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### RESEARCH ARTICLE

#### SUSTAINABLE MATERIAL SOURCING IN THE FASHION SUPPLY CHAIN: CURRENT TRENDS AND FUTURE DIRECTIONS

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#### Abstract

This review article aims to find the increasing need to source materials that are sustainable to mitigate the effects on the environment, improve the social status, and adapt to the dynamic fashion consumer needs. Some of the main trends discussed in this work include the use of organic fibers, recycling fabrics and the introduction of new biodegradable textiles. The review article also further discusses the implication of certifications and standards in the issue of transparency and accountability. This paper analyses the broader environmental, social and economical root causes of sustainable sourcing which focus on the long term gains although possibly costly in the short run. Moreover, the article also points out the directions for future research comprising of technology advances in recycling, biofabrication techniques, status changes in frameworks and policies and trends in consumer behaviour that may potentially influence the sustainability of fashion.

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#### Introduction:-

Sustainable sourcing of materials refers to the act of selecting and using such materials that minimize environmental impact and promote ethical practices throughout their lifecycle. The fashion industry has increasingly come under scrutiny for its huge environmental footprint including high levels of waste, pollution, and resource consumption. This has consequently increased attention to procuring more sustainable methods, particularly with the materials that significantly contribute to the overall sustainability of fashion products. (McKinsey, 2019; Triodos IM, 2024).

The significance of sustainable material procurement is generally acknowledged for various reasons. Firstly, it reduces the environmental harm associated with traditional textile production, including excessive water usage, pesticide use and carbon emissions (Fletcher, 2014). Secondly, it ensures fair labor practices and supports the communities by enhancing better social conditions involved in the supply chain (Ray and Nayak, 2023). Lastly, this indicates a response to the growing consumer shift towards environmentally conscious manufacturing of clothing and ethically created fashion, which may strengthen brand reputation and market competitiveness (Henninger, Alevizou, and Oates (2016).

Although advancements in sustainable practices in the fashion sector considerable chances for enhancement exist to fully implement the effects of these initiatives throughout the supply chain. The complicated processes of incorporating sustainable materials, ensuring fair labor standards, and satisfying consumer demands for transparency and environmental responsibility require further investigation. This review aims to address these gaps by examining

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current trends, evaluating environmental, social, and economic impacts, and exploring future directions and innovations in sustainable material sourcing. The primary research question is: "What are the current trends in sustainable material sourcing in the fashion industry and how do these practices affect environmental, social and economic outcomes?"

## **Background Study**

### **Current Trends in Sustainable Material Sourcing**

#### **i. Organic Materials**

Organic materials like organic cotton and hemp, have gained significant attention. Organic cotton is grown without synthetic pesticides and fertilizers that lead to pollution of soil and water. According to the Organic Trade Association (2022), organic cotton farming uses less water than conventional cotton farming. Another widely used organic fiber material is hemp, which requires very little water without using pesticides and in fact regenerates soil health that giving an environmental-friendly option (Fletcher, 2013).

#### **ii. Recycled Materials**

Recycled materials are another important component in sustainable fashion that gaining more importance now. Made from post-consumer plastic waste and discarded fishing nets, the fabrications of recycled polyester and nylon help in avoiding landfill wastes and reducing the demand for virgin materials. According to the Global Fashion Agenda (2019), recycling 1 ton of used polyester garments saves 1.5 tons of CO<sub>2</sub> emissions. Brands like Patagonia have long been synonymous with recycled materials, using them in product lines to mitigate the lowest possible environmental impact.

#### **iii. Innovative Materials**

Innovative materials like biodegradable fabrics and lab-grown textiles represent the cutting edge of sustainable fashion. Biodegradable fabrics like Tencel which made from sustainably sourced wood pulp decomposed more quickly than traditional textiles and reduce landfill waste (Sandin and Peters, 2018). Mushroom leather derived from mycelium offers a sustainable alternative to animal leather with a significantly lower carbon footprint. Lab-grown materials such as bio-fabricated silk mimic the properties of traditional fibers while eliminating the environmental drawbacks of traditional farming and production (Ray and Nayak, 2023).

