TRADE & INDUSTRIAL POLICY STRATEGIES

# INDUSTRY STUDY

# SUSTAINABILITY IN THE CLOTHING AND TEXTILE INDUSTRIES

TIPS industry studies aim to provide a comprehensive overview of key trends in leading industries in South Africa. For each industry covered, working papers will be published on basic economic trends, including value added, employment, investment and market structure; trade by major product and country; impact on the environment as well as threats and opportunities arising from the climate crisis; and the implications of emerging technologies. The studies aim to provide background for policymakers and researchers, and to strengthen our understanding of current challenges and opportunities in each industry as a basis for a more strategic response.

This industry study evaluates the sustainability of the clothing and textile industries, including carbon intensity across the value chain, firm-level environmental impact and initiatives, as well as the policy landscape and sustainability risks.

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## CONTENTS

## ABBREVIATIONS

| | |
|---|---|
| CTFLGP | Clothing, Textiles, Footwear and Leather Growth Programme |
| CBAM | Carbon Border Adjustment Mechanism |
| $CO_2$ | Carbon Dioxide |
| $CO_2e$ | Carbon Dioxide Equivalent |
| DFFE | Department of Forestry, Fisheries and Environment |
| dtic (the) | Department of Trade, Industry and Competition |
| EPR | Extended Producer Responsibility |
| EU | European Union |
| GHG | Greenhouse Gas |
| HFO | Heavy Fuel Oil |
| IPP | Independent Power Producer |
| kWp | Kilowatt-peak |
| $MtCO_2e$ | Metric Tonnes of Carbon Dioxide Equivalent |
| MWh | Megawatt Hours |
| PPA | Power Purchase Agreement |
| PV | Photovoltaic |
| QRM | Quick Response Manufacturing |
| R-CTFL | Retail-Clothing, Textile, Footwear and Leather |
| SACU | Southern African Customs Union |
| SADC | Southern African Development Community |
| TFG | The Foschini Group |

## 1. INTRODUCTION

The clothing and textile industries significantly contribute to environmental pollution, particularly through greenhouse gas (GHG) emissions and textile waste. Environmental impact is concentrated in the upstream phase of the value chain, where textiles are produced using fossil fuels that emit carbon dioxide ($CO_2$). The production of textiles is a water-intensive process, contributing to water pollution and scarcity. The lack of effective clothing and textiles waste management in the end-use phase further contributes to the environmental impact of the industries. Such impact is attributed to the rise of fast fashion, as increased production and over-consumption result in large quantities of textile waste. At the same time, most of the environmental impact in the upstream phase is outsourced to Asian countries that produce clothing and textiles on a large scale.

This industry study on sustainability in the clothing and textile industries discusses the carbon intensity of the industries across the value chain. The first section begins by illustrating the clothing and textiles value chain, examining the environmental impact in each phase of the value chain, including inputs and raw materials, midstream, downstream, and end-use.

The second section details environmental impact and sustainability initiatives at the firm level. The section discusses the environmental impact within the value chains of a global clothing company and a South African firm.

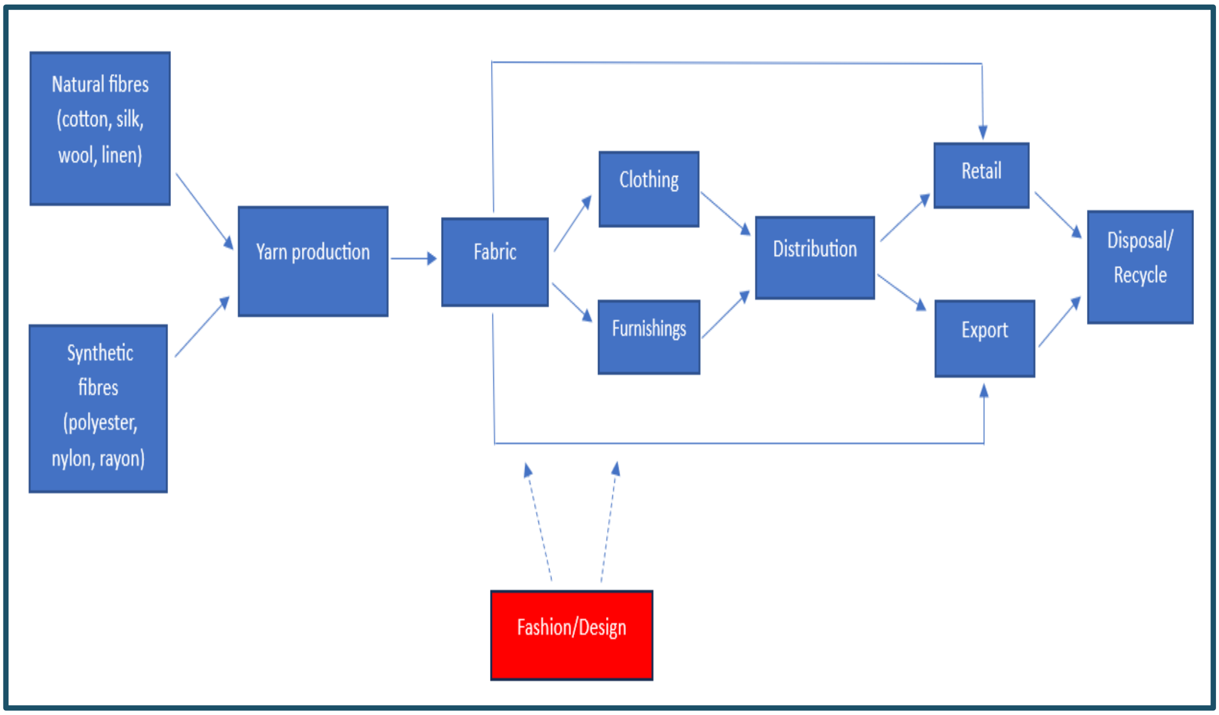
The third section analyses the policy landscape and sustainability risks, highlighting decarbonisation initiatives both in South Africa and globally. The section discusses the environmental regulations affecting the clothing and textile industries in South Africa, as well as the domestic and international policy risks. Finally, the section examines the costs and benefits associated with reducing emissions within the clothing and textile value chain.

