility (CSR) campaigns by companies themselves, NGOs, and sustainability-oriented consumers (Abdulsamad et al., 2015). The increasing demand from consumers for higher social and environmental standards has elevated the need for transparency in the supply chain both in the US and in the EU (Cattaneo et al., 2010). Leading companies are requiring their suppliers to be more transparent in these areas to ensure that the production chain reflects the sustainability principles of the brands themselves (Cattaneo et al., 2010).

The competitiveness is also affected by factors such as local market presence, political stability, and governmental backing but, despite political instability, certain countries, or regions, like Cambodia and Myanmar, continue to flourish (Fernandez-Stark et al., 2022). Therefore, in the selection decision of a supplier company, certain variables, such as cost, become even more crucial in the context of growing competition (Abdulsamad et al., 2015), and might be prioritized at the expense of other considerations, even though suppliers need to meet all or most requirements, rather than just one or two (Cattaneo et al., 2010).

Buyers are imposing stricter requirements on producers, demanding higher quality products, additional capabilities beyond production, and faster response times, all at lower costs (Cattaneo et al., 2010). Suppliers must respond to buyers' requests, with greater economic and decision-making power in their hands, to maintain orders, increase volume, and reduce costs (Talking Strategy 2008; see Cattaneo et al., 2010). The ease of entry into the industry has allowed numerous factories from different nations to enter the global apparel trade, leading to a situation where an excessive number of factories are competing for a limited number of orders (Cattaneo et al., 2010). This has resulted in excess capacity in the global apparel industry, creating intense competition, especially in low-cost countries (Cattaneo et al., 2010). In the short term, this situation has significantly raised the bar to be considered global competitors; producers must demonstrate greater creativity and completeness in developing their products and services (Technopak 2007; see Cattaneo et al., 2010).

4.3 MAPPING THE TEXTILE AND APPAREL GVC

4.3.1 ACTORS IN THE GVC TEXTILE AND CLOTHING

The global clothing supply chain comprises 4 types of actors that operate along the entire chain: focal companies, i.e., buyers; global clothing brands and retailers; clothing manufacturers and intermediaries, such as first-tier suppliers; suppliers of textile components, such as yarns and fabrics; and finally, suppliers of raw materials and other auxiliary inputs such as finishing, machinery, and chemical dyes (Abdulsamad et al., 2015).

Lead companies are often based in key markets, including Europe, the United States (Abdulsamad et al., 2015; Yu & Zhao, 2022), and Japan (Yu & Zhao, 2022). As already saw, in the clothing value chain, these organizations are often responsible for critical activities such as industrial design, advertising, and sales, and they subcontract the production process to a wide range of suppliers globally (Yu & Zhao, 2022).

4.3.2 TOP LEAD FIRMS

Top leading firms hold considerable market power due to their significant size: this is reflected in their current emphasis on value-adding activities along the value chain and their outsourcing of production to third parties (Cattaneo et al., 2010).

Fernandez-Stark et al. (2022) provide an analysis of the main categories of lead firms in the sector. Initially, the authors divide top leading firms into two main categories: retailers and non-retailers or brands.

The retailer's category includes major department store chains, such as Walmart and Target supermarkets, as well as department stores like Marks & Spencer; however, these companies are not involved in producing the clothing they market and, recently, several of these department stores have faced financial insolvency as a result of the transition to online sales (Fernandez-Stark et al., 2022). In addition to traditional leading companies with physical stores, powerful online sales companies have also emerged, including Western giants like Amazon and Asian e-commerce platforms like AliExpress and Shein, the latter of which, by 2020, reached a market share in the fast fashion sector equal to the combined share of H&M and Zara (Fernandez-Stark et al., 2022).

The category of non-retail actors mainly includes brand owners, who may or may not be involved in the production of their products (Fernandez-Stark et al., 2022). Among the major brand owners are companies like VF Corporation and Inditex (Fernandez-Stark et al., 2022).

From this initial categorization, it is further clarified that there are three main types of lead firms in the GVC of clothing (Cattaneo et al., 2010). The lead firm types are mixed retailers/mass merchants, specialty retailers, and brand owners (Fernandez-Stark et al., 2022). Brand owners can further be divided into brand marketers and brand manufacturers (Abdulsamad et al., 2015), resulting in four main types of lead firms in the clothing value chain: mass retailers, specialty retailers, brand marketers, and brand manufacturers.

In the case of brand manufacturers, the lead company is also the clothing manufacturer (Abdulsamad et al., 2015). Brand manufacturers own and control clothing production facilities, oversee textile material selection, and supervise marketing and branding strategies along the entire chain, often having direct business agreements with manufacturing countries (Abdulsamad et al., 2015, p. 11), making it more likely to coordinate the sourcing of production inputs and intermediate components (Fernandez-Stark et al., 2022; Cattaneo et al., 2010). Examples of brand manufacturers include Benetton (Abdulsamad et al., 2015) and Zara (Fernandez-Stark et al., 2022).

On the other hand, brand marketers manage branding and marketing activities; the physical production of goods is separate from design and marketing: they own the brands but not the production facilities and are thus considered factory less producers (Abdulsamad et al., 2015; Gereffi & Memedovic, 2003). Examples of brand marketers include Nike, Levi's, Adidas, Hugo Boss, and LVMH (Abdulsamad et al., 2015). Both types create brands that are marketed through outlets or department stores, or through manufacturer- or marketer-owned specialized stores (Abdulsamad et al., 2015; Fernandez-Stark et al., 2022). From the consumer's perspective, there is no distinction between lead manufacturing companies and those responsible solely for marketing activities (Abdulsamad et al., 2015).

Brand owners also have the option to grant licenses to external parties for the utilization of their brand name, receiving remuneration in exchange (Abdulsamad et al., 2015). In this situation, the company receives payment for the right to use the brand, while the agent or clothing manufacturer takes on the burden of distributing the finished product (Abdulsamad et al., 2015). In this context, the brand holder is not directly involved in selling the product to retailers or end consumers (Abdulsamad et al., 2015). In recent decades, there has been a decrease in the brand manufacturers' category as producers have shifted their attention towards more profitable segments of the chain by outsourcing production-related tasks to external parties (Abdulsamad et al., 2015). This trend has been observed over the past twenty years (Abdulsamad et al., 2015).

Similarly, to brand marketers, retailers, divided into mass merchants and specialty retailers (Cattaneo et al., 2010, p. 176), do not own production facilities (Abdulsamad et al., 2015). Mass merchants are further categorized into hypermarkets and discount stores, department stores, and online-only retailers (Fernandez-Stark et al., 2022). Hypermarkets and discount stores offer a wider range of products, and thus the term "store brands" is more appropriate in this specific case instead of using the expression "private label" (Fernandez-Stark et al., 2022). A practical example of this subcategory is Walmart (Fernandez-Stark et al., 2022).

Department stores, on the other hand, offer only in-house, exclusive, or licensed brand products available exclusively in the retailer's stores; typical examples are Marks & Spencer and Harrods (Fernandez-Stark et al., 2022).

Online retailers exclusively provide online platforms for selling clothing items and are growing and spreading rapidly in the market (Fernandez-Stark et al., 2022). Common examples are Shein, Amazon, and Aliexpress (Fernandez-Stark et al., 2022).

The subcategories of specialty retailers include specialty stores and specialty apparel stores (Fernandez-Stark et al., 2022). The former refers to a diverse offering of brands, including private, exclusive, and others (Fernandez-Stark et al., 2022), such as AW Lab. Instead, the

latter, specialty apparel stores, develop and own in-house brand products available only in their stores, such as Abercrombie & Fitch, C&A, Mango, Gap, and H&M (Fernandez-Stark et al., 2022).

The key competencies of retailers are primarily focused on marketing and branding, and they often have limited knowledge of the production practices of the products they purchase, and, for this reason, they prefer to work with suppliers or intermediaries capable of managing and providing a complete package covering all production and logistical activities (Abdulsamad et al., 2015). Unlike brand manufacturers, brand marketers, and retailers and professionals in the marketing of brands choose sourcing strategies that involve collaborating with original equipment manufacturers or complete solutions, purchasing ready-made clothing (Gereffi & Memedovic, 2003). In this approach, the buyer determines and provides detailed specifications for the clothing item, while the supplier is responsible for obtaining the necessary materials and coordinating all aspects of the production process: from fabric selection and cutting to garment assembly, washing, finishing, packaging, and distribution (Bair and Gereffi 2001; Bair 2006; see Cattaneo et al., 2010), relying on a global supply network (Gereffi & Memedovic, 2003).

In contrast, brand manufacturers tend to create production networks focused on clothing assembly using imported inputs; in this approach, the production networks of brand manufacturers are predominantly regional (Gereffi & Memedovic, 2003).

Lead firms in this sector are not necessarily traditional vertically integrated producers, nor are they necessarily involved in the production of finished products (Gereffi & Memedovic, 2003). Lead firms, such as fashion designers or private label retailers, can be located upstream or downstream in production, or they may be involved in the supply of critical components (Gereffi & Memedovic, 2003).

4.3.3 INTERMEDIARIES

Due to the evolving expansion and complexity of the apparel industry, intermediaries have emerged between producers and global buyers (Fernandez-Stark et al., 2022). These actors have gained an increasingly crucial role within the chain, as they manage the relationships and connections between them (Fernandez-Stark et al., 2022).

As an alternative to direct sourcing, leading firms may choose a form of indirect procurement; and when a lead firm chooses to involve an intermediary, limited or even no direct interaction with actual clothing manufacturers may occur (Abdulsamad et al., 2015).

This procurement model through intermediaries is more commonly preferred by buyers requiring smaller quantities of an item (Cattaneo et al., 2010) or by large brands and

specialized retailers only for secondary product lines that complement their main core (such as accessories) (Abdulsamad et al., 2015). The benefits arising from using a procurement intermediary stem from the absence of operational size limitations; the intermediary still possesses significant purchasing power and enables operational flexibility and risk-sharing among suppliers (Cattaneo et al., 2010).

Examples of intermediaries include multinational and national agents, who may not offer the same range of services as international agents but possess in-depth knowledge of the domestic market; network suppliers; direct intermediaries; national importers, responsible for sourcing from multiple countries on behalf of the buyer; and distributors, who are in charge of the logistics and additional activities that contributes value beyond the physical assembly of the end item (Abdulsamad et al., 2015). A concrete example of an intermediary pioneer in the sector is Li & Fung Limited, headquartered in Hong Kong (China), which is still growing within the market and is also involved in endeavours associated with product innovation, promotions, and brand establishment (Abdulsamad et al., 2015; Cattaneo et al., 2010).

Alternatively, instead of an external intermediary or an unaffiliated third party, the focal enterprise can leverage overseas-owned procurement offices in their key producing countries: this allows leading companies to directly interface with first-tier suppliers, saving between 4 to 8 percent on wholesale prices, which would otherwise be charged by procurement intermediaries (Cattaneo et al., 2010).

4.3.4 APPAREL MANUFACTURERS

The primary company interface with first tier supplier in sourcing the final product. This process can be managed directly or indirectly. When focal companies require large quantities of a particular product, direct sourcing is preferred as it eliminates an economic step (the intermediaries one); conversely, the model of indirect sourcing is favoured when buyers require smaller volumes of specific items (Abdulsamad et al., 2015) and the presence of an agent is necessary since they have more decision-making power in negotiations with the manufacturer, possessing purchasing power and the ability to distribute risk among suppliers.

In the past twenty years, prominent corporations have progressively enhanced the efficiency of their supply networks and now there are seeking for a reduced number of suppliers but with more capabilities in order to fulfil their requirements (Fernandez-Stark et al., 2022).

While cost was historically the primary focus in supplier selection, today these leading companies seek to streamline and reduce costs associated with complex global production networks, placing greater emphasis on strategic partners (Fernandez-Stark et al., 2022).

Although cost remains a crucial variable in supplier choice, buyers now search for suppliers capable of offering a wide range of products with consistent quality and reliability, along with fast delivery times (Lopez-Acevedo & Robertson, 2016; see Fernandez-Stark et al., 2022).

This streamlining process has led to the emergence of increasingly influential first-tier suppliers, transitioning from mere Cut-Make-Trim (CMT) operators to offering Original Equipment Manufacturing or Original Design Manufacturing (ODM) functions (Fernandez-Stark et al., 2022). Currently, the management of the CTM product life cycle is outsourced to other external suppliers, while first-tier suppliers also handle supply chain coordination within the industry and maintain a more direct relationship with leading companies (Fernandez-Stark et al., 2022). Additional roles assumed by top-tier suppliers include aspects related to product design and development, stock management, logistics, as well as production planning (Kumar, 2020; see Fernandez-Stark et al., 2022).

Therefore, first-tier suppliers possess the necessary expertise to fulfil various functions, offering customer services, technological capabilities, as the supply chain becomes increasingly digitized, and supply chain management (Frederick, 2015; see Fernandez-Stark et al., 2022).

Suppliers, and the supplying countries, are driven by leading companies to implement uniform codes of conduct to monitor and make transparent the supply chain in relation to social and environmental concerns (Fernandez-Stark et al., 2022). Examples of first-tier manufacturers include transnational manufacturers, regional apparel manufacturers and single country manufacturers (Abdulsamad et al., 2015). Transnational clothing manufacturing companies often serve as the main suppliers to leading companies and adopt a supply chain approach that encourages greater information sharing between buyers and manufacturers (Abdulsamad et al., 2015).

Modular production networks offer the lowest costs to leading companies (Cattaneo et al., 2010). Therefore, logistics coordination and procurement are often the first functional activities that leading companies are willing to relinquish, transferring responsibility for these to first-tier suppliers (Cattaneo et al., 2010).

Apparel manufacturing companies are the entities or suppliers tasked with performing the cutting and finishing of the final clothing item to create a completed product ready for final sale, as well as coordinating the entire production process (Abdulsamad et al., 2015). Clothing manufacturers can be distinguished based on several factors, comprising the doings they oversee or carryout to enhance worth; these value-adding tasks incorporate the assembly procedure, Free-on-Board Incoterms (also known as FOB), procuring materials (or manufacturing), design solutions, new product development/design, and brand construction

and progression (Abdulsamad et al., 2015). These value-adding actions are related with specific sorts of clothing producers that represent a functional improvement: the process of assembly is connected to the Cut-Make-Trim manufacturing approach, while logistics and design services fall under the category of "full package" services and, in the meantime, the third and fourth tasks correspondingly signify ODM and OBM (Abdulsamad et al., 2015).

The actions associated with CMT procedures are frequently accompanied by subcontractors, who do not establish a direct connection with the primary company but rather offer services like assembly or finishing in partnership with the main supplier and these kinds of subcontractors usually operate on a case-by-case basis and are often bound by brief or seasonal agreements (Abdulsamad et al., 2015).

Thus, in conclusion in order to summarize, in the markets of the US and EU is common that brand owners and apparel manufacturers are distinct entities, and, in such cases, the focal company need to procure clothing products from external suppliers or agents (Abdulsamad et al., 2015). Brand owners and retailers can manage this process by engaging in direct communication and interaction with clothing manufacturers, known as direct sourcing, or by opting for an indirect approach through intermediaries or a third party, referred to as indirect sourcing (Abdulsamad et al., 2015).

4.3.5 SECOND TIER SUPPLIER

As we have seen in the previous subsection, first-tier suppliers further subcontract low-value CMT activities to other suppliers. Second-tier suppliers are primarily Asian companies located in Hong Kong, Taiwan, and Korea (Fernandez-Stark et al., 2022). These suppliers are responsible for fabric cutting, garment sewing, and trimming, but they do not handle the supply of textile materials or accessories (Fernandez-Stark et al., 2022). These operations constitute basic functions in the supply chain that do not add much value to the chain, and as a result, they struggle to capture significant value from the chain itself (Fernandez-Stark et al., 2022).