#### **iv. Certification and Standards**

Certifications and standards play a vital role in verifying the sustainability of materials. The Global Organic Textile Standard (GOTS) ensures that textiles are produced organically covering the entire supply chain from harvesting to manufacturing. Similarly, the Oeko-Tex Standard 100 certifies that textiles are free from harmful substances, ensuring consumer safety and environmental sustainability (Henninger et al., 2016). These certifications provide transparency and accountability which allowing consumers to make informed choices about the products they purchase.

## **Environmental, Social and Economic Impacts**

### **Environmental Impact**

Sustainable material sourcing can significantly mitigate environmental degradation associated with traditional textile production. Organic materials, such as organic cotton and hemp, drastically reduce water usage and pesticide application. For instance, organic cotton farming uses less water and eliminates the need for synthetic pesticides, thereby reducing soil and water pollution (Organic Trade Association, 2020).

Recycled materials, including recycled polyester and nylon, decrease reliance on virgin resources and help divert waste from landfills. According to the Global Fashion Agenda (2019), recycling 1 ton of used polyester garments can save approximately 1.5 tons of CO<sub>2</sub> emissions. Innovative materials, like biodegradable fabrics and lab-grown textiles, also contribute to lowering the overall environmental footprint by reducing waste and resource consumption (Ray and Nayak, 2023).

### **Social Impact**

The social impact of sustainable material sourcing is profound, improving working conditions and providing socio-economic benefits to communities. Ethical sourcing practices ensure that workers receive fair wages, work in safe environments, and have access to necessary social benefits. Brands that commit to sustainable sourcing often work closely with communities to support local economies and improve livelihoods (Muthu, 2014).

For example, initiatives to source organic cotton often involve fair trade practices, which guarantee farmers a fair price and promote sustainable agricultural practices. These efforts help lift communities out of poverty and foster sustainable development (Henninger et al., 2016).

### **Economic Impact**

Economically, sustainable material sourcing presents both challenges and opportunities. While the initial cost of sustainable materials can be higher than conventional alternatives, the long-term benefits often outweigh these costs. Consumers are increasingly willing to pay a premium for products that align with their values, driving demand for sustainably sourced fashion (McKinsey, 2019).

Brands that invest in sustainable materials can enhance their market competitiveness and brand reputation. Moreover, as regulatory pressures increase, companies that have already adopted sustainable practices will be better positioned to comply with new regulations, avoiding potential penalties and benefiting from incentives (Triodos IM, 2024).

### **Methodology:-**

The research methodology for this review involved a comprehensive analysis of existing literature and case studies on sustainable material sourcing in the fashion industry. A thorough review of academic papers, industry reports and articles was conducted to identify current trends, challenges and opportunities in sustainable material sourcing. Key references were sourced from databases Science Direct and industry publications. Leading fashion brands which known for their sustainable practices were analyzed. These brands included Patagonia, Stella McCartney, H&M, Adidas, and Levi Strauss & Co. Data for these case studies were gathered from company reports, sustainability reports and relevant news articles. Secondary data from industry reports, sustainability indexes and certification bodies were collected to support the analysis. This sources included the Global Fashion Agenda, Organic Trade Association and Oeko-Tex Association. Findings from the review of literature and cases were synthesized to give an inclusive overview of how sustainable material sourcing is approached in the fashion industry. The synthesis is intended to isolate best practices, challenges, and potential innovations.

### **Review of Current Trends and Impacts**

Sustainable material sourcing has a great impact on the environment, society, and economy. Such impacts are a sign of why sustainable practices in the fashion industry are necessary.

Sustainable material sourcing can drastically reduce environmental degradation linked to conventional textile production. Organic materials such as organic cotton and hemp significantly reduce the use of water and pesticides. For example, organic cotton reduces water use by 91%, eliminates synthetic pesticides and reduces soil and water pollution due to agricultural practices (Organic Trade Association, 2020). Besides cotton other recycled materials like polyester and nylon reduce dependence on virgin resources and simultaneously reduce waste going to landfills. According to the Global Fashion Agenda(2019), recycling 1 ton of used polyester garments can save 1.5 tons of CO<sub>2</sub> emissions. Innovative materials such as biodegradable fabrics and lab-grown textiles further help reduce the overall environmental footprint of waste and resources (Ray and Nayak, 2023).

