SFES

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White Paper

Sustainable Fashion Employability Skills

SFES

SFES (Sustainable Fashion Employability Skills)

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INTRODUCTION

Photo courtesy of Tendam Global Fashion Retail

Fashion as an industry has a worldwide reach with an impact on the environment but also in terms of global employment particularly for (Low Income Countries) LICs and (Middle Income Countries) MICs. The industry has been under scrutiny, relating to carbon emissions and working conditions throughout its supply chain for example, yet it is an employer of great significance and value on the global stage. Collective initiatives by leading companies in the industry are tackling the issues and putting in place initiatives which are changing the fundamental drivers of the industry. This is creating new opportunities for employment and skills which are driven by sustainability and environmental awareness.

This White Paper is the culmination of a 3 year EU co-funded KA203 Strategic Partnership; Sustainable Fashion Employability Skills (SFES) project; awarded in 0ctober 2020 to Glasgow Caledonian University. The project focused on reviewing the sustainable activities and strategies fashion companies implement whilst recognizing and defining the employability skills that underpin them.

To achieve this, the White Paper built on the analysis and outputs from an industry-wide survey, company visits, expert interventions and interactive workshops which took place between October 2020 and February 2023. More than 120 students, academics, industry partners and key stakeholders from businesses and partner universities searched for and identified a range of employability skills which underpin the understanding, implementation and communication of sustainability activities and strategies through 5 key areas to facilitate their mapping and dissemination. SFES targets businesses, academics, students and other stakeholders including citizens who are operating in or have an interest in sustainable practices within the fashion industry.

In addition, forthcoming regulatory action reflecting the growing concern for a more sustainable approach for companies operating in the fashion sector makes this White Paper particularly relevant to the industry as a whole.

This project addresses the skills gap related to the understanding, implementation and communication of sustainability within a fashion business environment. It does not review issues related to the sustainable impact of the global fashion industry as there are many available reports for this purpose. However aspects relating to Emissions and Biodiversity are reviewed as they are crucial challenges necessary to the understanding of sustainability within the fashion industry and are relevant to the four key areas identified relating to employability within this industry. This White Paper supports the dissemination of the results related to the employability skills required for a sustainable approach for businesses and entities operating in the fashion industry. It is also accompanied by a Toolkit which will offer inspiration for the identified skills, supporting materials which underpin them and industry based case-studies. Downloadable copies of both this White Paper and the Toolkit can be found at https://sfes.eu.
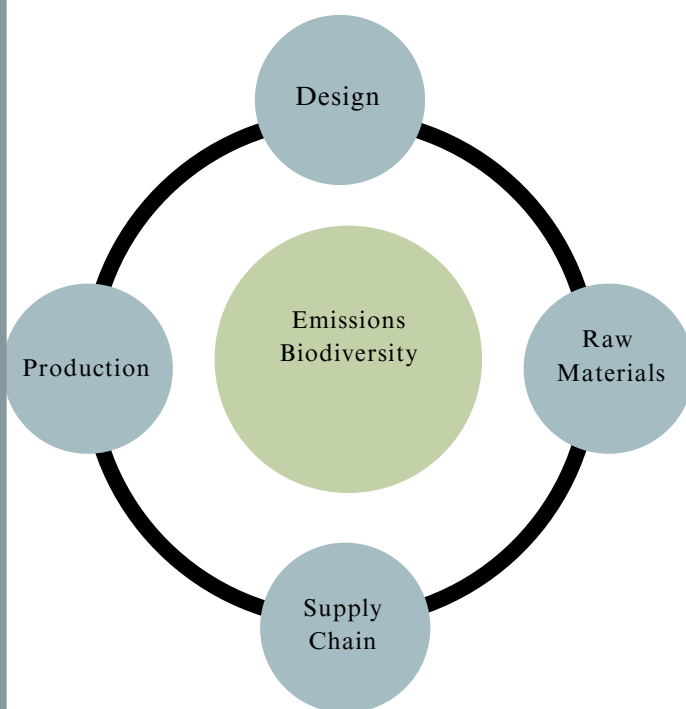
Figure 1: Key areas for employability orbiting crucial challenges for sustainability in the fashion industry (created by the authors).

The authors would like to point out that the fashion industry is already striving to address many of the points developed throughout this report. Right now, the industry is in a moment of development and implementation of new processes and technologies and needs young people prepared to cover the new skills that are in demand. This document strives to present a balanced view related to sustainability issues in the fashion industry and their relationship with employability opportunities without minimising the impact that the industry has on environmental areas but also without ignoring the work that many industry players are doing to improve its impact.
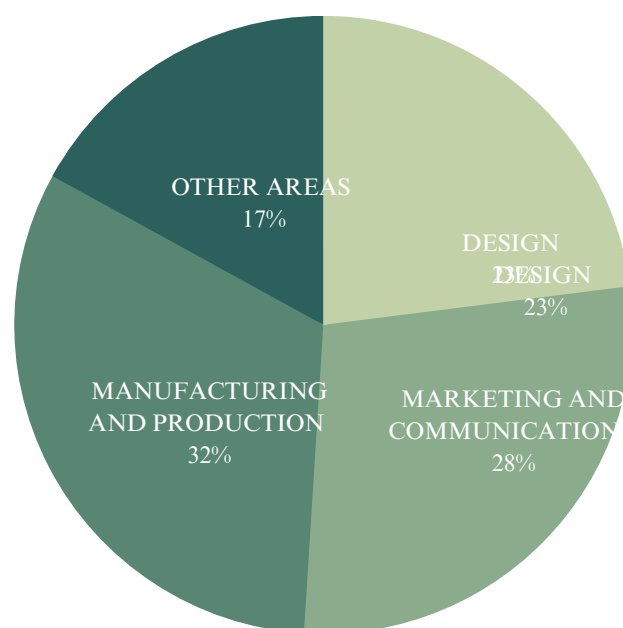
METHODOLOGY

A review of available research, reports and other materials related to sustainable issues and practices in the fashion industry was initially carried out by the project team however, there is little information relating to specific employability skills required to support the on-going development of sustainable strategies in the industry and therefore this data had to be gathered through more direct primary and creative means. The methods used for gathering and generating the data for this project are as follows: survey and workshops.

1. Survey

Following an extensive review of available academic and industry-based research a survey was designed by the project partners to elicit the understanding businesses operating in the fashion industry had in relation to sustainable practices.

The survey was distributed through the databases of suppliers, customers and relevant alumni of the academic and industry partners involved in the project which provided a very relevant demographic. 81 industry professionals responded. The respondents spanned 9 countries (all European based).

The full set of results and analysis from the survey can be found at:
https://sfes.eu

OTHER AREAS
17%

DESIGN
DESIGN
23%

MANUFACTURING
AND PRODUCTION
32%

MARKETING AND
COMMUNICATION
28%

Figure 2: Survey respondents job affiliations (created by the authors).

2. Workshops

Interactive workshops took place in June and October 2022 respectively in Scotland on the Islands of the Outer Hebrides (Harris and Lewis) and in Portugal on the Island of Madeira.

Over 40 students and staff participated in industry visits to operating sustainable businesses and entities from the fashion industry and wider afield when relevant (including expert interventions from the key business contacts within each company).

These visits were supplemented by the sharing of professional expertise related to sustainable issues from the staff on the project (both academic and industrial) and relevant outside partners and experts (spanning the disciplines of management, marketing, branding, communication, climate justice, environmental science, audiovisual, gaming, the digital sphere and the fashion and luxury industries).

Further details related to the methods used in these workshops can be found in Appendix 1 of this report.

Source: SFES project visits in Islands of the Outer Hebrides

Source: SFES project visits in the Island of Madeira

KEY SUSTAINABILITY CHALLENGES FOR THE FASHION INDUSTRY

Photo courtesy of Tendam
Global Fashion Retail

1. Emissions and Biodiversity

This section reviews the current situation, challenges, and future prospects related to global carbon emissions from the fashion industry, protecting biodiversity and stemming from the damage to the environment that is underway as a result of the exponential growth of the sector.

Greenhouse gas emissions (GHGs) are widely accepted to be the primary source of global climate change. GHGs from human activities are responsible directly for approximately 1.1oC of warming since the 1850-1900. Averaged global temperatures over the next 20 years will likely exceed 1.5oC of warming.

Biodiversity indicates the assortment and abundance of living species on the planet, including plants, animals, bacteria and fungi. The impact that the Fashion sector has directly and indirectly on biodiversity loss is as serious as climate change. The issue is wide ranging in the types of impacts on global ecosystems and in turn on affecting ecosystem services that are essential for human and animal life on the planet. Climate change is one of the main drivers of biodiversity loss due to rising temperatures and changes in the physical and biochemical environments by increased levels of CO2.

Destruction of ecosystems also undermines the natural world's ability to regulate GHG emissions and protect against extreme weather. This leads to acceleration of climate change and makes ecosystems even more vulnerable.

