

WHITE PAPER

BRITISH
FASHION
COUNCIL

Delivered by



Fashion & Environment

AN OVERVIEW OF FASHION'S ENVIRONMENTAL IMPACT
& OPPORTUNITIES FOR ACTION





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Abstract

The global fashion industry has a far-reaching impact on the natural environment, from the extraction of raw materials to the production, distribution, wear and disposal of clothes. As the world's population increases to a projected 8.5 billion people by 2030, annual global apparel consumption could rise by 63%, from 62 million tonnes today to 102 million tonnes—equivalent to more than 500 billion additional T-shirts¹. The current fashion system is unsustainable, our biggest risk is to carry on as we currently operate.

There is scientific consensus that we are in times of climate and ecological emergency as set out in the UN commissioned *Special Report on Global Warming of 1.5°* and *Global Assessment Report on Biodiversity and Ecosystem Services*.

For the fashion industry to have a response commensurate with global environmental challenges, it will require a systems level change and development of a new fashion system based in a sustainability paradigm. Bringing about this change is complex given the global nature of the industry and its many different parts. However, a transformation of the fashion industry, addressing its environmental impacts, has been signalled and these approaches and innovations need to be scaled outwards and upwards. The British fashion industry is well placed to respond with speed, agency and inspiration to create an environmentally and economically prosperous industry.

This paper is created by Julie's Bicycle and Centre for Sustainable Fashion (CSF) at London College of Fashion, University of the Arts London, on behalf of the British Fashion Council, enabled by DHL. It offers an overview of the environmental impacts of the fashion industry, a presentation of good practice in the UK, and how the industry can actively explore new definitions of good design and great business, including in:

- ***Design and materials***
Integrating sustainable design principles into product, service and system creation
- ***Green technology***
Fibre innovation, enzymology and molecular biology
- ***Manufacturing and processing***
Supply chain transparency, blockchain technology, water use and energy efficiency
- ***Packaging and delivery***
Innovation in shipping and logistics, reducing plastic and packaging waste
- ***Education and engagement***
Pioneering new curriculum, changing cultures and driving demand for sustainable action
- ***Strategy***
Setting carbon-based targets in alignment with the Paris Agreement; engaging with all above elements

SMEs (Small and Medium-sized Enterprises) make up half of the businesses in the fashion ecosystem. They play a crucial role in demonstrating what can be done differently, helping to upskill, inspire and enthuse the industry's key players to demonstrate that British fashion is at the vanguard of sustainability-led creativity.

There is now an opportunity for them to create new environmentally, aesthetically and economically positive practices, harnessing their creativity to develop and scale good design, materials, technologies, processes and business models to regenerate fashion and nature. This paper sets out recommendations for how fashion companies can constructively engage with the context of our times and through knowledge and action, the system change required will begin to take hold.

IMPACTS

of the global fashion industry.



93 billion

cubic metres of water used in textile production each year²



1.7 billion

tonnes of greenhouse gas (GHG) emissions emitted by 2015 textile production³



26%

of the global carbon budget will be used by fashion by 2050⁴



1 quarter

of industry resources are wasted as fabric and garment leftovers⁵



£140 million

worth of clothing goes to landfill each year⁶



160 million

tonnes of clothing will be produced by 2050 p.a.⁷

RECOMMENDATIONS

There are encouraging signs that some of our most creative fashion businesses are also some of the most forward-thinking in terms of sustainability. This paper presents inspiring highlights of good practice and offers **recommendations** to address the industry's environmental impacts:




Click the icons to go
to the section



“At the moment there is no incentive for the fashion industry to change in the short term – so only those businesses with conscience and long-sightedness are making bold moves.”

DILYS WILLIAMS, DIRECTOR, CENTRE FOR SUSTAINABLE FASHION

Foreword

CAROLINE RUSH

Chief Executive, British Fashion Council

The British Fashion Council exists to harness the collective power of the fashion industry to nurture and inspire designer businesses and drive sustainable growth for the sector. The fashion industry is an important and pivotal part of the UK economy with the industry directly contributing £32.3 billion to the country's GDP in 2017, with fashion a major UK employer representative of 890,000 jobs.

In 2019 we are more committed than ever to promoting our platform of Positive Fashion and driving change through collaboration with our committee of thought leaders at global brands, retailers and designer businesses. In this time of global change with brands redefining their approach to retail and increasingly digital and conscious consumerism, it is vital our businesses of the future adopt a sustainable approach to business.

The British Fashion Council's Positive Fashion platform celebrates industry best practice and encourages business decisions that create positive change. It is underpinned by three strategic pillars: Sustainability, Equality and Diversity, and Craftsmanship and Community. We hope this paper on environmental sustainability will be the first in a series, celebrating the individuals and brands taking positive action and inspiring many more to follow. It builds on existing Positive Fashion initiatives, including Fashion SWITCH to Green, a campaign encouraging British fashion businesses of all shapes and sizes, to switch to 100% renewable electricity.

The innovation and ingenuity of the British fashion industry continues to shape global trends and techniques, as it has done for centuries. From the mechanisation of textile manufacturing in the 18th century and William Henry Perkins' creation of synthetic dyes in the 19th century, to today's businesses like Unmade revolutionising made-to-order technologies to create unique pieces. Faced with an unfolding ecological crisis, we need to focus this ingenuity on fostering a positive, regenerative, sustainable industry.

Some of our British fashion businesses have been undisputed pioneers in environmental sustainability over the past decade, forging new standards, exploring novel concepts, and setting a higher bar for industry partners elsewhere in the world – from Stella McCartney redefining what a sustainable fashion brand looks like over the past 20 years, to M&S introducing one of the world's most ambitious retailer sustainability strategies with its Plan A as early as 2007.

We know the industry needs to take great environmental strides but we are so encouraged by the adoption of circular business models, the emergence of new material innovations and the energy from our young designer businesses and global powerhouses to adopt policies, communicate transparency and drive change. As an industry, fashion has the creative power to translate the story on sustainability into a consumer conversation.

At the British Fashion Council, we hope this paper will be one more step in the conversation and we look forward to working with and supporting many more British fashion businesses on this journey. Imagine what we can achieve with our sights set to use the power of fashion to support the Paris Agreement and the UN's Sustainable Development Goals.

Thank you to DHL, a long-term partner and patron of the British Fashion Council, Centre for Sustainable Fashion and Julie's Bicycle for this report.

Foreword

KATJA BUSCH

Chief Commercial Officer, DHL

When most people think of fashion, logistics is unlikely to be the first thing they think of. But logistics is in fact the grid that underpins the fashion industry.

At DHL, our logistics and supply chain experts keep the fashion industry moving. We have decades of experience and expertise in the field of fashion logistics and offer a wide range of customised logistics solutions including a variety of services for e-commerce, delivery to boutiques and shopping centres, or comprehensive warehousing and value-added services in special fashion distribution centres.

We are present in 220 countries and territories across the world. The global nature of our business also means that we have a view of the world's environmental challenges and the way they are affecting communities all over the world. We also know an ever-increasing number of fashion conscious consumers care about the carbon footprint of brands they purchase.

As a leader in our industry, we want to use our unique position to lead a shift to a zero-carbon world. Our goal is to reach zero emissions by 2050, in line with the Paris Agreement target of limiting global warming to less than two degrees Celsius. We know this is a highly ambitious goal. Through our GoGreen Solutions, we also support our customers in achieving their own environmental sustainability targets and are developing sustainable packaging solutions. To get to zero emissions by 2050, we have four interim targets to achieve by 2025:

1. Increase carbon efficiency by 50% over 2007 levels.
2. Operate 70% of our own first and last mile services with clean pick-up and delivery solutions, such as bicycles and electric vehicles.
3. Have more than 50% of our sales incorporate GoGreen Solutions.
4. Train 80% of our employees to become certified GoGreen specialists and actively involve them in DHL's environmental and climate protection activities – including joining partners to plant one million trees each year.

Historically, global trade has enabled the flow of goods across the world and changed the face of the fashion industry. Now, we want to be part of making another shift in the industry: one that takes us into a society living within the boundaries of our planet.



“Now is the perfect time to be in sustainability in the fashion industry because so many things are moving, so many providers of solutions are popping up that can actually help and make things really work.”

EVA VON ALVENSLEBEN, HEAD OF SUSTAINABILITY STRATEGY, KERING

Introduction

The rise of the global fashion industry.

All people knowingly or unknowingly interact with the global fashion industry.

It employs 60 - 75 million people worldwide⁸, with figures suggesting up to 300 million across the whole value chain. It is perhaps the most ubiquitous global industry. An estimated 5.6% of household expenditure in the EU is spent on clothing and footwear, with approximately 80% on clothing and 20% on footwear⁹ (approximately £60.4 billion in 2018¹⁰). The UK's household spend is higher than average among EU countries, with Britons spending over £1,000 per year on clothing.

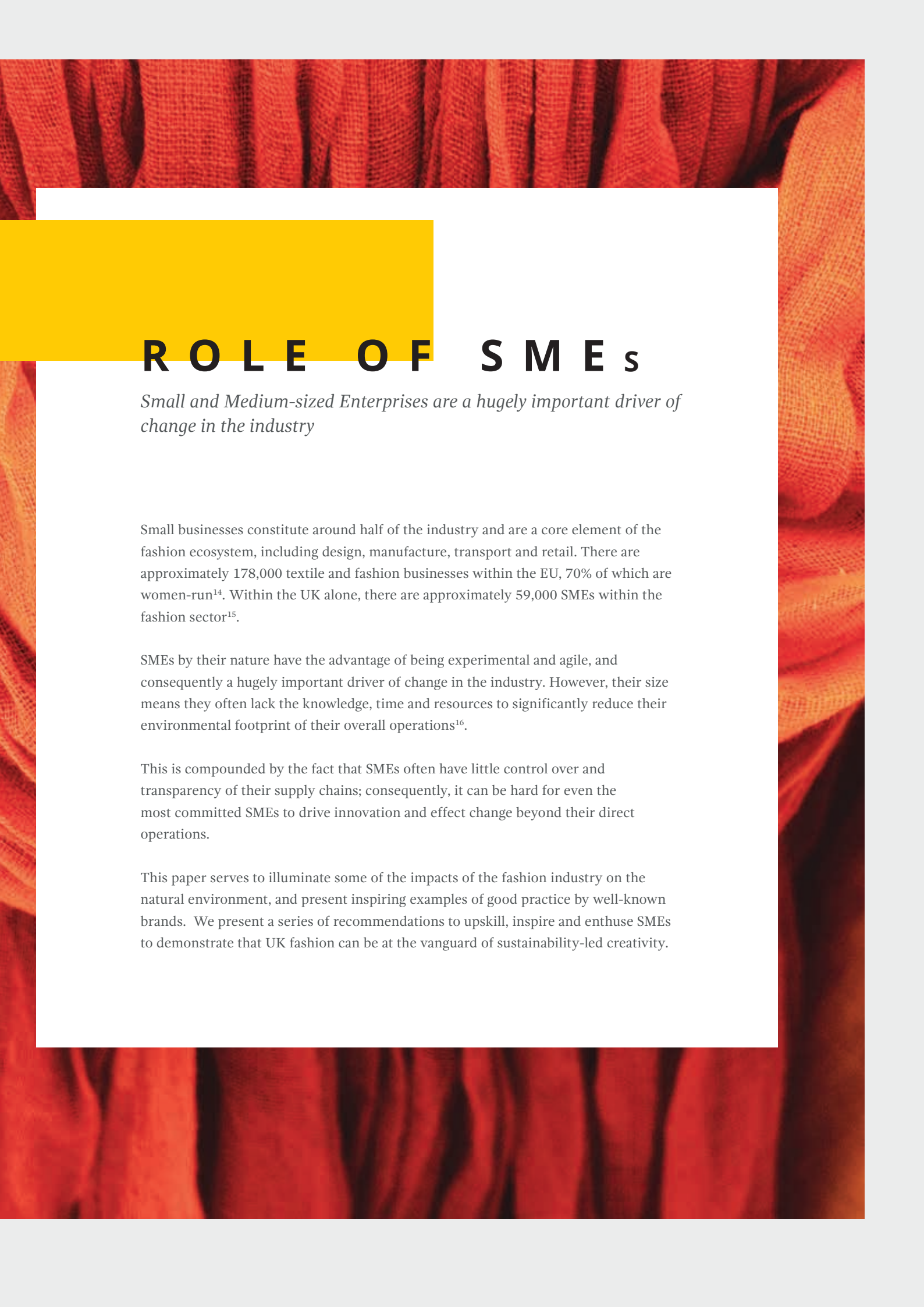
According to The Business of Fashion and McKinsey's *The State of Fashion 2019* report, the fashion industry outperformed even high-growth sectors like technology and telecommunications between 2003 and 2013¹¹.

The creation of globalised supply chains and liberalisation of trade tariffs ensures lower costs for customers in developed nations can be achieved. In short the global fashion industry is thriving, but this comes at a huge environmental and social cost not captured on balance sheets.

A business-as-usual model does not adequately meet the environmental challenges posed by the current scale of the fashion industry. Consumer demand has increased by 60% over the last 15 years¹² and shows no signs of shrinking. Large quantities of natural resources are extracted to meet these heightened levels of consumption, with commodities often short-lived – almost 60% of all clothing produced is disposed of within a year of production, often ending up in landfill or incineration. By 2050, the UN estimates that the equivalent of almost three planets will be required to provide the natural resources society needs in order to continue contemporary lifestyles¹³.

The consumption and production which drive the fashion industry are also driving environmental change on an unprecedented scale. Unless we understand our place within the complex relationship between the fashion industry and nature, our accelerating impacts upon the Earth will threaten our future prosperity and the life support systems we depend upon. This challenge calls upon the industry to change profoundly, but it likewise presents many opportunities for businesses to take constructive action.

This paper analyses each part of the fashion ecosystem and at each stage showcases examples of good practice within the industry, and recommendations for how you can align your business practice with the transition to sustainability. With proactive engagement by the industry as a whole, each individual maker, creator and business becomes part of new possibilities.



ROLE OF SMEs

Small and Medium-sized Enterprises are a hugely important driver of change in the industry

Small businesses constitute around half of the industry and are a core element of the fashion ecosystem, including design, manufacture, transport and retail. There are approximately 178,000 textile and fashion businesses within the EU, 70% of which are women-run¹⁴. Within the UK alone, there are approximately 59,000 SMEs within the fashion sector¹⁵.

SMEs by their nature have the advantage of being experimental and agile, and consequently a hugely important driver of change in the industry. However, their size means they often lack the knowledge, time and resources to significantly reduce their environmental footprint of their overall operations¹⁶.

This is compounded by the fact that SMEs often have little control over and transparency of their supply chains; consequently, it can be hard for even the most committed SMEs to drive innovation and effect change beyond their direct operations.

This paper serves to illuminate some of the impacts of the fashion industry on the natural environment, and present inspiring examples of good practice by well-known brands. We present a series of recommendations to upskill, inspire and enthuse SMEs to demonstrate that UK fashion can be at the vanguard of sustainability-led creativity.



