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Climate Change and Sustainable Fashion Industry

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ABSTRACT

The paper discusses the practicality of fashion's present interest in environmental issues in the context of an examination of the industry's unquestionably major aspect, its relationship to sustainability. This paper aims to elaborate on the need for ethical thought to guide aesthetic needs without sacrificing current trends or the love of glamour, style, or couture. The paper will conclude with a reevaluation and possible resolution, grounded in the performative nature of fashion, to the query of whether sustainable fashion can be seen as an existing, feasible, and maybe successful means of addressing modern environmental issues.

With the proliferation of cheap fashion and throwaway culture, textiles compete with plastics as the top contributor to our landfills. Can a partnership between the government, textile industry and consumers be achieved to take concrete and urgent measures towards creating a circular economy. India has put in place a number of legislative initiatives to safeguard the environment. The most well-known of them is the Water (Prevention and Control of Pollution) Act, 1974, which sets fines for violating regulations on the release of pollutants into water bodies. In order to encourage sustainable practices in the textile sector, the Indian government has also put in place a number of laws and programs. One such project is the Sustainable Textiles of India program, which attempts to encourage the production and consumption of textiles in a sustainable manner.

Keywords: *Sustainable fashion, climate change, Regulatory initiatives, ethical sourcing, Consumer awareness, innovation and technology.*

I. INTRODUCTION

There has never been a more noticeable focus on environmental issues and climate change among high-profile design firms. For clothes, designers and fashion firms are experimenting with alternative fabrics like Pinatex, which is made from leftover pineapple skins, banana fibre, jute, and bamboo. Fashion giants like Burberry, Gap, Levi's, and H&M are pledging to cut greenhouse gas emissions by 30% by 2030, and they are marketing their runways as being "carbon neutral." 2018 saw the release of the Fashion sector Charter for Climate Action and the

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United Nations Framework Convention on Climate Change (UNFCCC). By 2030, greenhouse gas emissions are to be reduced by 30%, and by 2050, net-zero emissions are to be reached. India is a centre for³ shopping and industry, and is a prime example of the externalities associated with depleting finite resources more quickly than they can be replenished. The industrial model of fashion has to incorporate biocentric and socio-ecological concepts, given the growing threat to the planet's safe operating zone. With billions of dollars in annual income, the fashion business is a major sector that is vital to the world economy. Nonetheless, the business is also well-known for its major negative effects on society and the environment, including worker exploitation, greenhouse gas emissions, and water pollution. The goal of sustainable fashion is to reduce the harmful effects of the fashion industry while advancing environmental, social, and economic sustainability. After the automotive and technology sectors, the fashion industry is the third largest in the world. It has a significant effect on the environment as well as the economy. The fashion sector in India is interwoven within the retail supply chain, notwithstanding its diversity. It involves producers of yarn, fabrics, dyeing and processing facilities, clothing manufacturing facilities, and suppliers of trimmings and accessories. Fabrics are imported as well as made in India. The garment manufacturing operations serve both the domestic fashion sector and the worldwide supply chain. Pre-consumer fabric waste may be turned into yarns by fabric recycling facilities.

II. CLIMATE CHANGE, SUSTAINABILITY, AND BUSINESS

The unfavourable result of unsustainable human activity that modifies natural surroundings is climate change. Ecological imbalance and social inequality are results of the post-industrial revolution, technological disruption, and automation. Business and climate change are therefore linked. The physical threats posed by climate change put the current business structures, supply chains, and decision-making processes under pressure. The socioeconomic circumstances of disadvantaged people are likewise impacted. In such an environment, adopting sustainable business strategies and practices is crucial for the benefit of people, the environment, and profit as a whole. Conventional business models took into account a restricted number of stakeholders and a linear value exchange among them. On the other hand, sustainable business models aim to create sustainable value while addressing the direct and dual engagement of stakeholders, particularly consumers. A business plan that incorporates sustainability guarantees the use of less energy and places an emphasis on repair and reuse as opposed to dumping and discarding.

³ Amira Mukendi, Iain Davies, et.al., "Sustainable Fashion: Current and Future Research Directions" 54 *European Journal of Marketing* 2873-2909 (27 February 2020).

Additionally, businesses work as agents to achieve sustainable growth.

Sustainable Fashion

The term "sustainable" gained popularity in the fashion industry following the 1992 Rio Earth Summit. Companies began searching for strategies to lessen the harm they caused to both the environment and humankind. Sustainability is the foundation of Sustainable Fashion, which embraces it at any or all phases of its lifespan to lessen its negative impacts on the environment and biodiversity while upholding social responsibility. The term "sustainable fashion" sounds contradictory since, although fashion is characterised by short product life cycles and seasonal updates, sustainability is associated with extended product lifespans. The slow fashion movement includes Sustainable Fashion, and eco-, green-, and ethical-fashion are sometimes used interchangeably. Sustainable clothing has very little negative impact on the environment and⁴ society across the whole lifespan of the product, including manufacture, use, disposal, and deterioration.