However if GHGs are mitigated (reduced, removed or sequestered), ecosystem performance improves and biodiversity loss will be reduced.

The global fashion industry is highly resource intensive. This is because the raw materials (natural or man-made fibres) are resource intensive (e.g., large amounts of land, water and fertiliser are needed for cotton production) or are sourced from fossil fuels (man-made fibres are polymers derived from chemical processing of crude oil such as polyester, rayon or nylon) and result in greenhouse gas emissions being released into the atmosphere.

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Source: Unsplash

Driving this escalating growth is that often consumers only use items for a fraction of their potential useful life. Table 1 below indicates some of the current challenges and projections in the sector related to GHG emissions and waste.

Case for Change	Today (2020)	Future horizon (2030)
Industry Size	$0.5 trillion	$1.1 trillion (2030 projection)
Illustrative waste volumes	92 million tonnes of clothing (mostly cotton and polyester) becoming waste every year - Less than 1% is recycled at the end of use 0.5 million tonnes of microfibers end up in the ocean annually = to over 50 billion plastic bottles 20% of all industrial water pollution is attributable to textile dying and treatment. - Industry accounts for ~10% of all CO_2 emissions	- Waste will grow to 148 tonnes (62% increase) by 2030 118 billion cubic tonnes of water will be consumed (**50%**) increase by 2030 35% more land is projected to be required for fibre production by the industry by 2030 - Emissions are projected to more than double by 2025
Value at Stake		$30 - $90 billion (3-8% of EBITDA[6]) by 2030

Table 1: The range of sustainability challenges faced by the Global Fashion Industry based on Lacy et al. (2020), The Circular Economy Handbook Realizing the Circular Advantage, p.185.

GHGs emerge all along the Global Fashion supply chain, from the deforestation of wild land to grow fibre crops or animals for leather, to the fertiliser, pesticide and herbicide use, to harvesting, processing, manufacturing, transportation, storage, retail, washing and maintaining garments through to end of life (to landfill or incineration).

Current estimates show the fashion industry produces between 4% to 10% of total Global GHG emissions (Berg et al., 2020).

Projections indicate that exponential growth is expected in the coming decades unless there is immediate and disruptive change in the form of multiple interventions within the entire industry and to market forces. Resources have been further pushed since the start of the millennium and the rise of fast fashion which has transformed the market, through the production of cheap, short product life use items and for many making clothing disposable.

The production of many natural fibres results in direct and indirect impacts for greenhouse gas emissions linked to increased production and more intensive agriculture. The cascade effect is compounding the increase in emissions as use of fertilisers and pesticides and herbicides causing biodiversity loss.
The clothing industry is complex in the range of products, raw materials, manufacturing processes and global distribution. There are different extents of life cycle analysis and this process is a critical tool in assessing resource efficiency and identifying areas of improvement.

Lifecycle analysis shows that it is the raw material extraction that has the highest environmental impact in the clothing lifecycle (GHG emissions and biodiversity loss).

However, LCA also shows that recycled cotton and flax, used as a virgin fibre, have very low overall environmental impacts.

Cotton buds - Photo courtesy of Tendam Global Fashion Retail

Fabric dying is the second biggest environmental impact and there are significant impacts related to garment maintenance from domestic washing. Dry cleaning for example is a high emission producing process as the chemical use in the process and energy use in the machines produced a high volume of emissions relative to each garment.

Berg, A., Magnus, K.-H., Kappelmark, S., Granskog, A., Lee, L. and Sawers, C. (2020). Fashion on Climate: How the fashion industry can urgently act to reduce its greenhouse gas emissions. Available from: https://www.mckinsey.com/~/media/mckinsey/industries/retail/our%20insights/fashion%20on%20climate/fashion-on-climate-full-report.pdf

There are wide variations globally for emissions per kilogram of natural and synthetic materials. What this means for the future is that a very variable swathe of approaches will be required to be applied to reduce emissions and make the supply chain resource efficient.

The end-of-life status of garments is responsible for 92 million tonnes of mostly cotton and polyester waste annually (Crumbie, 2023).

Also, there is the significant losses of microfibres from polyester that end up in the world's oceans because of washing this form of fabric. These plastic based microfibres do not degrade naturally in the environment and have been shown to cause ecosystem disruption. One of the main problems is that they bind with other chemicals in the sea to form more toxic compounds such as polybrominated diphenyl ethers which are endocrine disrupting chemicals to fish and other animals, but fish are particularly vulnerable. Of the 92 million tonnes of textile waste produced globally every year, less than 1% is recycled.

There is a growing reuse stage of textiles, which often involves shipping large tonnages of textiles around the planet, which in turn leads to further transport related GHG emissions and the data and research on this is limited.

However, it remains the case that at the end of life, 1% is recycled into either other fabrics or into other products. Up to 25% of discarded are estimated to be collected by charitable organisations or industrial enterprises for repurposing either for reuse or recycling. The remainder is either sent to landfills or to incinerators.

Recycled polyester - photo courtesy of Tendam Global Fashion Retail

Crumbie, A. (2023) What is fast fashion and why is it a problem?, Ethical Consumer. Available at: https://www.ethicalconsumer.org/fashion-clothing/what-fast-fashion-why-it-problem

There is a significant opportunity to make the fashion industry resource efficient by capitalising on the recycling and reuse approaches and this is not currently happening at a rate that is supportive to a sustainable industry.

The value chain for the global fashion industry is heavily dependent on virgin materials from non-renewable resources. As identified earlier in the section, the reliance on fertilisers for cotton production and oil to manufacture synthetic fibres such as polyester, and not to mention over 800 other chemicals including dyes and preservatives and the high rate of disposability of products means waste challenges across the whole value chain.

There are several key challenges to be addressed, including the material mix, resource intensive production and product disposability and these elements are interlinked.
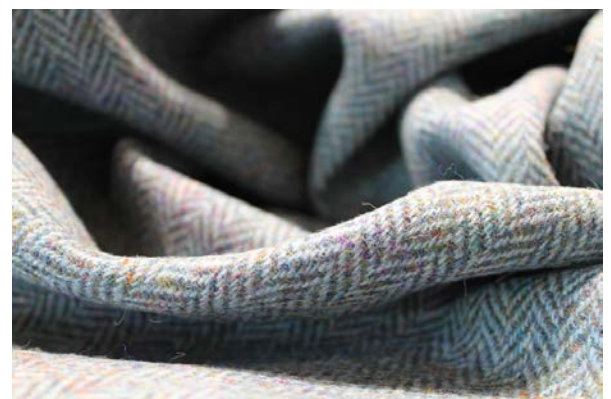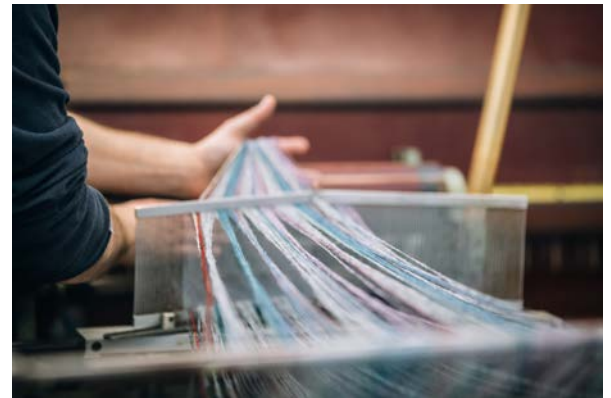
Harris Tweed fabric, naturally renewable, biodegradable and recyclable. - photos courtesy of Harris Tweed®

SFES TIMELINE

OCTOBER 2020

OCTOBER - DECEMBER 2020

NOVEMBER 2020 - FEBRUARY 2021

APRIL 2021

SFES EU funding awarded to GCU.

Recruitment of participants for project.

Research survey released.

Idea communicated to students, and Instagram account made for the project.

30TH JUNE - 16TH SEPTEMBER 2021

4TH NOVEMBER 2021

JUNE 2022

First online meeting followed by the first in person meeting with all partners.

GCU organized a zoom panel within the COP26 in partnership with our EU-funded SFES project, aiming to discuss reaching sustainable goals in the fashion industry through education and employability.

Launch of Sustainable Fashion Pills, a podcast by SFES European Project. This episodes cover a variey of topics, ranging from employability skills to Implementing Sustainable Design in Global Brands.

27TH JUNE - 1ST JULY 2022

First workshop led by GCU involving a week of immersive experiences in the Scottish Highlands and Islands, with local sustainable businesses including Harris Tweed Hebrides

9TH - 23TH SEPTEMBER 2022

The second workshop took place in Madeira where participants consolidated their sustainable champion status and were immersed in the crafts underpinning Madeiran culture.

5TH - 6TH OCTOBER 2022

Future of Fashion collaboration with the World Design Capital In Valencia and the launch of the Pact for Sustainable Fashion.