## 2. CARBON INTENSITY OF THE VALUE CHAIN

The clothing and textiles value chain starts with the farming of cotton and flax plants, sheep for rearing, and silkworms to produce natural fibres such as cotton, linen, wool and silk. The petrochemicals industry produces synthetic fibres including polyester, nylon, and acrylic. Wood and pulp processes produce cellulose fibres, including rayon. These natural and synthetic fibres are further spun into yarn and then woven, sewn or knitted to produce fabric. The fabrics are used to manufacture clothing and furnishings, and locally produced products are distributed to retailers or exported, while most clothing and textiles are imported into South Africa. Figure 1 demonstrates the clothing and textiles value chain.

This section discusses the environmental impacts of the clothing and textiles value chain. The section demonstrates the value chain in four phases: inputs and raw materials, midstream, downstream and end-use, and circularity. The purpose of the section is to highlight environmental pollution, including $CO_2$ emissions, water and land pollution, while indicating the concentration of emissions within the clothing and textiles value chain.

Figure 1: Clothing and textiles value chain




## 2.1. Inputs and raw materials

Natural fibres, such as cotton, silk, wool, and linen, are agricultural products derived from plants and animals. The production of natural fibres affects the environment through water consumption, pesticide and fertiliser use, and soil degradation. However, natural fibres are biodegradable, which means they can decompose naturally without leaving harmful substances.

Conventional cotton is grown using synthetic chemicals, including pesticides and fertilisers, to improve production. This practice contributes to water and soil pollution. Moreover, the conventional cultivation process can release 3.5 times more $CO_2$ than organic cotton cultivation (Niinimäki et al., 2020). Cotton requires significant amounts of water for irrigation and processing. For instance, to produce one kilogram of cotton, about 9120 litres of water are used annually. This includes 6785 litres per kilogram from rainwater and 2335 litres per kilogram from irrigation water (Kranthi, 2025). Cotton cultivation occupies 2.5% of the global arable land and requires 200 000 tonnes of pesticides and 8 million tonnes of fertilisers annually. This represents 16% and 4% of global pesticide and fertiliser use. The production of cellulose fibres further leads to the logging of 150 million trees annually, which damages soil quality and destroys natural habitats (Arthur, 2022).

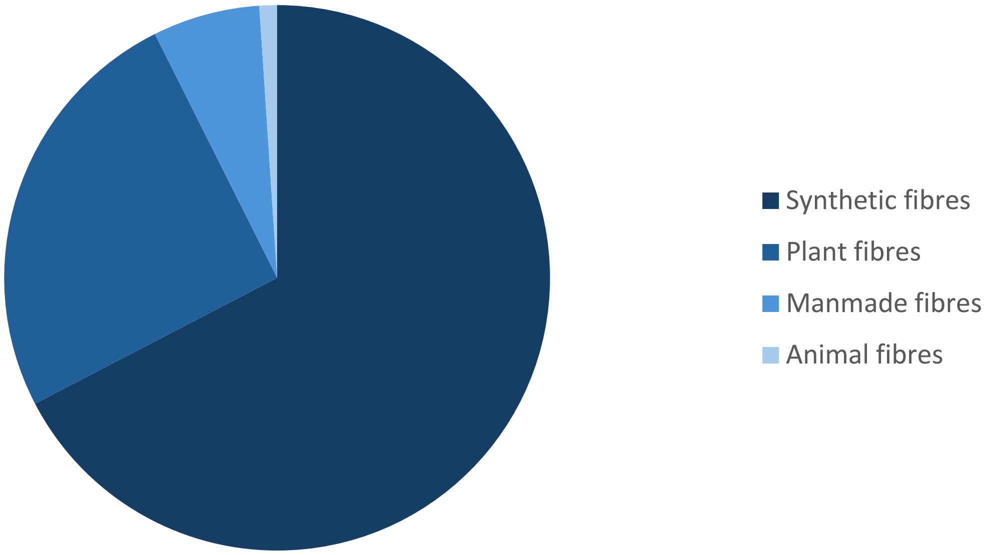
Synthetic fibres, such as polyester, nylon, and acrylic, are sourced from the petrochemical industry. While natural fibres also have an environmental impact, synthetic fibres have a larger effect due to their raw materials and production processes. The production of synthetic fibres begins with the extraction and processing of crude oil, a process that emits GHG. For example, manufacturing polyester is highly energy-intensive and relies on non-renewable resources such as crude oil and natural gas, with about 70 million barrels of oil consumed yearly to produce global polyester fibres (Ro, 2020). The conversion of polyester from a chemical component into a textile is the most energy-intensive part of this process (Gonzalez et al., 2023). Because fossil fuels are used to produce synthetic fibres, these fibres have a larger carbon footprint compared with natural fibres.