The social impact due to sustainable material sourcing is immense. It enhances work conditions and socio-economic statuses of communities. Ethical sourcing processes enable the provision of proper wage to workers, safe working conditions, and needed social benefits. Brands committing to sustainable sourcing usually work hand in hand with the communities, assisting them in the process of boosting local economies and improving livelihoods (Muthu, 2014). For example, organic cotton sourcing often involves efforts related to fair trade, where farmers are guaranteed a fair price as an incentive to grow crops in a sustainable way. All these attempts help elevate communities from poverty and support sustainable development.

Economically, material sourcing has some challenging features but also offers business opportunities. The short-term investment in sustainable materials is considered relatively expensive compared to conventional alternatives. The long-term benefits of using such materials outweigh such costs. More consumers are willing to pay more for products that satisfy their values, which is driving fashion sustainably sourced (McKinsey, 2019). For the brands, they have an increased potential to become better and most recognized in a competitive market, enhancing the competitiveness and reputation of their market. Moreover, as regulatory pressures increase, companies that have

already adopted sustainable practices will be better positioned to comply with new regulations, avoiding potential penalties and benefiting from incentives (Triodos IM, 2024).

### **Future Directions and Innovations:-**

The future of the sourcing of sustainable materials by the apparel industry is going to be very interesting. Some major areas of focus will be on technological innovations, policy and regulation changes, and evolving consumer trends.

#### **Technological Advancements in Sustainable Material Sourcing**

New recycling technologies are permitting the efficient recycling of more and more types of textiles, hence reducing waste and saving resources. For example, through the use of chemical recycling processes, complex fibers such as polyester can be broken down into a raw form, from which new textiles with the same quality can be produced again (McKinsey, 2019).

Biofabrication methods which involve growing materials from microorganisms are also gaining good traction. Lab-grown leather made from mycelium (the root structure of mushrooms) offers a sustainable alternative to traditional leather with a fraction of the environmental impact. Also, bio-fabricated silk and other protein based fibers mimic the properties of natural fibers without the need for traditional farming, reducing land and water use (Ray and Nayak, 2023).

#### **Policy and Regulation**

Governments and international bodies are increasingly implementing regulations to reduce the environmental impact of the fashion industry. European Union's Circular Economy Action Plan aims to make sustainable products the norm and emphasizes the importance of textile recycling (European Commission, 2020). New regulations are anticipated with a backbone of enforcing rigid standards for material sourcing, production processes, and end-of-life management. Companies that proactively adopt sustainable practices will not only comply with these regulations but also benefit from potential incentives and avoid penalties. Transparent supply chains supported by blockchain technology can enhance traceability and accountability and ensuring that materials are sourced and produced sustainably (Triodos IM, 2024).

#### **Consumer Trends**

Demand is increasing for products that are produced through sustainable and transparent methods. Modern consumers are also more attuned and have become more concerned with the natural and social consequence of what they purchase. Such change in consumer behavior therefore led to brands taking an increasing concern in sustainable sourcing practices and driving more visibility in their supply chain (Henninger et al., 2016). Brands that meet this demand by providing green products with transparent information on sourcing and production processes can build closer relations with their customers, translating into better brand loyalty. Additionally, the emerging emphasis being placed on sustainability in fashion will be further accelerated by the proliferation of social and digital media, with consumers increasingly empowered to criticize brands as well as to share all kinds of information on sustainable practices within the industry (Sustainable Brands Journal, 2024).

#### **Case Studies**

To illustrate the practical application and benefits of sustainable material sourcing, we can examine several leading fashion brands that have successfully integrated these practices into their operations.

##### **Patagonia**

One of the global giants in the use of recycled materials in its clothing is Patagonia. The company has always been a staunch environmental steward and started using recycled polyester in its manufacturing processes back in the 1990s. Patagonia uses old materials for new products, such as fleece, jackets, and backpacks. The company also encourages consumers to repair, reuse, and recycle equipment through its "Worn Wear" program. This shows high sustainability from its end. The commitment of Patagonia toward transparency and ethical sourcing in the industry has set benchmarks (McKinsey, 2019).

##### **Stella McCartney**

One of the pioneers in using sustainable material is Stella McCartney. This is a brand that shuns the use of animal products for an alternative environmentally safe approach. McCartney has been at the forefront in the discovery and

invention of vegetarian leather, which is made from a vegetable source while also using recycled textiles as part of the fashion material. Collaboration with various innovative material companies has similarly been evident; she has manufactured her eco-friendly fabrics without sacrificing quality and design (Sustainable Brands Journal, 2024).