27TH OCTOBER 2022

SFES project presented at Scotland House, Brussels, Changemakers and Pioneers showcase.

MAY 2023

Outputs from the project are finalised. These include the SFES survey Toolkit, White Paper, and Contemporary Issues in Employability and Sustainable Fashion Module.
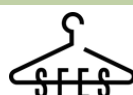
19TH - 23TH JUNE 2023

Final SFES workshop takes place at Universidad de Villanueva in Madrid, Spain.

JUNE 2023

Final Conference focusing on presenting the project outputs

FUTURE PROSPECTS

1. Reducing Emissions from Upstream Operations

Marginal Abatement Potentials have been carried out on the industry and this has revealed that the decarbonisation of upstream value chain activities has the potential to drive 61% of the accelerated abatement potential by 2030 . This is split into 4 key activities.

1

Decarbonised material production

A mixture of energy efficiency improvements in polyester manufacture and 40% reduction in fertilizers and pesticide use.

2

Decarbonising material processing

Achieved through introducing renewable energy and energy efficiency measures.

3

Minimising production and manufacturing wastage

Achieved through resource efficiency.

4

Decarbonised garment manufacturing

Energy efficiency in the heating, ventilation and energy efficiency improvements in sewing machines.

Berg, A., Magnus, K.-H., Kappelmark, S., Granskog, A., Lee, L. and Sawers, C. (2020). Fashion on Climate: How the fashion industry can urgently act to reduce its greenhouse gas emissions. Available from: https://www.mckinsey.com/~/media/mckinsey/industries/retail/our%20insights/fashion%20on%20climate/fashion-on-climate-full-report.pdf

2. Reducing Emissions from Brands Own Operations

This could achieve up to 18% of the target reduction in the sector and achieved through the following activities.

Improved material mix

This includes reuse of up to 20% of recycled polyester and 11% adoption of alternatives such as organic, recycled or bio-based textiles and embracing sustainable materials like cashmere, silk and wool. Only 2% of all textiles are made from wool.

Photo courtesy of Harris Tweed Hebrides,

Reduced overproduction

Over production means 40% of garments are sold at markdown. 10% reduction in overproduction by technology investment to sallow better forecasting and stock management is required.

Increased use of sustainable transport

Accomplished by shifting to 90% by sea and 10% by air compared with 83% and 17% currently and it assumes a 90% electrification of Business to Consumer light transport flee

Minimised Returns

Where e-commerce return rates reduce from 35% to 15% through technical improvements predicting size and fit and consumer behaviour.

Improved packaging

Accomplished by 20% increase in recycled material in corrugated boxes 80% recycled polyethylene in polybags.

Decarbonised Retail Operations

Mainly energy efficiency measures and transitioning to 100% renewables.

3. Encouraging Sustainable Consumer Behaviours

These activities could contribute 21% to the accelerated abatement potential through engaged partnership by brands with consumers through:

Circular Business Models

These include, re-commerce, rental models, repair models and refurbishment (product lifetime extension).

Reduced washing and drying

This relies on consumers changing their behaviours.

Increased recycling and collection

Moving the industry to a closed loop recycling operating model. Advancements needed in chemical textile to textile recycling, blend identification technologies and higher incentives for brands to enable CLR (Closed Loop Recycling) and consumer alignment and support.

Photo courtesy of Tendam Global Fashion Retail
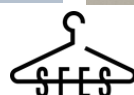
4. Businesses Making Sustainable Choices

There are some additional solutions that would build sustainability, enhance biodiversity and reduce emissions such as:

Ensuring that all cellulose fabrics are sourced from sustainably managed forests and so there is no further contribution to the destruction of ancient and endangered forests.

Preserving and protecting water - designers should work with fabric producers who act responsibly and are governed by strict rules on water management and pollution. Waterless dying technologies such as dry dye, using pressurised carbon dioxide in place of traditional water can be applied.

Using recycled and innovative materials lining - handbags linings could be fitted with linings made from recycled polyester from waste plastic water bottles and recycled cashmere made from free consumer manufacturing waste.

Sourcing certified organic cotton and other organic fibres which are less toxic at all stages along the supply chain whenever possible. For example adopting the alternative to extensive cotton cultivation such as **Better Cotton.**
https://bettercotton.org

Photo courtesy of Tendam Global Fashion Retail

Using labels which inform customers on ways that they can reduce the impact from washing and drying their garments.

Photo courtesy of Tendam Global Fashion Retail

Enabling the new environmentally-friendly process using environment safe solvent to dissolve old cotton clothing into cotton-like natural material that can made into new fibres, eliminating both waste and the problems that come with growing new cotton.

Algae based fabric - fast-growing algae (Chlorella vulgaris) grow naturally in lakes or even in waste water treatment facilities, thereby leaving the land free. The algae and be turned into woven and knitted fabrics into fabrics.

Recycling through Polyester degrading microbes.

Recycling Food Waste and using to create new yarns– Italian company **Orange Fiber SRL** (Catania, Italy) extract the cellulose from waste orange peels and produce a usable yarn for both knitted and woven fabric production. **Persiskin**, a Valencian company have developed innovative textiles using raw plant materials, and recently launched a vegan leather made from leftover persimmons, providing an eco-friendly alternative to traditional leather and reducing food waste. This could revolutionize the use of vegan leathers in the textile, shoe and automotive industries.

Biodiversity, Emissions and Silo-mentalities are important issues which affect the environmental and sustainable credentials of the fashion industry and that reflect broadly on the biological health of Earth's ecosystems. The next sections of the White Paper review the issues, challenges and employment opportunities afforded to businesses within the fashion sector when engaging with a more sustainable approach, wherever they may be on that journey. There is a broad need to introduce new skills as well as capitalizing on traditional skills to facilitate addressing some of the key challenges related to sustainability.
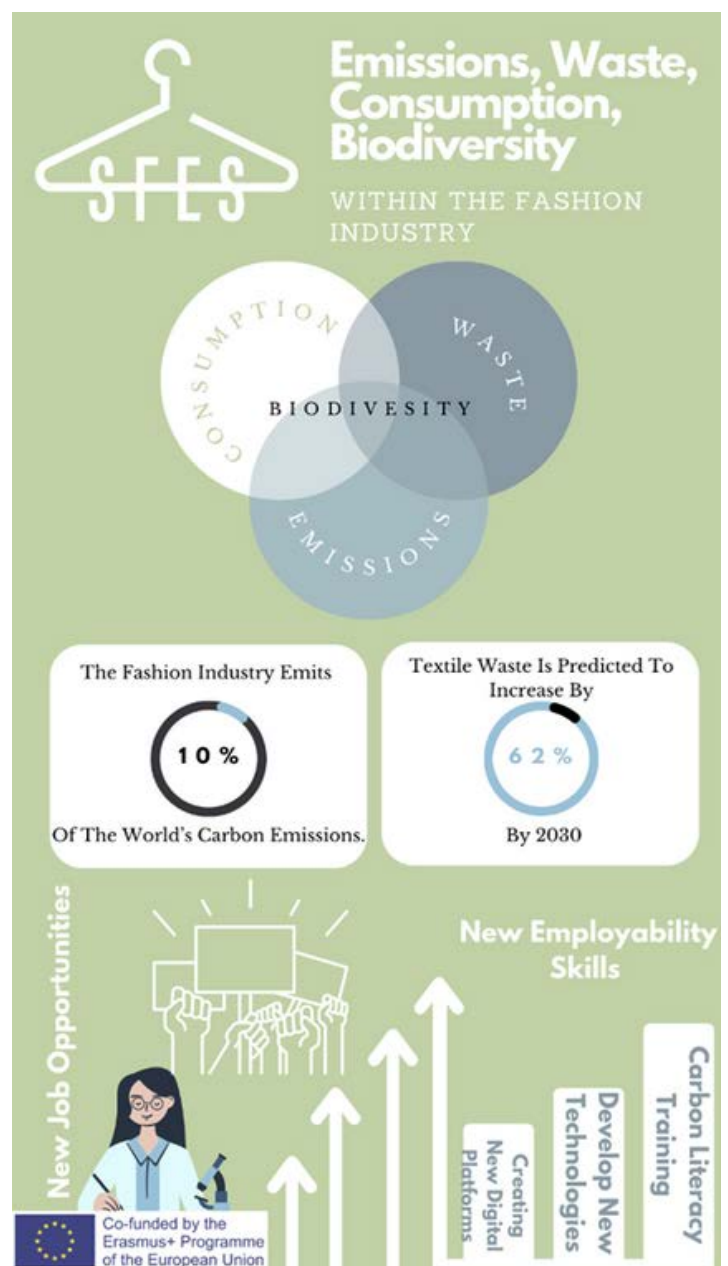
Poster created during SFES workshop by SFES participants. *

*Schmutz, M. and Som, C., 2022. Identifying the potential for circularity of industrial textile waste generated within Swiss companies. Resources, Conservation and Recycling, 182, p.106132.