The wastewater generated from synthetic fibre production may contain harmful pollutants such as lead, arsenic, and benzene (CDP, 2020).

Natural and synthetic fibre manufacturers employ various strategies to manage waste produced during fibre production, including recycling, repurposing, and disposing. For instance, cotton and wool can be shredded and spun into new yarn. Fibres that cannot be respun are used as a filling material. Although shredding affects the quality of the fibres, virgin materials can be added to improve the overall quality of the fabric (Harris, 2023).

Graph 1 illustrates global fibre production in 2023, indicating that synthetic fibres made up more than two-thirds of the total output. In the same year, global fibre production surged from 116 million tonnes to 124 million tonnes. Of this total, 7.7% of fibres were recycled, while 75 million tonnes were derived from fossil-based synthetic sources. The global fibre production rates indicate that most fibre is produced from high-emitting non-renewable resources. This is because synthetic fibre is versatile and cost-efficient to produce compared with natural fibre. The mass production of synthetic fibres is also due to increased textile demand.

**Graph 1: Global fibre production in 2023**




*Source*: Textile Exchange, 2024. *Note*: Synthetic fibres: polyester, polyamide (nylon), acrylics and elastane. Plant fibres: cotton, flax, hemp and other fibres. Man-made fibres: viscose, acetate, lyocell, modal and cuprammonium. Animal fibres: wool, silk and other fibres.

## 2.2. Midstream

The textile manufacturing process consists of several key steps: spinning, weaving, knitting, finishing, and dyeing. During these processes, natural and synthetic fibres are converted into yarns that are used to create textile fabrics. Textile manufacturers twist these fibres together to spin them into yarn or thread, resulting in a continuous length that can be used for weaving, knitting, or other textile techniques (Ecosilkly, 2023).

The spinning and weaving processes require significant amounts of energy and water. After the yarn is spun and woven into fabric, it undergoes finishing processes to enhance its texture and appearance. These finishing processes include washing to eliminate impurities and residues, bleaching to lighten the fabric's colour or remove stains, and mercerising, which involves treating the fabric to make it lustrous and stronger (Ecosilkly, 2023).

Textile dyeing is the process of applying colours to fibres, yarns, or fabrics. This process relies on water, chemicals, and energy. The dyeing and finishing phases contribute significantly to water pollution. Estimates indicate that textile production is responsible for about 20% of global clean water pollution from these processes (European Parliament, 2020).

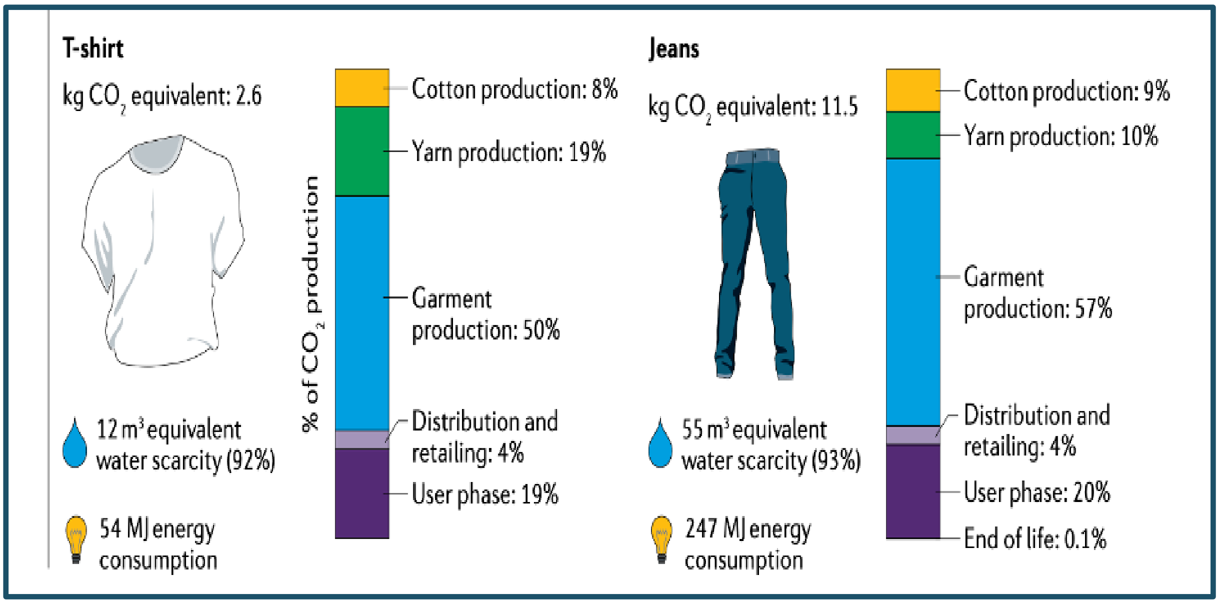
Wastewater generated from dyeing can contain heavy metals such as arsenic, mercury, and chromium, as well as azo dyes, which are produced using metal-containing compounds. These metals can travel through water bodies such as streams, rivers, and groundwater, ultimately reaching agricultural produce. This contamination poses a risk to human health, as these substances can be mutagenic and carcinogenic (Sakamoto et al., 2019; CDP, 2020).

The dyeing stage of textile production significantly contributes to abiotic depletion due to the substantial amounts of coal, steam, water, and dyes used (Gonzalez et al., 2023). For instance, textile manufacturing in China relies heavily on coal-based energy, resulting in a carbon footprint that is 40% larger than that of textiles produced in Europe (Niinimäki et al., 2020). Accordingly, the production of synthetic textiles depletes non-renewable resources such as crude oil. Wastewater from synthetic textile production processes contains microfibers, which further exacerbate microplastic pollution.

