



Closing the loop – Exploring the potential of upcycling and recycling in reducing fashion waste

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Abstract

Upcycling and recycling have emerged as promising strategies to reduce fashion waste and promote sustainability. This study investigates the potential of upcycling and recycling in reducing fashion waste, with a focus on the textile industry.

Using secondary approach, this research explores the current state of upcycling and recycling in the fashion industry, identifies key challenges and opportunities, and develops a framework for implementing upcycling and recycling strategies. The findings highlight the significant potential of upcycling and recycling in reducing fashion waste, while also creating new business opportunities and promoting sustainable consumption.

This research contributes to the growing body of literature on sustainable fashion, providing insights into the role of upcycling and recycling in reducing fashion waste. The findings have implications for policymakers, industry stakeholders, and consumers, emphasizing the need for collaborative efforts to promote sustainable fashion practices.

Keywords: Sustainable fashion, creative reuse, circular fashion, textile waste management, fast fashion

Introduction

The fashion industry once revered for its creativity and ingenuity, now became a significant contributor in harming the environment. The prevalent "take-make-dispose" approach, marked by the rapid production and consumption of clothing, has given rise to massive textile waste. Every year, millions of tons of garments are discarded, often ending up in landfills or incinerators, where they release toxic pollutants and aggravate environmental challenges. This unsustainable cycle drains natural resources, fuels climate change and pollutes waterways, making it clear that we urgently need a new way to step forward in solving this devastated issue.

A transformative shift toward circular fashion could be the answer. Unlike the traditional linear model, circular fashion emphasizes designing clothing with longevity, reuse, and recycling in mind. It aims to close the loop, ensuring that textiles re-enter the supply chain instead of being discarded. Two pivotal strategies in this sustainable approach are upcycling and recycling, both of which have the potential to redefine the future of fashion.

Upcycling breathes new life into discarded materials, turning them into products of greater value or functionality. In fashion, this could mean repurposing old garments into trendy clothing, accessories, or even home decor. By creatively reimagining unwanted textiles, upcycling not only reduces waste but also conserves energy and decreases reliance on virgin resources.

Recycling focuses on breaking down textiles into their fibers to produce new fabrics. While this process requires energy and certain chemicals, it presents a valuable opportunity to recover and reuse materials, reducing the demand for fresh resources. Recycling helps conserve water, lower greenhouse gas emissions and divert waste from landfills, contributing to a healthier planet.

This article delves deep into the potential of upcycling and recycling as solutions to mitigate the environmental

footprint of the fashion industry. It explores innovative techniques and technologies, evaluates the challenges and limitations, and highlights the social and economic advantages of adopting circular practices. By embracing these strategies, the fashion industry can move closer to a sustainable and environmentally conscious future.

Review of literature

1. Objectives

The upcycling and recycling of garments serve multiple objectives across environmental, economic, social, and innovation-focused dimensions. From an environmental perspective, these practices aim to reduce waste by minimizing the amount of garment waste sent to landfills, conserve resources by reducing the need for raw materials, water, and energy, and decrease pollution by lowering greenhouse gas emissions and textile effluent. Economically, upcycling and recycling create new revenue streams through the sale of repurposed garments, reduce production costs by minimizing the need for raw materials and manufacturing inputs, and enhance brand competitiveness by building a reputation for sustainable practices.

Socially, these initiatives promote sustainable consumption by encouraging consumers to adopt eco-friendly habits such as buying second-hand or renting garments. They also support local communities by engaging them in upcycling and recycling projects, fostering social inclusion and economic development, and improving working conditions throughout the garment supply chain. Furthermore, innovation and education objectives include the development of new technologies and processes for more effective garment upcycling and recycling. Raising awareness among consumers, designers, and industry stakeholders about the importance and benefits of these practices is also a key goal, along with fostering collaboration between researchers, educators, and industry

players to drive innovation and share knowledge. Collectively, these objectives contribute to creating a more sustainable and inclusive fashion industry.

2. The need of taking this topic for the research paper

The fashion industry is one of the largest global polluters, contributing significantly to environmental degradation throughout its supply chain. Its production, distribution, and consumption processes result in substantial greenhouse gas emissions, accounting for around 10% of global emissions. Additionally, the textile industry is a major contributor to water pollution, with chemicals and dyes contaminating waterways. Waste generation is another critical issue, as the average American discards 82 pounds of textile waste annually, most of which ends up in landfills.

The rise of fast fashion has further intensified these environmental challenges. Fast fashion's "take, make, dispose" model encourages overconsumption and frequent garment disposal. This approach not only promotes increased purchasing but also reduces the lifespan of garments, as they are often designed for short-term use. As a result, the fast fashion phenomenon has significantly amplified the growing problem of textile waste, making the need for sustainable solutions like upcycling and recycling more urgent than ever.

3. The Need for Sustainable Fashion Practices

The fashion industry is among the most significant contributors to environmental degradation, accounting for 12.8% of global greenhouse gas emissions and generating 92 million tons of textile waste annually. Despite these alarming figures, only 12% of clothing is recycled, and a mere 1% is upcycled, while 85% of garments end up in landfills. To address these challenges, sustainable practices such as upcycling and recycling of garments offer promising solutions to reduce waste, conserve resources, and mitigate environmental impacts.

