Preface

This Element focusses on sustainable value chain innovation. *Why write an Element on sustainable value chain innovation in the global garment industry?* This Element focusses on sustainable value chain innovation. We wrote this Element because we felt that there was a need for a concise and authoritative introduction to the subject of sustainable value chain innovation. The global garment industry is used as a case in point which can provide students, academics, and practitioners with a comprehensive overview of ongoing developments in this new and exciting, yet understudied, field of research, policy, and practice. As authors, in our work on sustainability we have both carefully studied and followed ongoing international developments in the global garment and textile industries. In short, we believe that the global garment and textile industries are now under pressure to reinvent themselves in ways that will ensure their long-term economic, social, and environmental stability and survival (Muthu & Gardetti, 2020). We see these pressures arising from multiple sources.

First, following the Paris Agreement on climate change, the need for limiting global warming has been reiterated in a dramatic fashion, requiring its signatories – almost 200 countries and the European Union (EU) – to work together towards limiting global warming (Jensen & Whitfield, 2022; United Nations, n. d.). Global garment and textile production creates significant contributions to greenhouse gas emissions. Yet there is still an evident knowledge gap in relation to how to significantly reduce the fashion industry's greenhouse gas emissions (Berg et al., 2020). Responding to this need, the United Nations' Fashion Industry Charter for Climate Action (FICCA) has been set up with a mission to drive the industry to net zero emissions by 2050. Through its various working groups, FICCA seeks to develop new insights into combatting CO_2 emissions in the industry by identifying and amplifying best practices, facilitating and strengthening collaboration among relevant stakeholders, joining resources, and sharing the tools and knowledge to enable the sector to achieve its climate targets (FICCA, 2021). Hence, there is now a large-scale interest in developing new solutions, or innovations, to facilitate a transition towards a climate-neutral garment industry (Kumar, 2017).

Another development has been the growth of new actors and alliances that have emerged with a view to facilitating the transition towards more sustainable garment value chains, such as the Ellen MacArthur Foundation, the Better Cotton Initiative, the Global Fashion Agenda, and the Sustainable Apparel Coalition (Ghori et al., 2022; Jensen & Whitfield, 2022). Such organisations also seek to facilitate new insights and new ways of working and organising in

garment value chains and introduce new technological tools and solutions such as those that can help in increasing the transparency of industry practices (Muthu & Gardetti, 2020; Alexander & Lund-Thomsen, 2021). These organisations and initiatives seek to facilitate broader sustainability transitions within the industry in ways that go beyond individual brand/retailer and supplier initiatives. Instead they seek to introduce broader systemic changes in the industry, in particular through joint collaboration and efforts to find answers to sustainability challenges – for instance, making cotton production more socially and environmentally sustainable – in areas where existing technological and business-oriented solutions may not be immediately apparent (Riisgaard, Lund-Thomsen, & Coe, 2020).

In addition, it has become increasingly obvious in recent years that the dominant fast-fashion industry model, which has promoted overconsumption and waste in the industry, is incompatible with a broader sustainability transition (Peters, Li, & Lenzen, 2021). This model offers consumers the ability to buy large volumes of fashionable clothes at low prices and requires a highly responsive supply chain that can support a product assortment that is rapidly changing. It has contributed to high levels of pressure on production practices. For instance, increasing cotton production can intensify the use of polluting fertilisers and pesticides (Bick, Halsey, & Ekenga, 2018). Moreover, the constant pressure towards ever-cheaper prices and shorter lead times for suppliers has, in turn, placed a downwards price squeeze on suppliers (Anner, 2018), making it highly challenging for them to invest in environmental and social upgrading initiatives in their factories (Ponte, 2019). Furthermore, the model has also been associated with a wasteful 'use once and throw away' culture that has expanded the generation of post-consumption waste.