Studies indicate that textile manufacturing is responsible for about 20% of total GHG emissions throughout a garment's lifecycle (Niinimäki et al., 2020; WeCount and UIT, 2023). Within this lifecycle, emissions are distributed as follows: spinning accounts for 43%, weaving and knitting contribute 34%, finishing is responsible for 3%, and assembling an item contributes 20% (WeCount and UIT, 2023).

Figure 2 illustrates the environmental impact of manufacturing a t-shirt and jeans in China, Bangladesh, or Turkey and end-use in Sweden. The majority of water usage in cotton garment production originates from cotton cultivation, accounting for 92% of the water used for a cotton t-shirt and 93% for jeans. The manufacturing processes in Asia are responsible for more than half of the carbon dioxide equivalent ($CO_2e$) emissions associated with the lifecycle of t-shirts and jeans (Niinimäki et al., 2020). This highlights that importers, especially those sourcing finished clothing, outsource the environmental impacts of textile and clothing production to competitive manufacturers in countries such as China and Bangladesh. However, these importers also need to manage clothing and textile waste generated from imported items.

**Figure 2: Water and energy consumption in the lifecycle of a cotton t-shirt and Jeans**




*Source*: Niinimäki et al., 2020.

## 2.3. Downstream and end-use

The downstream stage of the clothing and textiles value chain encompasses the consumption of finished apparel by consumers. This stage includes the transportation of goods from manufacturing facilities to end-users through air and ocean freight, particularly for goods in large quantities. Other goods are transported by road domestically. In line with Quick Response Manufacturing (QRM)[1], certain retailers prefer air freight for fast delivery to meet market demands. This approach is facilitated by vertical integration, where a retailer owns or controls the supply chain processes, including manufacturing, distribution, and retail stores.

Long-haul air freight has a larger carbon footprint compared with ocean freight because it consumes a significant amount of fuel, leading to high GHG emissions. The predominant use of air freight is driven by consumer demand for swift and efficient delivery of goods, alongside QRM sourcing strategies that help reduce lead times.

As shown in Figure 2, the user phase of a clothing item's lifecycle accounts for about 20% of $CO_2e$. Energy is consumed for washing, drying, and ironing clothing. The washing of synthetic fabrics made from polyester and cellulose, in household machines, releases microfibers, contributing to plastic pollution (De Falco et al., 2019). In South Africa, washing and drying clothing by end-users is associated with the use of carbon-intensive electricity.

## 2.4. Circularity

Several factors contribute to post-production waste, including unsold stock, consumer returns, faulty goods, production surplus, and excess inventory (Key et al., 2024). These factors are influenced by retailers' sourcing strategies, which involve either sourcing clothing in small batches or in large quantities. The mass production of clothing significantly contributes to environmental waste within the industry. Fast fashion is a major driving force behind this issue, as it promotes the rapid production of fashionable clothing items, which frequently change in style. This leads to unsold inventory that retail stores must discount to make sales. By its nature, fast fashion encourages overconsumption by catering to the constantly changing demands of consumers (Long, 2025).

The phenomenon of fast fashion is associated with reduced clothing utilisation, which in turn increases environmental waste. Reduced utilisation impacts the environment in two significant ways. First, the production of clothing and textiles is responsible for air, land, and water pollution. Second, overconsumption leads to the discarding of clothing after only a few uses, thereby contributing to overall clothing waste (Long, 2025).

Textiles represent 6.4% of the 1.1 million tonnes of waste disposed of at municipal landfills in the City of Cape Town (Edwards, 2018). In 2022, textile waste in Cape Town reached 70 310 tonnes, with polyester and other synthetic fibres making up 64% of this waste. Currently, Cape Town lacks large-scale textile recycling initiatives to process end-of-life textiles into secondary materials or products (GreenCape, 2023).

Recycling textiles is therefore essential for managing textile waste and minimising the environmental impacts associated with the industry. Recycled textiles can be repurposed into lower-value

[1] QRM includes the production of samples and loading them onto a website by e-commerce retailers. Other retailers select a few pilot stores. If items become popular, they are manufactured in mass to meet market demand. Traditional sourcing strategies include ordering clothing in large quantities, resulting in longer lead times and clothing that is not based on current trends.

applications, such as insulation materials, wiping cloths, and mattress stuffing (Niinimäki et al., 2020). Post-consumer clothing waste includes garments and textiles that consumers no longer need or want. Reasons for discarding these items include wear and tear, poor fit, damage, low quality, and, most commonly, being out of fashion (Key et al., 2024). Fast fashion clothing has a short lifespan due to low-quality materials, making second-hand shops reluctant to accept these items. Consequently, many of these clothes end up being incinerated or sent to landfills, where synthetic materials can take decades to decompose (Long, 2025). The decomposition of textiles in landfills produces methane and $CO_2$.

Common clothing disposal methods include landfilling, donation, giveaways, resale, swapping, and reuse. While some countries prefer incineration, this method is energy-intensive and produces high emissions. The European Union (EU) addresses unsustainable disposal practices by requiring residents to separate textile waste into dedicated bins (Gonzalez et al., 2023).