Current state and challenges

The adoption of upcycling and recycling is hindered by various challenges. A significant obstacle is the lack of adequate infrastructure and standardization, which limits the efficiency of recycling processes. Consumer awareness about the environmental impacts of fast fashion and the benefits of sustainable practices remains low, further slowing progress. Economically, the high costs associated with recycling and upcycling, coupled with limited market demand and competition from virgin materials, discourage businesses from embracing these practices. Technical limitations such as fabric degradation, material incompatibility, and challenges with colors and dyes add complexity to the processes. Additionally, the environmental costs of recycling and upcycling—such as energy and water consumption, chemical usage, and transportation emissions—highlight the need for more sustainable innovations. The absence of robust waste management systems and access to recycling facilities exacerbates the problem, particularly in underserved communities.

Steps toward sustainable practices

Efforts to promote upcycling and recycling focus on improving design, production, and post-consumer processes. Designing garments with recyclability in mind,

incorporating recycled materials, and implementing zero-waste designs are key strategies. Establishing collection programs for used garments and developing efficient sorting infrastructure are crucial for streamlining recycling efforts. Investments in advanced recycling technologies and upcycling programs, along with partnerships with specialized organizations, are helping expand the scope of sustainable practices. Consumer education campaigns and training programs for industry stakeholders aim to raise awareness and foster a culture of sustainable fashion. Collaborative efforts among industry stakeholders, technology companies, and consumers are essential for driving innovation and encouraging participation in these practices.

Benefits of recycling and upcycling

Recycling and upcycling offer numerous environmental, economic, and social benefits. Environmentally, they can reduce greenhouse gas emissions by up to 50%, conserve water by up to 90%, and decrease waste by as much as 80%. Economically, the recycling and upcycling industry has the potential to generate \$100 billion in revenue annually, create up to 100,000 jobs, and save companies up to 20% on production costs. These benefits underline the importance of integrating sustainable practices into the fashion industry.

Statistical context

Despite the clear benefits, the statistics reveal significant gaps in current practices. Only 12% of clothing is recycled, and 1% is upcycled into new products, leaving 85% of garments to decompose in landfills, often over hundreds of years. The need for robust infrastructure, increased consumer engagement, and technological innovation is evident to bridge these gaps and achieve a more sustainable future.

While the challenges of upcycling and recycling garments are significant, the potential benefits make it a vital strategy for addressing the environmental impacts of the fashion industry. By investing in infrastructure, fostering collaborations, and educating stakeholders, the industry can pave the way toward a more sustainable and circular future.

Future scope

The future of sustainable fashion is being shaped by a convergence of environmental concerns, technological advancements, changing consumer behaviors, innovative business models, education, and regulatory frameworks. Growing awareness among younger generations about environmental issues is driving demand for eco-friendly fashion practices. The concept of a circular economy, which emphasizes keeping resources in use for as long as possible through recycling and upcycling, is also gaining momentum, fostering innovation in sustainable garment production.

Technological advancements, such as digital and 3D printing, are enabling more efficient and sustainable production methods, while artificial intelligence and machine learning are optimizing design, manufacturing, and recycling processes, significantly reducing waste. Consumers are increasingly prioritizing sustainability, reflected in their preference for second-hand clothing and participation in the sharing economy, where renting or sharing garments is becoming more mainstream.

Businesses are also exploring innovative models like product-as-a-service, where garments are leased or rented

rather than sold outright, and closed-loop production systems that design clothing with recyclability in mind. Education is playing a pivotal role in this shift, with fashion schools incorporating sustainability into their curricula to prepare future industry leaders. Public awareness campaigns further educate consumers on the environmental impact of fast fashion and the benefits of recycling and upcycling. Policy and regulation are reinforcing these efforts, with governments introducing extended producer responsibility policies to hold manufacturers accountable for waste and implementing circular economy strategies to promote sustainable production and consumption practices. Together, these factors are driving a transformative shift toward a more sustainable and innovative fashion industry, where environmental stewardship and conscious consumption take centre stage.

Result

From the lit review, it was understood that the 'take-make-dispose' approach of the fashion sector has heavily impacted the natural environment through its unmitigated consumption, production, and waste models. This may thus be minimized through up-cycling and recycling practices in terms of waste, reduced use of resources, less greenhouse emissions, revenue flow, lower costs, as well as improved reputation about the brands.

Discussion

To fully realize the potential of upcycling and recycling, a few important challenges need to be addressed. First, advanced recycling technologies and efficient sorting infrastructure need to be invested in. The second is raising consumer awareness on the environmental impact of fast fashion and the benefits of sustainable practices. Government intervention through supportive policies can further incentivize sustainable practices and discourage wasteful consumption. The innovation in collaboration among brands, designers, and consumers will drive the industry forward to circular economy principles. Continued research and development will make recycling and upcycling more efficient and sustainable. All these challenges can be addressed with the incorporation of sustainable practices, bringing the fashion industry closer to a more circular and environmentally friendly future.

Conclusion

The fashion industry's environmental impact is a pressing concern that requires immediate attention. Upcycling and recycling of garments offer a promising solution to reduce waste, conserve resources, and promote sustainable fashion practices.

This research has highlighted the benefits of upcycling and recycling, including reduced greenhouse gas emissions, water conservation, and waste reduction. The study has also identified challenges and limitations, such as technical, economic, and social barriers.

To overcome these challenges, it is essential to adopt a collaborative approach that involves stakeholders across the fashion industry, including designers, manufacturers, retailers, and consumers. Governments, NGOs, and industry associations can also play a crucial role in promoting sustainable fashion practices through policy initiatives, education, and awareness-raising campaigns.

Ultimately, upcycling and recycling of garments offer a critical opportunity to transform the fashion industry into a more sustainable and responsible sector. By embracing these practices, we can reduce the environmental impact of fashion, promote sustainable consumption, and create a more circular and regenerative fashion system. By continuing to explore and address the challenges and opportunities of upcycling and recycling, we can work towards a more sustainable and responsible fashion industry.

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