In addition to the textile component consisting of fabrics, fibres, and yarns obtained from raw materials like cotton, silk, and linen or chemicals, which are subsequently transformed into fabrics or knits and assembled by garment manufacturers, there is the accessories sector that includes items such as thread, zippers, buttons, hangers, labels, and other small details added to finished products (Abdulsamad et al., 2015). Moreover, there is the non-textile input sector necessary for apparel production, which also encompasses equipment and machinery (like

sewing machines, cutters, markers, software), and chemicals for dyeing and finishing the articles (Abdulsamad et al., 2015).

4.3.6 STAGES IN THE TEXTILE AND APPAREL VALUE CHAIN

Yu & Zhao (2022) and Fernandez-Stark et al. (2011) identify six distinct value-adding activities within the Textile and Apparel Global Value Chain (T&A GVC): Research and Development (R&D) of new products, design, purchases, production networks (composed of both first-tier suppliers and their national and international subcontractors), logistics (procurement and distribution/export), marketing and branding, and services. The authors also emphasize that the most significant value-added stages consist of intangible services occurring before and after the apparel manufacturing process (Yu & Zhao, 2022). In the GVC model for the textile and apparel industry shared by Gereffi & Memedovic (2003) and Fernandez-Stark et al. (2022), the pre-production logistics phase is included, in addition to the other stages identified by Yu & Zhao (2022) and Fernandez-Stark et al. (2011).

These activities are coordinated through collaboration among lead firms, garment manufacturers, and intermediaries (Abdulsamad et al., 2015). Abdulsamad et al. (2015) also differentiate between various value-added stages in tangible and intangible phases: tangible stages relate to garment production and the supply chain of textile components, while intangible stages, also referred to as "immaterial" by Fernandez-Stark et al. (2011, p. 12), involve activities that contribute to the increased economic value of apparel products, encompassing activities upstream and downstream of tangible production activities. The T&A GVC phases are:

- Research and Development (R&D): Companies engaged in R&D activities, along with initiatives focused on improving the physical product or processes, as well as market and consumer research, are part of this value-adding function (Fernandez-Stark et al., 2011; Yu & Zhao, 2022).
- Design: This phase involves actors, individuals, and firms providing product creation and development services (Fernandez-Stark et al., 2022). Design is divided into creative design, primarily focused on aesthetics to capture consumer attention, and technical design, focused on product performance improvements, cost reduction, and competitive advantages (Fernandez-Stark et al., 2011; Fernandez-Stark et al., 2022).
- Pre-Production Logistics (OEM): This phase encompasses the inbound procedures involved in purchasing and physically transporting goods, clothing items, fabrics,

trims, and accessories (Fernandez-Stark et al., 2011; Fernandez-Stark et al., 2022; Yu & Zhao, 2022).

- **Apparel Production:** Garment manufacturers cut and sew fabrics directly from spinning mills (Fernandez-Stark et al., 2022). These companies produce complete lines of ready-to-wear clothing and/or made-to-measure clothing (Yu & Zhao, 2022; Fernandez-Stark et al., 2022).
- **Distribution/Logistics (OEM):** After the apparel production process, the distribution phase, also known as outbound, follows through a range of participants like distributors, intermediaries, logistics companies, and other entities (Fernandez-Stark et al., 2011; Yu & Zhao, 2022), which engage in value-contributing activities beyond production (Fernandez-Stark et al., 2022).
- **Marketing and Sales (OBM):** Activities involved in this stage of the value chain concern pricing, distribution, and sale of the finished product, including marketing, advertising, and branding activities; these are primarily carried out by lead firms (Fernandez-Stark et al., 2011; Fernandez-Stark et al., 2022).
- **Services:** This final stage involves any type of activity a company provides to its suppliers, customers, or workers, often as a strategy to differentiate itself in the market, such as offering consultancy services for international clothing companies or fashion trend analysis (Fernandez-Stark et al., 2011; Yu & Zhao, 2022).

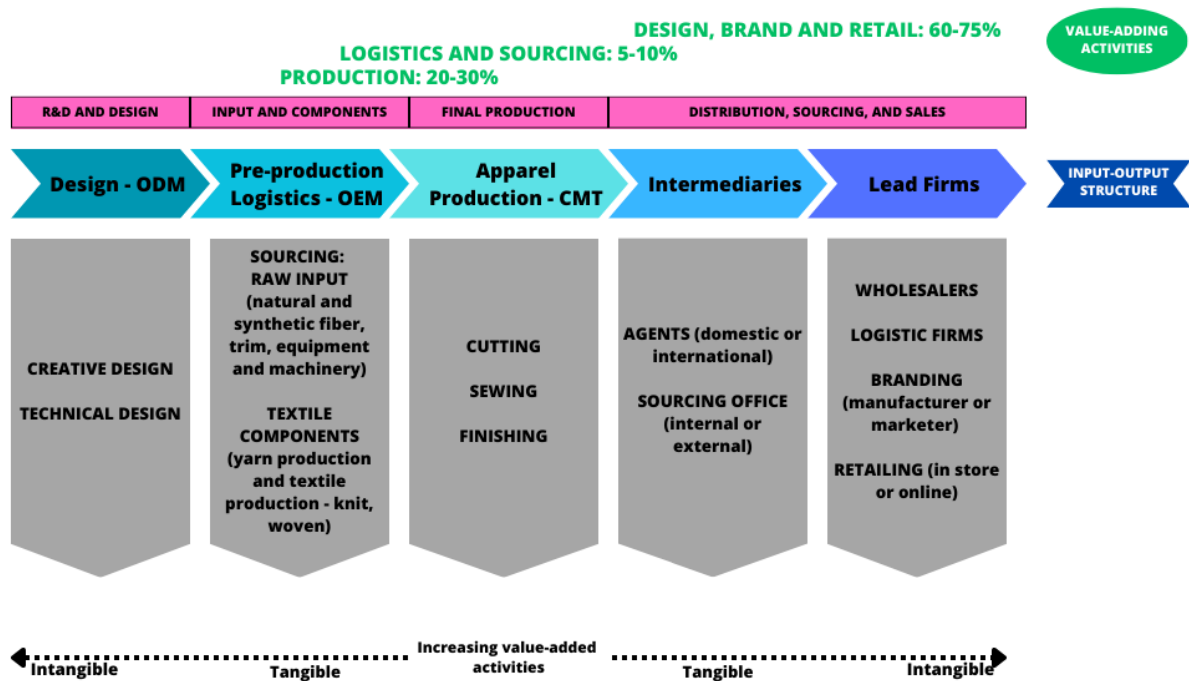
The design phase plays a pivotal role, as it is during this stage that the environmental impacts arising from product development are anticipated and carefully assessed. Within the design phase, choices are made among various alternatives, with the aim of selecting the product with the least possible impact in terms of waste production, chemical substance usage, air pollution emissions, energy consumption, and greenhouse gas production, taking into consideration additional criteria (Eryürük, 2012). As noted by Eryürük (2022), environmental impacts can be identified at each stage of the textile product's lifecycle, ranging from raw material production to the retail phase. The primary factors contributing to these impacts encompass excessive water resource consumption, the utilization of harmful chemical agents, and high energy demands. For instance, in the raw material manufacturing process within the textile industry, at least 8,000 chemical components with toxic properties are employed. This same trend continues into the garment production phase, where it becomes imperative to use additional environmentally and human health-detrimental chemical agents (Eryürük, 2012).

The adoption of eco-friendly alternatives, especially in these critical segments of the value chain, results in clothing production that has a reduced environmental footprint, thereby

contributing to an overall reduction in ecological impact. It is worth noting that the other phases of the T&A GVC also impact the environment, whether through the use of non-eco-friendly materials in packaging during garment packaging processes or through pollution generated during transportation at all stages of logistics, among other factors.

The structure of the value chain in the textile and apparel sector is now presented through a graphical representation (see Figure 5).

Figure 5: Structure of T&A GVC



Source: own elaboration based on Abdulsamad et al. (2015) and Fernández-Stark et al. (2022)

The main segments comprising the global apparel value chain, as previously described, are also depicted. This approach enables us to gain a clear and immediate understanding of the various activities involved throughout the entire process, from the conceptualization of a garment to its distribution and marketing.

Across the different phases of the value chain, such as design, procurement of raw materials and textile components, production, distribution, and marketing, the relative percentages of the retail price of clothing are further highlighted. These percentages indicate how much of the final price of a garment is attributed to specific activities that add value to the product. For example, these activities may encompass the actual manufacturing, the design process, or the brand-associated value.

The value chain figure distinctly illustrates the value-adding activities within the apparel value chain (represented in green). These activities are crucial for enhancing the product and

making it more appealing to consumers. Simultaneously, various steps of the supply chain (depicted in pink) that focus on the physical transformation of raw materials into finished products and the provision of additional services, such as raw material sourcing and distribution, are identified.

In this manner, a comprehensive view of the dynamics of the value chain in the textile and apparel sector is obtained, facilitating an in-depth analysis of the diverse components that contribute to the success of the final product in the market.

4.5 FORM OF GOVERNANCE

The apparel sector represents an example of a buyer-driven supply chain, a common characteristic in labour-intensive consumer goods industries, highlighting power disparities between producers and global buyers of finished products (Abdulsamad et al., 2015). Cattaneo et al. (2010), Gereffi and Memedovic (2003), Fernandez-Stark et al. (2011), Fernandez-Stark et al. (2022), and Yu & Zhao (2022) assert that the T&A industry is indeed the ideal model to represent a buyer-driven value chain.

The GVC presents power imbalances between suppliers of complete fashion products and buyers of those products (Cattaneo et al., 2010; Gereffi & Memedovic, 2003; Fernandez-Stark et al., 2022; Yu & Zhao, 2022).

Lead firms stand apart from other companies in the chain due to their dominant market position, resulting from brand control and marketing strategies at points of sale for the final product (Abdulsamad et al., 2015). The increasing globalization of the sector, consolidation among retailers, and the growing presence of suppliers worldwide have further accentuated power imbalances between lead firms and factory suppliers (Fernandez-Stark et al., 2022).

In situations where lead firms control the activities that contribute most to the value of apparel products (Abdulsamad et al., 2015) and profits stem from scale, quantity, and technological innovations, hence the gains in buyer-driven supply chains come from a “combination of high-value research, design, sales, marketing, and financial services” and these elements let sellers, designers, and dealers to act as strategic intermediaries, connecting companies and overseas suppliers (Fernandez-Stark et al., 2011, p. 11; Gereffi & Memedovic, 2003; Yu & Zhao, 2022). Global buying firms, referred to as lead firms, hold considerable power in deciding what to produce, where to produce it, and which supplier to engage; furthermore, they possess significant negotiation power in determining the purchase price from suppliers (Fernandez-Stark et al., 2022). Additionally, by delegating clothing production to their

producers, lead firms can achieve substantial economic advantages, as these manufacturers offer highly competitive rates (Fernandez-Stark et al., 2022).

Apparel industry production is characterized by fierce competition and growing fragmentation, with increasing barriers to upgrading; in fact, textile production companies compete for obtaining contracts with global brands, and this left many suppliers with limited influence in the chain (Abdulsamad et al., 2015). Clothing suppliers, to become integral components of this supply chain, are required to tackle a range of challenges. One notable challenge is the necessity to develop and possess pertinent skills in these activities that contribute significant added value to the overall process (Bair 2005; Gereffi et al. 2001; see Cattaneo et al., 2010); however, these practices allow them to enhance their position within the value chain and derive greater value from their activities. Nevertheless, there still exists an unequal distribution of value along the chain (Abdulsamad et al., 2015; Cattaneo et al., 2010), and significant disparities persist between these two actors (Gereffi & Memedovic, 2003).

More specifically, within the apparel value chain, we find two main forms of governance: modular and market or captive relationships (Abdulsamad et al., 2015).

The modular power form refers to the relationship between the lead firm and the first-tier supplier (Abdulsamad et al., 2015): lead firms, as previously mentioned, stand out due to their dominance in purchasing and controlling activities that generate the most lucrative returns (such as branding, product design, innovative technologies, and consumer demand) (Abdulsamad et al., 2015) and they maintain a special form of connection with their primary suppliers, as constant communication with them is necessary. In fact, between the lead firms and clothing suppliers, a tight coordination and continuous exchange of knowledge are established (Gereffi et al., 2005). This ongoing communication and information sharing are crucial for the success of their collaboration. Furthermore, these proficient suppliers possess the ability to comprehend the requirements of the focal companies when it comes to crafting confirmation samples for the reference season. They are adept at analysing market trends and formulating relevant proposals. Additionally, they can engage in price negotiations, wielding a certain degree of influence in the negotiation process. They also autonomously manage delivery timelines to ensure punctual deliveries. Furthermore, they independently oversee the raw material procurement process. This trend has created opportunities for large multinational clothing manufacturers and intermediaries/agents to play a role in coordinating supply chain activities (Abdulsamad et al., 2015), thus assuming a strategic position in the value chain.

Conversely, the relationship between first-tier suppliers and their subcontractors is typically in the form of a market relationship (Abdulsamad et al., 2015). The first-tier suppliers are in fact responsible for coordinating the supply chain and therefore make decisions about which

factories to include in the chain (Abdulsamad et al., 2015). The second-tier suppliers act independently, competing intensely with each other to offer better, and serve very cost-effective products to their first-tier suppliers.

On the other hand, in situations where first-tier suppliers opt to outsource production to smaller second-tier suppliers, a complex captive relationship ensues. This dynamic necessitates an exceedingly precise coordination between first and second-tier suppliers as they must efficiently address numerous operational intricacies critical to the successful outcome of the product. It is imperative that the first-tier suppliers furnish very detailed and specific information pertaining to the raw materials and accessories to be utilized in production. Additionally, highly complete, and comprehensible instructions on how to assemble and construct the product in accordance with the specific requirements of large multinational corporations are required. In this context, second-tier suppliers become significantly reliant on their larger first-tier counterparts, as the success of production and the quality of the final product hinge on impeccable communication and cooperation among all involved parties.

4.6. ENVIRONMENTAL CHALLENGES IN THE APPAREL SECTOR: FOCUS ON ENVIRONMENTAL UPGRADING

The clothing industry is facing significant challenges, focusing on the dynamics of environmental and economic improvement. Fears concerning the industry's environmental effect have been raised due to a rise in the buying of disposable apparel (Fernandez-Stark et al., 2022). The sector's poor sustainability practices are becoming more well known (Fernandez-Stark et al., 2022) and according to EMF & CFI (2017; see Fernandez-Stark et al., 2022), issues like the intensive use of water in cotton production, dyeing-related pollution, emissions related to globalized manufacture and trade systems, inadequate fabric recycling ability, and the effects of microplastics originating from fabrics have become pertinent concerns. In fact, only 1% of the materials used in the sector are efficiently recycled and a total of 92 million tons of textile waste are produced yearly (Fernandez-Stark et al., 2022).

4.6.1 ENVIRONMENTAL ISSUES IN APPAREL AND TEXTILE SECTOR

In 2016, the global apparel industry accounted for 6.7% of the planet's total climate impact, equivalent to 3,290 million tons of CO₂ eq. out of a total of 49,300 million tons of CO₂ eq., which is approximately 442 kg of CO₂ eq. per individual (Östlund et al., 2020). Furthermore, in just the year 2018, it was estimated that this industry contributed to approximately 2.1

billion metric tons of greenhouse gases emitted into the atmosphere, with half of these emissions specifically attributable to the fast fashion sector (Tebaldi et al., 2022). More specifically, the production of raw materials is largely responsible for the environmental impact of the textile and apparel industry (Šajin, 2022): in 2020, cotton represented approximately 24% of worldwide fibre production, polyester dominated the global fibre market with a 52% share, animal fibres held a market share of 1.57%, and Manmade Cellulosic (MMCs) constituted roughly 6% of the global fibre composition. Moreover, the market is currently dominated by the use of fossil fuel-derived textile fibres, accounting for approximately 63% of the total market (Östlund et al., 2020).