“Over the last year, we’ve worked closely with our packaging provider to reduce the environmental impact of our signature marbled box. We’ve made, and will have soon met, three bold pledges: to use responsibly sourced materials, to introduce a half-sized box, and to ensure our packaging is widely recyclable for the consumer.”

JESS CHRISTIE, CHIEF BRAND OFFICER, MATCHESFASHION.COM

“

The sustainability success story of some Positive Fashion committee businesses is already evident in terms of impact in water and energy usage, recycling and sustainable product lines, which are translating into commercial success. Promotion of strong evidence-based business cases and the growing demand from the investment community for green strategies, and a new level of engagement from consumers, will move the sustainability conversation higher up the agenda for businesses in every sector, harnessing Board level strategic support to become a commercial imperative.”

CAROLINE RUSH, CHIEF EXECUTIVE, BRITISH FASHION COUNCIL

A PATHWAY TO CHANGE

DHL, Patron and Official Logistics Partner of British Fashion Council (BFC), is collaborating with BFC to support environmental sustainability as part of BFC's Positive Fashion initiative. Through this partnership they have commissioned Julie's Bicycle, a charity supporting the creative industries to take climate action. Centre for Sustainable Fashion (CSF) at London College of Fashion, University of the Arts, have acted as special advisors and contributed expert content and direction to co-write this paper.

The paper explores how the fashion industry is responding to the climate emergency, in the global context set by the UN frameworks of the *Paris Agreement on climate change* and the *Sustainable Development Goals*, and the special reports by the intergovernmental science bodies on *Biodiversity and Ecosystem Services* and *Climate Change and Land*.

The paper brings to life the global *UN Fashion Industry Charter for Climate Action* for the British fashion industry; showcasing current good practice, exploring the frontiers of innovation, and supporting an ambitious vision for the fashion industry at the forefront of activity to ensure a sustainable, regenerative and liveable environment.



“The untapped potential of the creativity and ingenuity within the fashion industry is inspiring. Of all the global industries, I believe that fashion will embrace change and re-invent itself as an industry, so everyone can enjoy the feelgood benefits of fashion without today’s environmental consequences.”

CARMEL MCQUAID, HEAD OF SUSTAINABLE BUSINESS, MARKS & SPENCER

The Global Agenda

The United Nations Sustainable Development Goals.

In October 2015, more than 150 countries adopted 17 *Sustainable Development Goals* (SDGs) to end poverty, protect the planet and ensure prosperity for all by 2030. For the Goals to be reached, everyone needs to play their part: governments, organisations, businesses and civil society. It is generally acknowledged that in order for meaningful progress to be made towards the SDGs, all parts of society must work together to meet the targets.



17 Sustainable Development Goals

UNITED NATIONS FASHION INDUSTRY CHARTER FOR CLIMATE ACTION

In December 2017, the United Nations climate change secretariat invited a range of fashion sector representatives to convene to participate in the *Climate Action Dialogue*. This initiative was developed due to an understanding of the pivotal role of the fashion industry in achieving the Paris Agreement's aims for two distinctive reasons. Firstly, as the seventh largest industry in the world, the fashion sector makes a significant contribution to climate change through its globalised, industrialised practices. Secondly, as a critical contributor to cultural practices and perceptions, its place in creating cultures of climate care is highly significant.

The first meeting was held on 16th and 17th January 2018, bringing together a wide range of representatives from fashion brands, manufacturers, suppliers, academics, non-governmental organisations (NGOs) and other environmental organisations. Through this and subsequent meetings, an industry *Charter for Climate Action* was developed, agreed and ratified. Its ambition and commitment includes:

- the Paris Agreement represents a global response to the scientific consensus that human activity is causing global average temperatures to rise at unprecedented rates;
- the Paris Agreement, in enhancing the implementation of the United Nations Framework Convention on Climate Change (UNFCCC), brings together Parties under a common framework to aim to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels¹⁷;
- the goals agreed in the Paris Agreement translate to reaching climate neutrality in the second half of the twenty-first century. The fashion industry, as a major global player, needs to take an active part in contributing to the realisation of these goals;
- climate action under the Paris Agreement requires commitment, ingenuity and finance engagement by policymakers, the private sector and finance community;
- delivering on the climate agenda also contributes to the broader *Agenda 2030 for Sustainable Development*;
- current solutions and business models will not be sufficient to deliver on the current climate agenda. The fashion industry needs to embrace a deeper, more systemic change and scale low-carbon solutions;
- fashion industry stakeholders have a role to play in reducing climate emissions resulting from their operations, with an awareness that the majority of climate impact within the industry lies in manufacturing of products and materials;
- all companies, within the fashion, retail and textile global value chain, regardless of size and geography, have opportunities to take actions that will result in a measurable reduction in greenhouse gas (GHG) emissions;
- actions that reduce GHG emissions are consistent with, among other things, expanding economic opportunity, using resources more efficiently, driving economic competitiveness and innovation, and strengthening resilience;
- responding to climate change requires action on both mitigation and adaptation.

The Signatories to the Fashion Industry Charter on Climate Action affirm a commitment on behalf of their companies/organisations to:

1. Support the goals of the Paris Agreement in limiting global temperature rise to well below two degrees Celsius above pre-industrial levels;
2. Commit to 30% aggregate GHG emission reductions in *Scope 1, 2 and 3* of the Greenhouse Gas Protocol Corporate Standard, by 2030 against a baseline of no earlier than 2015;
3. Commit to analyzing and setting a decarbonization pathway for the fashion industry drawing on methodologies from the *Science-Based Targets initiative*;
4. Quantify, track and publicly report our GHG emissions, consistent with standards and best practices of measurement and transparency;
5. Partner with experts, businesses, investors, environmental advocates and other stakeholders to develop and implement a decarbonization strategy for the fashion industry, including by developing a work programme and tools necessary to achieve the GHG emission reduction targets;
6. Commit to prioritizing materials with low-climate impact without negatively affecting other sustainability aspects;
7. Commit to continuously pursue energy efficiency measures and renewable energy in our value chain;
8. As soon as possible and latest by 2025, commit to not installing new coal-fired boilers or other sources of coal-fired heat and power generation, on sites within *Tier 1* and *Tier 2*¹⁸;
9. Support global transition to low-carbon transport by giving preference to low-carbon logistics;
10. Support the movement towards circular business models and acknowledge the positive impact this will have towards reducing GHG emissions within the fashion sector;
11. Establish a closer dialogue with consumers to increase awareness of the GHG emissions caused in the use and end-of-life phases of products, building towards changed consumer behaviours that reduce environmental impacts and extend the useful life of products;
12. Partner with the finance community and policymakers to catalyse scalable solutions for a low-carbon economy throughout the sector;
13. Together with other stakeholders, develop a strategy that includes targets and plans to advocate for the development of policies and laws to empower climate action in the fashion industry, especially in supply chains;
14. Establish a dialogue with governments in key countries to enable renewable energy, energy efficiency and the necessary infrastructure for a systemic change beyond the fashion industry;
15. Communicate a shared vision and understanding through the development of common strategy and messaging, including by championing climate action within the fashion industry through an enhanced and trust-building dialogue with relevant stakeholders;
16. Support the UN Climate Change secretariat in its efforts to manage the tracking and recognition of progress of the commitments outlined in the Fashion Industry Charter for Climate Action.

“In the context of the climate change emergency, sustainability is imperative and with the emergent public interest, it is time to formulate an industry-wide coalition to bring together sustainability professionals to focus on the power of collective effort that will amplify independent activity and create educational programmes and campaigns that help drive forward a sustainable fashion system.”

CAROLINE RUSH, CHIEF EXECUTIVE, BRITISH FASHION COUNCIL

GOOD PRACTICE INDEX



Strategy: Adidas
Supply Chains: Canopy
Standards: Kering
Design: Petit Pli
Materials: Piñatex
Innovation: Stella McCartney
Processing: Colorifix
Manufacture: Clean by Design
Energy Efficiency: ASOS

Logistics: DHL & Customer
Logistics: DHL Customer
Packaging: DHL
Recycling: DHL
Recyclability: Eon
Supply Chains: Adidas
Activism: Vivienne Westwood
Education: V&A
Supply Chains: Burberry

In order of appearance

Signals of Change

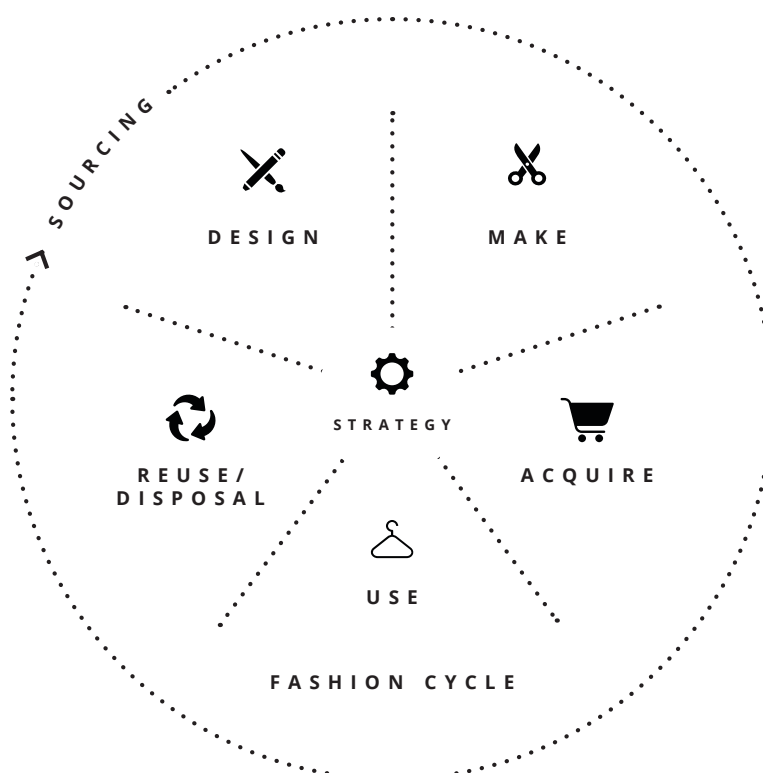
Mapping a sustainable future for the fashion industry.

OPPORTUNITIES

'Realising a transformation of the system involves interventions not only at technical and techno-product levels, but a radical re-imagining of the system's intentions, goals and success markers, realised through change in the wider levels of culture and accepted practices.'

— Dilys Williams, Director, Centre for Sustainable Fashion

In the following pages we present an overview of the stages of the fashion cycle. We include inspiring examples of good practice that demonstrate how the fashion industry is responding with creativity and agency to the climate emergency, leveraging its influence to drive change both in the production of fashion and in the way customers can extend the life cycle of the products so intrinsic to our self-expression.



*Click the icons to go
to the section*

STRATEGY

Adidas

Transparency, reporting on performance and knowledge sharing have been core to their sustainability commitment. They have been listed in the Dow Jones Sustainability Indices (DJSI) every year since 2000, and reported their sustainability performance annually since 2001, the only sporting goods industry to do so. Their products have reached 95% efficiency in material waste and 100 million litres of water have been saved through their innovative 'DryDye' technology.

In 2016 Adidas launched their Sustainability Roadmap for 2020, which translates the company's sustainable efforts into tangible goals and measurable objectives until 2020. Great strides have already been made to reach the 2020 targets, and achievements include plastic bag free stores, global plastic free offices, delivering their commitment to become 99% free of poly- and perfluorinated substances (PFCs) and creating five million pairs of shoes containing ocean plastics.

adidas-group.com



SUPPLY CHAINS

Canopy

Canopy is an NGO working with the forest industry and its main customers to sustainably manage the world's forests. It is estimated that a third of all cellulosic fibres comes from ancient and endangered forests; Canopy partners with global fashion brands and suppliers to develop sustainable sourcing practices that protect forests and their communities. Canopy has worked with brands including ASOS and Stella McCartney to develop their understanding and involvement with the wider elements of their supply chain that they do not have direct contact with. Exploring the impacts of these 'hidden' areas of the supply chain needs collaboration and education as it is often impossible for a single brand to understand its impacts alone.

canopyplanet.org



NEW BUSINESS STRATEGIES

Fashion needs to embrace transformation within the industry and engage with new processes throughout the entire value chain. *Kering's Sustainability Strategy* highlights the need for innovation and states, in relation to its Environmental Profit and Loss targets, that they know how to reduce 20% of the impact but are yet to explore how they will reach the remaining 20% reduction required.

There are a number of businesses that are embracing the human and ecological challenges posed by the linear business and growth model and turning these into opportunities. With the recognition that consumers are increasingly interested in design that contributes positively to society and nature there is an encouraging surge in the number of designers, many of whom are UK based, that are exemplifying an alternative approach.

The *Science-Based Targets initiative* is a strategic framework for companies to adopt carbon reduction targets to keep global warming within 2° C. Targets adopted by companies to reduce greenhouse gas emissions are considered “science-based” if they are in line with what the latest climate science says is necessary to meet the goals of the Paris Agreement – to limit global warming to well-below 2° C above pre-industrial levels and pursue efforts to limit warming to 1.5° C. Fashion and logistics companies that have set science-based targets include DHL, Burberry, C&A, Gap, H&M Hennes & Mauritz, Kering, Marks and Spencer and Puma. The *World Resources Institute* has published Guidance for the Apparel and Footwear Sector to set science-based targets.



STANDARDS

Kering

In 2011, global luxury group Kering launched their Environmental Profit and Loss (EP&L) account, a solution to measure, monetize and monitor the full environmental impacts of its business activities within its own operations and across the entire supply chain.

The tool has helped the Group to gain a transparent and quantifiable understanding of their supply chain. For example, their data suggests that 50% of the group's footprint is in raw materials, and a further 25% of their footprint is in the processing of those raw materials. Similarly, the tool studies the EP&L of 15 different kinds of wool, allowing designers to identify the impacts of their decisions where relatively subtle changes in fibre choice may have a significant knock-on effect for the rest of the supply chain.

Kering has adopted an open source strategy towards sharing their solutions, and have developed an EP&L app to help students, consumers and designers understand the impacts of their design decisions and buying habits. On June 2019, the Group has released a new digital EP&L platform allowing to navigate through the EP&L results starting from the overall Group impact to specific details, such as particular materials, processing activities or sourcing locations.

kering.com



DESIGN

Petit Pli

London based Petit Pli considers how they can extend the use phase of childrenswear through design engineering. Childrenswear notoriously has a very short lifespan and will all too often end up in the landfill. Their team, consisting of engineers, fashion designers, neuroscientists and sociologists, have developed outerwear that can grow with a child from the age of nine months through to four years.

petitpli.com

DESIGN

Designers play a crucial role in the fashion industry because the choices made in the design phase affect the whole value chain. Designers can have the capacity to champion environmental sustainability by selecting and designing with the most appropriate materials and processes.