III. ROLE OF FASHION IN SUSTAINABILITY

Fashion refers to the newest and most fashionable styles of attire, hairstyles, décor, and behaviour that are specific to a certain time, location, and situation. It is a means of developing the embodied identity culturally and expressing oneself. Fashion, which is mostly driven by societal expectations, frequently modifies social structures, vogue, aesthetic standards, and the entirety of human expression. As a result, it is a product that was created in response to societal expectations and has a big impact on society, particularly the upper class and women. Clothing, accessories, jewellery, and shoes are all considered parts of fashion. But the sole topic of discussion in this article is clothing and textiles. The business must keep up with the ever expanding worldwide demand from customers seeking new experiences in their life. The fashion industry has a huge global workforce and has a big social and economic influence. It is criticised, meanwhile, for having a detrimental impact on social justice and the environment. The term "fast fashion"⁵ describes the process of creating in-demand designs rapidly and inexpensively. The system's material throughput has grown, resulting in an abundance of affordable clothing. Cheap clothing does not last long and is thrown away more quickly, which exacerbates the waste issue. Fashion can help achieve the SDGs by lowering energy consumption, improving and limiting the use of water and natural resources, decreasing the

⁴ Laura T. Di Summa, "Climate Change and Fashion: At the Intersection of Ethics and Aesthetics" *Handbook of the Philosophy of Climate Change* 525–537 (25 November 2023).

⁵ Kirsi Niinimäki, "Ethical Foundations in Sustainable Fashion" *1 Textiles and Clothing Sustainability* (20 April 2015).

amount of waste that ends up in landfills, and using fewer harmful chemicals by implementing sustainable operations and fair trade standards.⁶ A complete departure from the quick fashion model and the adoption of a more circular model are ultimately necessary to reduce the negative effects of the fashion industry. Many people view fashion as a luxury, with upscale firms bringing in the newest styles. The majority of consumers think that sustainability should not come before luxury. Thus, fashion consumerism and purchasing habits play a significant role in promoting sustainability, especially in the clothing sector.

Use Of Eco-Friendly Processes

Organic cotton, industrial hemp, and bamboo are examples of environmentally friendly materials and fibres that are grown without the use of harmful chemicals or pesticides, which reduces pollution in the air and water. These materials can also be manufactured using environmentally friendly methods, like conserving water and using renewable energy sources, which further reduces carbon emissions from the fashion industry.

In India, hemp has been used traditionally for hundreds of years. Its roots are in Ayurveda,⁷ a holistic medicinal system that emphasises herbal medicines and healthy lifestyle choices to promote health and avoid disease. Originating around 3,000 years ago, Ayurveda describes in detail the many sections of the hemp plant for a range of medicinal uses. In fact, it is listed as one of the five most holy plants in the Vedas, which are thought to be at least 3400 years old. In the past, hemp was used in India to manufacture nutritious meals, herbal remedies, and textile fibre. A very sustainable fabric choice, hemp has become more and more well-liked in recent years because of all the advantages it provides to customers and the environment. Hemp plants are ecologically benign as they are naturally resistant to pests and do not require the use of pesticides or herbicides. Furthermore, hemp may be cultivated without irrigation and uses less water than other crops. A vast variety of garments and textile goods may be made from the robust fibre that the hemp plant produces. Furthermore, hemp is biodegradable, meaning that it will readily decompose in the environment without harming anything. The textile sector can purchase premium carbon credits produced by nature-based initiatives such as natural farming, agroforestry, sustainable agriculture, etc. to offset the remaining carbon emissions. The fashion sector can reduce its carbon footprint and build a more sustainable future by embracing sustainable fashion. Sustainable fashion offers a solution to many of the environmental and

⁶ Claudia E. Henninger, Panayiota J. Alevizou, et.al., "What is Sustainable Fashion?" 20 *Journal of Fashion Marketing and Management* 400-416 (3 October 2016).

⁷ Maxwell Boykoff, Patrick Chandler, et.al., "Examining Climate Change and Sustainable/Fast Fashion in the 21st Century: 'Trash the Runway'" 1 *Oxford Open Climate Change* 43-53 (4 March 2021).

social issues that the fashion industry faces by lowering energy and water consumption, decreasing waste, employing eco-friendly fibres and materials, minimising carbon emissions throughout various processes, and promoting circularity.

