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THE EVOLUTION OF SUSTAINABLE FASHION.

ABSTRACT

The fashion industry, a global industry, is driven by innovative architecture, design, and a desire for a symbolic lifestyle. Sustainable fashion design aims to create clothes with minimal environmental impact while maintaining style and quality. This study investigates the evolution of sustainability within the fashion sector, covering 1970-2023. The process of converting fiber into yarn, yarn into fabric, and fabric into garments has been influenced by historical examples of insufficient consideration for sustainable practices. However, the fashion and textile sectors have taken steps to provide sustainable solutions in their manufacturing processes due to growing global interest and consumer awareness. Strategies include fiber creation, garment fabrication, and supply chain management. Sustainable production methods can improve the environment, society, and economy, paving the way for a greener planet. This review presents information from relevant reviews and research articles on sustainable fashion and textile production. It examines current developments in eco-friendly textile and fashion manufacturing, highlighting the responsibilities of producers, retailers, and customers in developing sustainable fashion and textiles.

Keywords: sustainability; fashion design; zero-waste; recycling; design management, cradle-to-cradle, slow fashion, Circular economy

1. INTRODUCTION

| $\ \square$ Although the phrase "sustainable fashion" initially came into use in the 1990s, its origins |
|---|
| date considerably further back. |
| □ Clothing was manufactured in factories 11 during the Industrial Revolution in the 19th |
| century, which resulted in a sharp rise in output and waste. |
| $\ \square$ Although there were worries at the time regarding the fashion industry's influence on the |
| environment, sustainability did not become a prominent subject until the 20th century. |

| | ☐ In an increasingly worldwide economy, sustainability attempts to strike an equilibrium |
|--|--|
| | between the organic and artificial growth of human civilization. It has a significant influence |
| | on the evolution of all spheres of our existence. |
| | $\hfill\Box$ The fashion business is gradually expressing the acceptance of novel ideas and serving |
| | as an image of our contemporary culture. |
| | ☐ It is difficult to characterize fashion as "green," "eco-friendly," "sustainable," or "ethical." |
| | □ Whether a garment is composed of synthetic or natural materials begins to matter to |
| | average customers, particularly 2 if it is intended for undergarments. |
| | ☐ Many clothing businesses relocate their manufacturing facilities to developing nations |
| | where there are still gaps in environmental legislation and regulatory frameworks and a |
| | relative lack of understanding of ethical and environmental concerns. Some fashion labels, |
| | including Adidas, C&A, Inditex, and Benetton, have come under fire for building their |
| | supply networks in an unethical or unsustainable manner due to increased awareness of |
| | societal ideals about the harmonious growth of humans and the environment. Many |
| | fashion brands have been implementing "green" techniques in their production, marketing, |
| | and design processes recently. Brands like The North Face, New Balance, H&M, Muji, and |
| | Uniqlo are examples. |
| | ☐ There are always going to be obstacles and opportunities. Although 8 sustainable |
| | fashion design is growing quickly, there are still certain issues that need to be resolved. |
| | There are still discrepancies between sustainability and contemporary fashion practices, |
| | whether they be practical or ideological. 2 The creation of a sustainable fashion supply |
| | chain is still in its infancy and will have an impact on a variety of parties, including suppliers |
| | of raw materials, designers, manufacturers, retailers, and end users. The mistrust and |
| | even fear that consumers experience due to the safety and security issues associated with |
| | sustainable products also hinder the growth of the sustainable fashion sector. |
| | ☐ Sustainable fashion focuses on three main areas: design breakthroughs like zero-waste |
| | and recycling design, control over raw materials like using more organic and ecologically |
| | friendly textiles and materials, and fabric reuse. |
| | |

- The London College of Fashion, Tsinghua University Academy of Fine Arts, and Berlin's ESMOD International Fashion Design Institute are among the institutions offering courses on sustainable fashion. The world is becoming more aware of sustainable fashion concepts like "slow fashion", "regenerative design", and "zero-waste design". Practical and philosophical principles and design techniques related to sustainable fashion, such as "cradle to cradle," "functional design", "slow fashion", "zero waste", and "handcrafting", are receiving more attention and practice.
- 2. The 4 evolution of sustainable fashion design

PRE-INDUSTRIAL ERA

(1700S-1800S)

Clothes were manufactured by hand with materials that could be found locally during the pre-industrial period. This reduced the influence on the environment by allowing garments to be manufactured on a smaller scale. Furthermore, a lot of natural fabrics that were environmentally friendly and biodegradable, such as linen, cotton, and wool, were used. Furthermore, there was less waste because the clothes could be down from generation to generation.