The drive towards sustainability innovation in global garment value chains must also be seen against the backdrop of increasing volatility and value chain disruptions that have taken place in the early twenty-first century (Lund-Thomsen, 2022). The global financial crisis of 2007/8 saw many suppliers across the Global South facing a global slowdown in demand (Palpacuer & Smith, 2021). In addition, the outbreak of the US-China trade war forced many companies to rethink their global garment sourcing patterns in order to deal with the impacts of the US sanctions against China (Lu, 2020).

Furthermore, the outbreak of Covid-19 led to massive, albeit temporary, disruptions to global garment value chains, with local suppliers and millions of workers in countries such as India and Bangladesh being particularly hard hit by the global economic slowdown (Anner, 2021). While many factories are now

running at full speed again in these countries and many workers have now regained their employment within the industry, the Covid-19 crisis prompted many lead firms to find new ways of monitoring the social and environmental performance of their value chains at a distance when international travel was rarely possible (Lund-Thomsen, 2022). Suppliers also had to overcome the challenges involved in finding new ways of organising factory-floor and accommodation settings arising from the pandemic, such as the need to wear face masks, enforce social distancing, and rapidly vaccinate workers (Ruwanpura, 2022).

As the Covid-19 crisis appears to be receding, value chain challenges are continuing. Notably, the worldwide supply crises that emerged in late 2021 (Masters, 2022) have increased inflationary pressures (Rushe et al., 2022), and another round of value chain disruptions as a result of Russia's invasion of Ukraine (Simchi-Levi & Haren, 2022) has also forced companies in the global garment and textile industries to find innovative ways of overcoming structural challenges. Dealing with crises almost appears to have become a permanent feature of the world economy in recent years.

In addition to the increased worldwide pressures resulting from value chain disruptions, a range of new sustainability-focussed policy initiatives have emerged. Notably, a number of initiatives have been developed recently by the EU which have increased the international focus on the need for sustainable value chain innovation in the global garment and textile industries (Lund-Thomsen, 2022). First, in 2020, the EU introduced its new Circular Economy Action Plan, which was one of the main building blocks of the European Green Deal, Europe's new agenda for sustainable growth (EU, 2020). Second, in February 2022, the EU published its draft Directive on Corporate Sustainability Due Diligence, which sets out mandatory human rights and environmental due diligence obligations for corporations, along with civil liability regimes that enforce compliance and obligations to prevent, mitigate, or bring adverse impacts to an end (EU, 2022a). Third, two months later, in April 2022, this was followed by a Communication from the EU about the new EU Strategy for Sustainable and Circular Textiles (EU, 2022b).

While all these developments can be seen as drivers for change, the changes that are needed are yet to be defined. For example, many brands, retailers, suppliers, and sub-suppliers have limited expertise in the area of circular garment and textile production. Consequently, given the economic, social, and environmental challenges being faced, along with the pressures for change, the need for innovating new products, processes, and ways of orchestrating global garment value chains has never been more pertinent.

1 Introduction: Garment Value Chains and Sustainability

The garment and textile industries have been associated with diverse sustainability challenges. For example, they have been estimated to account for around 10 per cent of global CO_2 emissions, they consume huge amounts of water, and they involve jobs with poor working conditions (Locke, 2013; D'Ambrogio, 2014; Berg et al., 2020). While the widespread fast-fashion model reinforces these challenges, more sustainable systems are possible. Innovation is needed to create new systems. Potential solutions may lie in slow fashion (durable products produced on demand), circular economy models – 'a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible' (European Parliament, 2021) – and the creation of social enterprises, that is, businesses with social or environmental missions (EU, n.d.; Doherty et al., 2020). The emergence of new systems would impact the environment, workers, and economic development.

A key barrier inhibiting simple changes from transforming the global garment industry is that its production processes operate through global value chains (GVCs). Global garment value chains tend to involve complex networks that embody diverse sets of sustainability challenges (Alexander, 2022). Such networks often incorporate thousands of geographically dispersed producers contributing to production practices from disparate global locations, each making local level decisions. These networks are often highly fragmented and incorporate informal sector actors. Furthermore, this structure makes credible facts and numbers about global garment value chains difficult to ascertain (see Sturgeon, 2019).