What effect does rapid fashion have on the environment?

Climate change is caused by greenhouse gas emissions from the production of clothing, which also consumes a lot of natural resources. According to the UN, the fashion sector is accountable for 8–10% of worldwide emissions, which is greater than the total emissions from shipping and aviation. Additionally, the World Bank projects that by 2030, global apparel sales might rise by as much as 65%. The majority of the environmental effect of fashion is caused by the usage of raw materials: the production of cotton for the fashion industry utilises around 2.5% of global cropland, and the production of synthetic materials like polyester uses an estimated 342 million barrels of oil annually. Chemicals used in clothing manufacture procedures like dyeing demand 43 million tons annually. Additionally, the industry utilises a lot of water.

How much water does it take to make a piece of cloth:⁸

To make a T-shirt it takes close to 2,700 litres of water, which is 5400 bottles of water. To make a pair of jeans 10,000 litres of water is required which is close to 20,000 bottles of water and to make a pair of socks 600 litres of water is required which is 1,200 bottles of water.

How does fashion impact the climate?

The fashion sector is responsible for over 2.1 billion tons of greenhouse gas emissions annually, or 4% of all emissions worldwide, according to Fashion on Climate. This startling amount is equivalent to the yearly greenhouse gas emissions of Germany, France, and the United Kingdom all together. These projections are based on data from 2018, although further growth in the sector is anticipated. This implies that emissions are expected to increase to 2.7 billion tons annually by 2030 if our efforts to lessen the impact of fashion are not further intensified during the next ten years.

Clothing has a massive carbon footprint across the whole product life cycle and supply chain, but upstream activities like raw material manufacturing and processing account for 70% of fashion's emissions. Still, the majority of well-known businesses do not perform even the most basic due diligence on environmental issues at the locations of their suppliers.⁹ The steps that

⁸ Sarah Bly, Wencke Gwozdz, et.al., "Exit from the High Street: An Exploratory Study of Sustainable Fashion Consumption Pioneers" 39 *International Journal of Consumer Studies* 125-135 (15 January 2015).

⁹ Sandra Roos, Gustav Sandin, et.al., "Will Clothing Be Sustainable? Clarifying Sustainable Fashion" 19 *Textiles and Clothing Sustainability* 1–45 (21 August 2016).

include the largest carbon emissions are typically fibre production, yarn preparation, and dyeing and finishing. Fashion brands frequently underestimate the importance of these processes, mostly considering solely the emissions resulting from their own activities, such as shipping and retail.

In addition to carbon emissions, fashion has an influence on water, chemicals, deforestation, textile waste, microplastics, and other factors. The biggest brands and retailers in the world talk a lot about their sustainability initiatives, yet there is still a lack of openness on their activities and results across important environmental parameters, as our 2021 Fashion openness Index revealed. We cannot hold brands responsible for their climate objectives if they do not measure and share their data across their businesses. When it comes to the environmental effects of the supply chain and the fallout from unsustainable production and consumption, the fashion industry as a whole has to be more audacious and open about the extent of the global climate crisis. If brands don't collect and publish their data to help the public and other stakeholders better understand what work is being done and where more work is required, they won't be able to show that their environmental effects are being reduced. Social justice and climate justice are related as people all over the world will continue to suffer greatly from the socioeconomic effects of climate change. We think that protecting the rights of the environment and people must go hand in hand. For the fashion industry, this involves drastically altering the popular narrative that emphasises overconsumption and overproduction, as well as the economic model that relies on waste, exploitation, and extraction.

Science is something we are familiar with. The answers are with us. The moment to act on climate change is now. We cannot keep depleting the natural world's resources, polluting our land and oceans, failing to meet our climate change commitments, and placing our garbage on the backs of nations whose cultures we have destroyed. Furthermore, we cannot keep letting large corporations make money while supply chain employees fight for a dignified life. It is time for us to band together as global citizens, fashion enthusiasts, and buyers in order to slow down the fashion industry and give true sustainability a higher priority for future generations.¹⁰

The Impact of Climate Change on the Indian Apparel Market The Indian clothing market is seriously threatened by climate change. One of the world's most polluting businesses, the garment sector also depends heavily on natural resources. The garment industry's supply chain is being disrupted by climate change, which is also having an effect on customer demand.

¹⁰ Lisa McNeill and Rebecca Moore, "Sustainable Fashion Consumption and the Fast Fashion Conundrum: Fashionable Consumers and Attitudes to Sustainability in Clothing Choice" 39 *International Journal of Consumer Studies* 212-222 (21 February 2015).