INDUSTRIAL REVOLUTION

(1760-1840)

Production in large quantities and the invention of synthetic fibers like polyester and nylon began with the Industrial Revolution. This caused a change in production techniques that were quicker, less expensive, and more effective, which had a significant influence on waste.

5 THE EMERGENCE OF ENVIRONMENTAL AWARENESS

(1950S and 1970S)

The hippies, who favor handcrafted, locally grown, and pesticide-free goods, are credited with introducing sustainable fashion to modern culture. Hippies also wore vintage apparel as a protest against the mass manufacturing culture that took over America in the

1950s. □ A counterculture opposing societal standards including materialism, mass consumption, and capitalism was the hippie fashion movement. ☐ Environmental consciousness and 4 the environmental movement came into being in the 1960s and 1970s. 2 As a result, environmental groups that supported sustainability and planet preservation were founded, including Greenpeace and Friends of the Earth. Customer awareness of the effects of their purchases grows as a result, and they start to request ecologically friendly items ☐ When Rachel Carson released Silent Spring in 1962, the public began to take note of the environmental issues caused by the growth of the production forces. From that point until 1980, when the International Union for Conservation of Nature (IUCN) first proposed the idea of sustainable development, people lacked a defined objective for the preservation of the environment. The 1970s saw the rise of environmental consciousness in the fashion business, which was influenced by the energy crisis. American designer Victor Papanek noted that designers must be brave enough to shoulder social responsibility rather than pursue commercial interest (Papnek, 1971) in 12 his book Design for the Real World. Circular economy The concept 6 of the "circular economy," or "CE," first surfaced in the 1970s as a means of minimizing the amount of inputs used in industrial production. However, it may be applied to any resource. By employing 9 the natural cycle model to enhance human activity's resilience, CE suggests altering the "extraction-production-disposal" linear economy (LE) paradigm that is presently widely used in the industrial setting. Following the investigation on CE, significant stages in the development of this idea's history were identified: addressing trash from 1970 to 1990, at which time the industry's

first worries regarding the waste produced during industrial processes were addressed;

THE RISE OF SYNTHETIC FIBERS (1980S AND 1990S)

| Because of their affordability and longevity, synthetic fibers gained popularity in the 1980s |
|--|
| and 1990s. Fast fashion apparel became popular 2 as a result, with garments being |
| created rapidly and adding to waste. |
| ☐ To help farmers and producers on the margins of the economy better their livelihoods |
| and communities, the World Fair Trade Organization (WFT) was established. Fighting |
| poverty, injustice, 5 gender inequality, and climate change is another goal shared by the |
| global alliance of 401 groups. |
| □ Founded in the Netherlands, the Clean Clothes Campaign (CCC) is the biggest coalition |
| of its sort in the industry. The goal of the CCC is to empower all those employed in the |
| worldwide sportswear and fashion industries to better their communities and work |
| environments by promoting, defending, and exercising their human rights. |
| ☐ Sustainability has been emphasized by many different actors since the Brundtland report |
| (Brundtland, 1987). |
| □ 2 Slow Fashion is emerging as a more sustainable alternative to the Fast Fashion |
| industry although it is not yet officially recognized and established (Meadows, 1991). |
| □ 10 Leverage Points are places within the system that can be utilized to generate system |
| change in a strategic way (Meadows, 1999). As 2 the Slow Fashion movement is a |
| complex system that is intrinsically connected to our society and the ecosphere, this |
| concept acts as an organizing factor to the research and a lens to look through to help |
| identify areas of potential power for system change. It identifies areas the Slow Fashion |
| movement acts upon to contribute towards a sustainable society and those that 7 have |
| yet to be utilized. |
| □ Examples include green design (Mackenzie, 1991) the concept incorporates creative |
| reuse, repair, and refurbishment 2 as well as sustainable making, crafting, personalizing, |
| and (re)manufacturing products without recycling. |
| $\hfill\square$ Between 1990 and 2010, there was a link between input and output approaches for eco- |
| efficiency, as demonstrated by the creation of waste output metrics and waste-reducing |
| strategies (circular economy). |