# 3. FIRM-LEVEL ENVIRONMENTAL IMPACT AND INITIATIVES

This section discusses the environmental impact and sustainability initiatives within the value chains of a global and a South African clothing and textile firm. The section indicates that greenhouse gas (GHG) emissions are concentrated in indirect emissions for both firms. The international firm’s emissions are significantly from Scope 3, while the South African firm’s emissions are mostly from Scope 2.

## 3.1. International firm

Table 1 presents Shein's GHG emissions in 2023 and 2024. Shein is a global e-commerce retailer that primarily sells clothing. Scope 3, indirect GHG emissions, represent the largest share of emissions in Shein’s value chain. The majority of Scope 3 emissions in 2024, 11 million metric tonnes of carbon dioxide equivalent ($MtCO_2e$), were emitted from supply chain activities (Shein Group, 2025). These activities include manufacturing clothing, sourcing materials, dyeing fabrics, garment assembly, and the production and transportation of operational consumables such as office supplies, packaging and equipment. Moreover, supply chain activities include the use of data centres, cloud computing, and software services (Igini, 2025). The second largest source of Scope 3 emissions was upstream transportation and distribution, accounting for 8.5 million $MtCO_2e$ (Shein Group, 2025). This includes the transportation of goods to consumers, between distribution facilities, and returns. Fuel and energy-related activities resulted in 18 412 $MtCO_2e$, while industrial waste generated by the company’s operated warehouses accounted for 8322 $MtCO_2e$ in 2024 (Shein Group, 2025).

The majority of Shein’s Scope 1 and Scope 2 emissions were mainly linked to electricity usage, with the company’s global operations consuming 243 340 megawatt hours (MWh) in 2024. Efforts to decarbonise the value therefore include transitioning to renewable energy, with 76% of electricity in 2024 sourced from renewable sources. Shein also installed solar PV at 10 of its facilities, totalling 56.3 MW of capacity in 2024. The company consumed 15 105 MWh of solar energy in 2024, which correlates with an estimated reduction of 8 106 $MtCO_2e$ (Shein Group, 2025).

Other efforts to decarbonise the value chain include improving energy efficiency at its facilities, warehouses and offices, and phasing out fossil fuels, including natural gas and fuel-powered vehicles and equipment.

**Table 1: Shein's greenhouse gas emissions in metric tonnes of $CO_2e$, 2023 and 2024**

| CATEGORY | DESCRIPTION | 2023 ($MTCO_2E$) | 2024 ($MTCO_2E$) |
|---|---|---|---|
| Scope 1 | Fossil fuel combustion emissions | 1 446 | 2 809 |
| | Fugitive emissions | 5 107 | 1 407 |
| Scope 2 | Market-based emissions | 25 788 | 26 695 |
| | Location-based emissions | 91 505 | 121 566 |
| Scope 1 + Scope 2 (market-based emissions) | | 32 341 | 30 911 |
| Scope 3 | | 21 260 511 | 26 170 529 |
| Total Scope 1 + Scope 2 + Scope 3 GHG Emissions | | 21 292 851 | 26 201 440 |

*Source*: Shein Group, 2025. *Note*: Shein reports its emissions in accordance with the GHG Protocol Corporate Accounting and Reporting Standard.

## 3.2. South African firm

The Foschini Group (TFG)[2] is a South African vertically integrated clothing company that uses dual sourcing strategies. TFG locally manufactures and imports clothing and textiles. In 2024, Scope 3 emissions represented 58% of total emissions, followed by Scope 2 at 40% and Scope 1 at 2%, resulting in a total of 216 914 $tCO_2e$, as illustrated in Graph 2 (TFG, 2024). The substantial 30% increase in Scope 2 emissions in 2022 is attributed to the addition of new facilities to the TFG Africa[3] reporting boundary, and due to the return to work following lockdown restrictions. Scope 2 emissions are owed to coal-fuelled electricity purchased from Eskom to power operational processes.

The Scope 3 emissions surge in 2022 was linked to new Scope 3 categories being added to the reporting boundary, including capital goods, end-of-life treatment of products, water, and Well-to-Tank.[4] The increase in Scope 1 was due to stationary fuel from increased loadshedding and mobile fuel increase because of the Jet acquisition being reported for a full year (TFG, 2022). Generators were used during loadshedding to meet operational demands, which shaped the surge in GHG emissions.

TFG has put various initiatives in place to promote sustainable operations. This includes reusing packaging cartons in distribution centres, thereby reducing waste and shifting from virgin plastic to industrial waste bags. TFG upcycles textile waste from its factories. For instance, textile waste was upcycled to make products such as sleeping bags, therefore diverting waste from landfills. About 70% of TFG Africa's waste across its head office, factories, and distribution centres is recycled, while 72% from manufacturing sites is recycled (TFG, 2024).

TFG is implementing solutions to reduce energy consumption and transition to renewable energy. TFG has installed LED lighting in over half of its African stores and has started upgrading air-conditioning in its stores. The distribution centres in Midrand, Riverfields, and Tygerberg have been installed with solar photovoltaic (PV) systems with a maximum power output of 600 kilowatt-peak (kWp), 600 kWp, and 178 kWp. A 100 kWp solar PV system was installed at the Caledon manufacturing facility (TFG, 2024).