Impact on the supply chain

The fashion industry's supply chain is being impacted by climate change in a number of ways. For instance, more extreme weather events like floods and droughts are occurring as a result of climate change. Crops like cotton, a vital raw material for the clothing industry, may be harmed by this.¹¹ Rising sea levels brought on by climate change also pose a hazard to coastal infrastructure and enterprises.

Opportunities for the Indian apparel market

Climate change presents possibilities as well as difficulties for the Indian garment business. For instance, Indian clothing businesses have a chance to create and promote sustainable items because of the increasing demand for eco-friendly clothing. Furthermore, the garment sector in India has the potential to become a pioneer in the manufacture of sustainable clothes by capitalising on its sizable workforce and inexpensive labour. Using recycled materials and conserving water are two examples of the more sustainable practices that the textile sector has to use.

1. Investing in renewable energy: To lessen its need on fossil fuels, the garment sector must make investments in renewable energy.
2. Investing in Research and development: In order to create new sustainable technologies and materials, the garment sector must make R&D investments.
3. The Indian clothing sector may become more sustainable and less vulnerable to the effects of climate change by implementing these measures.

IV. SUSTAINABLE FASHION IN INDIA: A PATH TOWARDS ETHICAL AND ECO-FRIENDLY PRACTICES

The goal of sustainable fashion is to reduce the harmful effects of the fashion industry while advancing environmental, social, and economic sustainability. In the following section, we will examine the state of sustainable fashion in India, one of the top producers of textiles in the world, as well as the obstacles, opportunities, and fixes for the sector.

India, renowned for its rich textile heritage and vibrant fashion culture, stands as the second-largest producer of textiles globally. However, the glitz and glamour of the fashion industry often overshadow the harsh realities it conceals - environmental degradation and labour exploitation. The traditional practices of the Indian textile industry, coupled with modern

¹¹ Kathryn Reiley and Marilyn DeLong, "A Consumer Vision for Sustainable Fashion Practice" 3 *The Journal of Design, Creative Process & the Fashion Industry* 63-83 (27 Apr 2015).

demands,¹² have resulted in significant challenges. Yet, amidst these challenges lies an opportunity for transformation towards sustainable fashion practices. This article delves into the sustainable fashion landscape in India, exploring its challenges, implemented solutions, entrepreneurial opportunities, and the implications of private-public partnerships.

V. CHALLENGES

The Indian textile industry grapples with multifaceted challenges, ranging from water pollution to exploitative labour practices. The textile industry is notorious for its water-intensive nature, accounting for 17-20% of industrial water pollution in India. Chemical use exacerbates environmental concerns, with the textile industry being the third-largest water polluter, while also contributing to health hazards. Waste management remains a pressing issue, with India generating approximately 16 million tons of textile waste annually. Exploitative labour practices persist, with an alarming number of child labourers, estimated at 10-12 million, engaged in the textile industry. Transparency issues plague supply chains, hindering efforts to address environmental and social issues. Furthermore, low consumer awareness, limited availability of sustainable materials, high production costs, lack of government support, and the prevalence of fast fashion culture pose significant hurdles to sustainability efforts in the Indian fashion industry.¹³

Solutions Implemented by the Country

Despite challenges, India has taken commendable strides towards sustainable fashion. The adoption of sustainable materials, recycling, and upcycling initiatives, promotion of handloom and handicrafts, ethical labour practices, utilisation of natural dyes, circular fashion endeavours, awareness campaigns, collaboration with artisans, sustainable packaging, and government initiatives like Sustainable Fashion and Indian Textiles (SUIT) and Handloom and Handicrafts Development Programme, are notable examples. These solutions aim to address environmental, social, and economic concerns, fostering a more responsible fashion ecosystem in India.

Opportunities for Entrepreneurs

Entrepreneurs in India are presented with a myriad of opportunities to innovate and contribute to sustainable fashion. From leveraging innovative sustainable materials and circular fashion business models to establishing ethical fashion marketplaces and promoting zero-waste

¹² Karen Ka-Leung Moon, Charlotte Sze-Yeung Lai, et.al., "Popularization of Sustainable Fashion: Barriers and Solutions" 106 *The Journal of the Textile Institute* 939-952 (5 September 2014).