4 THE BIRTH OF SUSTAINABLE FASHION

(2000S-2010S)

| • As people grew more aware of their influence on the environment, sustainable fashion |
|---|
| emerged in the early 2000s. Businesses started implementing sustainable practices as 6 |
| the idea of fashion that is environmentally friendly gained traction. |
| □ Recycled fabrics were used by companies like H&M and Patagonia, while 3 designers |
| like Stella McCartney concentrated on making fashionable yet ecologically conscious |
| clothing. Social media's ascent contributed to the dissemination 2 of the sustainability |
| message and raised consumer awareness of the consequences of their wardrobe |
| decisions. As companies realized how important it was, they started integrating sustainable |
| practices into their manufacturing procedures. This covers 2 the utilization of organic |
| cotton, the addition of recycled components, and the implementation of eco-friendly |
| production techniques. |
| □ Investment, that brought many corporations in the developed world to relocate pollution- |
| intensive production from countries with strict regulations to others where these are less |
| rigid (Clark,2000). |
| ☐ The creation of the Global Organic Textile Standards (GOTS) to provide end users with |
| high-quality, secure, and sustainable organic fabric, the standard was developed as an |
| internationally recognized textile processing standard for organic fibers (2002). |
| □ Cradle to Cradle |
| $\ \square$ In 2002, the book Cradle to Cradle: Remaking the Way We Make Things was published |
| (McDonough & Braungart 2002). |
| □ The Cradle to Cradle philosophy aims to shift our focus from "doing less harm" to "doing |
| better. |
| ☐ 1 These findings underline the importance of integrating C2C principles into conceptual |
| product design and call for further research to address the limitations of the theory and |
| optimize its application in sustainable design |

| □ According to the principles of Cradle to Cradle (C2C) theory, products should be |
|---|
| designed in a way that they can be recycled sustainably and be health-friendly to humans. |
| Sustainable design using raw materials from nature is exemplified in Indonesia, where |
| designers have utilized pineapple leaf fiber as a fashion material. Similarly, the concept |
| product design discussed here utilizes maize seeds, a common plant from nature. |
| □ Qualitative and quantitative experiments were implemented to ascertain the viability of |
| the concept product by scrutinizing the absorption properties of hollow corn seeds. As |
| evidenced by our experiments, the capacity of hollow corn seeds to assimilate disparate |
| types and concentrations of solutions intimates that these seeds can be exploited as a |
| natural and renewable resource that can be utilized for a diverse range of applications. For |
| instance, the absorption properties of hollow maize seeds could be employed to fashion |
| novel food products or constituents with specific functional properties, such as |
| augmentation of texture or improved nutrient assimilation. |
| ☐ The reason 2 of slow fashion hypothesis can help us find a solution is because of the |
| low price and fierce competition that make it difficult to sell even conventional cotton, which |
| reduces demand and slows <mark>the growth of</mark> organic cotton output. |
| □ Slow Fashion |
| ☐ The slow fashion theory recognized the necessity 5 for a more measured pace in the |
| balance of fashion. It necessitates a blend of long-lasting, captivating, high-quality items, |
| as well as inventive modification and symbolic fashion expression(Fletcher,2007) |
| The term Slow Fashion was coined in 2007 by Dr. Kate Fletcher, who compared the |
| eco/sustainable/ethical fashion industry to the Slow Food movement, highlighting the |
| similarity in terms of processes and production (Fletcher, 2007). |
| □ Leverage Points were based on research conducted by Dr. Kate Fletcher in the |
| publication: "Sustainable 2 Fashion and Textile: Design Journeys" and from the |
| "Lifetimes" project. |
| □ All respondents were interested in sourcing more sustainable 1 materials in the future |
| but, apart from the cost factor, other barriers could take time to be overcome. |