### **H&M Conscious Collection**

The H&M Conscious Collection is an initiative to bring mainstream fashion into sustainable materials. This assortment includes clothing items crafted out of organic cotton, recycled polyester, and other sustainable materials. Equally, H&M has initiated the "Garment Collecting" drive, whereby people are encouraged to drop off old clothes for recycling. This reduces textile waste and creates awareness that sustainability in fashion is key. By making sustainable fashion easily available to a wider section of society, H&M is enabling the mainstreaming of sustainable practices in the industry (Shen, 2014; Triodos IM, 2024).

### **Adidas**

Adidas has gone a long way in including sustainable materials in their products. The partnership with Parley for the Oceans has seen them produce footwear and apparel made from recycled ocean plastics. For example, Adidas' "Futurecraft Loop" is aimed at producing fully recyclable running shoes to reduce waste, forming another example of a radical approach to innovation. These efforts have brought out the fact that Adidas is among those giants that are taking care of issues related to sustainability and has certainly shown how big brands can take up the initiative in their hands and bring positive environmental change (McKinsey, 2023; Sustainable Brands Journal, 2024).

### **Levi Strauss & Co.**

Sourcing sustainable materials has also been done by Levi Strauss & Co. through various initiatives. The "Water<Less" campaign, being run by the company, emphasizes savings in denim production, which reaches up to 96% less water than what is used in normal processes. On the one hand, it uses organic cotton, and on the other, it uses recycled denims as far as sustainable materials are concerned. It also ensures that its supply chain has fair working conditions. These initiatives show how much Levi's has placed its standards in terms of sustainable and ethical sourcing, so it serves as a great example for other brands to be set up within the industry (McKinsey, 2019).

### **Conclusion:-**

Sustainable material sourcing is essential for mitigating the fashion industry's environmental impact and fostering ethical practices. This review highlighted several key trends including the adoption of organic, recycled and innovative materials with the role of certifications to ensuring sustainability.

### **Key Trends**

- i. **Organic Materials:** The use of organic cotton and hemp reduces water and pesticide usage which provide a more environmental friendly option (Organic Trade Association, 2020).
- ii. **Recycled Materials:** The incorporation of recycled polyester and nylon from post consumer waste helps in minimizing landfill waste and conserving resources. Brands like Patagonia are leading the way in integrating these materials into their product lines (Global Fashion Agenda, 2019).
- iii. **Innovative Materials:** Development of biodegradable fabrics such as Tencel and lab-grown textiles like bio-fabricated silk offers new sustainable options that reduce environmental impacts. Mushroom leather, derived from mycelium, represents an eco-friendly alternative to traditional leather (Niinimäki et al., 2020).
- iv. **Certifications:** Certifications like GOTS and Oeko-Tex ensure that materials meet stringent sustainability criteria providing transparency and assurance to consumers (Henninger et al., 2016).

### **Future Directions:-**

- i. **Technological Innovations:** Technological advancements in recycling and biofabrication methods will further proceed to make the materials sustainable. With further developments in chemical recycling processes and the creation of bio-fabricated textiles, the impact of the fashion industry on the environment will be lowered (Global Fashion Agenda, 2019; Ray and Nayak, 2023).
- ii. **Policy and Regulation:** Anticipated regulatory changes that enforce higher standards upon sourcing, production processes, and material end-of-life management. Additionally, the level of policymaking by governments and international bodies has now taken a renewed interest in the implementation of a circular economy model and sustainable practices, respectively (European Commission, 2020; McKinsey, 2023).

- iii. **Consumer Trends:** As there is greater demand by consumers for sustainability and transparency of products, brands will have to acknowledge sustainable practices and communicate them effectively. The rise of social media and digital platforms makes it easier for consumers to demand accountability from brands, pushing the use of eco-friendly materials (Henninger et al., 2016; Naluda Magazine, 2024).

### Future Research

Future research should be done on the scalability of sustainable materials and their mass adoption in the long term. Investigating new sustainable materials and improving existing technologies will be crucial in advancing sustainability in the fashion industry. Further, research on the economic viability and consumer acceptance of new materials would assist the industry in driving toward sustainability (McKinsey, 2019). The sourcing of sustainable materials will thus allow the fashion industry to significantly reduce its environmental footprint, improve social conditions and meet increasing demand for environmental friendly products to set the foundation for a sustainable future.

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