Global brands including *Nike* and *Kering* have been developing design tools and training systems for designers to use throughout the design process. The Nike *MAKING design app*, created in partnership with Centre for Sustainable Fashion and London College of Fashion, UAL students, helps designers make informed material choices in relation to water, chemicals, energy and waste.

Champion of sustainable fashion *Christopher Raeburn* sees awareness as the first step to sustainability. *Inditex* and *ASOS*, along with 90 other signatories of the *Global Fashion Agenda 2020 Circular Fashion System Commitment*, have committed to educate 100% of their design teams in sustainable design principles by 2020. The *2018 Pulse of the Fashion Industry survey* demonstrated that by applying defined sustainability targets and increased traceability, rapid progress can be made. Many sustainability initiatives begin within companies themselves by teams and individuals who are motivated by sustainability mindsets. Alongside the increasing customer demand for heightened accountability in the industry, this energy and commitment is being harnessed by individual brands as they take the first steps onto a pathway of change.

Traceability and Sourcing

Full supply chain transparency reveals the key environmental impacts and where efforts/investments are best focused. Businesses can identify areas of high environmental risk by collaborating with their wider supplier network, especially regarding those activities occurring in countries with weaker environmental legislation, known pollution challenges, high deforestation and/or carbon-intensive energy generation (i.e. coal).

Supply chain transparency can help customers to make better choices. According to Fashion Revolution, since 2016 there has been a 32% increase in the number of brands publishing their supplier lists²⁰; this has been driven in part by the *#whomademyclothes* campaign that encourages customers to demand greater transparency from the fashion industry. Momentum is building fast: a recent poll from 10,000 customers across nine countries indicates 89% of customers expect brands to report on sustainability²¹.

The *Fashion Transparency Index 2019* reviews and ranks 200 of the biggest global fashion and apparel brands and retailers according to how much information they disclose about their suppliers, supply chain policies and practices, and social and environmental impact.

Industry Standards and Collaborations

Supply chains are complex, and the industry is developing tools and initiatives to help brands understand their wider impacts. Some cover the whole supply chain whilst others help fashion brands to focus on particular material groups. Systems such as the *Higg Index* and its related tools (a suite of online tools that provide an estimate and score of a product's environmental impact²²) help brands assess their sustainability performance, and offer comprehensive tools for use in product development, manufacturing and retailing, providing indicators of good practice.



MATERIALS

Piñatex

The production of leather has considerable ethical and environmental impacts, notably the rearing of livestock and the significant amounts of energy needed to turn hides into leather. The process is highly toxic due to the number of chemicals and dyes used, and whilst new techniques reduce the impacts of these hazardous chemicals, Piñatex offers a nature-based alternative. Piñatex by Ananas Anam Ltd is a sustainable textile made from pineapple leaf fibre, a by-product of pineapple agriculture in the Philippines. The long plant fibres are extracted from the leaves at the farm, providing the farmers with an additional source of income from a resource that would otherwise go to waste. It was developed by Dr. Carmen Hijosa, who worked in the leather industry and witnessed its detrimental effects. Her early research was supported through the Royal College of Art's InnovationRCA incubator programme.

ananas-anam.com



INNOVATION

Stella McCartney

Stella McCartney is developing industry collaborations to help source their cotton, cellulose, wools and silk sustainably and find alternatives for leather and fur. As part of their partnership with BOLT Threads, they launched a new biomaterial grown from mycelium, an underground root structure. The first product to be created from the new commercially available Mylo material was exhibited at the V&A Museum's 'Fashioned from Nature' exhibition.

stellamccartney.com



PROCESSING

Colorifix

Based in Norwich, Colorifix is developing a technology as a viable alternative for more traditional, often toxic, dye processes. The use of microorganisms (grown from agricultural by-products including sugar molasses and waste from the biodiesel industry) negates the need for heavy metals, organic solvents and acids. The technology can be integrated into current dye plants, and the use of synthetic biology has already proved scalable in other areas of the industry, such as textile scouring with enzymes. Its first product is expected to be commercialised by the end of 2019.

colorifix.com

New Technology

Blockchain technology decentralises the infrastructure of record keeping and has the potential to offer major advances in supply chain management²³ because a product can be tracked from the raw materials all the way to the consumer, increasing transparency and proof of authenticity. *LVMH* have just announced plans to launch a new platform called *Aura*, that will initially be used by *Louis Vuitton* and *Christan Dior Perfumes*, and intend to roll out the technology to their conglomerate and competitors. As the value and application of these technologies becomes more advanced, they may open up opportunities for making the environmental impacts of the supply chain more transparent. This technology has the possibility to assist the fashion industry in obtaining the information it needs to make procurement decisions that can green its supply chain. There are reservations and limitations to the use of blockchain technology, as with all things, it is vital to employ the most appropriate technology, undertaking a full assessment of its seen and unforeseen consequences.



MAKE

Raw Materials & Processing

Preferred traditional fibres

Sustainable farming methods can reduce the environmental impact of wool, cotton and cellulosic materials production. The difference between conventional and organic farming can be dramatic in terms of chemical, water and energy use²⁴. Land is kept fertile because of frequent crop rotation and maintaining local biodiversity. Today as much as 19% of the world's cotton is sourced organically²⁵, the balance between organic and conventional is predicted to increase.

The *Partnership for Sustainable Textiles* published an *Organic Cotton Sourcing Guide* which explains how to work with suppliers and gradually build in organic cotton. Over the last few years initiatives from the wool, cotton and cellulose industry have gained exposure working with brands through each step of the process, providing a solid framework to help more brands do the same (see *Appendix 5*).

These advancements are making the integration of preferred fibres more economically viable, and as the price difference to traditional methods decreases, more brands start to include organic in their preferred fibres, resulting in further investment and better farming and processing infrastructure. As the cost of input factors such as water, fuel and labour continue to rise, the price gap between sustainable and conventional methods will continue to decrease, reinforcing the business case for sustainable production.

Fibre Innovations

Technological developments are improving the viability of *existing and new biosynthetic fibres* at scale. For example, bast fibres such as flax, hemp and jute are very fast-growing and use less land and water than cotton, but are rougher and crease easily. Extensive research into enzymatic and mechanical retting could make their properties more similar to cotton²⁶. Another example is Tencel, a biosynthetic fibre made from the pulp of eucalyptus trees, which is manufactured using a closed loop process reusing nearly all water and non-toxic solvents²⁷.

The number of new products and materials being developed is on the rise, with many innovations exploring the use of agricultural by-products and food waste. Promising fibre innovations currently available on a small scale include *Orange Fiber*²⁸, who create textiles from discarded orange peel from Italy's citrus industry, and *S.Café*²⁹, who make odourless performance textiles from used coffee grounds.



MANUFACTURE

Clean by Design

Clean by Design is a supply chain efficiency initiative created by the Natural Resources Defense Council and the methodology is being scaled through a partnership with the Apparel Impact Institute. The program aims to cut the impacts of water, energy and chemical use in textile mills starting with low cost and easy to implement solutions, including installing meters, reusing water, recovering heat, optimizing chemical use and properly treating wastewater.

According to its 2018 progress report, the 56 mills that complete the Clean by Design programme since 2014 saved 7 million tonnes of water and 90 thousand tonnes of coal annually, with most participants able to pay back the cost of implementing solutions in under nine months. However, as Clean by Design identifies, in spite of the 200 mills that are currently making progress there are an estimated 1,500 mills operating in China alone.

nrdc.org



ENERGY EFFICIENCY

ASOS

Leading online retailer ASOS' corporate responsibility programme, Fashion with Integrity, runs throughout the business and drives its approach to transforming the impact of fashion on people, animals and the environment. One of its aims is to lower the greenhouse gas (GHG) emissions associated with its business operations, across buildings, energy, travel and packaging, and ASOS has taken action in these key areas to reduce its carbon footprint.

Between 2017 and 2018, ASOS' total location-based GHG emissions decreased by 10%. It achieved these reductions through engaging with its delivery carriers to work together to reduce emissions, including switching to electric delivery vehicles in central London; purchasing renewable energy and investing in onsite renewables; and offsetting emissions related to business travel.

ASOS has also prioritised the energy efficiency of its three international fulfilment centres. For its new facility in Atlanta, USA, which became fully operational in 2019 and is run by DHL, ASOS worked with an external energy consultant to install a range of sustainability measures, including: occupancy sensors throughout the warehouses, offices and meeting spaces; LED exterior lights on timers; installing 'sleep mode' on equipment when not in use; tints and blinds on windows; refresh air circulated by kitchen hoods; and skylights to maximise natural daylight in work areas. Additionally, ASOS has implemented water efficiency initiatives such as low flow faucets, toilets, showers and water cooler refill stations, as well as xeriscaping (low water use landscaping) where possible.

asos.com

Processing

The processing of materials has wide-spread environmental impacts, with dyeing in particular having a high energy demand for heating large volumes of water³⁰. Anthracite, with the highest energy density of all types of coal and the highest carbon content, as well as natural gas are together responsible for a share of 60% to 70% of the climate change impacts in the dyeing and finishing stages³¹.

Reducing water use through new technologies

Water-less dye processes are being developed by companies such as *DyeCoo* which use very low amounts of water, along with reclaimed carbon dioxide³², to create a highly pressurised environment that makes dyes dissolve and attach to textile fibre. In this case, reclaimed carbon dioxide works as the dyeing medium in a closed loop process. When pressurised its power to dissolve dye more easily increases, easily transferring the dyes to fibres and resulting in vibrant colours.

Enzymology and molecular biology

Advancements in molecular biology are beginning to provide viable and more environmentally sustainable alternatives for textile processes and ‘styling’ such as scouring, bleach clean-up, abrasion and polishing. Traditionally, high alkali baths break down and soften fibres: enzymes could be used as a lower impact alternative, because they are less alkali and require less heat, saving energy. Enzymes are proteins that catalyse chemical reactions. Their use is in development for industrial conditions by companies such as *DuPont* and *Novozymes*. Scouring fabric with enzymes at a neutral pH is a gentle process, retaining fabric softness with no need for chemical softeners. With this emerging technology, cotton mills save on average 67% of water, 50% of energy and 50% of processing time³³.

Collaboration and collective campaigns to clean up processing methods

In 2011, Greenpeace launched their *Detox campaign*, getting 80 brands (15% of the global production market) to commit to clean textile processing by 2020³⁴. The initiative has been instrumental in raising awareness of the toxic processing methods used by the industry. To meet their 2020 commitments brands have come up with a number of solutions including training in chemical management, wastewater and chemical testing, and water metering and recovery systems. So far, 72% of the brands have managed to eliminate PFC’s (perfluorinated compounds), a harmful substance used for the waterproofing of textiles, and progress continues to be made on the elimination of APEOs (alkylphenol ethoxylates).

Manufacturing

The *Pulse of the Fashion Industry 2018 report* states that a quarter of the industry’s resources are wasted as leftovers of fabric and garment production every year³⁵. Improvements in Artificial Intelligence (AI) and 3D printing offer opportunities for manufacturers to streamline their production processes, such as made-to-order production and fast batch production.

The/Studio offers a cloud-based platform that links small designers with a network of 400 manufacturers in China³⁶ through which they can order custom apparel and accessories on-demand in the required quantities. Nike, Tommy Hilfiger and Everlane have used the company’s services. Whilst not inherently sustainable, the development of this kind of technology offers exciting possibilities in the area of manufacturing including waste reduction through made-to-order models, transport efficiencies, and supply chain transparency.

Energy Consumption

Electricity is one of the most expensive commodities in the fashion industry. In 2017 an Indian study showed that because many mills still use old and inefficient technology the electricity needed to power the machines is 15%-20% of the overall production cost, putting it on par with the cost of raw materials³⁷. Opportunities to reduce electricity consumption, and hence carbon emissions, as well as benefit from direct financial savings, are extremely wide-ranging.



LOGISTICS

DHL & Customer

When DHL's customer planned to open a new distribution centre, they clearly outlined that the site should meet very specific requirements, including having recreational facilities, nearby nature trails for employees, space for child care and – most importantly – it should not be a “greenfield” site (undeveloped agriculture or forest land earmarked for commercial development.)

DHL helped find an abandoned coal mine and waste dump for the distribution centre, which was reclaimed and regenerated to high environmental standards in keeping with their customer's business ethic. The new site also helped bring new jobs to an area that had long relied on a fossil fuel-based economy.

In addition to the unique site for their customer, DHL also proposed other GoGreen solutions including internal and external LED lighting, low-flow water in sanitary facilities and additional insulation. The project uses ecologically sound paints and flooring, and will undergo operational carbon-footprint assessments.

DHL GoGreen Solutions



LOGISTICS

DHL Customer

In 2016 DHL's customer completed a new 40,000 m² warehouse facility in Belgium which achieved a **Gold standard LEED Certificate** for its groundbreaking design. The centre recycles 95% of all its waste and uses energy from local sources including wind, solar, hydroelectric and biomass. Large windows and an innovative daylight delivery system reduce energy demand for lighting, supplemented by LEDs.

In Brazil, their customer has installed onsite renewable solar generation on the rooftop of the DHL-run warehouse in Brazil, with plans to implement similar technology in Mexico.

The customer regularly holds, particularly in the US, Sustainability Continuous Improvement workshops to drive improved recycling rates. Their use of the proprietary DHL Carbon Optimisation tool at DHL Supply Chain operated sites reduces void fill and material inputs while finding the optimal shippers to stock.

In terms of sustainable mobility, this customer has tested all electric van apparel deliveries into Rio de Janeiro city centre during the 2016 Olympics. They have used four LNG trucks for linehaul services since March 2018 and use a 1.5 tonne electric truck for distribution to their flagship store in Berlin.

DHL GoGreen Solutions

Energy makes up a large proportion of warehousing and retailer costs. Some brands have started to see a return on their investments by making simple steps such as switching to LED lighting, upgrading heating/ventilation systems and installing energy meters to better manage energy use.

Carbon Measurement for Business: Greenhouse Gas Protocol

The **Greenhouse Gas Protocol** provides accounting and reporting standards, sector guidance, calculation tools and training. It establishes a comprehensive, global, standardised framework for measuring and managing emissions from private and public sector operations, particularly 'Scope 3' operations (i.e. indirect emissions such as the extraction and production of purchased materials and fuels, transport-related activities, indirect electricity consumption, outsourced activities, waste disposal, etc.).

In the context of the global fashion industry, understanding these indirect emissions and impacts can represent the largest source of greenhouse gas emissions. Formalising an approach to track and manage these wider emissions from supply-chain related activities is critical.

A C Q U I R E

Logistics, Packaging, Distribution & Transport

Carbon Footprint

The shipping and logistics industry enable global supply chains by transporting raw materials, components and other items sourced by the fashion industry from across the world. It needs to be considered that each journey increases the carbon footprint of a product. DHL, for example, has introduced green vehicles across its fleet to reduce the impact of greenhouse gas emissions and air pollution, and are training relevant staff to become certified **GoGreen** specialists who help customers assess the environmental impact of their shipping solutions.