¹³ Maarit Aakko and Ritva Koskennurmi-Sivonen, "Designing Sustainable Fashion: Possibilities and Challenges" 17 *Research Journal of Textile and Apparel* 13-22 (1 February 2013).

practices, the possibilities are vast. Opportunities also exist in local sourcing and production, green packaging solutions, sustainable supply chain management, upcycling, customization, and sustainable fashion education. These opportunities not only address environmental and social issues but also offer economic prospects for entrepreneurs in the burgeoning sustainable fashion sector.¹⁴

Outcome of Implemented Solutions

The implementation of sustainable fashion solutions in India has yielded positive outcomes across environmental, social, and economic dimensions. Notable outcomes include reductions in carbon emissions, preservation of natural resources, promotion of ethical labour practices, increases in responsible consumption, growth of circular economies, diversity, and inclusion promotion, improvements in supply chain transparency, creation of innovative business models, adoption of green packaging, and the development of sustainable fashion education. These outcomes underscore the transformative potential of sustainable fashion initiatives in India.¹⁵

Implications of Private-Public Partnerships, Alliances, and Collaborations Private-public partnerships, alliances, and collaborations play a pivotal role in advancing sustainable fashion in India. These collaborations facilitate improved access to resources, increased funding, shared expertise, improved policy frameworks, increased consumer awareness, and collective action towards sustainability goals. Noteworthy initiatives such as the Sustainable Apparel Coalition, Green Good Deeds campaign, Sustainable Fashion Forum, SAATAT initiative, and Better Cotton Initiative exemplify the power of collaborative efforts in driving sustainable fashion forward.

The journey towards sustainable fashion in India is characterised by challenges, solutions, opportunities, and collaborative endeavours. While challenges persist, the proactive implementation of solutions and the exploration of entrepreneurial opportunities signal a promising future for sustainable fashion. Private-public partnerships, alliances, and collaborations are instrumental in fostering collective action and driving positive change. As stakeholders unite in their commitment to sustainability, India's fashion industry can embark on a transformative journey towards ethical and eco-friendly practices, contributing to a more sustainable future for all. This article issues a call to action for all stakeholders in the fashion

¹⁴ Louise Lundblad and Iain A. Davies, "The Values and Motivations Behind Sustainable Fashion Consumption" 15 *Journal of Consumer Behaviour* 149-162 (11 November 2015).

¹⁵ Catharine Weiss, Anne Trevenen, et.al., "The Branding of Sustainable Fashion" 1 *Fashion, Style & Popular Culture* 231 - 258 (01 Mar 2014).

industry to collaborate and work towards a more sustainable and ethical fashion ecosystem in India. By leveraging innovative solutions, fostering entrepreneurship, and fostering private-public partnerships, the fashion industry can drive positive change and create a more sustainable future. Together, let us embrace the challenges, seize the opportunities, and embark on a collective journey towards a brighter, more sustainable tomorrow for India's fashion industry.

VI. GLOBAL SUSTAINABLE FASHION MARKET ANALYSIS

The size of the global sustainable fashion market was estimated at US\$ 7.80 billion in 2023 and is projected to increase at a compound annual growth rate (CAGR) of 22.9% from 2023 to 2030, when it is predicted to reach US\$ 33.05 billion.

Sustainable fashion is defined as apparel, jewellery, accessories, and shoes made in an ethical and ecologically responsible way.¹⁶ By implementing strategies such as resource efficiency, waste reduction, and the use of organic or recycled materials, it encourages equitable pay, secure working conditions, and a smaller environmental effect. The market is driven by government rules, incentives for eco-friendly products, and growing consumer awareness of sustainability.

The product type, fabric type, end user, and sales channel are the divisions used to segment the worldwide market for sustainable fashion. The market is divided into segments based on product types, including bags, jewellery, accessories, footwear, and clothing. In 2022, the segment with the biggest share was clothing. The market for eco-friendly clothes is expanding due to consumer demand for sustainable fashion, such as t-shirts, skirts and pants made of organic cotton, recycled polyester and regenerated materials.¹⁷

Regional Perceptions of the Sustainable Fashion Market:

- With more than 35.6% of the global market share in 2023, North America is anticipated to be the largest market for sustainable fashion worldwide throughout the projected period. High spending power, laws supporting sustainability, and growing consumer awareness of eco-friendly fashion are all factors contributing to the market's expansion in North America.
- With more than 25.8% of the worldwide market share for sustainable fashion in 2023, the European market is predicted to be the second-largest in the world. The European

¹⁶ Michael Patrick Stuart, "Sustainability in Style: The Legal Landscape Shaping the Fashion Industry's Future" 31 *International and Comparative Law Review* (March 7, 2023).

¹⁷ Asimananda Khandual and Swikruti Pradhan, "Fashion Brands and Consumers Approach Towards Sustainable Fashion" 1 *Fast Fashion, Fashion Brands and Sustainable Consumption* 37–54 (22 June 2018).

Union's strict sustainability standards and the growing demand for high-end sustainable fashion labels are credited for the market's expansion in Europe.

- With a CAGR of more than 16.5% over the course of the forecast period, the Asia Pacific market is anticipated to grow at the quickest rate in the worldwide sustainable fashion industry. The Asia Pacific market is expanding as a result of both the region's rapid economic growth and rising consumer awareness.