So, firstly, one cause of sustainability failure in the fashion industry is the non-adoption of eco-friendly materials alongside the use of unsustainable production processes (Todeschini et al., 2017). Additionally, to create an eco-friendly product, a complete rethinking of its design is necessary, from the product's design itself to its marketing in the final market, which represents a challenging task as difficult as its implementation (Todeschini et al., 2017). Despite this initial difficulty, if sustainable product development occurs, significant benefits can be realized (Todeschini et al., 2017). Therefore, if the adoption of eco-friendly materials, such as sustainable fibres or recycled materials, and sustainable production processes, like natural dye techniques, zero-waste mechanisms, and slow fashion methods, proves effective, then the environmental effects and benefits for the fashion industry can be positive (Todeschini et al., 2017). This allows for greater sustainability and a less detrimental impact on the ecosystem.

Moreover, the adoption of such techniques is challenging; for example, the clothing design phase using recycled materials is entirely different from designing traditional fashion items (Todeschini et al., 2017). Furthermore, technologies for recycling clothing into virgin fibres are only now emerging, and since these technologies are very recent and not widely implemented, the recycling process has not been very successful to date: consider that only 1% of used garments are recycled into new clothing, and less than half are collected for reuse (Šajin, 2022).

The process of converting raw materials into yarns, weaving fabrics, and using finishing methods such as dyeing or increasing fabric strength and lustre involves a significant amount of energy and substantial use of water and chemicals (Šajin, 2022). Furthermore, the manufacturing of clothing items itself requires a significant amount of energy for operations such as sewing, gluing, welding, and applying tapes (Šajin, 2022).

Large quantities of water are also used in industrial processes (Östlund et al., 2020): every year, 93 billion cubic meters are used for various textile productions (Tebaldi et al., 2022). To

give an idea of the water involved, producing a single T-shirt and a pair of jeans requires as much as 20,000 liters of water, while producing one kilogram of cotton requires about 8,500 liters (Tebaldi et al., 2022). These figures highlight the considerable impact of the fashion industry on water resource utilization and exploitation.

Furthermore, the rise of fast fashion has led to an increase in resource consumption, resulting in millions of tons of textile waste due to increased purchases and the rapid turnover of fashion products (Tebaldi et al., 2022). For instance, approximately 20% of textile waste in the industry comes from remnants left after cutting clothing patterns (Šajin, 2022).

Environmental damages are particularly pronounced in developing countries where environmental regulations are less stringent: for example, in these regions, the untreated discharge of wastewater into water bodies is common (Šajin, 2022). In such countries, much of the textile and apparel production takes place also due to the lack of environmental and human health protection measures, resulting in the externalization of production (Tebaldi et al., 2022; Šajin, 2022).

Responsible for the environmental impact of the textile sector are also transportation and distribution of final products and textile raw materials. This accounts for 3% of the entire supply chain, making it not the most environmentally damaging phase (Šajin, 2022). The importation of these products has a relatively "low" impact, a result of efficient management of the movement of goods by leading companies and large distributors (Šajin, 2022). However, it should be noted that over the past few decades, online shopping has been encouraged, leading to an increase in home deliveries, the possibility of returns, and a variety of waste related to packaging, bags, and other related materials, all with environmental consequences (Šajin, 2022).

4.6.2 ENVIRONMENTAL UPGRADING IN TEXTILE INDUSTRY

Leading companies have taken action to enhance their performance from production to disposal as a result of this increased awareness and the pledges made by nations to combat climate change in the wake of the 2015 Paris Agreement (Fernandez-Stark et al., 2022).

For example, some of the major brands, such as Adidas, Chanel, Burberry, Decathlon, Gap (UNFCC, 2022) and so on, have committed to the 2018 United Nations Fashion Charter on Climate Action, increasing the use of recycled materials, initiating recycling programs, and generally exerting pressure on their supply chains to reduce environmental impact (Fernandez-Stark et al., 2022).

Since environmental upgrading, as we already saw, is the method by which economic players transition to a production system that minimizes or prevents environmental damage caused by

their managerial practices, processes, or products (De Marchi et al., 2013), There are several concrete measures that companies can adopt to promote greater sustainability in the textile and apparel sector for example, they can adopt technologies for processing raw materials that consume less energy and waste less water or utilize recycled packaging materials for clothing items.

One key strategy involves transitioning to renewable energy sources, thereby reducing the environmental impact associated with energy consumption. Another way is to enhance material recycling and reuse, contributing to the creation of circular material flows that reduce the need for extracting new resources and disposing of waste. Some examples of material reuse and recycling in the textile value chain include transforming textiles into new fabrics, converting non-textile material into textiles, downcycling textiles into lower-quality products, and energy recovery (Östlund et al., 2020). Companies should not view textile waste merely as discarded material but rather as a resource to be reintegrated into the value chain itself or into other sectors or methods where such resources can be reclaimed. This can be achieved through green manufacturing, which involves not only recycling but also material reduction (Eryuruk, 2012). Activities such as reusing still usable parts of used garments and recapturing value at the end of a product's lifecycle are actions that help enhance the sustainability of the industry. Additionally, proper disposal of waste generated and/or discarded garments at the end of their useful life, pollution prevention, and reducing raw materials used in clothing production (textile waste management) all contribute to making the value chain more environmentally friendly.

Additionally, companies can make significant improvements in their production processes to minimize greenhouse gas emissions. This is particularly critical in the raw material production phase, as it has been identified as the primary source of emissions in the fashion industry, accounting for 38% of total greenhouse gas emissions in 2018, according to the Fashion on Climate report (2020), and responsible for 20% of global drinking water pollution. The adoption of these targeted strategies can significantly contribute to making the clothing sector more environmentally friendly, mitigating its overall environmental impact. Within the production context, it is advisable to prioritize the use of recycled fibres or those with a lower environmental impact, such as Lyocell, Modal, or polyester. Furthermore, a recommended option is the adoption of more sustainable and organic cultivation systems for raw materials like cotton. Simultaneously, the utilization of advanced industrial machinery is essential to enhance efficiency in various stages of the production process, including spinning, weaving, and knitting (Jensen & Whitfield, 2022). A conscious approach to production should,

therefore, encompass the responsible use of materials, significantly contributing to a reduction in the environmental impact associated with textile manufacturing.

In conclusion, the primary sustainable practices adopted in the fashion supply chain include the use of sustainable materials in clothing production, the reduction of CO₂ emissions, and the mitigation of pollution generated throughout various production and distribution phases (Tebaldi et al., 2022). The aforementioned strategies offer new opportunities to address the environmental and social challenges of the fashion industry more effectively and responsibly (Todeschini et al., 2017).

Nevertheless, it is crucial to emphasize that there is a clear distinction between upgrading as a process and upgrading as an outcome. As reported by Khan et al. (2020), among the strategies adopted by companies to attain greater value along the global supply chain, there may be challenges in achieving this value addition effectively. In other words, the transition from intentions to actions can pose a significant hurdle on the path toward sustainability in the textile industry.

Through a comprehensive quantitative analysis, sustainable actions actually undertaken by the sample of textile companies under scrutiny will be identified. The aim is to make the entire industry more environmentally friendly and, consequently, mitigate its environmental impact. This analysis will provide a concrete response to the previously outlined research question, contributing to a better understanding of the actual progress toward sustainability in the textile sector and offering insights for further enhancing business practices in this sphere.

5. QUANTITATIVE ANALYSIS: RESEARCH DESIGN AND METHODOLOGY

We proceed with an empirical analysis of the subject sector. The data required for our empirical research are provided by two indices: the Corporate Climate Action Transparency Index (CATI) and the Corporate Information Transparency Index (CITI). These indices have enabled the construction of the dataset to address the empirical questions posed in this thesis. These two indices allow us to thoroughly examine the sustainable actions of brand firms and to equally study the performance of the suppliers with whom the focal companies have working relationships.

The CITI is developed by the Institute of Public & Environmental Affairs (IPE) in conjunction with the Natural Resources Defense Council (NRDC) since 2014 to the present day. On the other hand, the CATI is of more recent origin, having been established only in 2021, replacing a previous similar index. It is also developed by IPE with technical support from the Chinese Academy of Environmental Sciences.

To provide more details, the IPE is a non-profit organization established in China in 2006, located in Beijing. Its primary mission is to track corporate environmental information in order to build a comprehensive database of environmental information divided by sector and by company that can help various social stakeholders gain a more comprehensive and extensive understanding of the sustainability level of a specific sector or company, as well as the various possible combinations.

In recent literature, we can also find studies that utilize data from IPE to conduct empirical analyses. For instance, Zhang et al. (2023) conducted a study to examine the impact of Green Supply Chain Management on enterprise value and used the CITI, disclosed by IPE, to measure the level of environmental management in the supply chain of the companies analysed in that article. Other examples of studies that have made use of IPE data include those conducted by Chen et al. (2023) and Qejvanaj (2021). In the first study, the authors apply the cumulative capacity theory to analyse environmental practices by correlating CITI data with the ability to build cumulative capacity. In the second study, the authors use the CITI index, as it is particularly efficient in monitoring the behaviour of multinational corporations towards sustainable actions, to investigate the existence of a dialogue on environmental issues between Chinese civil society and large global corporations.

Within the framework of this research, the collected data are processed using a practical approach to address the research questions questioned. Simultaneously, a statistical analysis is performed using the chi-square test of independence to determine whether there is a significant relationship between the categorical variables involved. This approach combines

practical data understanding with statistical robustness, allowing for an evaluation of underlying relationships and ensuring that conclusions are based on solid evidence.

5.1 DEFINITION OF THE VARIABLES

Through the CITI, it is possible to assess the environmental management of supply chains of brands that have supply chains based in China. CITI evaluates the overall environmental management of the supply chain of these brands through public information published by the brands themselves and government supervision data. There are 5 evaluation criteria in CITI, which are as follows: Responsiveness and Transparency, Compliance and Corrective action, Extended Green Supply Chain practices, Energy conservation and Emissions reduction, and Performance Disclosure. Through the first indicator, CITI assesses whether the company responds to and satisfies public demands regarding environmental violations in the supply chain, as well as whether the company provides general information about its suppliers in China for public scrutiny. Compliance and Corrective action assess how closely the company monitors the environmental compliance performance of its suppliers in China and whether the focal company requests its suppliers to take corrective actions towards climate issues. The third key performance indicator examines whether the company urges its direct suppliers to monitor environmental risks caused by their own actions and whether the company has responsible management of critical suppliers contributing to pollution. The fourth factor aims to assess whether the main company encourages suppliers to reduce their energy consumption, carbon footprint, resource usage, and pollutant emissions, and whether it discloses such data. The last measure evaluates whether the company guides consumers in making more sustainable product choices and promotes green choices to the public. These CITI evaluations respectively weigh 14%, 18%, 30%, 32%, and 6% of the total score.

Through CITI, major brands are ranked based on their involvement in the green supply chain, i.e., their voluntary commitment to transparency regarding sustainability actions, compliance with industry norms and standards, and efforts to eliminate or at least reduce processes that are not sustainable.

On the other hand, CATI evaluates the climate actions of companies along their value chains. This index assesses a company's climate action according to 5 main aspects. Governance, which measures the company's commitment to reducing greenhouse gas emissions and integrating climate change into its corporate strategy and supplier management mechanisms, mainly consists of two actions, 1.1 and 1.2, which respectively measure Pledge Policies and Mechanism construction. Measurement & Disclosure, which reflects how involved the

company is in measuring and disclosing greenhouse gas emissions data, both those directly produced (action 2.1) and indirectly generated (action 2.2). Carbon Target Setting, in which the company establishes and discloses emission reduction and carbon neutrality objectives, encompassing actions 3.1 and 3.2. Performance against the Carbon Setting, actions 4.1 and 4.2, evaluates whether the company discloses progress made toward emission reduction and carbon neutrality goals. Climate action assesses the company's involvement in implementing initiatives to reduce emissions and motivates suppliers to establish sustainable objectives, implement emission reduction initiatives, and disclose their carbon data, consisting of actions 5.1, 5.2, 5.3, and 5.4.

A detailed analysis of how CATI is constructed is now proposed. As mentioned earlier, CATI evaluates corporate climate actions based on 5 parameters. The policy and governance, the first of these parameters, accounts for 10% of the total score; Measurement and Disclosure accounts for 17%; Carbon setting targets accounts for 14%; Performance towards targets accounts for 17%, and Climate action, which carries the most weight, accounting for 42% of the total.

CATI includes companies oriented towards consumers, as well as publicly traded companies and large corporations in high-energy consumption sectors, but it is not guaranteed that they have a supply chain based in China. The construction of CATI is primarily based on information available from companies' annual economic reports and corporate social responsibility publications, information published on the companies' websites and social media, and other secondary reports or sources. CATI evaluations are dynamic, and IPE updates the scores at the beginning of each year.

Essentially, CATI annually assesses corporate performance in climate action, while CITI evaluates the overall effectiveness of an entire company's environmental management in the Chinese supply chain. Both indices can reach a maximum value of 100, indicating that the brands have a perfectly sustainable value chain and have perfect sustainable and environmental management of their Chinese supply chain.

5.2 DATASET CONSTRUCTION

IPE, as previously mentioned, collects sustainable information across various sectors and different companies within these sectors. It specifically analyses data from about 650 companies, spanning 20 sectors, and given the increasing awareness of environmental sustainability among businesses and the benefits they can derive from such participation, this number is likely to grow significantly.

As specified earlier, the focus of this study is limited to the textile sector. Excluding all sectors except textiles, the sample of companies on which our analysis is based decreases from around 650 to 155 companies, of which 124 have a supply chain in China. For data attribution purposes, we chose to consider only those companies that are proactive about environmental impacts and making their supply chain green, meaning they report positive values, so that greater than zero, in both indices. Consequently, companies like Kappa, DKNY, Umbro, Pierre Cardin, Head, Nine West, Tonlion, Yishion, Violet, Hsdp, Threegun, Menglan, Grace, Jalice, Top New, and HYX, which have CATI and CITI scores equal to zero and are therefore not considered sustainable according to these indices, were excluded. Instead, Victoria's Secret, Valentino, Ann Taylor, EuroGroup, Shein, which as a CATI equal to zero, they have been considered because they have a positive CITI value.

Huamao Share, DKNY, Nine West and Hnhs, which have CATI scores of zero and are not considered actively involved in green practices according to IPE, were also excluded from this analysis.

In this way, we end up with a CATI sample of 132 companies and a CITI sample consisting of 108 total companies. CATI and CITI values are also considered rounded.

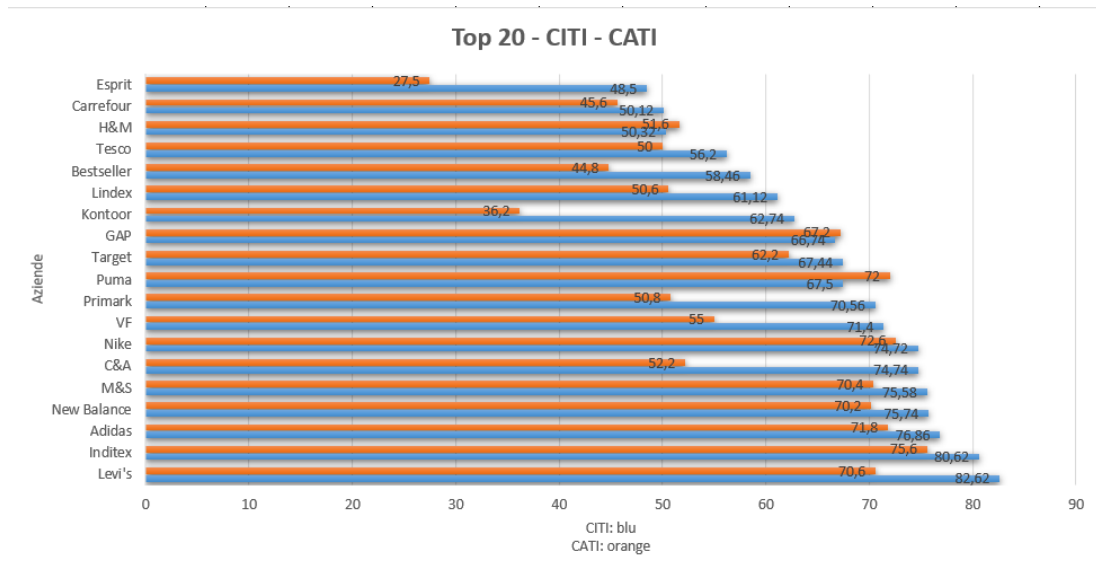
Another crucial aspect to consider, which is of fundamental importance for the creation of our dataset, is that only companies headquartered in North America, Europe, and China are considered. This criterion of geographical selection is essential to ensure an accurate and meaningful representation of business realities in these key regions. As mentioned earlier in the compilation section of this study, leading companies are predominantly located in Europe and North America, while the primary production players in the industry are situated in China. This observation underscores the relevance of geography in the landscape of top companies in the sector, confirming the importance of a geographically focused analysis for an in-depth understanding of our subject matter. Consequently, excluding companies located in Japan, Korea, Israel, and the Oceania region, our sample narrows down to a total of 98 companies, considering both the geographical distribution of CITI and CATI values jointly.