Photo courtesy of Harris Tweed Hebrides

KEY AREAS FOR EMPLOYABILITY

1. Design

Consumers are becoming more aware of the damage that fashion businesses involved in sourcing, production and disposal activities have on the environment and the reliance in some cases, of this global segment of activity on questionable working conditions for the workers involved in the production of garments, especially in developing nations. This has underpinned a growing movement demanding more transparency from fashion brands in all aspects of their business. The design process, although considered historically as using lesser resources and being less of a risk for damaging the environment directly than other component parts of a fashion garment such as its production or raw materials, can strongly influence the overall

> Design decisions based on sustainability principles mean more than using recycled or environmentally friendly materials including textiles, fabrics and dyes.

sustainable credentials of a product. Design decisions based on sustainability principles mean more than using recycled or environmentally friendly materials including textiles, fabrics and dyes. Designing a new fashion product can go further by incorporating sustainable principles.

"New tools and skills being applied to apparel have led the sector to major impact reduction. Artificial Intelligence and data analytics have allowed store staff to better recommend to customers what to choose, purchase departments to do a more accurate buy and left overs not to exceed 5% of the total purchase. Getting deeper into these skills, extending them to designers will develop new jobs and opportunities. The combination of Fash tech with new technology to allow more precise choices with a new concept of quality and value for a more timeless design, bringing back the respect for the garment will bring the right fashion we want."

Ignacio Sierra Armas
Corporate General Manager Tendam Global Fashion Retail

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Source: Unsplash

The design brief influences the environmental impacts of the garment and its lifetime therefore taking into account the amount of waste which will be generated on pattern cutting and production and being cognisant of the labour costs during production can be vital for increasing the sustainability of the garment. The reduction of toxic waste from pattern cutting and production, the creation of durable, distinct and unique garments, the use of digital enabled processes with production sites for approval of prototypes and patterns are all within the remit of the designer. Using localized production facilities limits the carbon footprint of clothes. New 3D design programs also allow verification images that reduce the need for samples.

Some designers focus on upcycling and reconstruction methods by using materials intended for other uses, disuses materials or donated/used clothing. Certain designers can feel a responsibility towards sharing the methods and expertise they use within their sustainable practice and can spread the knowledge through blogs and workshops, for example. The designer also influences the extent of the traceability of the finished garments by stipulating and facilitating that the consumer is able to track the product's initial lifecycle specifically related to the raw materials (their source, who produces them and how they are made). Some examples of sustainable design:

Upcycling:
A reconstruction method that combines outdated clothing and textiles to generate unique garments. It is essentially the practice of extending the life of objects.

Reconstruction:
Textiles are sourced through donations from the community and deadstock from organisations, stores and companies. Then they are sorted and prepared for reconstruction.

Handcrafting:
Making garments by hand to ensure durability, comfort, and with respect to some traditional and ancient techniques when appropriate.

Design Challenges

When working within the sustainable area for in the design context there is a particular focus related to the knowledge on textiles and fibres. Harris tweed Hebrides provide a solid benchmark here. Their unique fabric is woven in a traditional way so their is durability the product and longevity in the design. New technologies for fibre recycling show potential for being a replacement for virgin fibre contributions towards 100% recycled clothing or with a measure of recycled inputs which could contribute towards the reduction of environmental impacts of virgin clothing fibres. However, the wearability and durability of the finished garment needs to be taken into consideration and the competing priorities.

Incorporating circularity in fashion design means that anything designed to be effectively utilised, distributed and re-used in a responsible manner for as long as possible in its most valued form, and thereafter returned to the biosphere without damage or harm to others or the environment when no longer of use. In order to incorporate circularity into mainstream fashion design and thus into business the strategy of brands, the implementation could start with ensuring that design components are re-usable and that the materials used are of the highest quality.

There are some technical challenges related to incorporating sustainability in the design process of fashion and accessories.
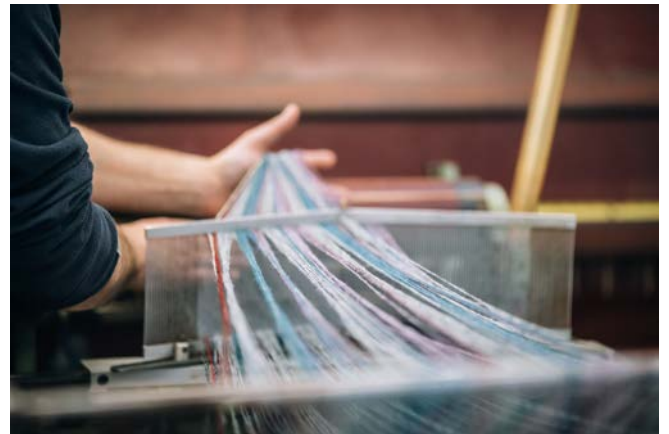
Photo courtesy of Harris Tweed Hebrides

There are some technical challenges related to incorporating sustainability in the design process of fashion and accessories. The tool of the designer, the 'tech pack' which gives the supplier all the necessary information related to every aspect of the garment from its material to the label and can include items such as drawings, technical sheets, measurements and label design may be more complicated and extended when incorporating sustainability.

The use of a recycled/new textile may take longer to source/understand how it works during the manipulation process; more trialing of the design may have to take place and more time for communication may have to be built in initially. Some areas to highlight are:

> 60 - 80% of a garment's sustainability impact is determined at the design stage.

Trialling designs in small batches will enable supply chain models that permit shipping of small batches of new products and designs before rapidly increasing production if they attract consumer demand. Companies strive to plan production with the aim of having as little stock as possible.

Incorporating Digital prototyping in the design process as it allows the visualisation of a complete product before it is physically built. In the design process, this helps with the reduction of waste as areas of surplus can be addressed before the manufacturing stage.

DESIGN
An underestimated resource

Design

60-80% of a garment impact on sustainability depends on the choices made at design and development stage

Skills & Knowledge

The design process must be intertwined with other skills and several kinds of knowledge to go further into the sustainable challenge.

Opportunities

By using a wide variety of new technologies like prototyping, that severely reduce waste and represent opportunities for coming out with bright new ideas.

Creativity

The design is way broader than drawing clothes, it goes from the choice of materials to the final product.

Innovation

Since nowadays, customers are giving way more importance about sustainable garments, designers can incorporate consumers ideas

Circularity

Certifications and regulations allied with QR codes provide a trustful source of information to consumers about traceability and lifecycle of garments.

Poster created during SFES workshop by SFES participants

The use of 3D technology which eliminates the need for the back and forth process traditionally used for sample/product approval. Due to the prevalence of speed to market, air freight, recognised to be the most polluting method of transport, used to be the preferred method for this process. The use of 3D computer technology, not only eliminates the need for the movement of sample garments but also creates a shorter cycle and affords designers and buyers time to read the market. This results in more product success, reduces inventory and inventory waste and fundamentally means only garments that will result in a sale will be transported.

> A further challenge in this area is the increased necessity for knowledge related to craftsmanship.

Finally, there is a debate around the role of certifications and regulation. Many companies are looking to prove their sustainability credentials through regulation and certification. Sometimes this depends on where they are based and whether they are private organisations (ie: **REACH** (European Regulation which stands for the Registration, Evaluation. Authorisation and Restriction of Chemicals) aims to give a level of protection from the use of chemicals for products in the EU. There is also the **GOTS** (Global Organic Textile Standard) which certifies the organic status of textiles from source to labelling. Finally, **ZDHC** (Zero Discharge of Harmful Chemicals) whose mission is to enable brands and retailers in the textile, apparel, and footwear industries to implement sustainable chemical management best practice across the value chain.

However, this may be topical within the industry but the translation through to the consumer in terms of the understanding of the credentials and their role within the decision-making process has still not been determined.

A further challenge in this area is the increased necessity for knowledge related to craftsmanship. This a wide diversity of crafts within the fashion industry. But it basically related to understanding the requirements of handmade garments including ancient skills such as knitting, spinning, looming or lace making.

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Source: Unsplash

Employability skills/
opportunities in Design

Creativity and innovation:
The ability to come up with new and unique ideas for designs, fabrics, and trends is crucial in the fashion industry. Creativity for product innovation and consumer creation. Being able to carry out a Life Cycle Assessment related to new garment design. Knowledge of textile recycling technologies and innovations in material sciences.

Adaptability:
The fashion industry is constantly evolving, so designers must be able to adapt to new trends, technologies, and techniques.

Technical skills:
Knowledge of design software and other tools used in the industry, such as Adobe Illustrator and Photoshop is important. Being trained on digital prototyping for the design process of the garment. Zero waste pattern cutting skills. Handcrafting, upcycling and re-construction skills. Knowledge of traditional skills, ancient crafts and ancestral techniques such as spinning/looming, embroidery techniques. Carbon Literacy.