According to the Organisation for Economic Co-operation and Development (OECD, 2018), the industry is characterised by several interrelated risks. These involve human rights and labour risks, which include child labour, discrimination, forced labour, occupational health and safety failings, violations of the rights of workers to establish or join a trade union and to bargain collectively, non-compliance with minimum wage laws, and wages that do not meet the basic needs of workers and their families. They also involve environmental risks which are related to hazardous chemicals, water consumption, water pollution, and greenhouse gas emissions. Finally, they involve integrity risks, which include bribery and corruption.

Sustainability innovation processes may play a critical role in dealing with the multiple, overlapping sustainability risks facing the global garment industry. Innovations can take place at micro or macro scales. With current systems creating a wide variety of sustainability challenges, there is a need for innovation within governance systems, production systems, or both.

Innovation can be seen as an outcome defined as 'a new or improved product or process (or combination thereof) that differs significantly from [a unit's own or other units'] previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)' (OECD & Eurostat, 2018). Innovation can also be seen as an action. It can be stimulated by a variety of triggers, which can be based on changing circumstances. The process of innovation can be seen to be driven through learning experiences which involve ongoing interactions between different actors, such as users and producers (Lundvall, 2016). Learning and innovation processes often emerge from routine activities but can also be the outcome of concerted research and development (R&D) activities. Thus, innovation can be carried out by diverse actors across the garment value chain.

To contextualise innovation for sustainability in the garment industry, it is important to understand how the industry currently works. While much diversity exists, some common steps in garment production can be identified. The first step often involves creating or collecting natural or synthetic fibres and yarns. Yarns are then turned into fabric. Finally, fabric is cut into pieces and sewn into garments (see Box 1 for more details).

Box 1 Overview of typical activities in garment production value chains

Fibre production takes place in a variety of ways. These include farming (e.g., cotton or flax), animal rearing (e.g., wool or fur), and chemical synthesis (e.g., polyester made from petroleum or rayon made from cellulose in wood). Different types of technology and production techniques are used in each of these methods. Thread can be manufactured by spinning shorter fibres or produced by extruding a single long synthetic filament. These threads can be used to knit or weave fabrics. Diverse sustainability challenges accompany the manufacturing of thread and textiles. For instance, wet processing involves bleaching, dyeing, or applying treatments that impact the materials' appearance or function, during which vast amounts of chemicals, water, and energy are used (Berg et al., 2020).

Finally, garment production takes place in thousands of factories around the world, often involving several layers of subcontractors that carry out different parts of the assembly process. Garment production is often highly labour-intensive and associated with labour rights challenges such as a lack of formal contracts, payment violations, sexual discrimination and harassment, and a lack of social insurance (Locke, 2013). Garment manufacturing also encompasses other non-textile components, buttons for instance. These components are produced within their own value chains that have their own associated sustainability challenges.

Businesses in garment value chains are diverse. At the base of the chain, fibre production involves businesses ranging from the agricultural (e.g., cotton farmers) to petrochemical (e.g., polyester producers) sectors. Furthermore, their organisational forms also greatly differ. For example, the largest garment manufacturers are multinational firms with thousands of employees (Raj-Reichert, 2019), whereas the smallest include home-based microenterprises operating in the informal sector. Acting as suppliers in GVCs, producers make both standard products and custom-made orders. Producers also engage in diverse sustainability initiatives. These can have multiple motivations and can be geared towards demands from global buyers or be driven by local priorities (Langford, Nadvi, & Braun-Munzinger, 2022).

Actors at all points in garment value chains are spread around the world. As garment production requires high levels of manual labour, activities are often concentrated where labour costs are lower. The top-ten garment-exporting countries are displayed in Table 1. The exports reported by EU countries may involve production in which only the final stages were conducted in each country. The production of textiles and fibres can require more diverse types of processes and are not necessarily carried out in the same countries where garments are made (see Table 2). It is also important to note that while Tables 1 and 2 provide one way to gain a picture of the industry, by looking at exports, this perspective does not capture the full picture as many products within value chains are sold domestically.