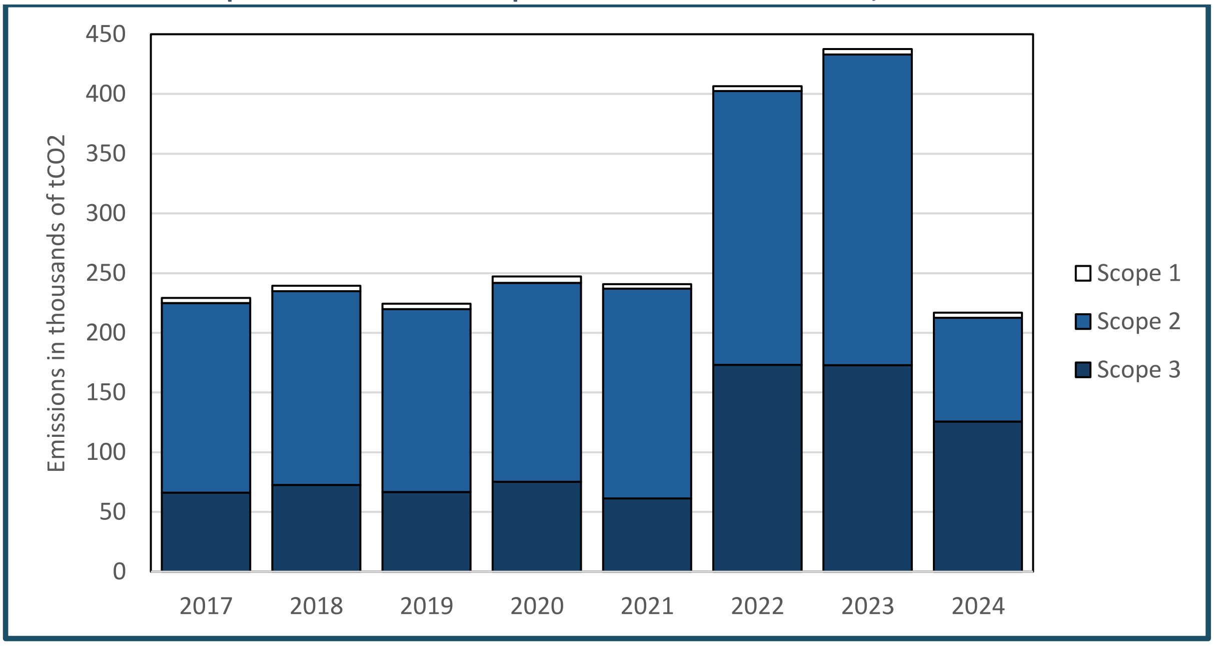
[2] TFG had 3397 outlets in South Africa in March 2024, a 71% share of the Group's total outlets. The group is vertically integrated, with a dual sourcing strategy that allows the group to manufacture clothing in South Africa and import textiles and finished clothing.

[3] TFG Africa's stores are in South Africa, Namibia, Botswana, Zambia, Eswatini, and Lesotho. TFG apparel manufactures 79.2% of units in South Africa and in neighbouring SADC countries.

[4] Well-to-Tank refers to the environmental impact of a product, from raw materials to the final product.

TFG reported that to manage waste, the company implemented a recycling programme at its head office and diverted 70% of waste from landfills. The company's distribution centres prioritise minimising packaging materials and divert 75% of waste from landfills. Across all operations in Africa, TFG has recycled 627 549 kilograms of waste and reused 52 195 kilograms (TFG, 2024).

**Graph 2: The Foschini Group emissions in thousand $CO_2e$, 2017 – 2024**




*Source*: The Foschini Group, 2018, 2021, 2023 and 2024. *Note*: TFG uses the GHG Protocol Corporate Accounting and Reporting Standard to measure the company's carbon footprint.

## 4. THE POLICY LANDSCAPE AND SUSTAINABILITY RISKS

This section discusses the policy landscape and sustainability risks within the clothing and textile value chains. The section highlights decarbonisation initiatives in South Africa and globally and discusses environmental regulations in South Africa. The section further highlights domestic and international policy risks for the clothing and textile industries and concludes by discussing the costs and benefits of reducing emissions within the value chain.

## 4.1. Decarbonisation initiatives

### 4.1.1. South African decarbonisation initiatives

The previous section highlighted decarbonisation efforts by a South African vertically integrated clothing company, indicating a shift to sourcing renewable energy for its manufacturing facility and distribution centres. This section further highlights decarbonisation initiatives by a South African textile manufacturer and a project that promoted sustainable clothing and textile manufacturing.

In October 2022, CVE South Africa and Net Zero Africa announced a solar PV Power Purchase Agreement (PPA) with Da Gama Textiles, a manufacturer of bleached, dyed and printed fabrics based in the Eastern Cape. The textile manufacturer has a production capacity of 20 million metres per annum (Felton, 2023). CVE South Africa, an Independent Power Producer (IPP), was contracted to develop, construct and operate a solar PV array that would provide 4.3 MW solar power to Da Gama textiles when complete. With the development in two phases, the first phase includes efficiency upgrades to the existing biomass boiler and HFO (heavy fuel oil) thermal heaters. The current coalfired boilers were set to be replaced with two biomass-fired boilers, which will supply steam and thermal energy to the manufacturing facility, a shift from coal reliance to renewable energy feedstock. After the installation of the second biomass-fired boiler, an Organic Rankine Cycle Generator was planned to be installed, producing 2.5 MW of green energy (Net Zero Africa, 2022). The operations commenced in January 2023.