Attention to detail:
Designers must have a keen eye for detail in order to produce high-quality garments and accessories.

Problem-solving skills:
Designers must be able to identify and solve problems that arise during the design process.

Project management skills:
The ability to manage and coordinate different aspects of a design project, including timelines, budgets, and resources, is essential. Knowledge related to responsible sourcing is essential. Knowledge and expertise related to compliance with regulations and certification is also crucial in the design process.
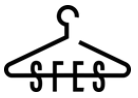
Leadership skills:
Designers often lead teams of designers, assistants, and other professionals, so strong leadership skills are important.
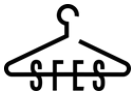
Communication skills:
Designers must be able to effectively communicate their ideas and designs to clients, manufacturers, and other members of the team and for spreading the information about responsible design. Understanding the target market and how to market designs and products effectively is crucial in the fashion industry.
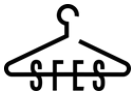
Time management:
Designers must be able to manage their time effectively in order to meet deadlines and deliver high-quality work in a highly competitive and fluctuating environment.

Additional resources:
Clothing Production: What is a Tech Pack and How to Make it?

https://youtu.be/dJjfxO4C8Ao

2. Raw Materials

Currently the way in which garments are designed, made, distributed and ultimately discarded, creates a significant environmental and societal impact.

In 2020, the industry faced a materials revolution towards sustainability, functionality, and e-textiles. Indeed, companies around the world filed eight times as many fibre innovation patent applications in 2020 as they did in 2013, according to McKinsey's analysis[15]. There are three drivers influencing this revolution: consumer demand for more sustainable fashion items that match their 'digitally enhanced lifestyles', more strict government regulations that require fashion brands to be more sustainable, and a rising demand for low-impact alternatives that are functional and sustainable. This materials revolution has led to a fundamental change in the fashion supply chain, such as increased collaboration between start-ups, development of product technology allowing brands to gain a competitive edge, vertical integration by brands with in-house roles for tasks that were formerly handled externally and a strong focus on functionality with fibre companies looking to reflect changing consumer behaviour in their products.

> Indeed, companies around the world filed eight times as many fibre innovation patent applications in 2020 as they did in 2013

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Source: Unsplash

In terms of regulation, the EU is aiming to stop overproduction and overconsumption of clothing. New measures will also discourage the destruction of unsold or returned textiles and restrict the export of textile waste. The EU already has comprehensive laws on waste – and the main law (the Waste Framework Directive) will be reviewed in 2023.

Whilst agricultural practices vary worldwide, from labour intensive farming of natural fibres to more industrialised agriculture to the fully industrialised synthetic production of man-made polymeric fibres, the raw material stage of the supply chain remains the second most resource intense and emissions producing. Currently, more than half of all fibres and fabrics are produced in Asia and 27% of the world's fibre and fabric is produced in China. Polyester, which is the world's most common fibre accounting for over 50% of the fibre market and 80% of synthetic fibres is increasing and over 65% of this fibre is produced in China[16].
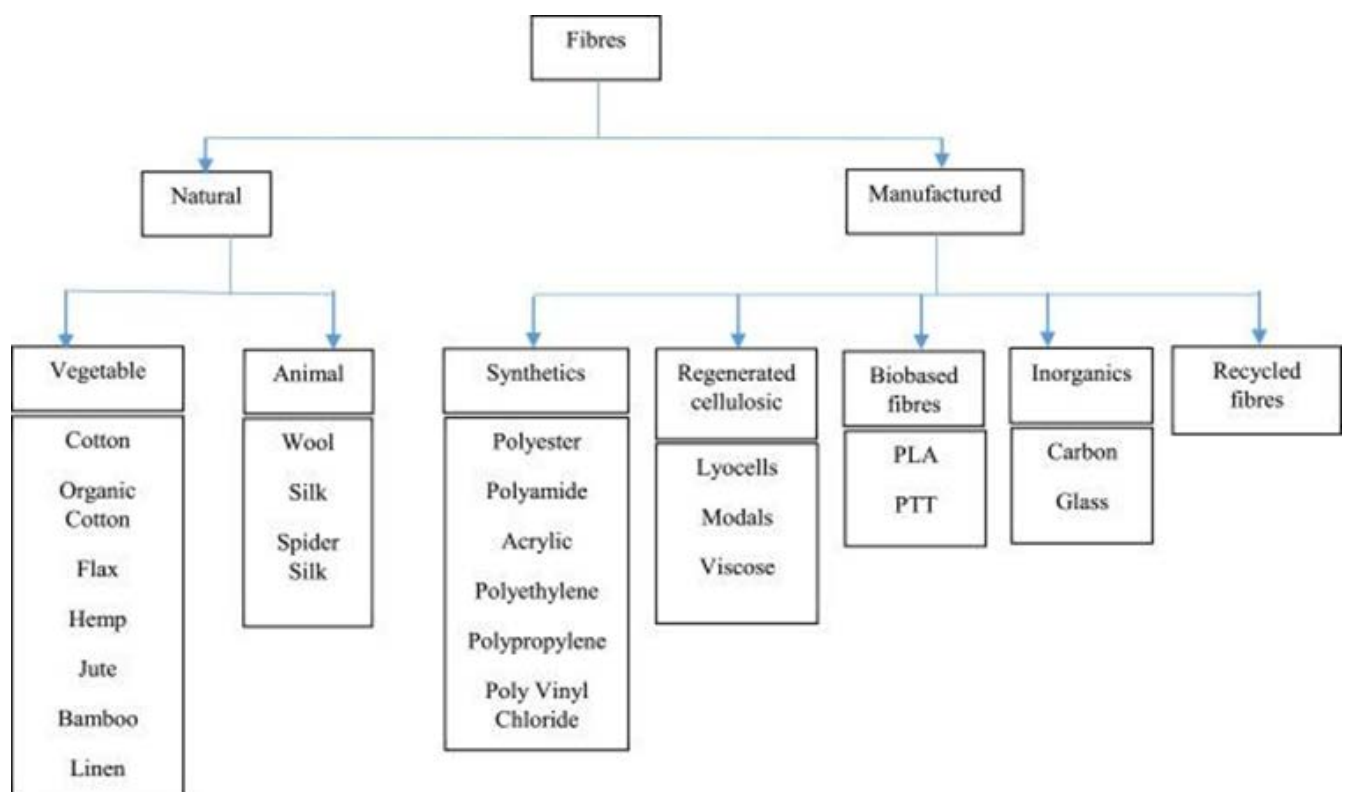
Fibre Sources

Figure 3 : Types of Fibre [17]

[15] McKinsey Apparel CPO Survey (2021) Revamping fashion sourcing: Speed and flexibility to the fore;
[16] Textile Exchange. (2021). Preferred Fiber & Materials Market Report 2021. Available from: https://textileexchange.org/knowledge-center/reports/preferred-fiber-materials-market-report-2021/
[17] Adapted from Muthu, S. S., Li, Y., Hu, J. Y. and Mok, P. Y. (2012). Quantification of environmental impact and ecological sustainability for textile fibres. Ecological Indicators, 13 (1), pp.66–74. doi:10.1016/j.ecolind.2011.05.008

Fashion consumers are increasingly conscious of where their purchases are coming from and exactly what is in them. As with the food industry, the component(s) of the finished product are being sought by the consumers, including their origin and production methods. Consumers are now refusing to use fur and leather products with there being an increase in the demand for vegan and alternative sustainable components of fashion items and accessories. An increasing number of consumers confirm sustainability is important within the purchasing decision for garments[18].

> The segment sales of sustainable and vegan textiles will continue to grow significantly.

Many retailers have recognised this and have pledged to stop using certain materials within their products. This supports the prediction that the segment sales of sustainable and vegan textiles will continue to grow significantly.

Photo courtesy of Harris Tweed Hebrides

Challenges in Raw Materials

The sustainable textile market is expected to grow to $89.6 billion by 2025, with an annual growth rate of 49.9% according to the Vegan Society. Social and environmental factors play a big part in the popularity for substitute raw material luxury goods and the demand for the vegan fabric alternatives. Ro (2020)[19] states that consumers are now looking for different fabric options, especially since the Covid-19 lockdown and the heightened use of social media. 75% of the 18-25 market said they would be willing to pay more for a vegan accessory product over multiple fast fashion outfits[20] although reasons for discarding fashion items include pilling (where small bobbles of fibre accumulate on the fabric), colour fading, fabric breakdown and loss of shape[21] (all issues mostly related to the choice of textile and the design of the garment).