Drivers of the Global Sustainable Fashion Market:

- **Growing customer demand and awareness for environmentally friendly products:** The worldwide sustainable fashion market is mostly driven by the increased demand for apparel made ethically and environmentally conscious. Customers are increasingly searching for brands that integrate sustainability throughout their value chain and products with a smaller carbon impact, particularly millennials and Gen Z. Customers are now more equipped to make educated decisions because of social media and technology, which have increased transparency into supply chains and manufacturing processes. Product sales on the market for products created from organic, regenerated, and recycled fibres have increased. Additionally, buyers are choosing packaging that is less harmful to the environment and endorsing companies that practise circular fashion.¹⁸
- **Positive laws and regulations:** To encourage environmental sustainability in the fashion sector, governments everywhere are enacting laws and regulations. By promoting circularity, the European Union's Strategy for Sustainable Textiles seeks to increase the industry's innovation and competitiveness. Marketers can make more convincing eco-friendly claims by using the U.S. Federal Trade Commission's Green Guides. The UN Alliance for Sustainable Fashion's principles take into account sustainability across the whole fashion cycle. Regulations of this kind are pushing brands to incorporate eco-design, resource efficiency, waste minimization, and disclosure into their sustainability strategies. Legislation requiring the use of organic cotton, recycled plastic, and other materials is also encouraging the use of sustainable products. For example, the India Textiles and Apparel Report, published in 2021 by the policy think tank NITI Aayog, outlined a plan for moving the sector towards

¹⁸ Hyun Min Kong, Eunju Ko, et.al., "Understanding Fashion Consumers' Attitude and Behavioral Intention Toward Sustainable Fashion Products: Focus on Sustainable Knowledge Sources and Knowledge Types" 7 *Journal of Global Fashion Marketing* 103-119 (10 Mar 2016).

sustainability by 2030. It emphasises things like using more organic cotton, emitting no dangerous chemicals into the environment, and recycling at a rate of 100 percent.

- **Leading fashion manufacturers' commitments and the rise of new competitors:** Big fashion brands like Inditex, Adidas, Nike, and H&M are stepping up their efforts to sustainability. They are bringing novelties like plant leather and re-commerce, creating new product lines composed of recycled nylon, polyester, and organic cotton, and making significant investments in circular capabilities. Upstarts like Allbirds, Everlane, Reformation, Christy Dawn, and others are creating sustainable business strategies from the ground up. In order to develop into eco-friendly kidswear,¹⁹ Gap acquired Janie and Jack, which is another transaction that the market is witnessing. The growing adoption of sustainable fashion by both big and small businesses is encouraging for the market's expansion.²⁰

Opportunities in the Global Sustainable Fashion Market:

- **Growth in emerging and developing economies:** For sustainable fashion firms, growing nations like China, India, Brazil, and the ASEAN region offer enormous potential. Increasing spending on clothing and footwear is a result of factors such as expanding populations, fast urbanisation, rising disposable incomes, and exposure to international fashion trends. A potential target market for eco-friendly items is the growing number of middle-class and upper-class consumers who are ethically and environmentally aware. It is possible for players to target the mass market with reasonably priced, eco-friendly apparel lines. Digital platforms also present chances to inform and sway consumers' judgements about what to buy in these markets. For example, India has pledged to get 50% of its energy from non-fossil fuel sources by 2030, according to a 2021 study by the International Renewable Energy Agency.
- **Collaboration and partnerships throughout the value chain:** Fashion businesses have a lot of chances to work with manufacturers, suppliers, technology firms, and logistics providers to improve sustainability all throughout the ecosystem. Collaborating with entrepreneurs in regenerative agriculture enables the procurement of environmentally sustainable raw materials. Collaborations with green chemical companies make it easier to obtain recycled and bio-based components. Transparency

¹⁹ Lisa Heinze, "Fashion with Heart: Sustainable Fashion Entrepreneurs, Emotional Labour and Implications for a Sustainable Fashion System" 28 *Sustainable Development* 1554-1563 (29 July 2020).

²⁰ Eunsuk Hur and Tom Cassidy, "Perceptions and Attitudes Towards Sustainable Fashion Design: Challenges and Opportunities for Implementing Sustainability in Fashion" 12 *International Journal of Fashion Design, Technology and Education* 208-217 (04 Feb 2019).

is increased when blockchain suppliers collaborate to co-create traceability solutions. Optimising last-mile logistics reduces emissions. In order to achieve consumer demand and global environmental goals, widespread adoption of sustainable practices will depend on these kinds of win-win collaborations along the value chain. For example, according to the World Bank in 2022, during the previous three years, participating brands and retailers have increased their use of more sustainable cotton and synthetic fibres by 30% as a result of their membership in the Sustainable Apparel Coalition.