E-commerce

E-commerce sales now total US \$2.3 trillion (£1.9 trillion) worldwide³⁸ and online shopping is driving fashion forward. The distribution model of stores on the high street has shifted over the last 15 years to e-commerce, and has radically changed how people consume fashion. The impact of items travelling repeatedly to and from delivery centres to customers' homes can add significantly to the carbon footprint of a garment.

The energy footprint of fashion has moved from being simply an in-store footprint to one encompassing packaging and logistics, and therefore requires consideration for how to deliver garments in the most efficient and sustainable manner possible. The increase of on demand fashion motivates brands to stock by consumer demand, therefore producing apparel only as needed.

Packaging

Despite recent improvements and switching to more easily recyclable/compostable packaging, many products worldwide continue to rely on single-use plastics/wrapping. Increasing public awareness of the issues around plastic pollution has helped put pressure on the industry. This is supported by organisations like the **Ellen MacArthur Foundation** which has motivated 150 brands, including **Burberry**, **H&M** and **Stella McCartney**, to sign up to a 2020 commitment to eliminate plastic packaging³⁹.



PACKAGING

DHL

There are good reasons for using plastics in logistics, such as product protection with light weight material. However, the growing amount of plastic usage is threatening the health of our planet. Therefore, DHL is working to reduce, reuse and recycle plastic across its logistics operations in three ways:

1. Providing guidance: By developing a strategy on single-use plastics and defining minimum standards and recommendations for sustainable packaging.
2. Developing solutions: By supporting testing of alternative packaging solutions together with customers and developing and sourcing alternative packaging solutions.
3. Raising awareness: By educating and engaging staff, presenting initiatives and disseminate knowledge across DHL.

DHL also launched the first internal theme-specific challenge focused on packaging. The goal of the Packaging Challenge 2019 is to identify meaningful packaging opportunities within the Group in order to increase operational efficiency, improve sustainability and potentially create new business models. Employees from all divisions can submit packaging related challenges and ideas, the selected teams will be supported in the development of solutions together with internal and external partners.

logistics.dhl



RECYCLING

DHL

DHL has been working with its customer to develop an end-of-life solution for Corporate uniforms. Historically, all of the customer's uniforms were sent to landfill at end of life. Following consultation, DHL developed a solution to ensure that now zero waste is sent to landfill: Body protection panels are reused for production in the automotive industry as clutch facings and fabrics are sent for recycling. Any remaining waste is sent to an energy-from-waste facility. For its own Corporate uniforms DHL now has plans to use recycled materials for t-shirts and polo shirts.

logistics.dhl



USE

Customer-directed campaigns are helping consumers understand the environmental impacts of their own behaviour, specifically the washing, wearing and disposal of their clothing. For example, average UK washing habits release at least 9.4 trillion microfibres per week into the environment and use up to 130 litres of water per wash⁴⁰. New technologies are helping to mitigate the release of microplastics. *Guppyfriend* and *Cora Ball* use patented solutions, such as a micro-filter washing bag and coral-like ball, that capture between 26-86% of microplastic fibres during the washing cycle that would otherwise be released into waste water^{41,42}.

Public campaigns by organisations such as *Fashion Revolution* and *Greenpeace* are building consumer awareness of the environmental and social impacts of the global fashion industry, resulting in growing customer demand for sustainable action from brands. Recent campaigns to reduce plastic across all industries are building momentum, with increasing numbers of brands making commitments to cut plastic consumption.



REUSE & DISPOSAL

‘Circular’ business models that encourage reuse across the fashion industry:

The circular economy, as opposed to the current *linear* economy, is based on three core principles:

1. Design out waste and pollution
2. Keep products and materials in use
3. Regenerate natural systems

The current economic model of fashion is linear and based on ‘take, make, use and dispose’. This model creates gigantic quantities of waste and pollution at every stage of the fashion lifecycle. An alternative model, known as the circular economy, seeks to help drive efforts to conserve products and resources by designing out waste and promoting reuse at each stage of the fashion cycle.

In the context of the fashion industry, the circular economy as a system, whilst based on long-standing ideas, is still a relatively new concept in industrial fashion terms, with most business models or solutions addressing or closing loops in one part of the supply chain. However, research has shown that by extending a garment’s life by just three months would lower its carbon, water and waste footprint by 5-10% if, at the same time, fewer garments are purchased as a result⁴³. The *ThredUp 2019 Resale Report* stated that 96% of fashion industry executives said they wanted to advance their company’s approach to circular fashion⁴⁴.



RECYCLABILITY

Eon

Eon is the leading Digital Identity company for fashion, apparel and retail. Eon partners with global brands and retailers to create digital profiles for physical products, connecting them to the Internet of Things and powering end-to-end business intelligence and introducing a new gateway for commerce. In collaboration with industry leadership, Eon introduced the Connect Fashion Global Initiative to introduce CircularID™ — the global standard and digital system for identification and management of products in the circular economy. CircularID™ makes it possible to identify products and materials for resale, repair, rental, reverse logistics, recycling and more. With the shared digital foundation enabled by CircularID™, it will be possible to operationalise circular economy, create new business incentives that reduce production and consumption, and bring measurement and accountability to products across the lifecycle.

eongroup.co



SUPPLY CHAINS

Adidas

Adidas have been championing sustainability for many years, starting in 1989 with the banning of CFCs. Since then, they have led on innovative approaches to their supply chain, product sustainability and ethical production. Their achievements were recognised in 2015 when they were ranked third among the Global 100 Most Sustainable Corporations in the World (Global 100 Index) at the World Economic Forum in Davos.

Adidas have pioneered standards and policies to ensure long term supply chain and product sustainability. In 2002, they became the first company in the industry to ban six high risk and hazardous chemicals and at the same time, their comprehensive and detailed environmental, health and safety guidelines to guide best environmental practice for suppliers were produced and shared as a framework for best practice across the industry. Other frameworks and initiatives they have championed include the Better Cotton Initiative, Fair Factories Clearinghouse, Better Work and the Sustainable Apparel Coalition (SAC), using stakeholder engagement and collaboration to address negative social and environmental impacts and drive positive change.

adidas-group.com

New ownership models

Mobile and online technology is allowing the development of new business models based on sharing and rental. The fashion industry is also experimenting with the nature of ownership, reflecting changes in people's relationship to fashion and their clothing. High demand for frequent changes in style, coupled with reduced living space for many, offers an opportunity for rental models that allow customers to frequently exchange what is in their wardrobes. Examples include peer-to-peer sharing through UK-based *Rentez-Vous*, and luxury fashion rentals offered by companies such as *Rent the Runway*, *Front Row*, *Chic by Choice*, and *Girl Meets Dress*. US-based *ThredUp* offers the world's largest online marketplace to buy used women's and children's clothing, while *Depop* allows creatives to buy, sell and discover fashion from other influencers.

Leasing can encourage closed-loop business models by ensuring garments are returned at the end of their use, enabling businesses to better repair, recycle, or upcycle. The potential to create a truly circular system through a shared economy will depend on change in wider social and economic systems. Close collaboration with the logistics industry can create systems for easy return and exchange, powered by renewable energy. The longer that clothes stay cherished and worn, the lower the emissions, water and waste in fashion.

A second life for clothing and accessories

At the same time, the lifespan of fashion products is becoming more elastic as pre-owned, refurbished, repair and rental business models continue to evolve, with 40% of consumers now considering the resale value of a garment before buying it⁴⁵. Studies show a 10% increase in second-hand sales could deliver significant environmental benefits, cutting carbon emissions per tonne of clothing by 3% and water use by 4%, equivalent to extending a garment's life by 50%⁴⁶.

End of use collection and recycling

End of use is the weakest step in the value chain because the solutions and their related infrastructure are not yet practical for the industry as a whole; systemic change and investment in technology is needed to achieve the level of change required. Fashion companies such as *M&S* and *Inditex* have introduced clothing collection points in their stores, but significant work remains to encourage wider action so that the value is retained in clothes and their constituent parts.

An increasing number of campaigns are educating customers on what to do with their unwanted clothing, such as *#Lovenotlandfill* run by the London Waste and Recycling Board, which states that 11 million items of clothing go to landfill in the UK every week⁴⁷. Launched in conjunction with London Fashion Week in 2018, it saw eye-catching clothing banks set up around the city. Similarly, emerging businesses like *Worn Again* and *re:newcell* are developing the technology needed to recycle clothing effectively, although further investment by the industry is required to take these emerging technologies to scale.

As at the start of the fashion lifecycle, designers play a pivotal role in reducing environmental impacts at the end-of-use phase because decisions made at the design stage determine how easily a product can be reused/recycled at the end of its life.



A C T I V I S M

Vivienne Westwood

Vivienne Westwood continues to communicate the threat of climate change through her slogan t-shirts. Crafted from organic, unbleached cotton that derives from a 20-year-old cooperative in Peru, Vivienne Westwood's Save the Arctic t-shirts are fully certified by the Global Organic Textile Standard, which ensures sustainability of the environment as well as traceability of the cotton from field to product. Once produced, each item was then printed within the UK with all proceeds going to Greenpeace.

Vivienne Westwood Save the Arctic Campaign

E D U C A T I O N

V&A

Fashioned from Nature was an exhibition held by the Victoria and Albert Museum in London during 2018-19 which explored the complex relationship between fashion and nature from 17th to 21st century. The exhibition is now touring. Commissioned by the exhibition's curator, Edwina Ehrman, CSF's Professor Dilys Williams acted as special advisor and conceived two installations for the exhibition, *Fashion Now* and *Fashion Futures 2030*.

Fashion Futures 2030 explores what fashion and nature might look like within four speculative scenarios, based on environmental, economic, social, cultural and technological changes taking place across the globe. Subsequently the Centre for Sustainable Fashion and Forum for the Future, with support from the C&A Foundation, have developed *opensource toolkits* for educators and industry professionals to consider how the scenarios can be used to consider design, strategy and communications within business and education.

vam.ac.uk

INDUSTRY & EDUCATION PARTNERSHIPS

The fashion industry has the potential to be transformed by its graduates who emanate from the world's leading universities in Art and Design. The close connection between these colleges, courses, students and industry organisations such as *British Fashion Council* is critical to a thriving fashion ecosystem. The forming of synergistic relationships between researchers and tutors in these colleges with industry practitioners is also a vital source for knowledge exchange between academia and industry.

Centre for Sustainable Fashion, based at London College of Fashion, University of the Arts London, has been instrumental in co-creating a curriculum with industry partners as well as engaging in knowledge exchange between design teams and research teams. It believes that education can create one of the biggest changes in the world and through teaching students in 151 countries through face-to-face and online learning, it sets out to do this at local and global scales.

As the leading research centre dedicated to fashion and sustainability in the world, it seeks to create change in academic understanding by creating a new discipline, Fashion Design for Sustainability, and a new curriculum that is ecologically and equity based. It has also established knowledge exchange through partnerships with industry and NGOs to transform the fashion system to one that recognises nature's boundaries and honours human equity.

However, more generally, sustainable design has yet to move from being a specialism to the core of mainstream fashion design education.

Incubators and specialist centres

Through UK Government and industry initiatives, a number of projects and specialist centres relating to fashion and sustainable innovation are being established. The UK Government's Industrial Strategy Challenge Fund has already resulted in two significant fashion projects. The *UK Business of Fashion, Textiles and Technology (BFTT) project* is a partnership between London College of Fashion, University of Arts London, Loughborough University, Queen Mary's University, Leeds University, Cambridge University, and University College London. It is supporting a range of innovations and SME innovators working in the fashion sector. The *Future Fashion Factory* research project is led by the University of Leeds in collaboration with the University of Huddersfield and the Royal College of Art.

Aside from these substantial projects, a range of other research projects are informing fashion and sustainability practice; the Arts and Humanities Research Council is funding 'Fostering Sustainable Practices' led by CSF with other LCF researchers, in collaboration with researchers in the Centre for the Understanding of Sustainable Prosperity at Middlesex University and the Open University, to explore ways in which micro and small businesses exemplify prosperity in social, economic, environmental and cultural terms. New dye technologies such as *Colorifix* would not have been possible without the investment of university research labs – the founder of *Piñatex* was able to research her new fibre as part of her PhD at the Royal College of Art with its incubator programme.

Brands' approach to environmental issues is an increasingly important factor for future employees. Generation Z see environmental impact as a key consideration when choosing employers. If brands wish to appeal to the most talented students emerging from universities, they will need to increase their engagement and action on environmental sustainability.

✂ SUPPLY CHAINS

Burberry

Burberry has had environmental and social programmes in place for more than 15 years. These programmes cover its operations, supply chain and extended communities and are designed to drive positive change and build a more sustainable future through innovation and collaboration.

In the last year, Burberry has become carbon neutral across the Americas region, its EMEA retail stores and UK operations, and is on track to achieve its target to be 100% carbon neutral in its own operational energy use by 2022. Building on its existing environmental targets, Burberry set two new, ambitious climate goals approved by the Science Based Target initiative, covering its direct operations (including electricity and gas consumption at stores, offices and internal manufacturing and distribution sites) and indirect emissions in its extended supply chain (which goes one step further to also include the impact from sourcing raw materials and manufacturing finished goods).

Burberry is also exploring ways to transition to a more circular model for fashion, achieving 50 disruptions (and counting) across its linear value chain from design to purchase and through the Burberry Foundation working with the RCA to research circular materials, manufacturing and consumer behaviour. Burberry recently launched a capsule collection made from ECONYL yarn created from regenerated fishing nets, fabric scraps and industrial plastic. Burberry is also working with partners including Smart Works and Elvis & Kresse in the UK and other organisations from around the world to repurpose raw material excess and unsaleable finished goods.

Meanwhile in stores, Burberry has launched new sustainable packaging made from paper created using fibre from recycled coffee cups and FSC certified virgin pulp. More than 30m cups have been diverted from landfill into Burberry's rebranded packaging, with the result also fully recyclable and FSC certified.

burberryplc.com

“Fashion SWITCH has resulted in an estimated 355 million kilowatt hours sourced from green energy and the avoidance of approximately 125,000 tonnes of carbon dioxide emissions in the first year of the campaign.”

CAROLINE RUSH, CHIEF EXECUTIVE, BRITISH FASHION COUNCIL



What Next?