[18] Mintel (2022) UK Fashion and Sustainability Market Report
[19] Can fashion ever be sustainable?, Available at: https://www.bbc.com/future/article/20200310-sustainable-fashion-how-to-buy-clothes-good-for-the-climate
[20] Veganism in vogue: Why animal-free fashion is booming. Available at: https://www.drapersonline.com/insight/analysis/veganism-in-vogue-why-animal-free-fashion-is-booming
[21] Fast fashion: common reasons garments are discarded, Available at: https://environment.ec.europa.eu/news/fast-fashion-common-reasons-garments-are-discarded-2022-11-16_en

Creating a circular economy could reduce global levels of raw material extraction by 10% by 2030 (European Commission). It could drive an increase in overall employment, although the types of jobs would change significantly. Moving away from low-skilled work in the manufacturing sectors and creating more opportunities for medium and high-skilled jobs in the service sector. While there are still many behavioural and policy barriers to overcome before a circular economy can be fully realised, new research explores whether averting environmental catastrophe via this type of economic system could also deliver sustained growth and jobs.[22]

Poster created during SFES workshop by SFES participants

[22] Vegan Leather Market (Product - Polyurethane, Recycled Polyester, and Bio Based; Application - Furnishing, Automotive, Footwear, Bags & Wallets, Clothing, and Other Applications): Global Industry Analysis, Trends, Size, Share and Forecasts to 2026; Available at https://www.infiniumglobalresearch.com/consumer-goods-packaging/global-vegan-leather-market

Employability skills/
opportunities for Raw Materials

Creativity:
Ability to come up with new and innovative ideas for alternative fabrics and textiles.

Curiosity:
Recognition of new emerging trends and developments in textiles.

Technical skills:
Knowledge of textile production processes, fabric manipulation, sewing and transforming techniques. Knowledge of textile recycling technologies and innovations in material sciences.

Attention to detail:
Ability to pay close attention to details when designing, producing, and finishing textiles.

Strong communication and interpersonal skills:
Ability to work with designers, manufacturers, and other team members all along the supply effectively.

Problem-solving skills:
Ability to think critically and solve problems that may arise during the design, production, and delivery of fashion and textile products.

Flexibility:
Ability to adapt to new trends and technologies in the fashion and textile industry.

3. Supply Chain

The supply chain is created by the flow of raw materials, consumables and finished goods through a network of interconnected businesses working towards the creation of completed products reaching the hands of the consumer. The current aim of the fashion supply chain is to realise this movement of goods to ensure the right products reach the right destination at the right time, with speed to market the primary goal. Speed to market, especially through the fast fashion trend, is the priority for the vast majority of mass manufacturing brands. This places pressure on the supply chain to distribute and deliver goods at speed

> The current aim of the fashion supply chain is to realise this movement of goods to ensure the right products reach the right destination at the right time, with speed to market the primary goal.

but also, as efficiently and as cost effectively as possible. This results in businesses choosing cost effective methods of movement of goods and distribution, rather than those that consider sustainable values. The industry is highly dependent on fossil fuel from the creation of synthetic fabrics, the water needed in the production of natural fibres, in particular cotton, through to the transportation mechanisms used to transport goods globally. According to Zelco[23] , the leading training organisation of logistics and supply chain management, 'while there are 750 million vehicles in the world today, this number is expected to increase to 2.2 billion by 2050'.

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Source: Unsplash

More recently a study by the International Transport Forum[24], supported these predictions by indicating, 'Global traffic volumes are set to more than double by 2050 and the resulting emissions are expected to increase by 16 percent — even if the current voluntary commitments to reduce CO_2 emissions are implemented.

23] https://www.zelco.be/en/supply-chain-management/
[24] https://www.itf-oecd.org/tags/transport-statistics

"In 2008, 70% of large textile orders went to the far east, currently with near shoring mainly to Portugal, Turkey, and Poland, that percentage has shrunk to 25%" -
Mark Hogarth, Creative Director
of Harris Tweed Hebrides

Given the global nature of the fashion industry and the dependence on solid fuels within the global supply chain networks, it is apparent that continuing with the current supply chain structures, or even those with improved emission rates, increased pressures on the environment and society as a whole will still result. However, reverse logistics (forward and reverse flow of goods) is one supply chain practice which is inherently sustainable. As Bouzon & Govindan (2015)[25] indicate, reverse logistics is the process of moving products from their typical final destination for the purpose of capturing value or proper disposal.

Reverse logistics therefore, provides a holistic view of the supply chain with a number of factors; direct re-use, repair/refurbish, re-manufacturing, recycling, incineration and landfill being used to create a 'closed loop' supply chain.

Challenges

Due to cost, sea freight is the most widely used long distance transport method. This transportation method primarily relies on fossil fuel, creating significant carbon dioxide (CO_2) emissions. Furthermore, the use of this transportation method for all goods including fashion, is predicted to increase. With forecasts predicting shipping will account for 15-30% worldwide CO_2 emissions by 2050. However, achieving sustainability in the supply chain is more than CO_2 emissions with wider environmental, economic and social factors requiring consideration. McKinsey & Company [26] stated that risks in a supply chain occur when there is vulnerability present, along with an unexpected event, clearly demonstrated by advent of the global COVID-19 pandemic.

sea freight is the most widely used long distance transport method

[25] Bouzon, M. and Govindan, K., 2015. Reverse logistics as a sustainable supply chain practice for the fashion industry: an analysis of drivers and the Brazilian Case. Sustainable fashion supply chain management: From sourcing to retailing, pp.85-104.
[26] McKinsey & Company, 2020. Biodiversity: The next frontier in sustainable fashion. https://www.mckinsey.com/industries/retail/our-insights/biodiversity-the-next-frontier-in-sustainable-fashion

Additionally, The State of Fashion 2023[27] report suggested that issues that currently put pressure on supply chains include the war in Ukraine, triggering an energy crisis, extreme weather conditions destroying crops in developing countries like Pakistan, and global inflation increasing input costs.

> **Practices of sustainability are seen primarily through reverse logistics, with a few examples of sustainable transportation methods being indicated.**

Currently, the focus by logistics and supply chain management providers is speed and efficiency to the market, through the use of technology, for example connecting e-commerce and physical retail delivery; reducing complexities and costs for warehousing and third-party logistics. Practices of sustainability are seen primarily through reverse logistics, with a few examples of sustainable transportation methods being indicated.

Primarily the focus has been on sustainable methods of movement of goods rather than considering all three sustainability factors. As Stephens highlights in his podcast[28], some supply chains are built on inequality and exploitation.Sustainable alternatives exist, but the industry is reluctant to embrace them, preferring to continue with the status quo. One factor that is making a difference to long distance transportation of goods however, is that of 'near' or 'reshoring'. The McKinsey State of Fashion[29] report highlights this change 'a number of European companies doubled down on nearshoring efforts through the pandemic, moving textile manufacturing from China to Turkey to minimise delays. Over 70% of companies plan to increase the share of nearshoring close to company

> **One factor that is making a difference to long distance transportation of goods however, is that of 'near' or 'reshoring'.**

headquarters, and roughly 25 percent intend to re-shore sourcing to their headquarters' country'. While speed and agility to the market may be a large part of the reason behind this, sustainable factors will be inherently addressed due to the shorter transportation routes to end markets.

[27]   https://www.businessoffashion.com/reports/news-analysis/the-state-of-fashion-2023-industry-report-bof-mckinsey/
[28] https://www.businessoffashion.com/podcasts/retail/retail-reborn-podcast-doug-stephens-supply-chains/
[29]https://www.businessoffashion.com/articles/retail/the-state-of-fashion-2023-report-supply-chain-manufacturing-nearshoring-vertical-integration/

Traceability is another challenge for the fashion sector as more and more consumers are getting used to the high level of traceability and transparency that exists in food production and supply. Economic factors are currently more important to consumers in the end markets and that changing consumer views on the societal aspects of the supply chain are needed.

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In terms of supply chain it is important to highlight that agreements are being signed by the industry players with Unions as observers of human rights compliance to work against inequality and exploitation (ie with factories in Pakistan and Bangladesh) to safeguard the employment conditions and safety of the factories.

One approach industry can provide the stimulus for this, would be through the use of technology e.g. QR codes on garments which allow the consumer to trace the product from fibre to store. However, the complexity of the supply chain means traceability between links in the chain are often lost. Blockchain technology (aligned to RFID mechanisms) are systems which offer this traceability using a 'digital ledger' of information, with the blocks of information interconnecting with each other. The system allows any organisation within the supply chain to record information, with the possibility of being visible and tracked by multiple parties at any time. Furthermore, data is irreversible, being permanently recorded, but can be updated at any point in the lifecycle of the garment and fabric it is made from. Whenever environmentally friendly fabrics or working practices (e.g. Fair Trade) are applied, additional certifications or inspections are not required, as it is already recorded and evidenced for all those in the supply chain to see.