Table 1 Top garment exporters in 2020

Country	Export value 2020 (billions USD)
China	124.5
Bangladesh	35.2
Vietnam	27.0
Germany	23.1
Italy	20.8
Turkey	15.0
India	12.2
Spain	11.6
Netherlands	11.1
France	10.7

Source: UN Comtrade (2023)
Note: Data reported by exporting countries, except for Bangladesh, which did not have self-reported data. The figure for Bangladesh is based on other countries' reported imports.

Table 2 Top textile and fibre exporters in 2020

Country	Export value 2020 (billions USD)
China	58.5
USA	10.8
India	9.8
Italy	6.1
Republic of Korea	5.9
Turkey	5.6
Vietnam	5.5
Taiwan	4.8
Germany	4.1
Japan	3.6

Source: UN Comtrade (2023)
Note: The figures in this table include HS Codes 50 (silk), 51 (wool, fine or coarse animal hair; horsehair yarn and woven fabric), 52 (cotton), 53 (vegetable textile fibres; paper yarn and woven fabrics of paper yarn), 54 (man-made filaments; strip and the like of man-made textile materials), 55 (man-made staple fibres), and 60 (fabrics; knitted or crocheted). Data reported by exporting countries.

At the end of the manufacturing processes, garment producers can sell their products directly to the public or they can sell them to wholesale buyers, such as fashion brands. Acting as buyers without owning their own production facilities, retailers and brands often dominate global garment value chains (Gereffi, 1999). Some of these companies have billions of USD turnover every year (see Table 3). Not only do these firms play a significant economic role through retail sales in many consumer markets but the items that they have manufactured also supply second-hand clothing markets in many parts of the world, which can comprise significant proportions of some national clothing industries (Brooks, 2019).

Large brands and retailers have been considered as chain drivers involved in orchestrating production processes carried out by tiered networks of producers (Gereffi, 1999). These lead firms can be considered as playing multiple roles in providing governance for sustainability. One aspect is having the ultimate say in design decisions.[1] Clothing designs have a key role to play in influencing the sustainability of garment manufacturing and consumption since they directly influence the types of production processes that are

[1] They can create their own designs, outsource design activities to third parties, choose designs created by suppliers, or collaborate with their suppliers in the design process.

Table 3 Top-selling apparel retailers in 2020

Company	Headquarters	Global apparel retail sales 2020 (billions USD)
Inditex, Industria de Diseño Textil SA	Spain	18.4
Fast Retailing Co Ltd	Japan	18.2
H&M Hennes & Mauritz AB	Sweden	15.4
Nike Inc	USA	15.2
Adidas Group	Germany	14.1
The Gap Inc	USA	12.9
Hanesbrands Inc	USA	7.9
Levi Strauss & Co	USA	7.0
PVH Corp	USA	7.0
LVMH Moët Hennessy Louis Vuitton SA	France	6.0
C&A Mode AG	Belgium and Germany	5.7

Source: Euromonitor (2021)

required and can determine whether product recycling options are feasible. Other aspects of lead firms' roles include setting prices and timelines and choosing production locations. Such decisions can have positive or negative implications related to sustainability outcomes. In their role as lead firms, many brands and retailers are engaging in a wide range of sustainability-related innovations that are often intended to influence the behaviour of producers, as we will discuss more in the body of this Element.

It is also important to note that not all commercial buyers of garments are similar to the world's largest lead firms. Large brands have been developing in emerging countries, such as Hailan Home from China, which had USD 3 billion in revenue in 2021 (Zhang, 2022), and the Indian company Aditya Birla Fashion and Retail, which had USD 1.1 billion in revenue in the 2022 fiscal year (Statista, 2022). Furthermore, the industry also includes many micro, small, and medium-sized brands and retailers whose behaviour and characteristics are quite distinct from those of large brands and retailers. These smaller companies do not have the same market power to dictate production and sustainability requirements to their suppliers. Moreover, wholesale buyers of clothing from manufacturers are not necessarily retail sellers. Alternately, some organisations

(e.g., private sector firms and government agencies) purchase wholesale orders, such as employee uniforms, from producers.