5.3 DESCRIPTIVE STATISTICS

After providing a detailed description of the indices, including their definitions and the dataset construction process, as well as the data cleaning procedures carried out to ensure data quality in our dataset, we can proceed to analyse how these indices, CATI, and CITI, behave when used to describe, represent, and summarize the sample of textile companies under examination. In short, a brief summary of the main characteristics of the study sample will be

presented. Given this initial overview of the data, at this point we examine the top-performing companies in terms of sustainability according to CATI and CITI (see Figure 6): we find the top 20 companies that are most influential in addressing climate impact violations, both those directly involved in operations and those acting at the green supply chain level.

Figure 6: Top 20 Firms according to CATI and CITI Index



Source: Own Elaboration

5.3.1 QUARTILES

The analysis begins the descriptive study of the data by calculating quartiles, which allows us to gain a clearer understanding of the distribution and variation of the values of our interest. Quartile analysis is a statistical technique that divides the sample into four equal parts. From this definition, quartiles divide the sample into three cut-off points, namely the first quartile (Q1), the second quartile (Q2), and the third quartile (Q3). The fourth quartile (Q4) represents the maximum value within the sample and corresponds to the top 25% of the highest data points within the dataset under examination. In contrast, the fiftieth percentile, known as the second quartile, is equivalent to the data's median, thus dividing the dataset in half.

For example, considering CITI values, the quartiles yield the following values: 10.25 (corresponding to Q1), 23 (corresponding to Q2), 57.5 (corresponding to Q3), and 83 (corresponding to Q4), as reported in Table 1.

Quartile analysis can serve other purposes as well, including the ability to compare data distributions among different groups.

Table 1: CITI Statistical Quartiles

Statistical Quartiles	#Brand	Average CITI Value	Average CATI Value
Q1 = 10,25	52	5	7
Q2 = 23	19	14	19
Q3 = 57,5	12	39	36
Q4 = 83	15	71	62
TOT	98	21	22

Source: Own elaboration

This allows for comparisons between groups and the detection of any differences, which may vary in terms of significance. Indeed, the table in question not only provides basic information regarding quartiles but also offers the opportunity to conduct comparisons between groups, highlighting variations, more or less significant, among them.

The fundamental assumption we have adopted for this data reprocessing implies that the discriminant criterion for determining whether a company can be considered sustainable or not is based on the sample mean. In other words, we are using the sample mean as a reference criterion to establish whether a company can be classified as sustainable, both in terms of the actions it takes and its operations within the value chain, or if it does not achieve this sustainable status. This choice of using the sample mean as a discriminant criterion is important because it provides an objective basis and a quantitative and measurable method to assess the degree of sustainability of each company in our sample.

First and foremost, it is interesting to note that the mean of our sample, specifically concerning CATI, stands at 22, while for CITI, it reaches the value of 21. However, through a detailed analysis based on quartile division, relevant data emerges. Out of a total of 98 companies considered in our study, a substantial 71 of them exhibit values for both CATI and CITI below the mean. This implies that 72% of the companies active in the textile sector, referring to our specific analysis sample, cannot be considered on average sustainable, neither in terms of environmental protection initiatives nor in terms of promoting an eco-friendlier supply chain. In other words, the majority of textile companies examined in our sample do not adopt a proactive approach to address climate change through measures and policies that include greenhouse gas emissions reduction, the adoption of renewable energy sources, energy use optimization, and other eco-friendly initiatives. Furthermore, these companies do not demonstrate significant commitment to environmentally responsible management of their supply chains in China and are not considered, on average, effective in mitigating negative environmental impacts during the production and distribution of their products.

In the third and fourth quartiles, on the other hand, we find companies in the apparel sector with CATI and CITI values above the sample mean. This indicates that almost 28% of the analysed companies are performing better in terms of sustainability compared to the other companies in the sample. This situation suggests that such companies are showing greater concern and effectiveness in making the textile sector and their supply chains sustainable. In other words, companies in the upper quartiles are implementing more advanced measures and more effective strategies to address environmental challenges within the textile sector. This behaviour may include the implementation of cleaner technologies, the adoption of renewable energy sources, responsible management of materials and resources, and other sustainable initiatives that help reduce the environmental impact of their operations. These companies play an important role in promoting sustainability within the sector and can serve as an example for other businesses looking to improve their environmental practices. Before proceeding with a detailed analysis of variations and differences between companies based on quartiles, we now present a general overview of the relationship between CATI and CITI.

5.3.2 CORRELATION BETWEEN CATI AND CITI

To understand if there is an existing relationship between the two variables, their correlation is studied, which is their tendency to vary together or, more precisely, their tendency to change in relation to each other, following a certain regularity. Therefore, the series of CATI and CITI values for the 98 companies in the sample are taken, and accordingly, the correlation function is calculated. In statistics, by definition, the value returned by the function is a number ranging from -1 to 1, where -1 indicates a perfect negative correlation, 0 indicates no correlation, and 1 indicates a perfect positive correlation.

In the specific case of the textile sector analysed, there is an almost perfect positive association between CATI and CITI, as the statistical correlation between the two indices measures 0.92. As we can see from the graph below, the relationship between the two variables is approximately linear, and the nature of the relationship is positive. Thus, there is agreement between CATI and CITI: the two variables are generally associated with each other. The positive correlation also indicates that when one variable increases, the other tends to increase (and vice versa). However, it is not investigated whether the association between the variables is due to a causal relationship or random coincidence. The presence of correlation, in this specific case positive, does not necessarily imply a cause-and-effect relationship. Further analysis is required to establish causes and effects.

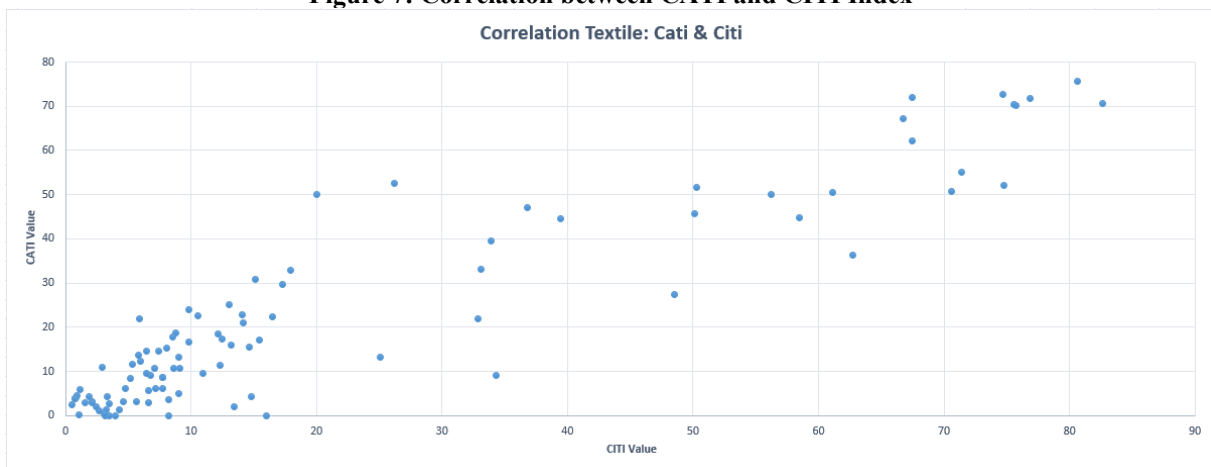
The fundamental information conveyed by this graph regarding the nature and strength of the relationship between the two variables is that when CATI is at low levels, CITI tends to have

low values, and when CATI is high, CITI tends to be high. This implies that companies that do not adopt environmentally sustainable practices do not distinguish themselves for greater sustainability in their supply chains, and vice versa. In other words, companies that demonstrate lower environmental commitment do not stand out in promoting an eco-friendlier supply chain, and those that are more effective in environmental aspects also tend to do the same for their supply chain.

This suggests that there is a correlation between companies' environmental sustainability and how they manage sustainability within their supply chains. This can have significant implications for corporate strategies and sustainability initiatives, as it indicates that improving sustainability internally, at the Corporate Sustainability level, can also positively influence sustainability throughout the entire supply chain.

From the scatter plot provided below (Figure 7), it is immediately evident that the distribution of companies shows significant variation in density. Undoubtedly, through a simple visual observation of the graph in question, it is clear, confirming what was already apparent during the preliminary analysis presented in Figure 6, that a predominant percentage of companies are concentrated in quadrant III. This result strongly suggests that the vast majority of companies in the sample exhibit low levels of both CITI and CATI. Furthermore, it is interesting to note how the trends of the two values are correlated, as when one of them increases, the other tends to follow the same upward trend. This aspect further strengthens the idea that there is a close connection between the two indicators analysed within the study.

Figure 7: Correlation between CATI and CITI Index



Source: Own elaboration

5.3.3 GEOGRAPHICAL DISTRIBUTION

Through the analysis of the locations of the central headquarters of the involved companies, we are able to identify a geographical distribution within the sample. In particular, we notice that the main headquarters are primarily concentrated in three key regions: the United States, Europe, and China. As we have already highlighted in the section dedicated to the comprehensive part of the thesis, it is reasonable to assume that lead firms are mainly located in the United States and the European Union, while the Chinese region will likely be characterized by a predominant concentration of manufacturing companies in the clothing and textile sector. If we consider the entire sample as a whole, we also observe the presence of central headquarters in other regions, such as Japan, Canada, Israel, Oceania, and South Korea. Specifically, it is interesting to note that Japan hosts the main headquarters of well-known brands like Uniqlo, Asics, Muji, and Mizuno; Lululemon and MEC have their main headquarters in Canada; Israel is the home of Delta Galil; in Oceania, we find Kathmandu (in New Zealand) and Jeanswest (in Australia); while South Korea is home to Fila. However, as the analysis of the key geographical regions (European Union, United States, and China) is of fundamental importance for the objectives of this research and involves the vast majority of the companies considered in our study, totalling 10 companies, we have deliberately chosen to exclude additional headquarters from this analysis in order to preserve data integrity. The final sample, as previously mentioned, thus narrows down to 98 companies in total. Regarding the geographical disposition of textile companies in the IPE sample, we can now proceed to a general overview of variations in CATI and CITI values based on geographic allocation.

Table 2: Geographic distribution

GEO	#Brand	Average CITI value	Average CATI value
EU	45	26	25
USA	33	24	26
China	20	6	7
Total	98	21	22

Source: Own elaboration

As a result, based on this geographical analysis, as highlighted in Table 2, we can observe that there are 45 companies located in the European region. The average values of CATI and CITI within this region are 25 and 26, respectively, out of a total of 100 (both for CATI and CITI). It is worth noting that within the European continent, the absolute maximum values recorded

for CATI and CITI are 76 and 81, respectively (values belonging to the Inditex group); however, it should be emphasized that in Europe, there are also numerous brands with significantly lower sustainability values, such as Armani, River Island, Lufama, and Hylo, which significantly reduce the overall average, bringing it to values of 25 and 26. Within the European territory, we notice that CATI and CITI values remain slightly above the overall sample average, suggesting that this region can be considered adequately sustainable in the contexts related to CATI and CITI.

A similar situation is also represented at the American level. In the sample, there are 33 brands headquartered in the USA, with average CATI and CITI values of 26 and 24. In the same vein, it is important to note that the maximum value recorded for CATI is 73 (attributed to Nike), while CITI reaches a maximum of 83 (also attributed to Nike). This clearly underscores that in both the American and European contexts, there is a significant disparity in terms of sustainability among the various companies under consideration. In absolute terms, it is possible to identify leading companies in terms of sustainability, as well as others that exhibit significantly lower values in both indicators.

In China, however, the situation is different: firstly, the sample of companies narrows down, as 20% of the total companies are based in China, and these companies have much lower average CATI and CITI levels compared to those based in Europe and America. Only one Chinese company, Li-Ning, can be considered significantly more sustainable than the Chinese average, as it has a CATI of 22 and a CITI of 33, which reflect its commitment to sustainability, both in terms of climate actions taken and in the green management of the supply chain. The summarized Table 2 above provides an overview and simplifies the description just provided.

Furthermore, by conducting a preliminary analysis of the same table, we confirm once again that, for all three geographical areas, the averages of CATI and CITI follow similar values. This indicates that companies engaged in sustainable climate actions tend to also have a sustainable supply chain. Conversely, as observed in the case of companies headquartered in China, they are neither environmentally sustainable nor concerned with making their supply chain greener.

An additional approach to gain a better understanding of CATI and CITI dynamics in the three geographical regions considered is to analyse Table 3. We now perform a detailed analysis, incorporating the geographical area into the quartile breakdown of the sample. We begin with the analysis of China, where we notice the presence of Chinese companies in all three of the quartiles: the first and second quartiles, considered non-performing in terms of sustainability as they fall below the sample average, and the third quartile.

The distribution of Chinese companies within these three quartiles reveals significant differences. For instance, approximately 19% of Chinese textile companies are in the first quartile, indicating that the vast majority, 90% of the Chinese textile companies analysed, exhibit very low CATI and CITI values, suggesting a significant lack of sustainability. Only one Chinese company, Li-Ning, consistently maintains CATI and CITI values close to the sample average, positioning itself as an example of a more sustainable company among the Chinese ones and moderately sustainable compared to the entire sample. This distribution highlights the considerable variation in the sustainability of Chinese companies and underscores the importance of further analysis to understand the factors underlying these differences.

In the American and European continents, we observe a similar trend where the majority of companies are primarily concentrated in the first two quartiles. Specifically, 64% of European textile companies in our study and 69% of American companies fall within quartiles indicating below-average sustainability levels.

These data clearly show that a significant percentage of textile companies in both these regions do not achieve acceptable levels of sustainability. Approximately 30% of American and European companies meet the criteria for being considered sustainable (i.e., CATI and CITI values above the sample average), but this distribution highlights the need for a more rigorous approach and incentives to improve sustainable practices in these regions in order to promote a positive environmental and social impact in the textile industry.

Around 30% of companies in industrialized nations like the United States and the European Union adopt sustainable strategies. This data once again underscores the need for much broader and deeper commitment to preserving the environment and promoting responsible business practices.

The geographical location of companies does not seem to have a significant impact on their sustainability. Regardless of their location, whether in developing or advanced countries, sustainability does not seem to receive the necessary attention. However, it is important to note that in the United States and the European Union, there is a more favourable outlook for sustainability improvement, as some companies belong to the fourth quartile, the most performant one, although the majority of companies fall into quartiles indicating low sustainability.