Traceability efforts are successful through collaboration, by sharing traceability technologies through sharing of data and collective standards between companies in the supply chain. Vertical integration has been described as the newest strategy for brands to improve sustainability within their supply chains, while cutting costs, improving margins and preventing delays. However, while technology and more environmental friendly transportation options can be adopted, this does not go as far as it might. The development of international trade agreements which have environmental and corporate social responsibility (CSR) within them, would make mandatory changes within the industry.

Poster created during SFES workshop by SFES participants

Employability skills/ opportunities

The fashion supply chain is a long and complex structure and as such, has a vast array of employment formats and opportunities within it. Given the dynamic nature of the supply chain, those employed in it will require skills that facilitate rapid change and agility. Given the supply chain's construction, whereby businesses are interconnected, working closely with one another to achieve delivery into the hands of the consumer, communication skills form the fundamental basis of those employed within it.

Opportunities for a more sustainable supply chain come from the increased use in technology. With employment in the creation of systems and software, operational aspects of using the technology and maintenance of it. Furthermore, employability may come from social development within the supply chain, Harris Tweed Hebrides provide a good example of where they have a vertically integrated production, but they are also horizontally integrated via the communities that are part of the industry. Through CSR and working with employees to ensure better working practices and living conditions.

Organizational and project management skills:
The ability to effectively manage and coordinate the movement of goods from design and production to delivery to retailers and customers.

Communication skills:
The ability to effectively communicate with vendors, suppliers, retailers, and internal teams to ensure that orders are fulfilled on time and to the correct specifications. Agility is required for a changing supply chain landscape.

Analytical skills:
The ability to analyse sales data, inventory levels, and other metrics to identify trends and make decisions about production and distribution.

Knowledge of industry trends and regulations:
Understanding of the latest fashion trends, as well as the laws and regulations that govern the industry, such as labor laws and import/export regulations.

Negotiation skills:

The ability to negotiate prices and terms with vendors and suppliers to ensure that the company is getting the best possible deals on materials and goods.

Attention to detail:

The ability to pay close attention to the details of each order and the production process to ensure that all orders are accurate and on time.

Problem-solving skills:

The ability to quickly and effectively resolve any issues that arise during the production and delivery process.

Leadership and Teamwork:

The ability to lead and work well with cross-functional teams, as well as the ability to motivate and inspire others to achieve company goals. Awareness of the effect of working practices within the supply chain and living conditions.

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4. Production

Garment production is one of the largest and most labour intensive manufacturing industries in the world. It is estimated that 60 million people are employed globally[30]. Most of these employees are based in the supply chain of fashion production companies which are predominantly based in Asia where manufacturing has shifted from western countries. In many of these countries, labour practices can be poor with workers not being paid fairly and working in hazardous conditions with little regard for workers' rights. Many of these countries also have lower environmental standards due to less governance on these issues and as such can use cheaper but more polluting chemicals and processes which have more of an environmental impact

> Most of these employees are based in the supply chain of fashion production companies

from these practices. The main driver for clothing and garment manufacturing moving away from western countries themselves which consume the most amount of clothes has been enabled by significant decreases in the cost of transporting goods with shipping containers revolutionizing trade.

"Innovation in raw materials and impactful process together with the right social behaviour in developing strong due diligence systems have been the true revolution during the past decade that must be expanded also to small and medium business. Laser drawing instead of dying or eroding, ozone instead of water to finalize denim, advance water treatment to reduce waste. All need engineering but also commercial expansion though the entire supply chain. But the major challenge is traceability from harvest to the stores where a lot of talent is now being required."

Ignacio Sierra Armas
Corporate General Manager
Tendam Global Fashion
Retail

With the move to fast fashion in the last two decades, this whole process has been exacerbated with companies chasing the doubling of purchases and producing clothes and garments at an ever-unsustainable but increasing volume. It is often cheaper to double volumes of clothing production with a factory and deal with excess waste. This means that there are large amounts of clothes being produced with many becoming deadstock. These issues mainly happen as overstocking is a common practice to meet seasonal demands[31]. This means there can be many unsold items even after being discounted.

[30] Fashion United. 2021. Global fashion industry statistics – International. Available from: https://fashionunited.com/global-fashion-industry-statistics/
[31] Mellor, S. 2021. Changing fashions: Retailers are dealing with deadstock more openly. Fortune. Available from: https://fortune.com/2021/04/29/retail-deadstock-unsold-clothes-fashion-supply-chain-covid/

Much of the unsold stock becomes deadstock where it does not make financial sense for the company to sell it. Although this deadstock can often contain many items which are in resalable condition, they are often incinerated or buried in landfill causing extra unnecessary pollution through emissions[32]. The reason why they are not disposed of in a different way is to ensure that retail prices are not devalued and often there can be tax incentives if deadstock is damaged as it can become a tax write off saving the company money by avoiding paying tax on those items. In addition to the issues raised above, there is a tendency for lack of transparency in this area of fashion and few companies publish or share openly their full production methods.

Challenges

Although there are several challenges in the production of garments and clothing some significant challenges are based on workers' rights and conditions and sustainable pay, reducing overproduction and meeting demand, reducing transport costs and increasing production security. Worker's rights, working conditions and fair pay are something that has plagued the fashion industry for numerous years now. Since the market is extremely competitive, contracts to secure the production of garments and clothing from buyers are fiercely competitive amongst suppliers. This means suppliers must be ruthless to secure contracts, often undervaluing themselves to secure contracts which in turn impacts how the clothing is produced[33]. The knock-on effect is many suppliers give lower wages to workers or require workers to work longer hours for the same pay. There can also be shortcuts taken to produce the items which can make places of work more hazardous. This leads to situations where, for suppliers to survive, they must employ cost-cutting practices to remain trading. In the very worst cases, some suppliers have been known to use forced labour and child labour, still a significant issue across the industry.

> contracts to secure the production of garments and clothing from buyers are fiercely competitive amongst suppliers.

[32] Bliss, D. 2019. The huge toll of 'fast fashion' on the planet – and why the answer could be circular. National Geographic. Available from: https://www.nationalgeographic.co.uk/environment/2019/06/the-huge-toll-fast-fashion-the-planet-and-why-the-answer-could-be-circular
[33] House of Commons Environmental Audit Committee. 2019. Fixing Fashion: clothing consumption and sustainability. Sixteenth Report of Session 2017-19. pp.17. https://publications.parliament.uk/pa/cm201719/cmselect/cmenvaud/1952/1952.pdf

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Some companies adopt certification processes from external organisations

To counteract this, certain companies adopt certification processes from external organisations, for example, the Ethical Trading Initiative (ETI), who will certify if the production and supply chains adhere to ethical conditions (UK based independent body wit no statutory rights) or the now somewhat discredited Higg MSI (Material Sustainability Index) which the Norwegian Consumer Authority banned the use of in 2022, ruling that Higg-backed marketing claims were inaccurate. There has been a reluctance to adopt non government underpinned certifications from many fashion companies. A major concern is that allowing an external body to validate processes and practices can lead to sensitive information about their operations becoming available to the competition. However, more brands are setting sustainability goals and committing to voluntary climate-focused third-party certifications. The issue with this is that there are little to no repercussions, legally or otherwise if companies fail to meet the sustainability goals, they set for themselves or by third-party certification. While voluntary certifications are a step in the right direction, government regulation is the next step to make all players accountable in the fashion supply chain to drive progress towards adressing issues with certification.

Another huge challenge the industry faces is how to deal with the over-ordering of stock which leaves companies with much deadstock. Part of this challenge is that many retailers and brands simply do not have accurate information about how likely products are to sell.

With the advent of Extended Producer Responsibility (EPR), which is an environmental policy approach that shifts the responsibility of a product's lifecycle to the producer, including design, take-back, recycling, and final disposal, the challenges faced by companies are amplified.

Since designing and manufacturing clothing and garments takes a significant amount of lead time (with times typically being between 3-6 months[34]), it means production must be planned well in advance. Therefore, decisions are made with incomplete information about what the market will want and exactly how much to order to meet expected demand. To make a bigger profit it is often more economical to overestimate demand so that there is enough product to sell and then dispose of dead stock later.

It has been estimated that if the discounted stock across the whole industry could be reduced by 15%, it would achieve a reduction in emissions of about 10%, without any impact on value growth to companies [35] .

A key employability skill in this area is therefore data analysis and monitoring to improve the prediction of market demand. The issue is that often there can be large amounts of deadstock that need to be disposed of - creating an unsustainable practice. Not all stock will become deadstock as some will get sold at heavily reduced prices by discounting it and selling it on to discounters. It also means more transportation of goods between retailers and discounters which increases the carbon footprint of the items.