| □ For instance, bamboo requires less area to produce an equivalent amount of, say, cotton |
|---|
| and is a quickly renewable crop that can thrive in 2 a range of climates. |
| □ Courses on sustainable fashion are generally lacking in the education of the next |
| generation of designers, while many UK colleges have lately introduced new, focused |
| programs on this subject. |
| ☐ In addition, Sung's publication output has increased significantly since 2008 in a variety |
| of fields, including engineering and technology, design, business, science, literature, and |
| lifestyles. These fields include fashion and textiles, plastic recycling, construction, organic |
| waste treatment, automotive, electronics, and interior design. |
| ☐ It should come as no surprise that the literature on 2 fashion and textiles concentrates |
| on textile waste and attempts to "refashion," "resurface," or transform it into a more |
| valuable new product. |
| □ Nevertheless, even this material and others still have some processing-related |
| environmental effects, so even 13 if they were widely accessible and reasonably priced, |
| they wouldn't be sustainable. If processing technology advances quickly, 7 some of these |
| negative effects on the environment may be mitigated. Another example is hemp: US |
| hemp growing is still restricted by laws, and processing technology is still being developed. |
| These obstacles must be removed, but Slow Fashion participants frequently are unable to |
| do so because of issues with new suppliers and the scarcity of sustainable fiber options |
| that also affect the wider fashion business. |
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| The growth of sustainable fashion |
| (2010S-2021S) |
| □ Customers who are more aware of their influence on the environment have contributed |
| to the growth in popularity of sustainable fashion over the past ten years. 3 As a result, |

novel and inventive materials have been developed, such as Tencel, a sustainable substitute for synthetic fibers. Additionally, customers now have better access to sustainable clothes because of the growth of second-hand clothing and the circular economy. Additionally, brands are beginning to take sustainability more seriously, with many pledging to lessen their environmental effect and promote eco-friendly behaviors. Such lifetime extension of products, components, or materials 1 is one of the important options for material efficiency (Allwood, 2012). Material efficiency refers to lowering the quantity of fresh materials required for a given level of output or service. This improves an economy's resource efficiency, lowers the energy required 2 for the production of products and services, and eventually lowers greenhouse gas (GHG) emissions. ☐ Refashioned clothes, remade furniture, soaps, and fertilizers (and energy) from organic waste, artistic objects from scrap metal, and even a whole building from reused components from deconstruction. The creation of jewelry, bags, clothes, and other fashion items by upcycling, in particular, has been called 'traction' (Bramston & Maycroft, 2013). ☐ Although scalability has not yet been demonstrated, upcycling in fashion, or "trashion," may be 2 one of the effective instances (for pros as well as amateurs). ☐ The surge in upcycling publications identified a need to look at household upcycling behavior 13 as well as a disconnect between public interest (crafts, hobbies, home DIY for housewares, furniture, jewelry, and accessories) and academic study (fashion, textiles, plastic recycling). ☐ Academic journals have not focused enough on topics of popular interest, such as upcycling crafts, hobbies, and do-it-yourself home projects for housewares, furniture, jewelry, and accessories, aside from fashion and textiles and plastic recycling. 14 Circular economy In the era of resource depletion, which is characterized by worsening global impacts and strong demand for raw resources, optimizing value retention in 2010 and beyond, □ Designing for a circular economy is complex. Gone are the days of 'sustainable' or 'eco'

design, when a simple change of material to a recycled alternative would give a project environmental credibility. Now, to understand all the facets of the problem, we need to talk to each of the stakeholders involved in the lifecycle of a particular product (RSA, 2016)

The evolution to the present day (2021S-present)

The sustainable fashion trend has been developing over the past few years. More people are using biodegradable materials like hemp and bamboo, while new technologies like 3D printing have made it feasible to make clothing more effective. With the growing popularity of the circular economy, which emphasizes reusing resources as much as possible, businesses are now searching for methods to increase the lifespan of their products.

Customers are looking for apparel that is ethical and ecologically friendly, and sustainable fashion is more popular than ever now. Since the Industrial Revolution and the use of new materials and procedures, the industry has advanced significantly.

CONCLUSION

In conclusion, during the past few decades, fashion design has seen a major evolution in sustainability.

The fashion sector is starting to take action to lessen its environmental effects as it recognizes the value of sustainable practices. Eco-friendly materials, moral manufacturing practices, and circular economy models are all being explored by designers. Additionally, customers are becoming more conscious of sustainable fashion and are putting pressure on companies to be transparent. Still, there is a long way to go until the fashion business is completely sustainable. To create a more sustainable future, producers, consumers, and designers must keep cooperating. The fashion sector may improve the economy, society, and environment by adopting sustainable methods.

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