VII. CURRENT DEVELOPMENTS

Introduction of new products

With the introduction of their most environmentally friendly denim collection to date in March 2022, Levi Strauss & Co. used organic cotton and Circulose, a wood-based fibre. When compared to traditional jeans, the new Levi's jeans range can save up to 17% on carbon emissions. The American apparel firm Levi Strauss & Co. is well-known across the globe for its denim pants under the Levi's name. It was established in May 1853 when German-Jewish immigrant Levi Strauss relocated to San Francisco, California, from Buttenheim, Bavaria, in order to establish a branch of his brothers' dry goods company on the West Coast, based in New York.

Adidas

Making a real impact was the initial inspiration behind it all. Adidas joined together with Parley for the Oceans, an environmental group that promotes awareness of the oceans' beauty and fragility, in 2015. A prototype shoe created by the partnership was created using only yarns and filaments recovered and repurposed from unlawful deep-sea gillnets and ocean debris. The takeaway was quite clear: multinational brands don't always have to be built around sustainability; it may be their central focus. The design itself was a salute to the waters, beyond only the materials. The design, which drew inspiration from ocean waves, acted as a continual reminder of the shoe's charitable roots and the brand's dedication to the cause. However, the ocean-plastic movement encompassed more than simply footwear. It extended to all of Adidas's merchandise, including apparel and jerseys. Famous soccer teams like Real Madrid and Bayern Munich have spread awareness of the cause among millions of supporters worldwide by donning jerseys made from recycled ocean plastic. This project has changed Adidas's brand story beyond product lines. Their dedication has sparked discussions about environmentally friendly business methods in the sportswear sector and established standards for rivals. When the brand saw how much potential there was and how urgent the need was, it increased its

efforts. Adidas manufactured the first mass-produced footwear made from recovered marine plastic garbage in 2016, when it released about 7,000 pairs of the UltraBoost Uncaged Parley. Kering Luxury Group launched its first collection of gowns in November 2021 as a part of its Chime for Change campaign, which promotes women's empowerment. Sustainable objectives are met via the collection's use of organic, recyclable, renewable, and biodegradable textiles. Kering is a multinational company with headquarters in France that focuses on luxury products. The company owns a number of well-known brands in jewellery, fashion, and leather goods, such as DoDo, Ginori 1735, Yves Saint Laurent, Gucci, Balenciaga, Bottega Veneta, Boucheron, Pomellato, Alexander McQueen, and Creed.

Purchases and collaborations:

- Ralph Lauren and Earth Colours, a natural fibre manufacturer, announced a collaboration in June 2022 to launch a more environmentally friendly cotton dyeing method that uses less water and natural indigo pigment. Established in 1967 by American fashion designer Ralph Lauren, Ralph Lauren Corporation is a publicly traded fashion corporation. The corporation, which has its headquarters in New York City, manufactures goods in the mid-range to premium markets.
- PUMA and First Mile teamed up in January 2022 to enhance the amount of recycled plastic used in their sportswear. First Mile will provide recycled polyester to PUMA subsidiaries as part of this plastic programme. With its headquarters located in Herzogenaurach, Bavaria, Germany, Puma SE is a multinational firm that creates and produces sports and casual footwear, clothes, and accessories. Puma is the third-largest sportswear manufacturer in the world. The company was started by Rudolf Dassler in 1948. First Mile is a London-based environmental and trash management company in the United Kingdom. It assists companies in lessening their influence on the climate by providing services including trash management, recycling, and renewable energy.

Some sustainable fashion innovations

3D Virtual Sampling: Physical samples were formerly required for the design process as well as the purchasing and selling lifecycle. Designers and retail buying teams can both see an accurate depiction of the product in these samples; yet, it may take up to 20 samples to produce a single completed style. Virtual sampling, on the other hand, already makes a digital complete line review possible as 3D technology advances, which cuts waste in both product development and design. The idea is shown on a screen using 3D virtual sampling, which produces almost little waste. One of the main benefits of this innovative approach to sustainable fashion is the

decrease in expenses and time required for the production of tangible prototypes. Digitising an on-demand production strategy with a customer emphasis can also be aided by virtual sampling.