Recommendations for the UK fashion industry to become more sustainable

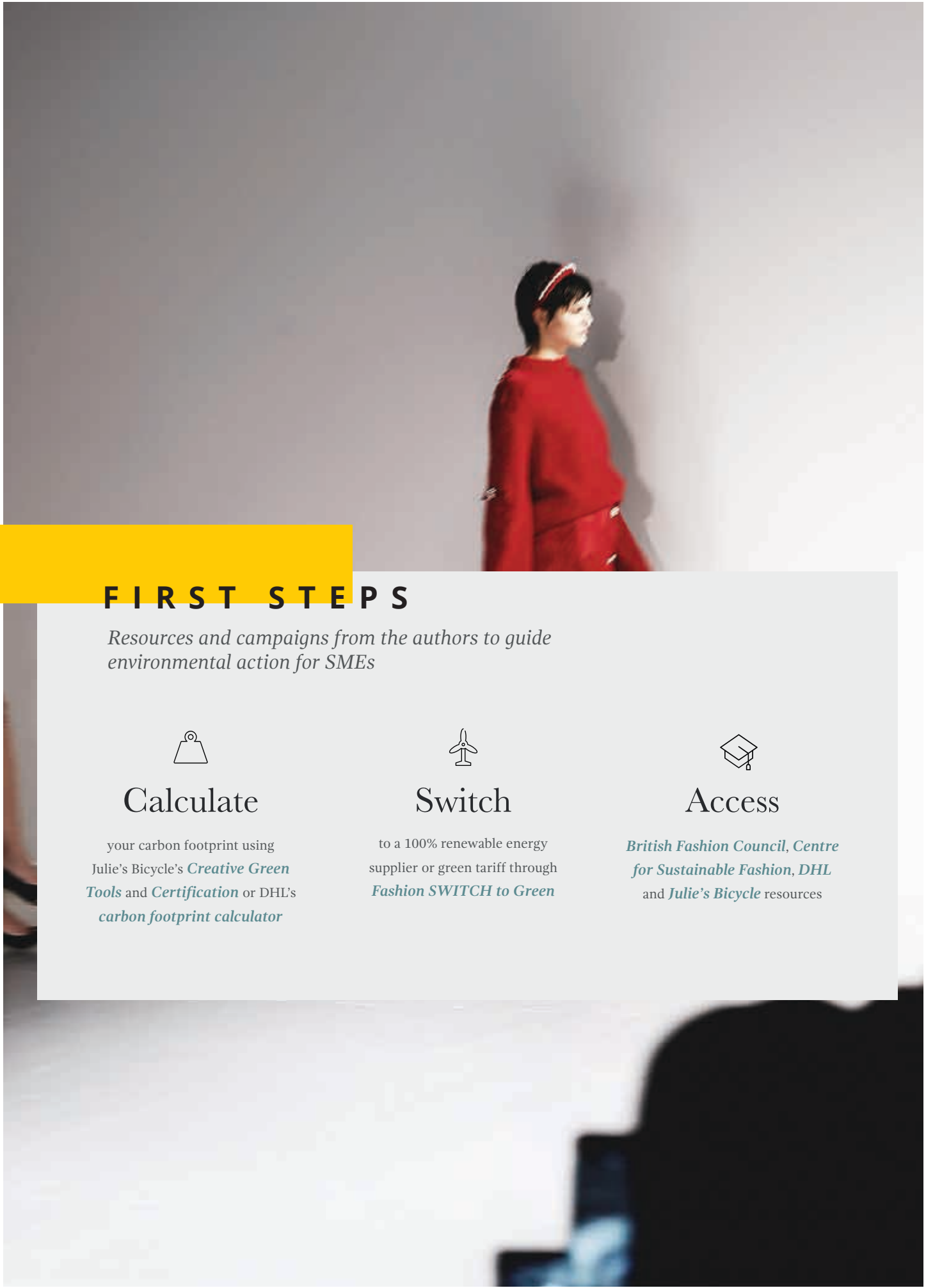
This paper highlights a wide range of activity being undertaken to understand, mitigate and resolve the wide-ranging environmental impacts of the fashion industry, highlighting solutions that are being put into practice by small organisations to multi-national corporations. The fashion industry is beginning to mobilise; it is taking action to build greater understanding of direct and indirect impacts and there is obvious and growing commitment to address environmental issues, evidenced by the emergence of new designers and businesses with groundbreaking ideas and approaches.

The key to this mobilisation lies in first understanding the issue and your business' place within it; taking concrete actions to produce tangible results in your own design practice, supply chain and business model; and connecting to a broader community to scale your impact and accelerate change.

For companies both in the UK and globally, the following needs to happen:

1. A whole systems approach needs to be taken that moves beyond small changes within the current system to sustain our futures. Visionaries are needed to ideate products and systems.
2. We need to move beyond standard compliance towards transformational approaches to value all elements of nature and human skills employed in fashion. Be bold, set your own standards as well as referring to validated reference points.
3. We need to understand and address the seen and hidden impacts related to our business by having the policies, planning and procurement practices that will create the shift to environmentally sound practices.
4. A continued focus on reducing energy and resource consumption across all stages of the fashion lifecycle is the no brainer.
5. Using collaborative projects to leverage existing activity in the sector through shared learning will help each business and all businesses.
6. A greater diversity of contributors need to be included in the fashion and sustainability discourse. Check yourselves.

In the following pages we have set out recommendations for good practice towards a net positive fashion industry. By adopting these good practices fashion companies can do their part to address their current environmental impacts and help create the momentum and drive the systems change that the climate and ecological emergency ultimately require. In [Appendix 5](#) we have listed out a number of environmental initiatives for the fashion industry specifically, or of relevance – we recommend fashion companies engage and participate in the initiatives most pertinent to them.



FIRST STEPS

Resources and campaigns from the authors to guide environmental action for SMEs



Calculate

your carbon footprint using Julie's Bicycle's *Creative Green Tools* and *Certification* or DHL's *carbon footprint calculator*



Switch

to a 100% renewable energy supplier or green tariff through *Fashion SWITCH to Green*



Access

British Fashion Council, Centre for Sustainable Fashion, DHL and *Julie's Bicycle* resources

Recommendations

GOOD PRACTICE

We present inspiring highlights of good practice and recommendations to reduce the industry's environmental impacts. *Click the icon* to be taken to the section.




Click the icons to go
to the section



Strategy

RECOMMENDATIONS

P O L I C Y

Your environmental policy sets out your commitment and ambition on your environmental impacts and responsibilities.

An environmental policy is a public statement of your organisational commitment and ambitions. Together with an *action plan*, it provides a unifying direction and purpose that will guide the actions of your employees, management, stakeholders, audience and suppliers. An environmental policy can act as a public statement & commitment (stronger branding), support decision making, help engage staff, customers and suppliers, and maintain regulatory compliance.

Examples of environmental policies include *DHL*, *M&S*, *Burberry* and *Kering*. For guidance on how to prepare your own environmental policy, see the *environmental reporting and action plan guidelines* available from Julie's Bicycle.



Questions to ask

- ☐ Do you (or your supplier/s) have an environmental policy?
- ☐ If so, is everyone in your organisation aware of it?
- ☐ Does it cover the entirety of your organisation and its activities?
- ☐ If you do not have an environmental policy, free guidance is available [here](#)

Environmental Action Plan

- ☐ Do you (or your supplier/s) have an environmental action plan?
- ☐ Is it approved by your senior team / Board?
- ☐ Does it have measurable objectives and targets, with assigned responsibilities?

Linking to your wider business strategy

- ☐ Is environmental sustainability embedded in broader business mission, strategy or planning?
- ☐ Are you committed to environmental procurement and sourcing?
- ☐ Are you communicating with and engaging your stakeholders on environmental sustainability?

Understanding your organisation's impacts

- ☐ Have you monitored energy, water and waste data for at least a year?
- ☐ Have you surveyed your suppliers/customers about their attitudes to the environment and your products/services?
- ☐ Have you used your energy/waste/travel/etc. data to set targets?
- ☐ Have you evaluated any impacts from initiatives you have undertaken? (e.g. upgrading lighting to LEDs)
- ☐ Have you calculated your carbon footprint? If not, use this [free online calculator](#) for SMEs.





Design

RECOMMENDATIONS



DESIGN AWARENESS

The design phase plays a critical role as the choices made here affect the whole value chain, beginning with product aims and selecting appropriate materials and processes.

- ☐ Substantial elements of the fashion industry's environmental impact happens through decisions made at the design phase; start with understanding the steps your designers follow when approaching creating a new garment or collection.
- ☐ Identify what training and resources are needed to drive culture change in your organisation – what do your teams need in order to work more closely together?
- ☐ Build relationships with suppliers, ask your suppliers if they have a certification/standard for their products, processes or materials; how is their energy supplied and what plans do they have to reduce their energy consumption and improve energy efficiency. This can be a great way of accessing tried and tested information to educate your team.



P R I O R I T I E S

- ☐ Start by focusing on a particular fibre, for example, and work through its sourcing and the suppliers you rely on. Building the relationship with that supplier can clarify their practices and help identify opportunities to be more innovative. There are a number of industry bodies such as the [*Better Cotton Initiative*](#), [*Canopy*](#) or [*The Woolmark Company*](#) who specialise in fibre types and supporting brands make the transition to preferred materials.
- ☐ You may prefer to start with a product and think holistically about the lifecycle of a whole garment for example, from sourcing materials, transporting and processing them, through to manufacture and distribution, sale and eventual use of the garment and how it might be disposed of at the end of its life.
- ☐ Work with mills, suppliers and visit textile fairs such as [*Future Fabrics Expo*](#) to get new ideas for exciting and innovative fabrics. Start to think about what fabrics could offer viable solutions for your brand.



Make

RECOMMENDATIONS



S U P P L Y C H A I N S

For most fashion industry businesses the majority of their environmental impact lies not within their own operations, but in their actual supply chain and the sourcing and processing of raw materials. There is enormous potential at this stage for the industry to reduce its environmental impacts.

- ☐ As you trace back down your supply chain you will understand who is responsible for what at each stage. The dyeing and processing part of the production chain can be quite daunting especially for small to medium brands, as often fabrics will be purchased from a textile wholesaler and it is hard to know where and how the textiles were dyed.
- ☐ Start by having open conversations with your fabric supplier to find out more information. If you are dyeing/printing textiles yourself, investigate what processes are most appropriate to use, experiment with new materials and processes such as digital printing where appropriate.





- ☐ A **Manufacturing Restricted Substance List** (MRSL) provides brands, retailers, suppliers and manufacturers with acceptable limits of restricted substances in chemical formulations which are used in the raw material and product manufacturing processes. An MRSL is used as a tool by companies around the world to regulate the safety of chemical formulations used to make the raw materials that go into products and samples. The regulation of chemical formulations upstream, through an MRSL, protects workers, consumers and the environment. Adhering to an MRSL can also protect brands and retailers from potential negative publicity on product safety. Does your company know whether an MRSL is being adhered to effectively by suppliers further upstream?

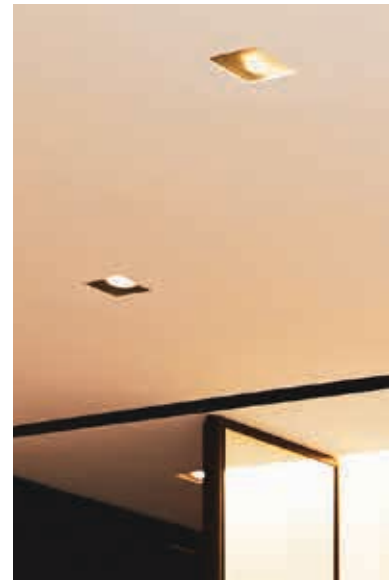
- ☐ Check the **Zero Discharge of Hazardous Chemicals Programme**, which works to catalyse positive change in the discharge of hazardous chemicals across the textile and footwear product life cycle.





Make

RECOMMENDATIONS



ENERGY EFFICIENCY

Increasing building efficiency in the fashion sector offers plentiful opportunities to reduce electricity and gas consumption — and therefore carbon emissions — resulting in measurable cost savings.

- ☐ Make an assessment of your workshop, office, studio or retail store to identify key areas for energy efficiency improvements. A walk-around survey during the day, then also at night, will help identify significant areas/processes that use energy.
- ☐ Write up a step by step plan to implement changes; some will be immediate actions, whereas others will need some investment that can be built into your budgets.
- ☐ Energy efficiency measures are one area where brands report seeing the most direct and quickest savings. Track your cost savings and impacts, talk and share information about what solutions have worked.

To find out more about how you can undertake an energy saving audit of your premises, please contact [*Julie's Bicycle*](#).

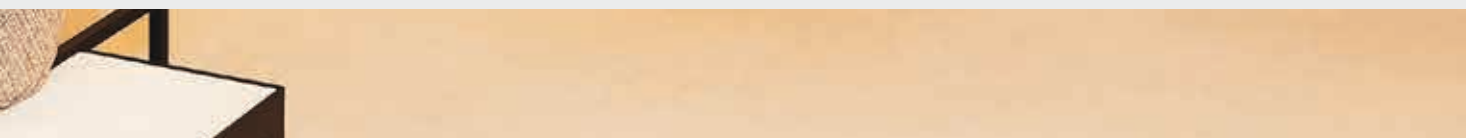




RENEWABLE ENERGY

Once you have identified key ways to save energy and reduce your demand, the next step is to consider switching to a renewable energy supplier. The British Fashion Council has been gaining momentum with the *Fashion SWITCH to Green* campaign encouraging British fashion brands to switch to a green energy supplier by 2020 in their UK stores and offices. SWITCH to Green have recently created a new web platform for brands to compare renewable energy suppliers. After reducing energy consumption, switching to green energy is one of the easiest and effective steps brands can take to reduce their impact. See the Julie's Bicycle *Renewable Energy Factsheet* for more information.

- ☐ Find out if you can switch your energy supplier(s)
- ☐ Can your partners/suppliers switch?
- ☐ Can you ask staff/consumers to switch?





Acquire

RECOMMENDATIONS



CARBON FOOTPRINT

The carbon footprint of your product increases with each journey from point of sale to customer. Raw materials are transported around the world via shipping and logistics networks and your suppliers are a vital part of the process to reduce your environmental impacts, and are likely to support your efforts if they understand the ambitions.

- ☐ Start by making a list of your main suppliers by price or volume (for example). Identify the key suppliers: how many are there, what role do they each play and how does their work affect your organisation?
- ☐ Ask your suppliers for their environmental policy.
- ☐ Start by listing all your Tier 1 suppliers. Start conversations with them and build a relationship, ask questions about who their suppliers are and encourage sustainable thinking along the supply chain.





- ☐ In terms of your wider supply chain, what are other companies doing on sustainability? What initiatives are they developing? How might you be more involved in developing solutions?
- ☐ Are there any examples of best practice you could interpret for your organisation? Look to industry bodies such as the Sustainable Apparel Coalition to help you. Where this isn't possible, build on tried and tested methods by approaching your suppliers and asking the right questions.
- ☐ Less complex supplier networks can help facilitate better interaction and traceability.





Acquire

RECOMMENDATIONS



DELIVERIES

With e-commerce sales totalling US \$2.3 trillion (£1.9 trillion) worldwide, online shopping is driving fashion forward. By their nature, your online sales will require transportation, and while some environmental impacts are inevitable, there are processes you can put in place to minimise them.