The National Cleaner Production Centre and the Centre for African Resource Efficiency and Sustainability implemented the InTex Project in South Africa, in collaboration with the European Union and the United Nations Environment Programme. The InTex Project aimed to promote sustainable and innovative practices to small and medium textile enterprises across the country. The interventions included implementing renewable energy solutions, adopting environmentally safe dyes and water recycling systems. Results of the InTex Project included K-Way Manufacturers improving from producing 25 000 units annually to efficiently producing over 600 000 units. Green Thread Manufacturing saved 53 tonnes of carbon emissions and created 63 jobs, Unica Textile Mills saved 24 tonnes of carbon emissions and created 15 jobs, and Hextex Industries optimised its steam system, saving 130 tonnes of carbon emissions while retaining 108 jobs (NCPC, n.d.).

### 4.1.2. Global decarbonisation initiatives

There are various decarbonisation initiatives aimed at reducing global GHG emissions from the production and consumption of clothing and textiles, primarily driven by circularity principles. As part of the European Green Deal, the EU Strategy for Sustainable and Circular Textiles was introduced in 2022 to manage the lifecycle of textiles while supporting the green transition. The strategy addresses textile design and consumption through sustainable technological and innovative processes (European Commission, 2022).

The State of California in the United States enacted the Responsible Textile Recovery Act of 2024 (Senate Bill No. 707) to manage textile waste and promote sustainability in the clothing and textile industries. The Act established a statewide Extended Producer Responsibility (EPR) programme for apparel and textiles to promote repair and reuse and minimise the generation of hazardous waste and GHG emissions (California, 2024). Firms are therefore required to join a producer responsibility organisation, which must have an approved plan for the proper collection, sorting, and recycling of textile waste from member companies (Long, 2025).

## 4.2. Environmental regulation

In November 2020, the South African Department of Forestry, Fisheries and Environment (DFFE) introduced the EPR under the National Environmental Management: Waste Act No. 59 of 2008. The EPR is an environmental policy that holds producers accountable for the full life cycle of the products they place in the market, encompassing design, production and disposal phases. These regulations place the responsibility on producers to manage their waste post-consumer phase, including textile waste management. The responsibilities include financing collection, sorting, reuse, and recycling of textiles and footwear. Moreover, the regulations prohibit the destruction of unsold textiles and footwear, encouraging recycling or reuse.

In addition to targeting producers, the EPR regulations allow consumers to manage their waste in the clothing and textiles industries. For instance, initiatives such as the product return scheme allow consumers to return products to the producer or retailer for safe disposal, reuse, recycling or repair (DFFE, 2024). Waste management challenges, however, continue to persist in South Africa, with increased concerns about municipalities' lack of capacity to recycle and divert waste from reaching designated landfill sites. The National Waste Management Strategy was introduced in 2020 to further improve waste management and achieve the goals of the Waste Act No. 59 of 2008.

The Department of Trade, Industry and Competition (the dtic) promotes competitiveness of the clothing and textile industries through the Retail-Clothing, Textile, Footwear and Leather (R-CTFL) Master Plan 2030. The R-CFTL Master Plan was finalised in 2019 to build a stronger foundation for the industry, attracting retailers, manufacturers, cotton producers and organised labour, working with the government. Its vision is to develop a competitive, sustainable and dynamic R-CTFL value chain that provides customers with compelling products and that is invested in increasing employment and advancing inclusion and transformation. While the R-CTFL Masterplan has several key objectives, it does not have an objective targeted specifically to decarbonisation. One objective, however, aims to create an environmentally responsible value chain.

The Clothing, Textiles, Footwear and Leather Growth Programme (CTFLGP) replaced the Clothing and Textiles Competitiveness Programme, which included the Competitiveness Improvement Programme and the Production Incentive Programme. The CTFLGP became effective in July 2024 and is administered by the Industrial Development Corporation on behalf of the dtic. The CTFLGP is a South African government initiative targeted to boost the competitiveness of the clothing, textiles, footwear, and leather industries. The CTFLGP supports process innovation of technologies that reduce impact on the environment and energy consumption, and processes that use organic waste to produce energy (the dtic, 2024).

## 4.3. Domestic and international policy risks

The Carbon Tax Act No. 15 of 2019 was introduced in South Africa to combat GHG emissions sustainably and cost-effectively while rewarding energy-efficient firms (Republic of South Africa, 2019). The carbon tax penalises high-emitting entities, including entities that operate facilities that generate emissions to a certain threshold. This includes textile manufacturers that operate facilities that generate 10 megawatts thermal (MW (th)) or above annually (Republic of South Africa, 2019).

The use of steam boilers by textile manufacturers to dye, print, dry, and finish textiles consumes the most energy in clothing production. Traditional textile steam boilers are powered by coal, natural gas, oil, and biomass. Vertically integrated clothing companies in South Africa mostly account for indirect, Scope 2 emissions from Eskom's coal-fuelled electricity. For this reason, Eskom pays the carbon tax.

From January 2025, the carbon tax was applied at R236 per $tCO_2e$ and is set to increase gradually until R462 per $tCO_2e$ in 2030 (National Treasury, 2024). South Africa's carbon tax is, however, considered very low by global standards. This has implications for tax collecting, with exporting firms anticipated to pay a high difference compared to the carbon tax they would pay in South Africa.

South Africa's major clothing and textiles export partner does not pose trade limitations through environmental instruments such as carbon taxes. In 2023, South Africa exported 76% of its clothing and textiles to African countries, 8% to the European Union, 3% to the United States and 2% to China (Mthembu, 2024). Major export partners in the African continent are within the Southern African Customs Union (SACU) and the Southern African Development Community (SADC). Neither SACU nor SADC impose decarbonisation policies that could hamper South Africa's exports of clothing and textiles to its key export markets.