Alternative Textiles: Common garment materials need a lot of resources and generally decay slowly. One cotton shirt uses as much water to produce as one person drinks in 2.5 years. Although they produce less water when made, synthetic fabrics like polyester and nylon release harmful greenhouse gases into the atmosphere. Alternatives are being offered, nevertheless, by the advancement of sustainable technologies for clothing and textiles that are reusable, regenerable, recyclable, and supplied ethically. Recycled fibres and fibres taken from agricultural waste items like leaves and rinds are two eco-friendly textile substitutes. These new fabrics²¹ provide solutions that are biodegradable, long-lasting, and generate less waste during manufacture. Hemp, bamboo, and ramie are examples of natural fibres that are frequently used in place of cotton. Because cupro is made using closed-loop technology from cotton linter, a waste product of the cotton plant, brands like COS and H&M opt to use it. Using cutting-edge materials like bio-based fur, designers like Stella McCartney have pioneered closed-loop and sustainable business strategies. Compared to traditional synthetic fabrics, this 37% plant-based fabric uses up to 30% less energy and generates up to 63% less greenhouse gas emissions. It's also important to discuss muskin, a vegetable leather derived from mushrooms, and Piñatex, an inventive, environmentally friendly substitute for leather manufactured from pineapple leaf fibre by Ananas Anam.

Virtual Dressing: The only method for customers to find out how a garment fits them properly whether they buy it in-store or online is to try it on. Sadly, the item frequently doesn't fit as well as a mannequin in the store or a model on the internet. Essentially, putting on clothes to check fit amounts to little more than exchanging data. Both a customer and a piece of apparel have certain measurements. Up until recently, exchanging this data required the laborious process of trying on several sizes. The method is being drastically altered by evolving 3D technology, which digitizes what was before a very laborious, physical procedure by exchanging fit information over a digital platform. Customers can instantly ascertain their clothing fit thanks to mobile 3D body scanning, which uses millions of data points to generate a three-dimensional image. The merchant, on the other hand, has the ability to compare customer information that encompasses hundreds of measures that go into the specific details of a certain item of clothing, in addition to the standard collar size, chest size, and sleeve length. This will lead to better customer experiences by making it easier for customers to select clothing they adore.

²¹ Rajkishore Nayak, Amanpreet Singh, et.al., "A Review of Recent Trends in Sustainable Fashion and Textile Production" 4 *Current Trends in Fashion Technology & Textile Engineering* 11–45 (07 February 2019).

Furthermore, this technology serves as a sustainable fashion breakthrough that has the potential to significantly lower material waste and logistical emissions across the board. Thanks to augmented reality clothing try-on solutions, businesses may reduce product return rates by gathering more data to better understand body form and design better-fitting garments while customers use mobile body scanning tools to better size online purchases. Virtual dressing experiences will drive the future of virtual purchasing and

provide whole new partnerships for brand connection over the course of the next five years as immersive technologies like AR, VR, and MR become more widespread.

Making Fashion Circular: New initiatives are being taken to reduce waste as retailers and customers grow more conscious of the massive quantity of waste generated by the fashion industry. Creating the Make Fashion Circular project, major companies such as Burberry, Gap, H&M, Nike, and Stella McCartney have come together to support sustainable fashion. By designing waste out of the product and production system, the circular economy idea seeks to prolong the useful life of resources and products. Recycling used clothing into new ones and ²⁰ using sustainable materials help achieve this.

VIII. CONCLUSION

In conclusion, there are opportunities as well as challenges in the fashion industry's transition to sustainability. Prominent design houses and major fashion brands are exploring alternative textiles and making commitments to cut greenhouse gas emissions as a result of the growing attention being paid to environmental issues and climate change. The goal of sustainable fashion is to lessen the negative impacts of the industry while advancing social, economic, and environmental sustainability. The textile sector in India, a significant participant in the global fashion market, has obstacles like water contamination and unethical labour practices, but it also offers chances for innovation and a shift toward sustainability.

The garment sector can drastically lower its carbon footprint by investing in renewable energy sources and implementing eco-friendly practices like using bamboo and organic cotton.²² However, because of the high water and greenhouse gas emissions across the supply chain, the fast-paced nature of the fashion industry's production still contributes to climate change. All parties involved governments, corporations, consumers, and civil society must work together to address these issues. Collaborations, alliances, and partnerships between the public and private sectors are crucial for promoting sustainable fashion practices and effecting good

²² Bin Shen, "Sustainable Fashion Supply Chain: Lessons from H&M" 6 Sustainability 6236-6249 (11 September 2014).

change. The fashion sector can contribute to a more sustainable future for everyone by embracing circular business models, encouraging entrepreneurship, and utilising new solutions. With favourable legislation and regulations, growing consumer demand for eco-friendly products, technical breakthroughs, and value chain collaborations, the global market for sustainable fashion holds great growth potential. By embracing these opportunities and working together towards a common goal, the fashion industry can lead the way towards a more sustainable and ethical future.