Table 3: Geographic Distribution and Quartiles

GEO All2	Statistical Quartiles	#Brand	Average CITI Value	Average CATI Value	Brand %
EU	Q1 = 10,25	19	6	8	19%
	Q2 = 23	10	14	17	10%
	Q3 = 57,5	8	43	38	8%
	Q4 = 83	8	71	61	8%
EU Totale		45	26	25	46%
USA	Q1 = 10,25	15	6	7	15%
	Q2 = 23	8	15	24	8%
	Q3 = 57,5	3	29	38	3%
	Q4 = 83	7	72	62	7%
USA Totale		33	24	26	34%
China	Q1 = 10,25	18	4	6	18%
	Q2 = 23	1	16	0	1%
	Q3 = 57,5	1	33	22	1%
China Totale		20	6	7	20%
TOTAL OVERALL		98	21	22	100%

Source: Own elaboration

To address the second research question, we examine the association between the two categorical variables (i.e., geographical distribution and the division of companies into quartiles, indicating the degree of sustainability) using the Chi-squared test. Consequently, we formulate the null hypothesis of the test (H0): for each of the geographical areas considered, there is no association between the geographical distribution of the sample and the incidence of sustainability. We then verify the significance of one geographical area at a time, intending to assess the individual effect of Europe, America, and China.

We have calculated the Chi-squared test statistic, known as the p-value, for each of the geographical regions under consideration. The results show a p-value of 0.48 for Europe, 0.62 for America, and 0.011 for China. Using a predefined alpha value of 5% ($\alpha=0.05$), we can draw some meaningful conclusions.

Specifically, for the European and American regions, the null hypothesis, which posits no dependency between the variables, is accepted. This means that, regardless of the geographical location of a textile company within Europe or America, there is no statistically significant evidence indicating a correlation between geographic location and the level of sustainability adopted. In other words, it appears that the issue of sustainability is not significantly influenced by geographic location for these two regions.

From this analysis, we can deduce that geographic location, at least concerning Europe and America, does not play a significant role in determining the level of environmental concern or sustainability of textile companies. This demonstrates that the choice to promote sustainability, for both the EU and US, remains a business decision regardless of geographic

location. However, it is important to note that the levels of CATI and CITI for companies belonging to quartiles Q1 and Q2 in these geographical areas, EU and US, tend to be higher than those found in Chinese companies. Despite these values being significantly better, the urgent need to intensify efforts to enhance sustainability approaches within companies operating in these advanced geographical regions is evident. This strengthening is crucial to ensure optimal and continuous sustainability in such contexts. In the case of China, we notice that the p-value calculated using the Chi-squared test is lower than the previously set significance value α , which is 0.05. Consequently, we reject the null hypothesis, which posits no dependency between the variables. Instead, we accept the alternative hypothesis, which suggests that the two variables can be considered dependent at a 5% level of significance. In other words, this means that the geographic location of textile companies in China has a significant impact on corporate sustainability, which, in this case, is low. Since the p-value is lower than α , there is statistically significant evidence supporting the rejection of the hypothesis that geographic location in China does not influence corporate sustainability.

However, it should be noted that the p-value, while lower than α , is not particularly low. This could indicate that the observed association between geographic location and the level of sustainability may not be very strong or practically significant. In other words, the variation in sustainability levels among companies in China may not be very pronounced. A concrete example of this situation is represented by the company Li-Ning, whose sustainability level is average compared to the overall sample. This indicates that even in the Asian region, there are companies achieving sustainability levels that can be considered positive. In other words, geographic location alone might not be the sole determining factor in corporate sustainability, and other variables could influence the outcomes.

In summary, while there is a statistically significant association between geographic location and sustainability in China, the strength of this association may be moderate, suggesting that there are other factors at play in determining levels of corporate sustainability in the region.

In summary, with a p-value of 0.011 and a significance level α of 0.05, the statistical evidence for rejecting the null hypothesis in favour of the alternative hypothesis, although indicating an association between the categorical variables under examination, may not be extremely strong. Therefore, it is important to also consider the practical relevance of the results.

5.3.4 CATI SUSTAINABLE ACTIONS AND GEOGRAPHICAL REGIONS

In this subchapter, we delve into the specific sustainable actions taken by brands in the textile sector based on a geographical classification. We introduce the following Table 4 to provide a practical analysis of the data and address the third research question.

Table 4: Sustainable Operational Practices and Geographic Areas

CATI CLIMATE ACTIONS	GEOGRAPHIC DISTRIBUTION		
	EU	US	CH
<i>1,1 Governance: Pledge Policies</i>	91%	93%	80%
<i>1,2 Governance: mechanism construction</i>	62%	73%	45%
<i>2,1 Measurement & Disclosure: Scope 1&2</i>	89%	76%	35%
<i>2,2 Measurement & Disclosure: Scope 3 Emission</i>	76%	73%	15%
<i>3,1 Carbon Targets Setting: Scope 1&2</i>	73%	76%	20%
<i>3,2 Carbon Targets Setting: Scope 3 Targets</i>	71%	61%	5%
<i>4,1 Performance against Carbon Targets: Scope 1&2 Emission Reduction Progress</i>	51%	67%	5%
<i>4,2 Performance against Carbon Targets: Scope 3 Emission Reduction Progress</i>	38%	39%	0%
<i>5,1 Climate Action: Decarbonization in Company Operation</i>	73%	89%	75%
<i>5,2 Climate Action: Decarbonization in Value Chain</i>	36%	36%	65%
<i>5,3 Climate Action: Affiliated Company Engagement</i>	16%	24%	10%
<i>5,4 Climate Action: Upstream Supplier Engagement</i>	51%	55%	5%

Source: Own elaboration

In the previously presented Table 4, we have counted the companies that have adopted various climate actions analysed by CATI, dividing them by Europe, America, and China. To obtain this data, we focused exclusively on positive values, those greater than zero, associated with CATI actions.

After tallying the companies involved in each of the considered actions, we performed a normalization procedure to enable a meaningful comparison across the different geographical areas under examination. This normalization involved transforming the observed quantities into percentages, thus facilitating data comparison between the various regions.

We observe that the majority of companies operating in the textile industry, regardless of their geographical origin (Europe, America, or China), have primarily implemented pledge policies. The action that stands out for its widespread adoption is 1.1, which has been successfully implemented by a significant percentage of companies, reaching 91% of European enterprises, 93% of American companies, and 80% of Chinese ones. These data

highlight a common trend among textile companies worldwide in promoting action 1.1. However, while action 1.1 prevails in numerical terms, we note that the landscape of textile companies is starting to differentiate. Specifically, concerning European companies, we notice that the second most commonly adopted action is 2.1, which has been applied by 89% of enterprises in this geographical region. On the other hand, we observe that although action 2.1 is prevalent among European companies, it is adopted by only 35% of Chinese enterprises. This observation clearly underscores the significant variability in the adoption of climate measures depending on the region of origin of the companies.

In the case of American and Chinese companies, the second most widely adopted action is 5.1, with adoption rates of 89% and 75%, respectively. These data reveal a common trend between these two geographical regions in implementing action 5.1. At the same time, it is interesting to note that action 5.1 is equally embraced by European companies, with 73% of the European sample implementing it. However, a preference for another action, 2.2, emerges, chosen by 76% of European enterprises. This indicates that, while there is convergence in the adoption of action 5.1 across different regions, there is still a distinction in the approach of European companies, which seem to favour action 2.2.

Regarding the less frequently adopted actions within the sample, we observe a significant disparity among regions. In particular, in China, no company seems to adopt action 4.2, whereas this action has been implemented, albeit by a minority, by both European and American companies. On the other hand, the least commonly adopted action by American and European companies is 5.3, with only 16% of European companies and 24% of American ones having adopted this specific action. In other words, only a minority of companies in these regions have integrated action 5.3 into their business processes. In addition to the practical data analysis, we can observe a statistical confirmation of the practical observations made. We employed the chi-square test to assess the potential association between two categorical variables: the climate actions of CATI and the geographical distribution of companies. The objective is to determine whether there is independence between these two aspects under consideration (H_0).

By observing the discrepancies between the values actually observed and those theoretically expected, the result obtained from the chi-square test of independence yielded a p-value of 0.000488. Having previously set a significance level of 5%, this leads us to a significant conclusion: the two variables are indeed correlated, and thus, we can reject the null hypothesis.

This statistical evidence confirms what we have already noted in the practical data, namely that differences in the adoption of climate actions among different geographical regions can be attributed to the geographical location of the companies. In other words, the geographical position of companies has a significant impact on choices related to the adoption of sustainable actions. This result is of considerable relevance, as it suggests that companies operating in the textile sector consider geographical specificities and regional conditions in the planning and implementation of sustainability initiatives.

The heterogeneity that emerges in the adoption of actions reflects the complexity of sustainability challenges in the textile industry. Factors such as environmental awareness, regulatory context, the availability of local resources, and deliberately chosen corporate strategies can significantly influence companies' choices regarding actions to adopt.

This diversity in adoption underscores the importance of considering the regional context and adapting corporate strategies based on the unique specificities of each geographical region in order to successfully promote sustainability in the textile industry on a global scale. This highlights the crucial relevance of adopting flexible and targeted strategies and policies that can also take geographical differences into account to promote sustainability initiatives successfully.

Even though preferences for the adoption of specific sustainable corporate actions vary depending on the company's headquarters, this does not provide concrete indications about the overall degree of sustainability. In other words, the correlation between the action taken and the company's location does not necessarily imply that the sustainability of the company is influenced by its geographical location. As highlighted in our initial analysis, geographical location does not appear to be a critical determinant of sustainability because the mere fact that a company undertakes a climate action does not necessarily guarantee a significant impact on environmental sustainability with resulting actual improvements.

5.3.5 AN ANALYSIS BY SUB-SECTORS

We commence this paragraph with a business case example, considering the case of Li-Ning. Our attention is now direct towards the tangible impact and practical implications of the result obtained from the analysis on Chinese companies conducted in section 5.3.3, with a particular focus on a specific company that stands out for its significant commitment to corporate sustainability. The company in question falls within the third quartile and notably surpasses other Chinese companies operating in the textile sector. This company is Li-Ning, a prominent Chinese firm specializing in the production of sportswear, footwear, and accessories. Its history is marked by remarkable growth in just 30 years since its foundation,

initially with the primary goal of providing Chinese athletes with a national brand to wear during international Olympic competitions. Today, the company distinguishes itself through its product design expertise, thanks to constant technological advancement in the industry.

This Chinese enterprise stands out positively from the majority of other Chinese companies concerning its adoption of sustainable practices. In fact, it aligns with the sample mean of the companies considered as the reference sample in terms of sustainability and exhibits a significantly higher degree of corporate sustainability compared to the Chinese average.

It is important to analyse the reasons behind this remarkable level of sustainability achieved by this company to understand the motivations that justify a higher level of sustainability than the CATI and CITI averages in the region of China. These motivations may encompass a range of factors, including committed corporate leadership towards sustainable objectives, investments in eco-friendly technologies, a corporate culture oriented towards environmental and social responsibility, and the adoption of practices and processes that reduce environmental impact.

Furthermore, with the increasing awareness of the importance of sustainability on a global scale, the company recognizes the long-term benefits that can stem from being a sustainable organization, as outlined in the comprehensive part of this study. This may include greater appeal to sustainability-conscious consumers, access to new markets and business opportunities, as well as the mitigation of risks associated with potential stricter environmental regulations.

In any case, the Chinese enterprise in question sets a positive example, both for other companies in the industry and within the same geographical area, of how it is possible to achieve and maintain high standards of corporate sustainability, simultaneously contributing to improving the company's image and the well-being of the environment. Specifically, Li-Ning actively commits to playing its role in environmental stewardship as a company and contributes to the goal of achieving carbon neutrality by 2025. The company continually refines its sustainable operations management system, enhances its environmental management system, and implements eco-friendly initiatives. Moreover, it promotes innovation in sustainability and actively responds to the impacts of climate change, such as through the implementation of specific climate risk management procedures, monitoring supplier environmental performance, and providing financial incentives for emissions reduction actions. The company has also developed a plan and management system to achieve corporate carbon neutrality, although the subcategories of CATI related to carbon target setting, performance against carbon target, and disclosure of progress made against its

renewable energy target are all scored at zero, as is the value regarding climate actions aimed at decarbonizing company operations.

At present, Li-Ning and its supply base in Guangxi have obtained certification in compliance with the ISO 14001 standard for environmental management. The company continues to strengthen emissions management and resource utilization, strictly adhering to regulations related to eco-friendly operations, and integrates sustainable development principles and environmental awareness into the daily work of its employees. Throughout 2022, the company actively promoted expansion, innovation, and the implementation of ecological measures, in synergy with the environmental goals set for its office operating environment. This steadfast commitment has led to continual refinement and adaptation of the implementation plan, reinforcing the path toward a higher level of corporate environmental management.

What may motivate Li-Ning to dedicate particular attention to environmental sustainability could be attributed, in part, to its prominence in various essential sports product categories, largely due to its collaborations with NBA (National Basketball Association) superstars. In fact, the company has established sponsorship partnerships with various prominent NBA players.

The NBA represents the primary and most prestigious basketball league in the United States of America, composed of professional teams from both the United States and Canada, renowned for hosting some of the world's finest basketball talents. The NBA enjoys significant global popularity, with a substantial following worldwide.

Furthermore, the NBA is actively involved in numerous initiatives related to environmental sustainability, including the well-known "NBA Green" program, aimed at promoting ecological responsibility. This commitment by the NBA extends beyond sustainability in the realm of sports, seeking to inspire its business partners to minimize environmental impact and contribute to sustainable economic progress.

The business relationship between Li-Ning, a pioneering Chinese sports goods manufacturer, and the NBA, a globally renowned sports organization committed to sustainability, could be one of the reasons why this Chinese manufacturing company stands out in terms of sustainability compared to the average Chinese companies in terms of CATI and CITI. Li-Ning's adoption of a corporate sustainability strategy may, therefore, derive from external influences, such as its collaboration with the NBA. The NBA, oriented toward sustainability and engaged in initiatives with other environmental partners such as the Arbor Day Foundation, Clever Carbon, Green Sports Alliance, and Sport & Sustainability International,

is highly motivated not to associate its name with non-sustainable companies, as this could significantly damage its image in the event of impactful negative occurrences. In this way, the partnership between Li-Ning and the NBA contributes to promoting a more sustainable approach in the sports goods and commercial activities sector, generating a positive impact on Li-Ning's corporate sustainability.

Furthermore, through this example, the previously expressed concept becomes clearer: corporate sustainability is not solely determined by a company's geographical location, although institutional context may exert some influence. Indeed, according to this study, sustainability is a decision that depends on a range of factors, which can be internal or external to the company, contributing to its overall strategy. Therefore, a company's ability to adopt and promote sustainable practices is not primarily constrained by its operational location but depends on its vision, willingness to engage, available resources, and influences and collaborations with external entities, such as organizations and associations promoting sustainability.

From an understanding of the Li-Ning business case analysed in this subchapter, this could lead us to believe that sportswear companies are generally more sustainable than other clothing companies. The involvement of world-famous athletes who exert pressure for sustainability, for example, through their personal engagement in social and environmental initiatives, is not the sole reason why sportswear companies can be considered more sustainable. Companies producing sports goods may appear more sustainable than other textile companies because they have a greater tendency toward innovation, driven by their investment in research and development to enhance the performance of sports articles, which can lead to the adoption of more sustainable materials and more efficient production processes. In fact, sports goods companies often use and develop technologically advanced materials that can be more sustainable. Significant sporting events that frequently place special emphasis on sustainability, consumer pressure from those purchasing sports products who are often more environmentally aware, and jurisdictional regulations on environmental matters often influence sports goods companies as well.

However, it is important to note that not all sports goods' companies are automatically considered sustainable. As highlighted in the table below (Table 5), sustainability within sportswear companies can also vary significantly from one company to another.