Based in a range of global locations, businesses in garment value chains operate in diverse environments that involve different institutional pressures, including norms and rules (Scott, 2013). Furthermore, they experience distinct sustainability challenges and have divergent perspectives on sustainability (Alexander, 2018; Krauss & Krishnan, 2022; Lund-Thomsen, 2022). Across value chains, challenges can range from creating high levels of carbon emissions to using forced labour. In many cases, the technologies used in different parts of the world for the same activities can vary dramatically. For example, in some regions hand picking cotton is the norm and in others producers use high-tech harvesting equipment (Riisgaard et al., 2020).

Research into GVCs can provide unique insights into ongoing sustainability-related innovation processes by focussing on the reconfiguration of production and its developmental consequences. With a strong focus on value chain structures, we set out to answer five interrelated questions in this Element:

(1) What is sustainable value chain innovation?
(2) What are the key drivers behind this kind of innovation?
(3) Who are the actors involved in sustainable value chain innovation?
(4) Which innovative practices do these actors claim to engage in?
(5) Why are these practices likely to be (un)successful in achieving their aims?

The rest of this section introduces key concepts and outlines the contributions we intend to make before providing an outline of the rest of the Element.

1.1 Sustainability

The concept of sustainability is highly contested, while definitions of sustainability abound (see Box 2). In this Element, we consider sustainability to include economic, social, and environmental dimensions. From a business perspective, sustainability not only relates to companies maintaining financially viable operations; it also considers the ability of businesses to operate harmoniously within society, such as by providing employment and decent work and not causing social challenges. Additionally, it involves minimising the negative environmental impacts of business operations or, potentially, businesses generating positive environmental impacts. Sustainability in garment value chains is connected to diverse practices, which range from raw material production or extraction to manufacturing activities and waste disposal to transportation systems.

Box 2 Defining sustainability for businesses in global value chains (GVCs)
A hotly debated topic is whether corporate sustainability is different from corporate social responsibility (CSR) (Montiel, 2008). While both corporate sustainability and CSR are defined in multiple ways, a frequently used definition of CSR states that 'the social responsibility of business encompasses the economic, legal, ethical, and discretionary expectations that society has of organizations at a given point in time' (Caroll, 1979, p. 500). Corporate social responsibility has sometimes focussed on the social impacts of business operations while, at other times, it has, somewhat confusingly, been employed to describe the environmental aspects of business operations. Regarding corporate sustainability, this term often denotes whether current actions can exist 'without compromising the ability of future generations to meet their own needs' (World Commission on Economic Development, 1987, chap. 2, para. 1). Hence, some researchers and practitioners who refer to 'sustainability' emphasise that sustainable development should consider economic, social, and environmental pillars of business activities. Yet other researchers and commentators, sometimes implicitly, refer to sustainability as only including a narrower environmental lens, de facto referring to 'ecological sustainability'. Reflecting some of these variations in definitions, some brands, retailers, and suppliers in the global garment industry have established separate departments that are responsible for economic, social, and environmental risk management, whereas they are more integrated within the same business units in other companies. In this Element, we use the term 'sustainability'. We believe that it is more in line with recent debates about the future of the global garment and textile industries, including a green transition/climate change mitigation and adaptation, as well as human development.

The United Nations' Sustainable Development Goals (SDGs) are an international agreement that outlines global objectives related to having more sustainable global systems by 2030 (United Nations, 2015). The seventeen goals are outlined in Table 4. Whereas sustainable consumption and production are the explicit focus in SDG 12, activities in garment value chains can be linked to multiple goals such as poverty reduction (SDG 1), decent work (SDG 8), and climate change (SDG 13). At the same time, it is important to acknowledge that these are politically determined goals and that there may be inherent trade-offs within and across some of these goals. For instance, it may be difficult to secure