As a last resort you may look for a logistics partner that offers carbon offsetting, but foremost always work with a partner who has a clear environmental protection strategy that reduces their footprint as much as possible (see [DHL GoGreen](#)). Another is to ensure your products are delivered first time. Not only does a first time delivery make for a great customer experience, it also eliminates the unnecessary impacts of second or third delivery attempts. If you want to get your deliveries right the first time, here are the questions you should ask yourself:

- ☐ *Have I collected accurate contact details for my customer?*
These ensure your customer is kept informed of their estimated delivery date, preventing any confusion.
- ☐ *Does my logistics partner offer 'in-flight' updates via an app, SMS or email?*
Real time updates notify your customer when the parcel is on its way and due for delivery. Take this to the next level by letting them choose how they want to be contacted – some cultures may prefer text messages, while office workers might check their email more often.
- ☐ *Can changes be made to orders even after they have left my warehouse?*
With the busy lives we lead, it's not uncommon for your customer's schedule to change quickly. When this happens there should be flexibility to customise their delivery service to prevent a wasted journey. They might choose to waive the need for a signature, ask the courier to leave the parcel in a safe place, or nominate a neighbour to take the delivery on their behalf.





☐ *Is there flexibility to deliver parcels to alternative addresses?*

Many customers prefer the flexibility of collecting a parcel at their convenience, or may choose to have the parcel re-routed if they can no longer be at home. DHL, for example, offers delivery to secure parcel lockers or a network of over 1000 retail outlet partners in the UK.

☐ *Can your shoppers save their preferences?*

Once you know how your customer likes things to be delivered, give them the option to save their preferences. This will streamline the process for them and ensure your products have the best chance of reaching their destination first time.

Giving your customer choice and control over their delivery will increase satisfaction, reducing unsuccessful delivery attempts and minimising the carbon emissions generated.

P A C K A G I N G

☐ What materials do you most commonly use to package your products?

☐ Is it clear to your organisation (and importantly, the final customer) what parts of your packaging can be recycled?

☐ Assess your packaging – is all of it necessary? What can you eliminate? What could you do differently in order to reduce the amount of packaging and/or optimize the choice of materials to facilitate 100% recyclability?

☐ Look at alternative options such as *Re:Pack*





Use

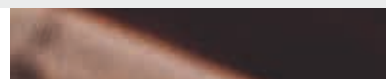
RECOMMENDATIONS



S U S T A I N A B L E U S E

How does your company engage with its customers after point of sale? There is an increasing drive towards customer engagement in the industry, with initiatives to help customers understand the environmental impacts of their own behaviour.

- ☐ Educate your customers about the most environmentally sustainable ways to wash and care for their clothes to prolong their life.
- ☐ Reach out to customers via social media to share their own stories and tips for caring for clothes and maintaining a sustainable wardrobe.
- ☐ Make use of new innovations in fibre care, such as *Guppyfriend* and *Cora Ball*, which capture microplastic fibres during the washing cycle and reduce the amount released into waste water.
- ☐ Be responsive to your own customer base and the growing demand for sustainable action by brands, reaching out via social media and other campaigns to start a conversation on how both brand and customer can drive change in the industry.

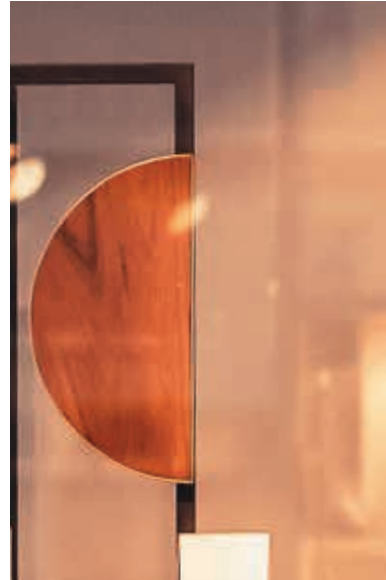


- 
- ☐ Reduce plastic and non-recyclable packaging for your items, both at the delivery stage and during in-store purchase.
 - ☐ Offer incentives for customers to bring their own reusable bags for their items at point of purchase.
 - ☐ Extend your responsibility for your products beyond the point of sale. Educate customers on how they can repair and care for their items and offer these services as part of their purchase.
 - ☐ Extend responsibility for your packaging. Source sustainable packaging materials that can be taken back from the customer to be recycled.
 - ☐ Participate in BFC's SWITCH to BLUE Campaign and move your existing plastic hanger supplier to Arch & Hook, who develop their hangers using 80% marine plastic harvested from oceans and waterways.



Reuse/Disposal

RECOMMENDATIONS

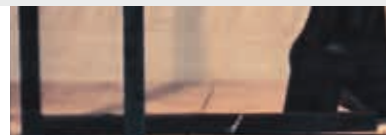


EXTENDING LIFECYCLES

While traditionally seen as the responsibility of the customer at point of sale, companies are now looking at innovative ways to extend the life cycle of their products and take ownership of the last phase of the fashion cycle — reuse and disposal.

Sit down with your design team and consider every aspect of one of your key products:

- ☐ How long do you expect your product to last?
- ☐ Can the product be refreshed, repaired and resold?
- ☐ Can elements of the product be taken apart and re-used, or re-cycled?
- ☐ How durable is the product in terms of style, quality and adaptability to a changing body shape?
- ☐ Can you share stories with your customer on care, repair and other uses?
- ☐ What will happen to the product at the end of its life?
- ☐ Can you integrate schemes for garment collection or repair?





From the Authors

PROFESSOR DILYS WILLIAMS

Director, Centre for Sustainable Fashion

Nature is our only source of prosperity and the fashion industry has been living on credit for a very long time. We have been borrowing from the future, using up resources that cannot be replaced; that credit is running out. We overproduce and undervalue fashion not only in terms of nature's resources, but in terms of human resources too. We want it cheap and quick, and in so doing, we can't honour and protect the precious elements of nature, creativity and skilled labour.

The fashion industry is broken and those with foresight are acting. It's not easy: in the short term, there's money to be made from discounting the real cost of fashion. But for those who can think beyond the now, you need to engage foresight and imagination to sustain our abilities to creatively adorn ourselves and to live well together. There's lots of talk about sustainability, but we need to be honest about what it is that we want to sustain. If it's the current system in which we create, wear and value attire, then we are running out of ideas and resources! If we want to sustain the source of our art, delight and distinction through fashion, then come, get busy with us!

Beware of distractions that are not enough of a response to the climate emergency and the epidemic of modern day slavery, they might look easy, but they are ineffective.

The good news is that we have some ingenious designers in our midst, taking a variety of different approaches to become new kinds of creatives, doing new kinds of things. We need a diversity of approaches and indeed diversity in every aspect of fashion's products, services and systems.

Each of us, whether citizen, designer, maker, journalist, producer or with hybrid roles, can make positive change in fashion. Not everyone can turn their business around over night, but everyone can value nature. We haven't always had so many collections, so much in our wardrobes, but we've always had style. Its time for us to be more imaginative about what fashion might be.

Everything is connected and the issues of inequality in human to human and human to nature terms spans a range of outmoded behaviours. It's time to stand up in what we stand up for. Get with it. At Centre for Sustainable Fashion (CSF), University of the Arts London, we challenge the status quo and seek ways to develop research, education and knowledge exchange in industry that contributes ways for us to live well together, in nature.

From the Authors

ALISON TICKELL

Founder and CEO, Julie's Bicycle

The climate and biodiversity crisis has been upgraded to an emergency at astonishing speed; a combination of two UN scientific assessments, a Swedish school girl, and the deepening perception of the crisis around us has created a public outcry. The thousands of designers, makers and supply chains that constitute the UK fashion industry have a deep imprint on our environment. Together the industry needs to respond at scale and speed, using its abundant ingenuity and leverage to good purpose: those that choose the business-as-usual option risk their reputations in the short term but, more seriously, all our futures. Those that seek out the true causes and costs of the current predicament and build businesses based on this reality are much more likely to thrive.

Julie's Bicycle has been driving climate action in the creative community for twelve years, helping to redefine creative practice. In the first half of 2019 we have seen more appetite in the creative industries to drive positive change than at any time previously; in the UK Culture, Music, Heritage, and Architecture have all declared climate emergencies, a combined response of around 2,500 businesses and creatives committing to take action.

Understanding the full impacts of doing business is the first step to a net zero emissions business which regenerates the natural world.

The fashion industry has disproportionately contributed to environmental degradation; by the same token fashion can exponentially drive solutions at scale and accelerate positive change. There is no shortage of imagination, talent and innovation in the fashion industry; it needs to be put to good cause.

Appendix 1

FASHION FACTS

Design Fact:

75% of consumers in five countries surveyed in the Pulse of Fashion 2019 report view sustainability as extremely or very important⁴⁸. A designer's integrity depends on their sustainability decisions.

Raw Materials Fact:

Cotton makes up about a third of all fashion products. One kilogram of traditional cotton can take 10,000 - 20,000 litres of water to produce⁴⁹. Cotton makes up 33% of all fibres in textiles and an average cotton shirt production creates 2.1kg of GHG emissions. Polyester, which makes up around another third, can produce 5.5kg of GHG emissions for a single shirt⁵⁰.

Materials Processing Fact:

Hard coal and natural gas show a share of 60% to 70% of the climate change impacts in the dyeing and finishing stage (partly due to the high energy/heat demand of wet processes used)⁵¹.

Manufacturing Fact:

A quarter of the industry's resources are wasted as leftovers of fabric and garment production every year⁵².

Distribution Fact:

It is estimated that shifting a single percent of transportation allocation from shipping to airfreight would cause a 35% increase in carbon emissions⁵³.

Retail Fact:

Heating, lighting and ventilation account for 5% of the industries CO₂ emissions⁵⁴.

e-Commerce Fact:

Returns cost UK companies £60 million per year⁵⁵.

Customer Fact:

The number of times clothes are worn has dropped by a third since the early 2000s⁵⁶.

Disposal / End of Life Fact:

£140 million worth of clothing goes to landfill each year⁵⁷. £380 billion is lost each year thanks to clothes underutilisation and lack of recycling⁵⁸.

Appendix 2

HISTORY OF THE FASHION INDUSTRY

As its processes and technologies have evolved, the fashion industry has always had to adapt and be flexible in the face of environmental challenges.

Human civilization and clothing have evolved side by side. The making of textiles is one of humanity's oldest technologies, allowing people to adapt to almost any environment. Clothing has never been purely utilitarian: its history is cultural as much as the expression of ideas, beliefs and social status through shapes, materials, colours, and decoration. Fashion is a part of being human, belonging and affinity, its use enabling individuals to express themselves and their identity, to stand out and to connect with one another.

The transformation of natural – and later synthetic – material into cloth tells the story of cultural and economic development and global business. Trade in cloth funded some of the world's largest and most successful empires and developed vast trade routes connecting east and west. Like spice and gold, fabrics and dyes have shaped the world's colonial past; the industrial revolution is a story grounded as much in the textiles industry as it is the steam engine.

From the clearing of vast forests to make space for cotton plantations in North America, to the hunting for furs in North America by the English and French that decimated beaver populations in the 18th century, fashion's footprint on the environment is profound.

In 19th century India, indigo plantations covered an estimated 7,000 km² to meet demand for the natural dye. The discovery of synthetic dyes – created using waste by-products from the coal industry – unlocked a chemical revolution that promised a full spectrum of colour that was not only universally available, but also would eliminate some of the challenges of using natural dyes (such as the amount of land required and the ability to dye larger volumes evenly).

By the 1930s, industrialists were making breakthroughs with Cellulose-based synthetic fabrics, paving the way for nylon stockings. Many of these breakthroughs promised solutions to challenges in the supply chain – such as localised pollution – yet broader environmental and human costs emerged over time.

The fashion industry now faces its biggest challenge: climate change. This is globalised and systemic, problematic because the industry is a core part of global and national GDP, and within this economic framework is highly successful and growing. The sheer scale of consumption testifies to the scale of the challenge. As in previous centuries, the fashion industry – and the international web of businesses it comprises – have no option but to grasp this opportunity to invest in new research and technologies, experiment with new business models and embrace emerging concepts such as reuse, the circular economy and clean energy. Climate change and ecological degradation require no less.

Appendix 3

A FRAMEWORK FOR SUSTAINABILITY IN FASHION

Centre for Sustainable Fashion at London College of Fashion, UAL, has led the development of a Framework for Sustainability that maps the context, agendas, issues and mindsets of fashion and sustainability to support informed action in this subject area. Whilst this paper is focused on ecological impacts relating to the fashion industry, the Framework considers as a starting point both Human Equality and Planetary Boundaries and explores a set of four agendas (ecological, economic, cultural and social) before mapping out a number of critical issues affecting the fashion industry⁵⁹.

The Framework starts by considering the context within which we are all living and working. It frames a set of questions to explore ways to live within nature's limits. A set of agendas within which the fashion industry operates and needs to be considerate of are explained with ways to explore and understand what we are best placed to create, contribute to or otherwise participate in. Through these agendas, eight main critical issues have been identified. They are categorised as the symptoms of the environmental challenges confronting the fashion industry, those in need of resolution and those most relevant to developing fashion and sustainable industry practice. These eight mindsets offer distinctive approaches to design that can guide creatives in their work.

1. *Climate Change*

The Ellen MacArthur Foundation estimates that textile production, of which over 60% is destined for clothing, is responsible for 1.2 billion tonnes of CO₂ emissions each year – more than maritime shipping and international flights combined⁶⁰.

Resource intensive production methods are responsible for producing the majority of emissions. Increasing pressure on agricultural land is a driver of deforestation, accelerating climate change with the loss of CO₂e absorbing trees. However, further down the supply chain, worldwide distribution, warehousing, factories, stores and end of use all have a significant impact. In total the industry is responsible for almost 10% of global emissions⁶¹. Of those emissions dyeing and finishing have the highest impact due to the amount of energy needed to heat water and run machinery⁶².

Many of these impacts are a direct result of apparel's reliance on coal and natural gas to generate electricity and heat in key processing locations. Asian countries such as China, India and Bangladesh not only comprise the largest manufacturers, but also have heavily coal-based energy mixes⁶³.

Whilst it is important to note that retail itself is the *driver* of many environmental impacts, for most fashion industry businesses the majority of their environmental impact lies not within their own operations, but in their supply chain and the sourcing and processing of raw materials. For example, Kering's Environmental Profit & Loss calculations imply that 93% of their environmental impact is created within their supply chain⁶⁴. Understanding how to influence operations that are geographically removed and not within direct decision-making control represents a significant challenge for the industry.

2. Land Use & Biodiversity Loss

UN predictions show a global population of 8.5 billion in 2030 will require a 60% increase in agricultural production to feed everyone⁶⁵. The fashion industry is projected to use 35% more land for fibre production by 2030 – an extra 115 million hectares⁶⁶, with the potential to be in direct conflict with requirements for food production and a growing demand for agriculturally-grown biofuels.

Alongside habitat destruction, its replacement with agricultural monocultures, and the increased use of pesticides drives biodiversity decline. Intensive farming methods for cotton and other textiles such as cashmere deplete soil quality and degrade land (as seen in Mongolia, for example).

Biodiversity – earth's abundant wealth of life and our critical life-support system – is impacted by and at every stage of the value chain. Crop cultivation (cotton, animal skins, etc.) and industrial-scale farming can destroy habitats due to clearance, mono-cultures and over use. Chemicals used at each phase of garment manufacture contribute to biodiversity loss and toxification.