Table 5: CITI performance in the Sportswear subsector

Sectoral Subsector	# Brand	% Brand
<i>Sportswear</i>		
Q1= 10,25	11	52%
Q2 = 23	2	10%
Q3 = 57,5	3	14%
Q4 = 83	5	24%
TOTAL	21	100%

Source: Own elaboration

In the case of the analysed sample, it is observed that only five companies (namely Adidas, New Balance, Nike, Puma, and Lindex), representing approximately 24% of the "sportswear" category within the sector, exhibit optimal performance in terms of sustainability. At the same time, 52% of the companies within this specific sector exhibit minimal levels of environmental sustainability. This result once again practically confirms what was highlighted in response to the second research question, namely that sustainability represents a choice made at the discretion of individual companies. Furthermore, it is noted that the motivations driving some pioneering companies in the sports sector, such as Li-Ning, to embrace sustainability, are not shared or considered sufficiently attractive by other major brands, including Under Armour, JD Sport Fashion, and Skechers, to name a few. The latter belong to the first quartile of the sample distribution, thus indicating minimal values in terms of CATI and CITI. It is, therefore, not possible to generalize and assert that companies trading in sports articles can be leaders in sustainability and that they are all more sustainable than other textile companies included in the studied sample.

To conduct a category-level analysis of the companies included in the textile sample, each company was assigned a specific sector in which they operate. This categorization involved eight distinct subsectors, each defined based on the company's target market and the brand's position within that market. For example, the luxury sector includes prestigious companies such as Coach, Chanel, Burberry, Hugo Boss, and others. The fast fashion segment encompasses brands like Shein, Inditex, Mango, Primark, and Benetton, to name a few examples.

The casual lifestyle category includes companies that offer higher-quality products than fast fashion companies but do not reach luxury levels. In this segment, we find brands such as Levi's, Desigual, Guess, and Lacoste. Finally, in the lingerie sector, there are two companies, namely Victoria's Secret and Etam.

This division was made by carefully considering the market context in which each company operates and its position within that context, in order to create an accurate categorization of the companies within the analysed textile sample.

Consequently, we proceed to apply this information, as was done for Table 5, to the entire sample, thus creating a detailed breakdown of the sample based on the sectors in which companies operate and their assessment of sustainability in relation to quartiles. In other words, we are analysing the sample as a whole and categorizing companies into categorical variables based on both their industry sector and their performance in terms of sustainability, using quartile analysis, as seen earlier, as a reference for this assessment.

Before turning our attention to the practical relevance of the results, we test whether the two categorical variables are statistically independent using the chi-squared test. We then verify whether membership in a specific textile sector is not correlated with the degree of sustainability (H_0), setting an alpha value of 0.05 (thus accepting a 5% risk of concluding that the two variables are independent when they are not). The statistical analysis conducted in this spectrum primarily aims to determine whether belonging to a specific sector within the textile industry significantly influences the level of sustainability of companies. The chi-square value returned in terms of p-value, having compared the variation in sustainability caused by all fashion sectors together (having thus controlled the entire table together), measures 0.099.

As the p-value is greater than the level of significance, the null hypothesis is accepted. Consequently, it is assumed that sector membership in the textile industry does not have an influence on a higher or lower level of sustainability.

The results obtained from the analysis have indicated that the difference between the observed frequencies (i.e., companies from different sectors adopting sustainable actions) and the expected frequencies (based on a theoretical model of independence between sector and sustainable actions) is not statistically significant. The absence of statistical dependence suggests that, under the analysis conditions, there is insufficient evidence to support the idea that belonging to a particular sector demonstrates a correlation with the degree of sustainability. In other words, the data collected and analysed do not support the hypothesis that companies in one sector are significantly different from companies in another sector in terms of sustainability.

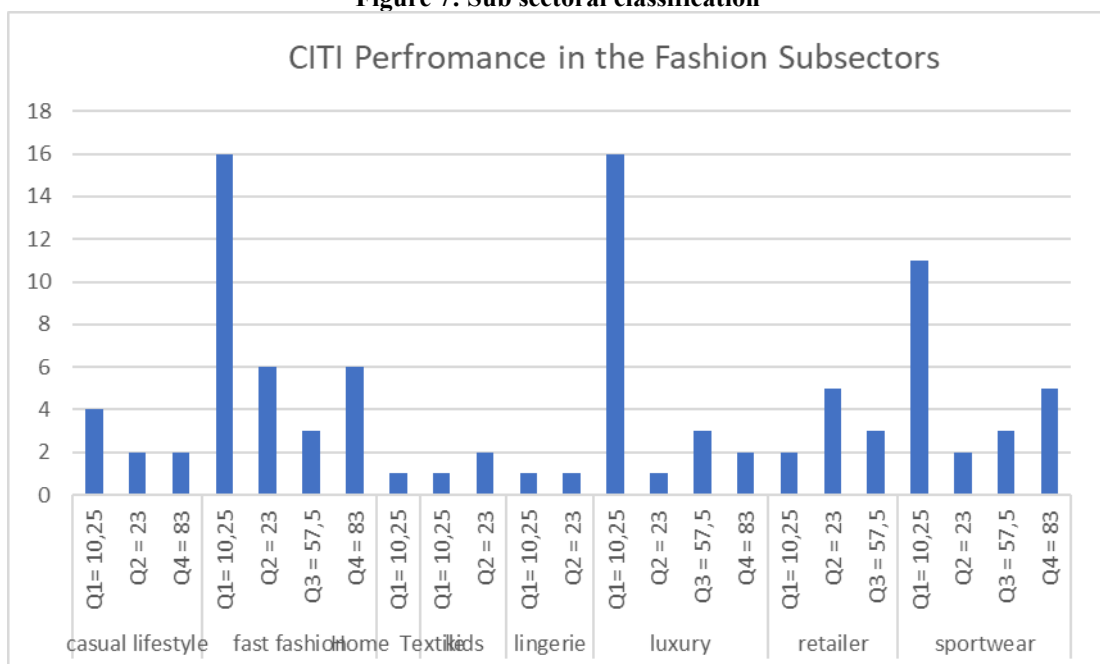
Indeed, from a practical interpretation of the data presented in the table below, several relevant insights emerge regarding the more sustainable sectoral subcategories, namely casual lifestyle, fast fashion, luxury, and sportswear, as previously examined in detail. Surprisingly, we observe that, apart from the casual lifestyle category, where 25% of the companies in the

subcategory (equivalent to only two companies in the total sample) exhibit optimal levels of sustainability, the fast fashion category has a higher number of companies in the fourth quartile of the sample compared to the sportswear category. This result provides a significant response to the fourth research question, and it contradicts the commonly held belief that fast fashion companies do not consider sustainability in their corporate strategy. To cite a concrete example of a company operating in the fast fashion sector, that exhibits optimal CATI and CITI values, is the Inditex Group.

The analysis reveals that 19% of the companies in the fast fashion sector included in the sample demonstrate very high sustainability performance, thus showcasing their ability to undertake operational sustainable actions and contribute to making their supply chain more environmentally friendly. This data suggests that some fast fashion enterprises are adopting meaningful sustainability practices, signalling a positive shift within this category, and refuting the notion that they disregard sustainability in their corporate governance.

These findings can have significant implications for understanding sustainability in the textile industry. If sector membership is not a significant factor in determining sustainability levels, this may indicate that other variables or factors could be more influential. Furthermore, such conclusions can serve as inspiration for strategic and policy decisions aimed at promoting sustainability across the entire industry, regardless of the specific branch in which companies operate.

Figure 7: Sub sectoral classification



Source: Own Elaboration

5.4 CASE STUDIES: TOP 3 COMPANIES FOR GREENING OF SUPPLY CHAIN PERFORMANCES

Now we can start analysing practical examples of some companies that implement, or has already implemented, sustainable practices for a greener planet. We focus our attention in studying Levi's, Inditex group and Adidas, being the companies that report highest CITI score (see Table 6).

5.4.1 LEVI'S

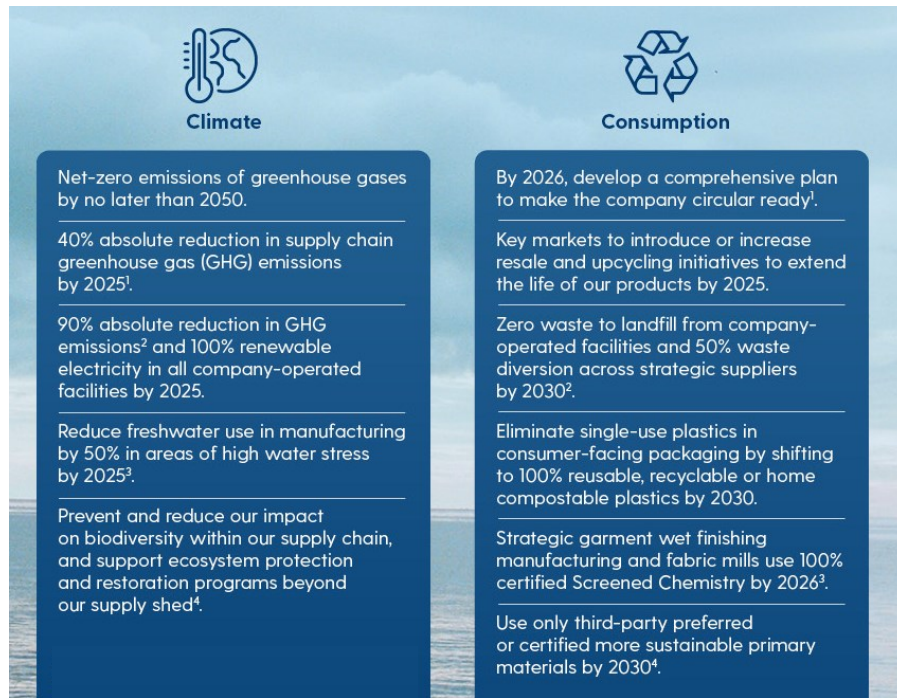
Levi's addresses climate change by minimizing water usage during production processes and implementing factories with better energy efficiency (Levis, 2023). Specifically, Levi's saved 13 billion litres of water by 2020 through the introduction of their technology called Water<Less, which was launched in 2011 (Levis, 2023). Furthermore, the company has implemented a water reuse and recycling guide that aims to recycle more than 20% of water used in its industries (Levis, 2023). Additionally, to achieve better energy efficiency in their industries, Levi's employs more modern heat production processes, reduces natural gas usage, and prefers LED lighting systems (Levis, 2023).

They also launched the "Buy Better, Wear Longer" campaign in 2021, which promotes more conscious purchasing decisions, encouraging customers to buy higher quality items that can be worn for a longer time, consequently reducing waste (Levis, 2023). Furthermore, Levi's actively participates in improving the circularity of its products by proposing scalable innovations for positive change, using recyclable and renewable materials that can be reused, and striving to limit resource consumption during the production process (Levis, 2023).

Levi's has made significant commitments to responsible denim production, including the adoption of lower-impact materials like recycled cotton and a commitment to using less water (Jacobs, 2023). By 2025, Levi's has set a series of Climate Goals, including an absolute 40% reduction in greenhouse gas emissions in the supply chain, a 90% reduction in greenhouse gas emissions, 100% use of renewable energy in all company-operated facilities, a 50% reduction in freshwater use in production in water-stressed areas, and continued assessment and identification of material impacts and dependencies on nature throughout the value chain to implement a comprehensive biodiversity strategy (Levis, 2022).

Levi's has fully embraced the challenge of reducing hazardous chemicals used in the dyeing and treatment process of its garments, with the ambitious goal of completely eliminating these harmful substances by 2020 (Jacobs, 2023). Levi's has achieved significant progress in this regard, achieving this important ecological goal in collaboration with the prestigious Zero Discharge of Hazardous Chemicals (ZDHC) group (Jacobs, 2023).

Figure 8: Levi's Sustainability Goals for 2025



Source: Levis (2022)

5.4.2 INDITEX

Now we delve into the climate actions of Inditex, another top lead firm strongly committed to combating climate change. In line with their sustainability commitment, they have advanced their Net Zero Emissions goal to 2040 (thus anticipating the goal by 10 years), aiming to reduce emissions across their entire value chain by 50% by 2030 (Climate Action, 2023). They are also active participants in various initiatives focused on climate change, such as Race to Zero under the United Nations Framework Convention on Climate Change (UNFCCC), the We Mean Business Coalition, and the Business Call for a UN Treaty on Plastic Advertising. Notably, they also participated in the 2021 review of the Fashion Industry Charter for Climate Action goals (Inditex, 2021). Inditex's Sustainability Policy establishes the principles of environmental action applicable to all business areas and throughout the value chain (Inditex, 2022). It emphasizes the fundamental principle of environmental preservation through continuous improvement actions in aspects like atmospheric emissions, resource consumption, chemical use, and waste management (Inditex, 2022). This has allowed them to reduce the relative water consumption in the supply chain by 17% compared to 2020 and achieve 100% renewable electricity use in their facilities by 2022 (Inditex, 2022). Among these principles, noteworthy actions include considering environmental variables in planning and developing activities, both within the company and with partners and suppliers;

promoting environmental awareness; and complying with applicable environmental legislation (Inditex, 2022). These principles of action align with Inditex environmental strategies, including the global energy strategy and the global water management strategy (Inditex, 2022). The group also collaborates with suppliers and other organizations to promote the implementation of specific improvement plans in their supply chain, closely partnering with organizations like MIT through the Climate and Sustainability Consortium, the Fashion Pact, the UN Fashion Industry Charter for Climate Action, Textile Exchange, and Zero Discharge of Hazardous Chemicals (ZDHC) (Inditex, 2022). Specifically, Inditex has joined the ZDHC Board of Directors, which aims to achieve zero discharge of hazardous chemicals in the textile industry (Inditex, 2021).

The ISO 14001 certified environmental management system adopted by the group guides Inditex towards a commitment to using renewable energy and circular management models (Inditex, 2022). Regarding the impact of greenhouse gas (GHG) emissions, the group's actions include monitoring consumption and associated emissions, opting for consumption alternatives with lower impacts, and adopting efficiency and optimization strategies using less energy-intensive equipment and techniques (Inditex, 2022). In 2022, indeed, 100% of the electricity consumed in their facilities came from renewable sources, resulting in a total saving of 451,430 tons of greenhouse gas emissions, a 95% increase compared to 2018 (Inditex, 2022).

Other efforts in which Inditex is involved in collaboration with its suppliers and in making their supply chain greener include the following (Inditex, 2022):

- Reducing energy consumption by providing suppliers with information about best available techniques for various production processes through an online knowledge transfer platform developed by Inditex, publicly accessible to the entire industry. For instance, they shared new dyeing and washing techniques that decrease water consumption by lowering the required process temperature and cutting energy use, thus reducing associated emissions;
- Encouraging suppliers to replace fossil fuels with greener alternatives like biomass from responsible sources supported by certifications, or fuels derived from agricultural waste. The group's goal is to eliminate the use of coal in their supply chain by 2030 and avoid installing new coal equipment from 2023;
- Promoting the use of renewable energy in the supply chain by sharing information with their key suppliers about availability, regulations, procedures, and indicative prices for implementing a range of renewable energy sourcing solutions;

- Collaborating with suppliers to analyse and promote efficiency improvements in transportation and distribution, such as the use of electric vehicles for last-mile deliveries in China across 42 cities. This initiative reduces GHG emissions and air pollution in cities, resulting in savings of 217.18 tons of CO₂ and a 53% reduction in GHG emissions.

Inditex's approach to water management emphasizes reducing water consumption in company operations and the supply chain (Inditex, 2022). This not only preserves water as a natural resource but also contributes to reducing greenhouse gas emissions, as less energy is required to heat water in production processes that involve it (Inditex, 2022). The Global Water Management Strategy encompasses initiatives in both operations and the supply chain (Inditex, 2022). Initiatives in operations, for example, refer to initiatives aiming to reuse 100% of water through rainwater storage tanks. In 2022, these initiatives enabled the collection of 25,080 m³ of water for garden irrigation purposes (Inditex, 2022). Initiatives within the supply chain refer to the program developed by Inditex, Care for Water (Inditex, 2022). Involving the supply chain in efficient water management is crucial as it covers the two areas where water consumption is most significant in the production of goods: on one hand, it encompasses the cultivation and production of raw materials like cotton, and on the other, the wet processes (dyeing, washing, printing, among others) necessary to create the items they sell (Inditex, 2022). Consequently, the Group has set a goal to reduce water consumption throughout the supply chain by 25% by 2025 (Inditex, 2022; Inditex, 2021). In 2022, relative consumption was reduced by 17%, compared to 9310 liters per kilogram of product consumed in 2020 (Inditex, 2022).