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Source: Unsplash

[34] Koe, T. 2020. Can Technology Eliminate Fashion's $500B Overproduction Problem? Fashion Manuscript. Available at: https://www.mannpublications.com/fashionmannuscript/2020/11/06/can-technology-eliminate-fashions-500b-overproduction-problem/
[35] McKinsey & Company. 2022a. The State of Fashion 2022. [Online]. pp.84. https://www.mckinsey.com/~/media/mckinsey/industries/retail/our%20insights/state%20of%20fashion/2022/the-state-of-fashion-2022.pdf

Another concern is that of the reliability and security of production facilities and supply routes. The Covid-19 pandemic caused outbreaks with workers in many manufacturing hubs resulting in shutdowns that caused significant disruption to production output. The fragile nature of supply routes was clearly highlighted in 2021 with the Suez Canal blockage stopping shipments for 6 days but this is not the only route to have issues. With just a few main global shipping routes the transport and delivery system is quite fragile. Additionally, prices for shipping have increased substantially since before the pandemic. However, this pressure is not going to alleviate, and this is something fashion companies will have to adjust to with higher shipping costs, potential hiccups in the transportation of goods and for unexpected events such as Covid outbreaks to affect the production itself.

With just a few main global shipping routes the transport and delivery system is quite fragile.

To assist in better rights, pay and conditions for workers there need to be more transparency through the whole supply chain and production cycle to help validate things are improving. One technology that could help would be product passports which can use QR codes, RFID and NFC to access information or more comprehensively through Blockchain technology which is a new approach to recording, sharing and verifying information.

These technologies can create a digital twin of a garment stored in the cloud that can give information on where and how it was created. For example, where it was produced and certifications the factory has; what processes and materials have been used to create the garment; any associated official documentation for the garment and potentially even point of sale information and future resale information. This helps consumers trace the origins of a garment and know many details about how it was made making the whole process much more transparent allowing the customer to have more knowledge about if the product was produced ethically and sustainably. As an example, wool suppliers working with Harris Tweed Hebrides are researching this technology so that every garment can be traced - farm to fashion.

Enforcing standards through certification of the supply chain and production processes could become much easier using product passports.

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The traceability of the systems allows for producers to be held accountable if there are violations of practices. This could help to alleviate many of the issues with workers' rights, conditions, and fair pay. There is also the opportunity for governments to legislate and act on indiscretions when encountered, and therefore the potential for certification companies to be active members to lobby governments into action on these conditions and promote positive change. There is an opportunity with reshoring or nearshoring for companies which is when companies move parts of the supply chain and production closer to territories where the products will be sold.

This has the benefit of better control of the supply chain, so they have better security for unforeseen circumstances such as issues related to Covid or transport, but more importantly to help with overproduction. By having more control over the supply chain there is an opportunity to only ramp up production as and when needed. With nearshoring the time to produce garments and ship them decreases which gives companies the chance to produce orders more quickly and frequently[36]. This could mean fewer volume orders are needed due to being able to produce and ship more quickly. With fewer garments produced at a time and only when needed, this can help to avoid overproduction, and reduce the amount of possible deadstock in the process.

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Other approaches to reducing deadstock and overproduction have been the utilisation of AI (Artificial Intelligence) to better predict orders. This combined with more automated production systems can help speed up production, creating on-demand systems where the hope is that clothing and garments get produced as needed according to the immediate demand for them. A system commonly known as MTO- Made to Order.

[36] Salerno-Garthwaite, A. 2021. Fashion's reshoring rush: Why now and for how long? Vogue Business. Available from: https://www.voguebusiness.com/companies/fashions-reshoring-rush-why-now-and-for-how-long

There are also new technologies such as automated sewing machines and robots that can produce items at greater speed. This can also facilitate quicker market tests by producing smaller orders and testing the market before ramping up production to full capacity. With automation, the usage of product passports could be further combined to better track the amounts of stock being created and where it is held. This could help companies make decisions to cease production if stock isn't selling or ramp up production if a particular item is selling well. This extra information can then be fed back into the on-demand systems to adjust as needed and to help reduce overproduction.


Poster created during SFES workshop by SFES participants

Employability skills/ opportunities

From the challenges, the fashion industry faces there are new opportunities to emerge to address the challenges which will require new skillsets for employees. New technologies such as product passports, AI and automation will require employees with a whole range of new skill sets that the industry has traditionally not had whilst ensuring the traditional skill sets are also still available.

Sewing and textile knowledge including understanding of garment construction and pattern making and familiarity with industrial sewing machines and equipment.
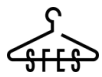
Skills in new technologies such as data science and analytics for cloud based systems but also basic math skills for measuring and cutting fabric.

Experience with textile design software or other design tools.

Understanding and knowledge of robotics related to the automation of production lines and monitoring of control systems - Process efficiency and Resource efficiency experts.

Good communication skills including time management and ability to meet deadlines and the ability to follow instructions and work in a team.

Knowledge of safety regulations and procedures.

Knowledge related to carbon emissions of different production processes - Carbon and Sustainability champions.

Knowledge of regulations related to garment production and sustainability values to track authenticity of garment claims in supply chain and production.

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APPENDIX 1
Workshop methods

The workshops used strategies such as digital and real time storytelling, transmedia narrative, social media creation and group working co-creative pedagogical strategies to engender intergenerational, interdisciplinary and intercultural exchanges.

These were used to identify and understand the sustainable activities and strategies that the visited businesses were implementing and crucially, the recognition and documentation of the employability skills underpinning it.

Source: SFES project

The workshops were also supported by a series of tasks set for the students on the project from October 2021 to February 2023 related to identifying sustainable fashion brands and examining their practices and strategies and creating outputs including, case studies, mood boards, posters and social media posts.


Source: SFES project


Source: SFES project

Workshop methods continued

The Skill hunting form, developed by the project team, is a powerful tool which every participant to each industry visit was required to complete. It required the participant/visitor to identify and describe each sustainable activity the business was implementing, its perceived impact in terms of sustainability, if it could be scaled or transferred to another area of the business and finally what skills underpinned that strategy or activity within the business.

These forms were subsequently used within the co-creative activities of the workshops to develop the final outputs. The workshops also served to determine the most creative means of disseminating these findings to the wider community of stakeholders identified in the introduction of this White Paper. Finally, the outputs from these visits and workshops have further been used in the creation of both this White Paper and the Toolkit.
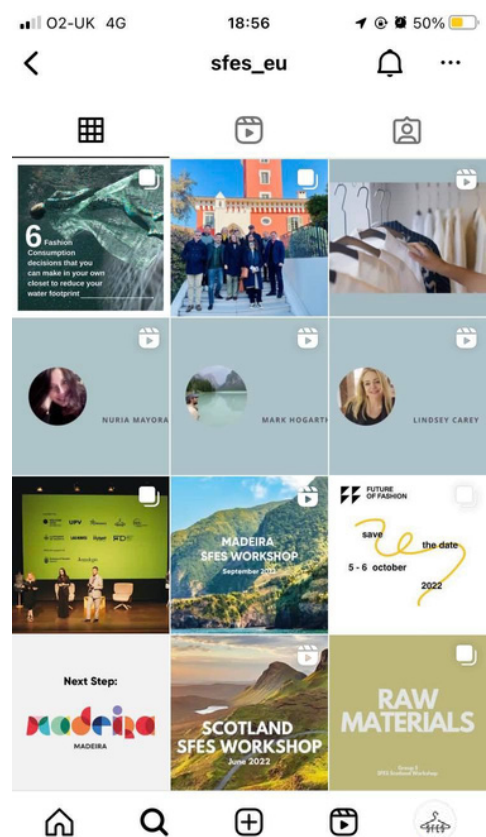
Samples of Social Media Dissemination:
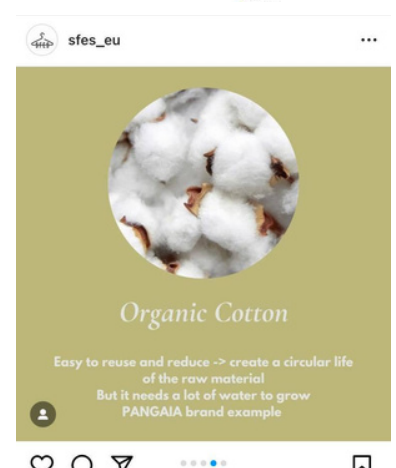
White Paper
Key Facts

1. This White Paper supports the dissemination of the results related to the employability skills required for a sustainable approach for businesses and entities operating in the fashion industry. It is one of the outputs from a 3 year co-funded Erasmus+ project led by Glasgow Caledonian University.

2. This White Paper is based on the analysis and results of an industry-wide survey, industry visits, expert interventions, and interactive workshops. Since 2020, more than 120 students, academics, industry partners, and key stakeholders from businesses and partner universities searched for and identified a range of employability skills that underpin the understanding, implementation, and communication of sustainability activities in the fashion context.

3. This White Paper focuses on describing the main skills required to address challenges and prospects related to reducing global carbon emissions from the fashion industry, to protecting biodiversity and to stemming the damage to the environment that is underway because of the exponential growth of the sector in the following 4 key areas: Design, Raw Materials, Supply Chain and Production.

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