The EU's Carbon Border Adjustment Mechanism (CBAM), however, is set to penalise carbon-intensive imports into its market from January 2026. CBAM will require importers to pay the difference between

South Africa's and the EU's carbon tax, which is anticipated to be €85 (R1630) per tonne by 2026 (Gasealahwe et al., 2024). The first phase of CBAM includes high-emitting industries such as iron, steel, aluminium and electricity, excluding clothing and textiles. To prevent carbon leakage on its imports, clothing and textiles are under consideration by the EU to be included in CBAM-listed industries because of high emissions, particularly in textile production processes, which is indicative of potential future risk. The carbon tax accordingly prompts EU exporting firms to devise sustainable production processes to sustain export competitiveness.

## 4.4. Cost and benefits of reducing emissions

Reducing emissions presents a set of costs and benefits for producers in the clothing and textiles industries. Decarbonising textile production includes transitioning from coal-fuelled energy to renewable energy, improving energy efficiency, and reducing waste. The transition to renewable energy means that firms need to construct renewable energy power stations at their own manufacturing facilities or source renewable energy from IPPs through PPAs. Such power stations include solar PV power stations that can be small-scale or large-scale, depending on the facility's energy needs. Improving energy efficiency by manufacturers requires investments in innovative technologies that are more efficient, requiring staff to be trained to operate such machinery and equipment. Both the transition to renewable energy and improving energy efficiency are characterised by high upfront capital costs. These costs, however, result in long-term savings due to reduced energy costs. Clothing and textiles companies further require devising and implementing company waste management strategies to manage waste informed by circular economy principles, such as reuse and recycling. Extending the lifecycle of clothing items through the second-hand clothing market can contribute to clothing and textile waste reduction in South Africa. This, however, requires investments in logistics to collect and deliver used clothing and further investments in technology to recycle used clothing items (Jenkin and Hatting, 2022).

Retailers that adopt zero-waste or circular economy models can decrease disposal costs by repurposing waste into new products or recycling materials for future use. In addition, retailers may gain a competitive advantage as consumers gravitate towards brands that promote sustainable consumption patterns. Sustainable practices have a positive impact on brand reputation and customer loyalty, potentially offsetting some of the costs associated with sustainability initiatives (Yusuff, 2024). This indicates that retailers that produce sustainable clothing and textiles can gain access to new markets with sustainability standards and trade policies, as well as attract environmentally conscious consumers.

Furthermore, an increase in the use of sustainable raw materials such as organic cotton can result in increased production costs that drive up textile prices. This would make textile manufacturers less competitive than producers that use fossil fuel-based synthetic textiles such as polyester. South Africa does not produce enough cotton to meet its domestic needs, due to limited spinning, weaving, and knitting capacity, with 80% of domestic cotton lint exported for beneficiation. The opportunity cost to the economy for sacrificing local beneficiation is estimated to be about R20 billion (Cotton SA, 2021).

## 5. CONCLUSION

This industry study on sustainability in the clothing and textile industries started by demonstrating the carbon intensity within the value chain, including inputs and raw materials, midstream, downstream and end-use. The second section indicated the environmental impact of an international and a South African clothing and textiles firm. The final section highlighted the policy landscape and sustainability risks within the value chain, highlighting decarbonisation initiatives in South Africa and globally. The section further analysed environmental regulation in South Africa, domestic and international policy risks, and concluded by discussing the costs and benefits of reducing emissions within the clothing and textiles value chain.

Environmental impact in the clothing and textiles value chain is concentrated in the upstream phase, where inputs and raw materials include fossil fuels such as coal and petrochemicals. Coal is used as a feedstock for steam boilers in the production of textiles, while crude oil is used to produce synthetic fibres such as polyester. The dyeing, printing, drying, and finishing of textiles consume the most energy and water, contributing to GHG emissions and water contamination because of the chemicals used in dyeing processes. Such contaminated water can end up in waterbodies and agricultural produce, which can impact human health. The management of textile waste in the end-use phase results in further environmental impact due to overconsumption of clothing and textiles, which is attributable to mass production and fast fashion.

The change in technological processes of clothing and textiles firms is resulting in increased vertical integration, which sees retailers controlling their supply chains. This shapes sourcing strategies and sustainability initiatives by these firms. The upstream environmental impact of South Africa's clothing and textiles industries is largely outsourced to Asian countries. The country is therefore left to deal with textile waste from the consumption of clothing and textiles. For South African clothing and textile manufacturers, GHG emissions are concentrated in indirect, Scope 2 emissions. This means that manufacturers do not pay the carbon tax for such emissions from Eskom's coal-fuelled electricity.

Decarbonisation initiatives within the clothing and textiles value chain are evident with the transition to sourcing renewable energy to feed production and operational processes. Clothing and textiles companies are increasingly installing solar power stations on a small or large scale at their production facilities. Certain firms source renewable energy through PPAs with IPPs. On the ground, municipalities are considered ineffective in managing textile waste, which limits recycling initiatives, resulting in landfill depletion. The cost of reducing emissions for textile manufacturers includes changing production technologies and raw materials. The former is characterised by high upfront investments and long-term savings and competitiveness, particularly for environmentally conscious export markets. While the latter would increase the cost of production and limit producers to niche markets because of pricing and quality.

Accordingly, South Africa risks remaining a passive importer, bearing waste without reaping industrial benefits, unless decarbonisation and circularity are built into policy and firm-level strategies.

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