Livestock-rearing and associated activity is one of the largest sources of water pollution, contributing to eutrophication (pollution of water from fertiliser use), “dead” zones in coastal areas, degradation of coral reefs, human health problems and the emergence of antibiotic resistance⁶⁷.

3. Water Stress

According to the United Nations, more than 5 billion people could suffer from water shortages by 2050, caused by climate change, water pollution and increased demand⁶⁸. The textile industry consumes around 93 billion cubic metres of water per year⁶⁹ and is responsible for 20% of industrial water pollution⁷⁰. Fibre production has the highest impact on freshwater withdrawal and ecosystem quality due to cotton cultivation⁷¹ – for example, the processing of fibres for a standard polycotton t-shirt requires approximately 2,500 litres of water⁷². Similarly, according to the Clean by Design programme dyeing just one tonne of fabric can use up to 200 tonnes of water⁷³. High water use continues once the garment is in use, with a standard load of washing using as much as 180 litres of water⁷⁴.

Cotton, which is used to make nearly half of the fibres used to make textiles and clothing worldwide, is a particularly water-intensive crop. Its unsustainable cultivation has already led to serious environmental consequences including the depletion of the Aral Sea in Central Asia, formerly the fourth largest lake in the world, which shrunk drastically from the impact of cotton irrigation and production, creating an ecological disaster⁷⁵. Water is also used for the dilution of chemicals such as pesticides, and the associated agricultural chemical run-off polluting local waterways.

The processing of fibres into yarns, textiles and colouration also require high levels of water consumption and chemical use. If poorly regulated, the resulting effluent can contaminate waterways, habitats – and communities – with heavy metals, solvents and acids. The Citarum river in Indonesia has over 200 textile factories along its river bank and is the most polluted river in the world. The communities who live alongside the river rely on this water source, yet clothing manufacturers often dump untreated chemicals straight into the river⁷⁶.

4. *Consumption & Waste*

Inefficiencies in production methods (such as pattern cutting, for example), sales and distribution, as well as consumer habits mean that large amounts of the resources extracted every year by the fashion industry end up as waste. This is complicated by technological and scalability issues that limit the ability to recycle textiles, meaning the majority of mixed-fibre clothing ends up in landfill or incineration. The UK's Environmental Audit Committee estimates that less than 1% of material used to produce clothing is recycled into new clothing, and more investment into developing chemical and mechanical recycling methods, particularly those that can separate blended fibres, is needed⁷⁷.

Some East African countries have recently banned the import of second-hand clothes because they undercut local manufacturing and are considered undesirable and, for many, undignified⁷⁸. Consumer habits are also changing, with analysis by the Circular Fibres Initiative suggesting the number of times people wear their clothes is decreasing significantly⁷⁹.

5. *Hazardous Chemicals & Pollution*

Around the world, many communities – particularly in the Global South – witness multi-coloured rivers; a result of effluent from the dyeing and processing of clothes for global clothing brands.

Energy use in factories and for transport is a major source of air pollution.

Further down the lifecycle, manufacture of synthetic fibres – and also product washing by consumers – is a substantial source of microplastics⁸⁰. Washing clothing has a significant environmental impact due to the energy used for washing machines and tumblers dryers; the water needed for each cycle; and the release of microplastics into waterways and oceans. Polyester clothing is also polluting rivers and seas even while its still being worn, with just one piece of clothing releasing up to 1 million microplastic fibres in a single wash⁸¹.

These hazardous particles of plastic eventually find their way back into the food chain and our food, either by being consumed by marine life that is then eaten by humans, or directly into drinking water supplies.

6. *Wellbeing (Human & Animal)*

The current level and pace of the fashion industry, increasing the speed of production and consumption compromises not only the wellbeing of the environment but also that of workers, communities, wearers and animals. This voracity is often fuelled by marketing messages, through an increasing number of channels, that pressurise women and men to look, feel and shop in a particular way. Furthermore, the fashion industry serves as an illustration of the increasing gap between rich and poor, contributing to inequalities of race and gender.

There are still many instances in which workers in the fashion industry, often women, are exposed to poor health and safety standards, low wages, long working hours, exposure to hazardous chemicals and factory fires. These factors also affect the communities that surround areas of production, with their right to access to clean water and food, for instance, being affected by local factories.

Many businesses have now published and adopted animal welfare standards and practices. Some have joined the Fur Free Alliance⁸². However, there are still many animals being exploited throughout the fashion supply chain, with the use of exotic skins, mulesed wool and fur.

7. *Modern Day Slavery*

Modern Slavery still exists today in the forms of forced labour, people trafficking and child exploitation. Victims of Modern Slavery are unable to leave their situation because they are subject to threats, violence, punishment, coercion or deception.

With a lack of transparency across the industry, 77% of companies operating in the UK believe Modern Slavery might exist somewhere in their supply chains⁸³. The increasing speed of the industry can't be separated from social injustice. Distinct from labour practices or working conditions, victims of Modern Slavery are unable to leave their situation because they are subject to threat, violence, punishment, coercion and deception.

The United Nations International Labour Organisation estimates around 21 million people are involved in forced labour at any given time⁸⁴. Fashion is one of the most labour intensive industries and given the lack of transparency across global supply chains, it is unclear how many people are working directly or indirectly in fashion. And whilst the UK passed the Modern Slavery Act in 2015, and Modern Slavery legislation has been spreading around the world, there is still a long way to go before slavery is truly abolished from fashion.

8. *Diminishing Resources (Human & Natural)*

The issue of diminishing resources is twofold – considering the use of natural and human resources. The making, transporting and use of fashion is almost completely dependent on fossil fuels, whilst hand-based skills and crafts from around the world are rapidly vanishing because of faster and cheaper manufacturing options.

Polyester is one of the most used materials in fashion today and relies primarily on oil, a finite and extremely polluting resource. However, natural materials can also be heavily reliant on natural resources. It is often not known or forgotten that viscose uses wood pulp, another natural resource. There are examples of precious metals and stones that are fast depleting, whilst we have seen the use of exotic skins from species threatened by extinction in recent history.

Appendix 4

EXAMPLES OF INTERNATIONAL INITIATIVES AND PARTNERSHIPS

Group	What do they do?
<i>Better Cotton</i>	The Better Cotton Standard System is a holistic approach to sustainable cotton production which covers all three pillars of sustainability: environmental, social and economic. Uses monitoring mechanisms to evaluate results and impact in the cotton industry.
<i>Bluesign</i>	A standard that assesses key segments of the textile production as chemistry, textile technology, environment technology and supply chain management.
<i>Canopy</i>	Canopy is an environmental not-for-profit organisation that works to protect the world's forests. In 2013 it launched Canopy style to address the rapidly growing threat that rayon and viscose fabrics have become to forests.
<i>Common Objective</i>	A business network for the fashion community, providing connections, practical intelligence and learning, profile matching, and higher search and profile rankings for members based on their sustainability initiatives.
<i>Cotton Communiqué</i>	Consisting of 13 of the world's most famous clothing and textile companies who are pledging to use 100% sustainable cotton by 2025.
<i>Cotton UP Guide</i>	Helps businesses source sustainable cotton by providing resources and guides.
<i>Cradle to Cradle Certification</i>	The Cradle to Cradle Products Innovation Institute, a non-profit organisation, administers the Cradle to Cradle Certified™ Product Standard which guides designers and manufacturers through a continual improvement process.
<i>Fashion Revolution</i>	A group made up of stakeholders from across the fashion sector to promote and empower groups and individuals to take action through raising awareness and scrutinising areas for concern within the fashion industry.
<i>Fashion SWITCH to Green</i>	Part of BFC's Positive Fashion initiative, participating fashion brands are committing to switch to a 100% renewable energy provider or to a green energy tariff by 2020.
<i>Global Fashion Agenda</i>	A non-profit organisation, Global Fashion Agenda has organised and hosted Copenhagen Fashion Summit, the world's leading business event on sustainability in fashion, since 2009. Also publishes its annual Pulse of the Fashion Industry report in collaboration with The Boston Consulting Group.

Group	What do they do?
<i>Greenhouse Gas Protocol</i>	Greenhouse gas accounting standards and comprehensive global framework to measure and manage GHG emissions from the private and public sectors.
<i>Global Organic Textile Standard</i>	The development, implementation, verification, protection and promotion of organic textiles. This standard stipulates requirements throughout the supply chain for both ecology and labour conditions in textile and apparel manufacturing using organically produced raw materials.
<i>Higg Index / tools</i>	Developed by the Sustainable Apparel Coalition, the Higg Index is a suite of tools that enables brands, retailers, and facilities of all sizes — at every stage in their sustainability journey — to accurately measure and score a company or product's sustainability performance.
<i>Microfibre Consortium</i>	Created to tackle the growing concern around microplastic pollution. A collaborative approach for a better understanding and industry-based solutions.
<i>OEKO-TEX</i>	The STANDARD 100 by OEKO-TEX® is a worldwide and independent testing and certification system for raw, semi-finished and finished textile products at all processing levels, as well as accessory materials. Oeko-Tex Eco Passport is a mechanism by which chemical manufacturers and suppliers can demonstrate their products meet specific standards, screened against their MRSL and RSL, as well as REACH and ZDHC guidelines.
<i>Partnership for Sustainable Textiles</i>	A multi-stakeholder partnership striving to improve the conditions in global textile production.
<i>Project Everyone</i>	Executed by a team of communication specialists, the campaign seeks to disseminate information about the Global Goals as widely as possible
<i>Provenance</i>	A digital platform that enables brands to achieve greater transparency through blockchain technology.
<i>REACH</i>	European regulation restricting uses of certain chemicals in industry.
<i>Sustainable Clothing Action Plan</i>	SCAP is an industry-led action plan to deliver positive environmental economic outcomes to organisations, by reducing carbon, water and waste through the SCAP 2020 Commitment.
<i>Textile Environment Design</i>	Practice-based sustainable design strategies that assist designers in creating textiles that have a reduced impact on the environment. Their approach is summarised in their report The TEN, covering topics such as designing to minimise waste and designing to reduce the need to consume.
<i>Textile Exchange</i>	A global non-profit organisation working closely with all sectors of the textile supply chain to reduce the fashion industry's environmental impacts.
<i>UN Fashion Charter</i>	Industry-led action plan delivers positive environmental and economic outcomes to organisations by reducing carbon, water and waste through the SCAP 2020 Commitment. SCAP is a collaborative framework and voluntary commitment to deliver industry-led targets for reducing the use of resources in the clothing industry.
<i>Zero Discharge of Hazardous Chemicals (ZDHC)</i>	A program to eliminate hazardous chemicals from the fashion industry. Participating brands commit to adhering to a Restricted Substances List and report on results from wastewater testing.

Appendix 5

MAJOR UNITED NATIONS ENVIRONMENTAL FRAMEWORKS & SCIENTIFIC REPORTS

FRAMEWORKS



Paris Agreement

The *Paris Agreement* is an agreement within the United Nations Framework Convention on Climate Change (UNFCCC) that commits signatory nations to limit global temperature increase to no more than 1.5° C. It was signed in 2016 and currently has been ratified by 185 UNFCCC parties.



SDGs

The *Sustainable Development Goals (SDGs)* are a collection of 17 global goals set by the United Nations in 2015, to be achieved by 2030. The goals are broad and interdependent, including eradicating poverty and hunger, gender equality and education, affordable and clean energy, and climate action.



1.5° C

The *Special Report on Global Warming of 1.5° (SR15)* was published by the Intergovernmental Panel on Climate Change (IPCC) in October 2018. Human activities are estimated to have caused approximately 1.0° C global warming above pre-industrial levels, with a likely range of 0.8° C to 1.2° C. Global warming is likely to reach 1.5° C between 2030 and 2052 if it continues to increase at the current rate. Its key finding was that while emissions reductions were possible, deep and far-reaching societal changes would need to take place to avert runaway climate change.



Biodiversity / Land

The *Global Assessment Report on Biodiversity and Ecosystem Services* is an overview of the state of our planet's rapidly declining biodiversity due to changes in land and sea use, direct exploitation of organisms, climate change, pollution and invasive alien species. It concludes we have a limited window of action to avoid unprecedented damage to our life support systems. The *Special Report on Climate Change and Land* provides an analysis of the pressure on terrestrial ecosystems due to climate change, desertification and land degradation. It presents pathways to land management to keep global warming below 2° C and ensure long-term food security.

REPORTS

About the Authors

JULIE'S BICYCLE

Julie's Bicycle is a leading global charity with 12 years of experience in supporting the cultural and creative community across the UK and internationally to take action on climate change and the environment. We have supported over 2,000 organisations on reducing their environmental impacts, providing strategy research to the sector, engaging audiences and customers, devising creative programming, governance, policy development, and supporting artists. Our programme of events attracts creative practitioners from across all fields; we mentor creative businesses and professionals globally; undertake direct consultancy projects with organisations of varying sizes; facilitate cultural networks on sustainability; and drive a small number of priority campaigns across the creative industries. Additionally, we are advising on international and city cultural policy in relation to environmentally sustainable development. Since 2012, Julie's Bicycle has been the Arts Council's contracted delivery partner for supporting 800+ arts organisations report their carbon footprint, policy and action plan. We have developed online carbon footprint calculators and environmental certification programme specifically designed for the creative industries.

CENTRE FOR SUSTAINABLE FASHION

Centre for Sustainable Fashion (CSF) at London College of Fashion, University of the Arts London, is a globally recognised research centre, working to transform the field of fashion through sustainability. Made up of a diverse community of researchers, designers, educators and communicators, CSF works at the crossroads of research, education and knowledge exchange with industry and NGOs. It explores ecological and social sustainability in and through fashion's artistic and business practices. CSF works with world leading fashion design and retail businesses including Kering, Nike, Levi's, Selfridges & Co, H&M and ASOS and has provided mentoring to over 150 smaller businesses including Christopher Raeburn and Michelle Lowe Holder to strengthen their businesses through design for sustainability thinking. CSF works across disciplines and delivers a variety of activity from research, product development and practice-based exhibitions to education and engagement programmes.

BRITISH FASHION COUNCIL

The *British Fashion Council* (BFC) was set up in 1983 to promote British fashion internationally and co-ordinate this promotion through fashion weeks, exhibitions and showcasing events. The BFC now supports designers beginning at college level and extending to talent identification, business support and showcasing schemes to help British designer businesses develop their profiles and business globally and promote British fashion and its influential role in Britain and London. The BFC Colleges Council offers support to students through its Foundation, BA and MA scholarships, links with industry through design competitions and Graduate Preview Day. Talent identification and business support schemes include BFC/Vogue Designer Fashion Fund, BFC/GQ Designer Menswear Fund supported by JD.com, Inc. and NEWGEN which includes womenswear, menswear and accessories. The BFC also runs and owns charities including the BFC Fashion Arts Foundation, the BFC Fashion Trust and the BFC Education Foundation. Showcasing initiatives and events include London Fashion Week, London Fashion Week Men's, LONDON show ROOMS, International Fashion Showcase, London Fashion Week Festival and the annual celebration of creativity and innovation in the fashion industry: The Fashion Awards.