Inditex's waste approach consists of a series of projects to facilitate the recovery, reuse, and subsequent recycling of materials, transforming them into resources that can continue to be used and maximizing their value; this is implemented through the Zero Waste Program (Inditex, 2022). Their commitment is that by 2023, waste generated at their headquarters, logistic centers, owned factories, and owned stores will be correctly collected and managed to be available resources for new use through reuse or recycling (Inditex, 2022). This challenge not only involves selecting the right materials for treatment and subsequent recycling but also offers the opportunity to rethink processes in order to avoid generating waste in the first place and instead maximize the use of these resources in their creation, logistics, store, and end-of-life processes (Inditex, 2022).

Additionally, Inditex relies on the Green to Pack program, which aims to optimize the use of packaging materials, such as bags, labels, and protective items, extending their lifespan and improving recyclability (Inditex, 2022).

Inditex is also engaged in Responsible Consumption and Production practices (Inditex, 2021). In 2021, they continued to promote the production of items labelled with their Join Life standard, which identifies products made from the most sustainable raw materials and environmentally friendly production processes, reaching 47% of market-introduced products with this standard (Inditex, 2021). Furthermore, they actively participate in projects like Fashion Re- and partnerships such as the one initiated in 2020 with the UNHCR, with the goal of extending the lifecycle of textile products and reducing waste generation (Inditex, 2021).

Another ambitious goal set by the Inditex group is to use 100% of textile fibres with a lower environmental impact by 2030, achieved through the use of materials created through technological innovation, recycled fabrics, and raw materials cultivated using organic and regenerative agricultural practices (Climate Action, 2023).

In this regard, one of the group's top priorities is achieving zero-impact fibres by 2030 (Climate Action, 2023).

Figure 9: Inditex Sustainability Roadmap



Source: Inditex (2022)

5.4.3 ADIDAS

Adidas is committed to transitioning to a comprehensive offering of sustainable products for consumers on a global scale, expanding its circular services, and striving for climate neutrality throughout the value chain. Adidas is working to transform its product range into a comprehensive offering comprised of items with reduced environmental impact, targeting consumers worldwide. Additionally, the company is expanding its circular services and is putting significant efforts into achieving climate neutrality (in terms of CO2 emissions) across its entire production chain (Adidas, 2022).

Furthermore, Adidas is persistently raising awareness among its employees to become advocates for sustainability. Likewise, they are encouraging global consumers to actively engage and communicate with the company regarding sustainability (Adidas, 2022).

Adidas clearly understands that achieving these goals is not possible alone. They recognize the need to leverage their enduring relationships with suppliers to ensure they can continue on the path of emissions reduction alongside the company. Moreover, they are closely collaborating with partners to expand the use of innovative materials and recycling technologies (Adidas, 2022).

The company has set targets aimed at limiting emissions according to the 1.5°C parameter to contribute to a emissions-free future. Adidas is committed to:

- Achieving climate neutrality (CO₂) within its operations by 2025.
- Achieving climate neutrality (CO₂) for the entire value chain by 2050.
- Reducing absolute greenhouse gas (GHG) emissions across the entire value chain by 30% by 2030, compared to 2017 values.

The emission reduction targets for 2030 have been approved by the Science Based Targets initiative (SBTi). For the 2025 target, they commit to reducing absolute greenhouse gas emissions by 90% compared to the 2017 baseline. This goal aligns with the reductions necessary to avoid temperature increases beyond 1.5°C, the more ambitious goal of the Paris Agreement. The emission reduction goal for the entire value chain adheres to the SBTi's criteria for ambitious value chain goals, ensuring alignment with current best practices (Adidas, 2022).

The "Environmental Footprint Tool" adopted by Adidas provides the ability to calculate, monitor, and transparently disclose their carbon footprint not only within their operations but also along the entire production chain. This process covers every stage, from raw material research and extraction to production and processing, product assembly, internal operations and logistics, to product usage and end-of-life (Adidas, 2022).

According to the data, the average annual greenhouse gas emissions along the value chain per product for 2022 decreased compared to the previous year (Adidas, 2022). This reduction was mainly attributed to a focus on innovation, which enabled, for example, emission reductions through the adoption of lower-carbon impact production processes and materials. In 2022, 96% of the polyester used was sourced from recycled materials. Additionally, Adidas is pursuing its decarbonization strategy, incorporating further material innovations, transitioning to cleaner energy sources among its suppliers, creating low-carbon products, and achieving climate neutrality (Adidas, 2022).

Table 6: Summary of the major important actions carried out by Adidas, Inditex and Levi's

<i>ACTIONS</i>	<i>ADIDAS</i>	<i>INDITEX</i>	<i>LEVI'S</i>
<i>Climate goals</i>	Achiving climate neutrality by 2025; Reducig by 30% of GHG emission by 2030	Achiving zero-impact fibers by 2030; Reducing by 50% of the emission by 2030; Achieved 100% renewable electricity in their facility	Reducing -40% gas emission; Reducing -50% freshwater usage; Achieved 100% usage of renewable energy
<i>Climate initiatives</i>	Environmental Footprint Tool	Race to Zero; We Mean Business Coalition; Green to Pack; Care for Water	Buy Better, Wear Longer; Water<Less
<i>Eco-efficient product</i>	Material innovation; Produce low-carbon product; Usage of 96% of recycled polyester	Water management strategy and global energy strategy	Recycled cotton usage

Source: Own elaboration

6. CONCLUSIONS

Nowadays the primary goal of any organization cannot be solely profiting maximization: it's essential to recognize that environmental issues cannot be ignored to ensure long-term sustainable development (Sarker et al., 2019) and, therefore, there is a need for active commitment on the part of companies to adopt and implement sustainable actions and measures in order to progress towards a more sustainable future, also considering the high polluting impact of their activities. In this regard, organizations can adopt sustainable practices across all their functional areas and gain also competitive advantage (Onyango et al., 2014; Straka et al., 2021).

In this thesis, after a thorough analysis of the literature on sustainability and GVC, it was proceeded to apply the concepts examined from a theoretical standpoint to practice. Specifically, as a first step, we seek to study the value chain of the textile sector, the subject of our study, by meticulously determining the phases that comprise this chain, how companies in the sector interact with each other, and how value is created and distributed within it. From the literature, multiple studies emerge that investigate and confirm the considerable environmental impact of textiles; however, it is of paramount importance to understand the role played by each economic actor in order to better determine the extent of their impact along the chain, which phases of the chain have the greatest impact, as well as what practical improvements can be made to enhance this process. Thus, the first assumption of this research was the analysis of the value chain in the textile industry.

After this initial part focused on qualitative analysis, we shifted our focus to empirical research. The purpose of this quantitative research is to understand the climate actions most commonly used by textile industry companies to combat environmental degradation, and to this end, we conducted cross-sectional and comparative analyses, including a geographical perspective.

In summary, from the analysis conducted, both in terms of the geographical distribution of the textile companies under examination and in relation to their sector of operation, as well as their environmental initiatives, three main significant conclusions emerge.

Firstly, it is observed that sustainability, at least for the analysed textile companies, primarily represents a corporate decision, influenced to a greater or lesser extent by a series of factors, both internal and external to the organization. It is interesting to note that, as highlighted by various statistical analyses and practical data elaborations, sustainability levels can vary significantly, even within the same geographical area of operation and industry sector. This suggests that the willingness to embrace sustainability can vary from one company to another,

regardless of the geographical specificity and the sector of operation, which may still have an influence.

Another important consideration that emerges from this study is that companies in the fast fashion sector, representing 21% of the total sample analysed, partially achieve positive results in terms of sustainability, contrary to the common perception that fast fashion only has a negative environmental impact. In fact, it is important to note that only 15% of the sample falls within companies with high sustainable levels, placing them in the fourth quartile of the data distribution. Of this 15%, 6% of the companies operate in the fast fashion sector, while the remaining 9% is divided among the sportswear (5%), casual lifestyle (2%), and luxury (2%) sectors.

A relevant aspect that significantly influences the choices of actions adopted by the textile companies examined in this research is their geographical distribution. This factor, as a result of statistical testing, plays a decisive role in shaping the landscape of sustainability initiatives implemented in these companies. Each geographical area has its own operating context, which, in turn, is formed by factors such as regional government and environmental policies, local consumer preferences, available natural resources, and specific economic dynamics, which can exert, as revealed, significant pressure on the choice of climate actions to be adopted. However, this finding does not undermine the initial argument that sustainability for companies operating in the fashion sector represents a corporate choice. Another thing is that, as highlighted by the latest analysis conducted, we are unable to draw any conclusions about the actual sustainability of the actions taken. This means that companies may choose to undertake climate actions for various reasons, including their geographical location, but their effectiveness in bringing about actual improvements in environmental sustainability remains a separate issue and requires further assessment as the geography of the analysed brands does not influence the degree of sustainability. In other words, the choice to act sustainably is an important step, but ensuring actual positive impact requires ongoing commitment and rigorous evaluation of corporate practices.

6.1 LIMITATIONS

One limitation inherent in this study, given its quantitative approach, is the potential presence of errors in the dataset on which the statistical analysis is based. These errors could result from some inaccuracies during the data transcription process and the fact that the data itself is not up to date as of the current date but rather dates back to the earlier part of the current year. It is important to acknowledge that data accuracy and timeliness are crucial for the reliability of quantitative analyses. Furthermore, the analytical approach employed in this thesis is

limited to descriptive quantitative analysis and analytical comparison of the variables used for such analysis, as the creation of a linear regression model was foregone.

The present study focuses on analysing the environmental dynamics of textile companies; however, it is imperative to emphasize the inevitable relevance of the social aspect within this intricate context. It should be noted that during the course of this research, the complex social dynamics that permeate the fashion industry were not explored. This can be considered a limitation of this study. This gap has not brought to light a series of significant issues, including the protection of worker safety, unacceptable precarious working conditions, the issue of inadequate wages, widespread poverty, as well as serious concerns regarding the protection of women and children, to name a few. A tragic event that characterized the dark side of the textile industry is represented by the tragic incident that occurred in Bangladesh in 2013, known as the "Rana Plaza collapse". This devastating event affected a building that housed various textile-related activities (Fernandez-Stark et al., 2022; Repubblica, 2021). The catastrophe highlighted the atrocious working conditions to which the employees of the involved textile factories were subjected, drawing attention to the social issues associated with the garment industry (Fernandez-Stark et al., 2022). Aspects related to social dynamics are also essential, alongside the economic and environmental dimensions, for an approach to Sustainable Development.

6.2 SUGGESTION FOR FUTURE RESEARCH

Further investigating the effectiveness of the sustainable actions implemented and assessing whether this translates into actual improvements in environmental sustainability represents a promising starting point for future research. This direction for future studies could be interesting in conjunction with the consideration of the widespread phenomenon of greenwashing. In other words, a suggestion for future research could be to examine whether companies in the textile sector are genuinely contributing significantly to sustainability or if they are simply promoting a good image of environmental responsibility without concrete results.

Another interesting perspective for future analyses could be to examine the extent of the influence exerted by the institutional context on the adoption of specific practices compared to others. The relevance of this aspect arises from the fact that regulatory conditions, public policies, and ethical standards can vary significantly between different regions and countries, consequently influencing corporate strategic decisions. Analysing how the institutional

context impacts corporate choices could provide a more comprehensive picture of the underlying dynamics of corporate sustainability.

For future research, it would be crucial and interesting to carefully examine the various differences, stemming from the heterogeneity of climate actions adopted by the textile sample, that occur across different geographical areas. This would aid in developing effective and region-specific sustainability promotion strategies and addressing regional specificities within the textile industry. Studying these differences, whether they arise from economic, political, and environmental contexts or from the dynamics of the textile sector, is important for fully understanding how companies adapt to the challenges of sustainability based on their geographical location. This variation in the adoption of actions suggests, therefore, the importance of taking a closer look at the factors driving these choices within the textile industry and based on geographical area of operation.

Another aspect worthy of further research lies in examining the influence of both internal and external factors on the prevalence of sustainable practices adoption. Gaining a deeper understanding of internal factors such as corporate culture and leadership, as well as external factors like government regulations and market expectations, which impact the adoption of sustainability practices, could aid in the development of more targeted and specific strategies for promoting sustainability. Therefore, identifying the levers or gaps in climate-related corporate actions can offer valuable assistance to policymakers in developing and formulating policies aimed at incentivizing companies to become more sustainable and facilitating the intricate management of environmental aspects.

REFERENCES

- Abdulsamad, A., Frederick, S., Guinn, A., & Gereffi, G. (2015). *Pro-Poor Development and Power Asymmetries in Global Value Chains*. The Duke University Center on Globalization, Governance & Competitiveness (Duke CGGC). <https://doi.org/10.13140/RG.2.2.32872.88323>
- Adidas (2022). *Rooted in our Purpose - Adidas Annual Report 2022*. <https://report.adidas-group.com/2022/en/group-management-report-our-company/sustainability/rooted-in-our-purpose.html>
- Ashby, A., Leat, M., & Smith, M. H. (2012). Making connections: a review of supply chain management and sustainability literature. *Supply Chain Management*, 17(5), 497–516. <https://doi.org/10.1108/13598541211258573>
- ASVIS (2023). *Alta sostenibilità: equità intergenerazionale per un futuro resiliente e inclusivo*. <https://asvis.it/radio-alta-sostenibilita/1457-6963/alta-sostenibilita-equita-intergenerazionale-per-un-futuro-resiliente-e-inclusivo#> [retrieved on: 03/06/2023]
- Balkau, F., & Sonnemann, G. (2010). Managing sustainability performance through the value-chain. *Corporate Governance*, 10(1), 46–58. <https://doi.org/10.1108/14720701011021102>
- Beckerman, W. (1994). “Sustainable Development”: Is it a Useful Concept? *Environmental Values*, 3(3), 191–209. <https://doi.org/10.3197/096327194776679700>
- Berke, P., & Manta, M. (1999). *Defining Sustainable Development from Planning for Sustainable Development: Measuring Progress in Plans*, on JSTOR. Retrieved June 24, 2023, from <http://www.jstor.com/stable/resrep18489.4>
- Brink, M. T., Hengeveld, G. M., & Tobi, H. (2020). Interdisciplinary measurement: A systematic review of the case of sustainability. *Ecological Indicators*, 112, 106145. <https://doi.org/10.1016/j.ecolind.2020.106145>

Cattaneo, O., Gereffi, G., & Staritz, C. (2010). *Global Value Chains in a Postcrisis World: A Development Perspective*. <https://doi.org/10.1596/978-0-8213-8499-2>

Chen, Y., Zhu, Q., Sarkis, J. (2022). Green supply chain management practice adoption sequence: a cumulative capability perspective. *International Journal of Production Research*, 61(17), 5918-5933, DOI: [10.1080/00207543.2022.2118891](https://doi.org/10.1080/00207543.2022.2118891)

Climate Action (2023). *Zara set new ambitious sustainability goals*. Retrieved August 23, 2023, from <https://www.climateaction.org/news/zara-set-new-ambitious-sustainability-goals>

Da Silva Batista, Á. A., & De Francisco, A. C. (2018). Organizational Sustainability Practices: A study of the firms listed by the Corporate Sustainability Index. *Sustainability*, 10(1), 1–13. <https://doi.org/10.3390/su10010226>

De Marchi, V., Di Maria, E., & Micelli, S. (2013). Environmental strategies, upgrading and competitive advantage in global value chains. *Business Strategy and the Environment*, 22(1), 62–72. <https://doi.org/10.1002/bse.1738>

De Marchi, V., Di Maria, E., Golini, R., & Perri, A. (2020). Nurturing International Business research through Global Value Chains literature: A review and discussion of future research opportunities. *International Business Review*, 29(5), 101708. <https://doi.org/10.1016/j.ibusrev.2020.101708>

Di Maria, E. (2012). Sostenibilità ambientale e imprese del Made in Italy. *Venice International University*.