DHL

DHL is the leading global brand in the logistics industry. The DHL family of divisions offers an unrivalled portfolio of logistics services ranging from national and international parcel delivery, e-commerce shipping and fulfillment solutions, international express, road, air and ocean transport to industrial supply chain management. With about 380,000 employees in more than 220 countries and territories worldwide, DHL connects people and businesses securely and reliably, enabling global trade flows. With specialized solutions for growth markets and industries including technology, life sciences and healthcare, energy, automotive and retail, a proven commitment to corporate responsibility and an unrivalled presence in developing markets, DHL is decisively positioned as "The logistics company for the world".

DHL is part of Deutsche Post DHL Group. The Group generated revenues of more than 61 billion euros in 2018.

Acknowledgements

Julie's Bicycle: Chiara Badiali, Antonia Beard, Catherine Bottrill, Paul Crossley and Alison Tickell

Centre for Sustainable Fashion: Sarah Needham and Dilys Williams

Report design: by Michelle Murvai

Endnotes

- 1 UK Parliament, 2019. Fixing fashion: Clothing consumption and sustainability. <https://publications.parliament.uk/pa/cm201719/cmselect/cmenvaud/1952/full-report.html>
- 2 World Bank, AQUASTAT, and FAO, Dataset, 2014. Annual freshwater withdrawals, total.
- 3 Brits hung up on online fashion. Mintel Press Team, September 2017
- 4 Down to Earth, 2019. Fashion industry may use quarter of world's carbon budget by 2050. <https://www.downtoearth.org.in/news/environment/fashion-industry-may-use-quarter-of-world-s-carbon-budget-by-2050-61183>
- 5 Pulse of the Fashion Industry 2018, Global Fashion Agenda <https://www.globalfashionagenda.com/publications/#pulseofthefashionindustryreport>
- 6 Valuing our Clothes, The Cost of UK Fashion, 2017, WRAP http://www.wrap.org.uk/sites/files/wrap/valuing-our-clothes-the-cost-of-uk-fashion_WRAP.pdf
- 7 The Apparel Industry's Environmental Impact in 6 Graphics. Deborah Drew and Genevieve Yehounme, World Resources Institute, 5 July 2017
- 8 Clean Clothes Campaign <https://cleanclothes.org/resources/publications/factsheets/general-factsheet-garment-industry-february-2015.pdf>
- 9 Consumer Spending on Clothing in the United Kingdom (UK) from 2005 to 2018 (in million GBP). Statista. May 3, 2019. <https://www.statista.com/statistics/289999/consumer-spending-on-clothing-in-the-united-kingdom-uk/>
- 10 Environmental Indicator Report 2014, European Environment Agency <https://www.eea.europa.eu/publications/environmental-indicator-report-2014>
- 11 The State of Fashion 2019 - A Year of Awakening, Business of Fashion and Mckinsey <https://www.mckinsey.com/~media/mckinsey/industries/retail/our%20insights/the%20state%20of%20fashion%202019%20a%20year%20of%20awakening/the-state-of-fashion-2019-final.ashx>
- 12 Style that's Sustainable, a New Fast Fashion Formula, Mckinsey <https://www.mckinsey.com/business-functions/sustainability/our-insights/style-thats-sustainable-a-new-fast-fashion-formula>
- 13 United Nations, Sustainable Development Goals, Goal 12: Ensure sustainable consumption and production patterns.
- 14 Euractive, 2017. The textile and fashion sector: A powerhouse of EU manufacturing. <https://www.euractiv.com/section/economy-jobs/infographic/the-textile-and-fashion-sector-a-powerhouse-of-eu-manufacturing/>
- 15 Office for National Statistics, 2018. Fashion Industry Small and Medium Enterprises (SMEs). <https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/adhocs/008125fashionindustrysmallandmediumenterprisessme>
- 16 OECD, 2015. Environmental Policy Toolkit for Greening SMEs. <https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/adhocs/008125fashionindustrysmallandmediumenterprisessme>
- 17 United Nations Climate Change, 2019. The Paris Agreement. <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>
- 18 Sustainable Apparel Coalition. Redefining Transparency: Product Environmental Performance on Display. <https://apparelcoalition.org/the-methodology/>
A-Z Glossary of Sustainable Fibres. <https://www.1millionwomen.com.au/blog/a-z-glossary-of-sustainable-fibres/>
<https://www.globalfashionagenda.com/pulse-2019-update/#>
- 20 Fashion Transparency Index, 2018, Fashion Revolution https://issuu.com/fashionrevolution/docs/fr_fashiontransparencyindex2018?e=25766662/60458846
- 21 Pulse of the Fashion Industry 2018, Global Fashion Agenda <https://www.globalfashionagenda.com/publications/#pulseofthefashionindustryreport>
- 22 Sustainable Apparel Coalition. The Higg Index. <https://apparelcoalition.org/the-higg-index/>
- 23 Blockchain in Logistics, 2018, DHL <https://www.logistics.dhl/content/dam/dhl/global/core/documents/pdf/glo-core-blockchain-trend-report.pdf>
- 24 Sustainable Cotton Challenge Report_2018_Textile Exchange https://textileexchange.org/wp-content/uploads/edd/2019/02/2025-Sustainable-Cotton-Challenge-Report_2018-1.pdf

- 25 Sustainable Cotton Challenge Report_2018_Textile Exchange https://textileexchange.org/wp-content/uploads/edd/2019/02/2025-Sustainable-Cotton-Challenge-Report_2018-1.pdf
- 26 The Substitution of Hemp and Flax for Cotton in Wound Spool Filters_2014_Department of Chemical and Process Engineering, University of Sheffield <https://www.sciencedirect.com/science/article/pii/B9781845692148500084>
- 27 1 Million Women, 2014.
- 28 Orange Fiber <http://orangefiber.it/en/>
- 29 S.Cafe <http://www.scafabrics.com/en-global/about/particular>
- 30 Measuring Global Impacts Study, 2018, Quantis https://quantis-intl.com/wp-content/uploads/2018/03/measuringfashion_globalimpactstudy_full-report_quantis_cwf_2018a.pdf
- 31 Measuring Global Impacts Study, 2018, Quantis https://quantis-intl.com/wp-content/uploads/2018/03/measuringfashion_globalimpactstudy_full-report_quantis_cwf_2018a.pdf
- 32 DyeCoo, CO2 Dyeing <http://www.dyecoo.com/co2-dyeing/>
- 33 Novozymes, 2019. Reliable, Gentle Scouring with Enzymes.
- 34 Destination Zero: Seven Years of Detoxing the Fashion Industry_2018_ Greenpeace https://storage.googleapis.com/planet4-international-stateless/2018/07/destination_zero_report_july_2018.pdf?ga=2.233906014.1197627283.1530705012-677200237.1525881631
- 35 Pulse of the Fashion Industry 2018, Global Fashion Agenda <https://www.globalfashionagenda.com/publications/#pulseofthefashionindustryreport>
- 36 The/Studio interview with CEO Joseph Heller, Fashion United <https://fashionunited.uk/news/business/interview-the-studio-making-small-batch-production-easier/2019011741076>
- 37 A Review on Energy Management in Textile Industry_2017_ Department of Textile Technology, Indian Institute of Technology <https://www.omicsonline.org/open-access/a-review-on-energy-management-in-textile-industry.php?aid=92916>
- 38 Statista, 2019. Retail e-commerce sales worldwide from 2014 to 2021 (in billion U.S. dollars). <https://www.statista.com/statistics/379046/worldwide-retail-e-commerce-sales/>
- 39 Ellen MacArthur Foundation, 2017. <https://www.ellenmacarthurfoundation.org/our-work/activities/make-fashion-circular>
- 40 Fixing Fashion, The Environmental Audit Committee, 2018_from Napper and Thompson results of a poly cotton wash <https://publications.parliament.uk/pa/cm201719/cmselect/cmenvaud/1952/report-summary.html>
- 41 The Guppyfriend Washing Bag, 2019. <https://guppyfriend.com/en/>
- 42 FAQs, 2019. <https://coraball.com/pages/faqs>
- 43 Valuing our Clothes, The Cost of UK Fashion, 2017, WRAP http://www.wrap.org.uk/sites/files/wrap/valuing-our-clothes-the-cost-of-uk-fashion_WRAP.pdf
- 44 Resale Report, 2019, Thred-up <https://www.thredup.com/resale>
- 45 Resale Report, 2019, Thred-up <https://www.thredup.com/resale>
- 46 Valuing our Clothes, The Cost of UK Fashion, 2017, WRAP http://www.wrap.org.uk/sites/files/wrap/valuing-our-clothes-the-cost-of-uk-fashion_WRAP.pdf
- 47 <https://www.lovenotlandfill.org/>
- 48 Global Fashion Agenda, 2019. Consumer Sentiment.
- 49 Valuing our Clothes, The Cost of UK Fashion, 2017, WRAP http://www.wrap.org.uk/sites/files/wrap/valuing-our-clothes-the-cost-of-uk-fashion_WRAP.pdf
- 50 The Apparel Industry's Environmental Impact in 6 Graphics. Deborah Drew and Genevieve Yehounme, World Resources Institute, 5 July 2017
- 51 Measuring Global Impacts Study, 2018, Quantis https://quantis-intl.com/wp-content/uploads/2018/03/measuringfashion_globalimpactstudy_full-report_quantis_cwf_2018a.pdf
- 52 Pulse of the Fashion Industry 2018, Global Fashion Agenda <https://www.globalfashionagenda.com/publications/#pulseofthefashionindustryreport>
- 53 Measuring Fashion: Environmental Impact of the Global Apparel and Footwear Industries Study, 2018. https://quantis-intl.com/wp-content/uploads/2018/03/measuringfashion_globalimpactstudy_full-report_quantis_cwf_2018a.pdf

54 Pulse of the Fashion Industry 2018, Global Fashion Agenda_H & M Sustainability Report <https://www.globalfashionagenda.com/publications/#pulseofthefashionindustryreport>

55 Financial Times <https://www.ft.com/content/52d26de8-c0e6-11e5-846f-79b0e3d20eaf>

56 A New Textiles Economy 2017, Ellen Macarthur Foundation https://www.ellenmacarthurfoundation.org/assets/downloads/publications/A-New-Textiles-Economy_Full-Report.pdf

57 Valuing our Clothes, The Cost of UK Fashion, 2017, WRAP http://www.wrap.org.uk/sites/files/wrap/valuing-our-clothes-the-cost-of-uk-fashion_WRAP.pdf

58 A New Textiles Economy 2017, Ellen Macarthur Foundation https://www.ellenmacarthurfoundation.org/assets/downloads/publications/A-New-Textiles-Economy_Full-Report.pdf

59 Valuing our Clothes, The Cost of UK Fashion, 2017, WRAP http://www.wrap.org.uk/sites/files/wrap/valuing-our-clothes-the-cost-of-uk-fashion_WRAP.pdf

60 A New Textiles Economy 2017, Ellen Macarthur Foundation https://www.ellenmacarthurfoundation.org/assets/downloads/publications/A-New-Textiles-Economy_Full-Report.pdf

61 Measuring Global Impacts Study, 2018, Quantis https://quantis-intl.com/wp-content/uploads/2018/03/measuringfashion_globalimpactstudy_full-report_quantis_cwf_2018a.pdf

62 Measuring Global Impacts Study, 2018, Quantis https://quantis-intl.com/wp-content/uploads/2018/03/measuringfashion_globalimpactstudy_full-report_quantis_cwf_2018a.pdf

63 Measuring Global Impacts Study, 2018, Quantis https://quantis-intl.com/wp-content/uploads/2018/03/measuringfashion_globalimpactstudy_full-report_quantis_cwf_2018a.pdf

64 Pulse of the Fashion Industry 2018, Global Fashion Agenda <https://www.globalfashionagenda.com/publications/#pulseofthefashionindustryreport>

65 World Bank, Water overview, 2017 <http://www.worldbank.org/en/topic/water/overview#1>

66 Pulse of the Fashion Industry, 2017, Global Fashion Agenda Global Fashion Agenda & Boston Consulting Group, Pulse of the Fashion Industry (2017)

67 <https://constantine.typepad.com/files/biodiversity-risks-and-opportunities-in-the-apparel-sector.pdf>

68 The United Nations world water development report 2018: nature-based solutions for water, <https://unesdoc.unesco.org/ark:/48223/pf0000261424>

69 A New Textiles Economy 2017, Ellen Macarthur Foundation https://www.ellenmacarthurfoundation.org/assets/downloads/publications/A-New-Textiles-Economy_Full-Report.pdf

70 A New Textiles Economy 2017, Ellen Macarthur Foundation - Kant, R., Textile dyeing industry: An environmental hazard, Natural Science, Vol. 4, 1 (2012), p.23 https://www.ellenmacarthurfoundation.org/assets/downloads/publications/A-New-Textiles-Economy_Full-Report.pdf

71 Measuring Global Impacts Study, 2018, Quantis https://quantis-intl.com/wp-content/uploads/2018/03/measuringfashion_globalimpactstudy_full-report_quantis_cwf_2018a.pdf

72 Water Assessment of Polyester and Viscose, 2017, Waterfootprint https://waterfootprint.org/media/downloads/WFA_Polyester_and_Viscose_2017.pdf

73 NRDC: NRDC's Green Supply Chain Initiative to Clean up the Fashion Industry <https://www.nrdc.org/sites/default/files/cbd-initiative-fs.pdf>

74 <https://www.mamoq.com/journal/world-water-day-why-fashion-needs-to-take-more-responsibility-for-the-worlds-water/>

75 WWF – Thirsty Crops (2013) <https://www.worldwildlife.org/publications/thirsty-crops-our-food-and-clothes-eating-up-nature-and-wearing-out-the-environment>

76 Water in the fashion industry, Drop4drop <https://drop4drop.org/water-in-the-fashion-industry/>

77 Fixing Fashion, The Environmental Audit Committee, 2018 <https://publications.parliament.uk/pa/cm201719/cmselect/cmenvaud/1952/report-summary.html>

78 Measuring Global Impacts Study, 2018, Quantis https://quantis-intl.com/wp-content/uploads/2018/03/measuringfashion_globalimpactstudy_full-report_quantis_cwf_2018a.pdf

79 A New Textiles Economy 2017, Ellen Macarthur Foundation https://www.ellenmacarthurfoundation.org/assets/downloads/publications/A-New-Textiles-Economy_Full-Report.pdf

80 https://storage.googleapis.com/planet4-international-stateless/2018/07/Toxic_v14.pdf

81 https://www.greenpeace.de/sites/www.greenpeace.de/files/i03971e_gp_flyer_mikrofaser_7_17.pdf

82 <https://www.furfreealliance.com/>

83 Corporate Leadership on Modern Slavery, ETI, 2016, https://www.ethicaltrade.org/sites/default/files/shared_resources/corporate_leadership_on_modern_slavery_full_report_2016.pdf

84 ILO, 2012 https://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_181961/lang--en/index.htm