Duke University (2017). *The Global Industry of Apparel*. Retrieved on May, 3, 2023 from https://sites.duke.edu/sociol342d_01d_s2017_team-7/1-the-global-industry-of-apparel-unfinished/

Duran, D., Gogan, L. M., Artene, A. E., & Duran, V. (2015). The Components of Sustainable Development - A Possible Approach. *Procedia. Economics and Finance*, 26, 806–811. [https://doi.org/10.1016/s2212-5671\(15\)00849-7](https://doi.org/10.1016/s2212-5671(15)00849-7)

Eryürük, S. H. (2012). Greening of the textile and clothing industry. *Fibres & Textiles in Eastern Europe*, 20, 6A (95): 22-27 <http://www.fibtex.lodz.pl/2012/6A/22.pdf>

Fashion on Climate (2020). Fashion on Climate: How the Fashion Industry Can Urgently Act to Reduce its Greenhouse Gas Emissions. McKinsey & Company. Retrieved from: <http://www2.globalfashionagenda.com/initiatives/fashion-on-climate/>.

Fernandez-Stark, K., Frederick, S., & Gereffi, G. (2016). *The Apparel Global Value Chain: Economic Upgrading and Workforce Development*. Duke University Center on Globalization, Governance and Competitiveness (Duke CGGC). Retrieved August 19, 2023, from https://www.globalvaluechains.org/wp-content/uploads/2011-11-11_CGGC_Apparel-Global-Value-Chain.pdf

Fernandez-Stark, K., Bamber, P., & Couto, V. (2022). *Analysis of the Textile and Clothing Industry Global Value Chains*. Inter-American Development Bank. <https://doi.org/10.18235/0004638>

Gereffi, G. (1999). International trade and industrial upgrading in the apparel commodity chain. *Journal of International Economics*, 48(1), 37–70. [https://doi.org/10.1016/s0022-1996\(98\)00075-0](https://doi.org/10.1016/s0022-1996(98)00075-0)

Gereffi, G., & Fernandez-Stark, K. (2016). Global value chain analysis: a primer. *Center on Globalization, Governance & Competitiveness, Duke University*. https://dukespace.lib.duke.edu/dspace/bitstream/handle/10161/12488/2016-07-28_GVC%20Primer%202016_2nd%20edition.pdf

Gereffi, G., & Memedovic, O. (2003). The Global Apparel Value Chain: What Prospects for Upgrading by Developing Countries? *United nations industrial development organization*. https://www.unido.org/sites/default/files/2009-12/Global_apparel_value_chain_0.pdf

Gereffi, G., Humphrey, J., & Sturgeon, T. J. (2005). The governance of global value chains. *Review of International Political Economy*, 12(1), 78–104. <https://doi.org/10.1080/09692290500049805>

Gill, D., Dickinson, S. and Scharl, A. (2008). Communicating Sustainability: A Web Content Analysis of North American, European and Asian Firms. *Journal of Communication Management*, 12(3), 243-262. https://eprints.weebly.com/93/1/JCM_CSust-2008.pdf

Giunipero, L. C., Hooker, R. E., & Denslow, D. (2012). Purchasing and supply management sustainability: Drivers and barriers. *Journal of Purchasing and Supply Management*, 18(4), 258–269. <https://doi.org/10.1016/j.pursup.2012.06.003>

Global Value Chains (2022). *GVC Intro - Global Value Chains*. Global Value Chains - GVC. Retrieved August 23, 2023, from <https://www.globalvaluechains.org/about/gvc-intro/>

Hart, S. L., & Milstein, M. B. (2003). Creating sustainable value. *Academy of Management Perspectives*, 17(2), 56–67. <https://doi.org/10.5465/ame.2003.10025194>

ILO (2021). *Environmental Sustainability in Market Systems and Value Chain Development for Decent Work*. https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_779348.pdf

Inditex (2022) *Inditex Annual Report 2022: Statement on Non-Financial Information*. Retrieved August 23, 2023, from https://static.inditex.com/annual_report_2022/pdf/ENVIRONMENT.pdf

Inditex (2021). *Sustainability, the basis for transformation*. Retrieved August 23, 2023, from https://static.inditex.com/annual_report_2021/en/unique-model/sustainability-basis-transformation.html

Inomata, S. (2017). Analytical Frameworks for Global Value Chains: An Overview. *Social Science Research Network*. <https://www.ssrn.com/abstract=3074988>

Jacobs, M. (2023). *How Ethical Is Levi's? - Good On You*. Good on You. Retrieved August 23, 2023, from <https://goodonyou.eco/levis-ethical/>

Jensen, F., & Whitfield, L. (2022). Leveraging participation in apparel global supply chains through green industrialization strategies: Implications for low-income countries. *Ecological Economics*, 194, 107331. <https://doi.org/10.1016/j.ecolecon.2021.107331>

Kemp, R., & Martens, P. (2007). Sustainable Development: How to Manage Something That is Subjective and Never Can Be Achieved? *Sustainability: Science, Practice, & Policy*, 3, n. 2, pp. 5-14.

Khan, M. J., Ponte, S., & Lund-Thomsen, P. (2020). The 'Factory Manager Dilemma': Purchasing Practices and Environmental Upgrading in Apparel Global Value Chains. *Environment and Planning A*, 52(4), 766-789. <https://doi.org/10.1177/0308518X19876945>

Kuhlman, T., & Farrington, J. W. (2010). What is Sustainability?. *Sustainability*, 2(11), 3436–3448. <https://doi.org/10.3390/su2113436>

Landrum, N. E. (2017). Stages of Corporate Sustainability: Integrating the strong Sustainability Worldview. *Organization & Environment*, 31(4), 287–313. <https://doi.org/10.1177/1086026617717456>

Lenssen, G. G., & Smith, N. C. (2018). *Managing sustainable business: An Executive Education Case and Textbook*. Springer.

Levis (2023). *Building a better, more sustainable future*. Retrieved August 23, 2023, from https://www.levi.com/IT/it_IT/features/sustainability

Levis (2022). *Climate - Levi Strauss & Co*. Retrieved August 23, 2023, from <https://www.levistrauss.com/sustainability-report/climate/>

Li, Y., Zhao, X., Shi, D., & Li, X. (2014). Governance of sustainable supply chains in the fast fashion industry. *European Management Journal*, 32(5), 823–836. <https://doi.org/10.1016/j.emj.2014.03.001>

Lin, J., Demirkaya, M., Bethmann, E. (2019) Global Value Chain Analysis: Concepts and Approaches. *Journal of International Commerce and Economics*. https://www.usitc.gov/journals/jice_home.htm.

Lotti, G., Giorgi, D., & Marseglia, M. (2017). Prove di design altro. Cinque anni di progetti per la sostenibilità. *Ricerche | Architettura, Design, Territorio*, 0–204. <https://flore.unifi.it/handle/2158/1108780>

Lozano, R. (2013). A Holistic perspective on corporate sustainability drivers. *Corporate Social Responsibility and Environmental Management*, 22(1), 32–44. <https://doi.org/10.1002/csr.1325>

Martins, V. W. B., Rampasso, I. S., Anholon, R., Quelhas, O. L. G., & Filho, W. L. (2019). Knowledge management in the context of sustainability: Literature review and opportunities for future research. *Journal of Cleaner Production*, 229, 489–500. <https://doi.org/10.1016/j.jclepro.2019.04.354>

Matthew, R. A., & Hammill, A. (2009). Sustainable development and climate change. *International Affairs*, 85(6), 1117–1128. <https://doi.org/10.1111/j.1468-2346.2009.00852.x>

Meuer, J., Koelbel, J., & Hoffmann, V. H. (2020). On the Nature of Corporate Sustainability. *Organization & Environment*, 33(3), 319–341. <https://doi.org/10.1177/1086026619850180>

Muthu, S. S. (2014). Ways of measuring the environmental impact of textile processing: an overview. In *Elsevier eBooks* (pp. 32–56). <https://doi.org/10.1533/9781782421122.32>

OECD (2023) *Global value chains and trade*. Retrieved August 25, 2023, from <https://www.oecd.org/trade/topics/global-value-chains-and-trade/>

Olawumi, T. O., & Chan, D. W. (2018). A scientometric review of global research on sustainability and sustainable development. *Journal of Cleaner Production*, 183, 231–250. <https://doi.org/10.1016/j.jclepro.2018.02.162>

Onyango, M. B., Nyaoga, R. B., Matwere, R. B., & Owuor, O. J. (2014). Green Supply Chain Management and Economic Performance: A Review of Tea Processing Firms in Kericho and Pazienza, M., De Jong, M., & Schoenmaker, D. (2022). Clarifying the concept of corporate sustainability and providing convergence for its definition. *Sustainability*, 14(13), 7838. <https://doi.org/10.3390/su14137838>

Östlund, Å., Roos, S., Sweet, S., & Sjöström, E. (2020). *Investor Brief: Sustainability in Textiles and Fashion*. A Mistra Dialogue Report. https://www.mistra.org/wp-content/uploads/2020/09/mistradialogue_rapport_investor_brief_textiles_final.pdf

Parlamento Europeo (2023). *Emissioni di gas serra nell'UE per paese e settore: Infografica*. Retrieved September 26, 2023 from https://www.europarl.europa.eu/pdfs/news/expert/2018/3/story/20180301STO98928/20180301STO98928_it.pdf

Parlamento Europeo (2023). *L'impatto della produzione e dei rifiuti tessili sull'ambiente (infografica)*. Retrieved September 1, 2023, from <https://www.europarl.europa.eu/news/it/headlines/society/20201208STO93327/1-impatto-della-produzione-e-dei-rifiuti-tessili-sull-ambiente-infografica>.

Prakash, M., Toksoz, K. Espey, J., Sachs, J., Shank, M., Schmidt-Traub, G. (2017). Sustainable development goal setting from The U.S. Cities Sustainable Development Goals Index 2017: ACHIEVING A SUSTAINABLE URBAN AMERICA on JSTOR. (n.d.-b). <http://www.jstor.com/stable/resrep15885.8>

Qejvanaj, G. (2021). New Trends in Sustainable Environmental Governance in Mainland China. The Zhejiang Case. *SAGE Open*, 11(2). <https://doi.org/10.1177/21582440211023136>

Repubblica (2021). *Bangladesh, Rana Plaza 8 anni dopo: quegli accordi sulla sicurezza sottoscritti, ma che non piacciono a tutti*. La Repubblica. https://www.repubblica.it/solidarieta/diritti-umani/2021/04/23/news/bangladesh_rana_plaza_8_anni_dopo_a_un_passo_da_una_nuova_tragedia-297672327/

Ruggerio, C. A. (2021). Sustainability and sustainable development: A review of principles and definitions. *Science of the Total Environment*, 786, 147481. <https://doi.org/10.1016/j.scitotenv.2021.147481>

Rullani, E. (2010). *Modernità sostenibile: Idee, filiere e servizi per uscire dalla crisi*. Marsilio Editori spa.

Šajn, N. (2022). *Textiles and the environment*. EPRS | European Parliamentary Research Service. Retrieved August 11, 2023, from [https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/729405/EPRS_BRI\(2022\)729405_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/729405/EPRS_BRI(2022)729405_EN.pdf)

Sarker, Md. M., Das, B. K., Islam, Md. A., & Akter, S. (2019). Green Supply Chain Management Practices for Green Apparel Supply Chain. *International Journal of Scientific & Engineering Research*, 10(1), 1764–1768. https://www.researchgate.net/publication/331556333_Green_Supply_Chain_Management_Practices_for_Green_Apparel_Supply_Chain

Seuring, S., Sarkis, J., Müller, M., & Rao, P. (2008). Sustainability and supply chain management – An introduction to the special issue. *Journal of Cleaner Production*, 16(15), 1545–1551. <https://doi.org/10.1016/j.jclepro.2008.02.002>

Silvestri, M. (2015). Sviluppo sostenibile: un problema di definizione. *Strategie E Pratiche Delle Culture Contemporanee, Gentes, anno II, numero 2*. Dipartimento di studi linguistici-letterari, storico-filosofici e giuridici, Università degli Studi della Tuscia di Viterbo.

Straka M., Oláh, J &. Kassakorn, N., (2021). Impact of Green Supply Chain Integration on SMEs Technological and Economic Performance. *Global Journal of Entrepreneurship and Management*, 2(1):12-30. <https://doi.org/10.57585/GJEM.021.006>

Sustainable Development Solutions Network (2013). *An Action Agenda for Sustainable Development. Report for the un secretary-general*.

Tajoli, L. & Agenzia ICE (1989). *Il protezionismo nel settore del Tessile-Abbigliamento e l'Accordo Multifibre* [Report]. AGENZIA ICE. Retrieved March 23, 2023, from <https://www.ice.it/it/sites/default/files/inline-files/Rapporto%20Ice%201989%20-%20Tajoli%20-%20Onida%20%28sup.%29.pdf>

Tate, W. L., & Bals, L. (2016). Achieving Shared Triple Bottom Line (TBL) Value Creation: Toward a Social Resource-Based View (SRBV) of the Firm. *Journal of Business Ethics*, 152(3), 803–826. <https://doi.org/10.1007/s10551-016-3344-y>

Tebaldia, L., Brun, A., & Bottani, E. (2022). Evidences on sustainability issues in the Fashion Supply Chain: An empirical study in Italy. *Sustainable Production and Consumption*, 33, 651–663. <https://doi.org/10.1016/j.spc.2022.07.032>

Todeschini, B. V., Cortimiglia, M. N., Callegaro-De-Menezes, D., & Ghezzi, A. (2017). Innovative and sustainable business models in the fashion industry: Entrepreneurial drivers, opportunities, and challenges. *Business Horizons*, 60(6), 759–770. <https://doi.org/10.1016/j.bushor.2017.07.003>

UNFCC (2022). <https://unfccc.int/climate-action/sectoral-engagement-for-climate-action/fashion-charter/participants#Signatories->

United Nations (n.d.). *Sustainability | United Nations*. Retrieved May 13, 2023 from <https://www.un.org/en/academic-impact/sustainability>

Valera, L. (2012). La sostenibilità: un concetto da chiarire. *Economia & Diritto Agroalimentare*, 17(1), 39–53. <https://doi.org/10.1400/205627>

WCED (1987). *Our Common Future*, Oxford University Press, Oslo.

Yu, D., & Zhao, P. (2022). Global Value Chain Governance of the Apparel Design Industry under the Background of Global Sustainable Economic Development. *Journal of Environmental and Public Health*, 2022, 1–11. <https://doi.org/10.1155/2022/5178301>

Yürek, M. A., Natsuda, K., Akkemik, K. A., & Yağmur, M. (2019). The textile and clothing industrialization cycle. *İktisadi İdari Bilimler Fakültesi Dergisi*, 41(1), 256–277. <https://doi.org/10.14780/muiibd.582322>

Zanato Orlandini, O. (2013). Lessico Pedagogico, Sostenibilità. Studium Educationis, Pensa Multimedia Editore srl, 121-124. Anno XIV - n. 3. ISSN 2035-844X (online)

Zhang, L., Dou, Y., and Wang, H. (2023). Green supply chain management, risk-taking, and corporate value—Dual regulation effect based on technological innovation capability and supply chain concentration. *Front. Environ. Sci.* (11)1096349. doi: 10.3389/fenvs.2023.1096349

Zimek, M., & Baumgartner, R. (2017). Corporate sustainability activities and sustainability performance of first and second order. Conference: 18th European Roundtable on Sustainable Consumption and Production Conference (ERSCP) https://www.researchgate.net/publication/320612163_Corporate_sustainability_activities_and_sustainability_performance_of_first_and_second_order