

From Linear Fashion to Circular Fashion: The challenges of Sustainability in the Textile Industry

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Abstract

The textile and fashion industry is among the most environmentally damaging sectors worldwide. Phenomena such as fast fashion, greenwashing, and the lack of systematic adoption of standardised environmental monitoring tools deepen a crisis that is already severe. This article offers a critical yet constructive perspective on the urgency of shifting towards circular models, examining the role of Life Cycle Assessment (LCA) and Organisational LCA (OLCA) as strategic instruments for companies in the sector, with particular attention to small and medium-sized enterprises (SMEs). Consumer education and supply chain transparency emerge as fundamental levers for meaningful change.

Introduction

A sector at a crossroads: The environmental crisis of fashion

Global textile fibre production has quadrupled since 1975, reaching 113.8 million tonnes in 2022, with projections pointing to 149 million tonnes by 2030 [1]. The environmental footprint of the textile sector has been extensively documented across institutional and academic literature, highlighting its disproportionate contribution to global resource consumption, pollution, and waste generation [2,3]. The fashion sector generates approximately one billion tonnes of CO₂ equivalent annually and accounts for 17-20% of global industrial water pollution through chemicals used in dyeing and finishing processes [1]. These figures collectively underscore the urgency of transitioning toward more sustainable and circular production and consumption models within the textile sector.

The fast fashion model has normalised a throwaway culture in which garments are worn an average of just seven times before being discarded. This translates into an annual loss of 500 billion dollars in value, driven by insufficient recycling and the chronic underuse of clothing. The challenge is not merely one of production; it is equally behavioural and cultural [4].

Compounding this is the widespread problem of greenwashing - the use of misleading environmental claims to project a false image of sustainability. According to the European Commission, 53% of green claims are vague or unsubstantiated, while 40% lack supporting evidence altogether. The scientific literature has identified five recurring patterns in such practices: Misleading, Concealing, Vagueness, Overselling and Irrelevance - a taxonomy that provides stakeholders with a useful framework for critically evaluating corporate environmental communications [4].

LCA as a compass for sustainability

Against this backdrop, Life Cycle Assessment (LCA) has established itself as one of the most rigorous tools available for measuring, communicating and reducing environmental

impact across the entire value chain [5]. A systematic review of the scientific literature from the past decade [6] identified six core categories of benefit delivered by LCA in the fashion industry: reduction of environmental impact, support for decision-making, supply chain and waste management, contribution to policy development, green communication, and overall efficiency gains.

A growing number of major brands have already integrated LCA into their operations, using it both to pinpoint environmental hotspots within production cycles and to underpin sustainability claims with scientific evidence [6]. SMEs, however, which form the backbone of European industry, continue to face significant barriers to adoption - economic, technical, and organisational in nature.

Organisational LCA (OLCA) offers a complementary and more accessible approach: rather than assessing a single product, it captures the overall environmental footprint of an organisation, enabling performance monitoring over time. A case study carried out on an Italian SME in the clothing sector with annual revenues of approximately five million euros [7] found that electricity consumption is the primary environmental hotspot (43.5% of global warming potential), followed by cotton fibres (87.3% of freshwater eutrophication) and polyester fibres. A combined set of measures - a shift to renewable energy and the adoption of recycled fibres - could reduce the organisation's carbon footprint by as much as 34.6%.

It should be noted, however, that LCA methodologies remain sensitive to data quality, system boundary definitions, and supply chain transparency constraints, and results should therefore be interpreted with appropriate methodological awareness [5].

The critical role of consumers and education

The transition to circular fashion cannot be achieved without addressing consumer behaviour. A study conducted among consumers in Cyprus [1] found that the vast majority of respondents purchase fast fashion items at least once a month, while second-hand clothing remains largely marginal. It is acknowledged that consumer attitudes and purchasing behaviors may vary considerably across different regional, cultural, and socioeconomic contexts, and these findings should therefore be interpreted as illustrative rather than universally representative.

Yet the data also reveal a telling paradox: the willingness to pay (WTP) for sustainable products is present - 69% of respondents said they would be willing to buy recycled garments - but it is constrained by a limited ability to pay (ATP), that is, the financial capacity to consistently afford premium pricing.

An integrated agenda: Transparency, certification and policy

The European Union has moved decisively in this direction, introducing a series of increasingly binding instruments: from the

Strategy for Sustainable and Circular Textiles and the Digital Product Passport, to the Corporate Sustainability Reporting Directive (CSRD) - which from 2025 extends mandatory sustainability reporting to listed SMEs - and the ESPR Regulation, which makes digital passports compulsory for textile products [7]. Within this framework, certifications are assuming growing strategic importance. A persistent gap nonetheless remains between large corporations and smaller firms in their capacity to obtain and maintain such certifications, pointing to the need for targeted support policies.

A genuinely holistic approach for fashion companies should encompass circular design (durability, repairability, recyclability), supply chain transparency supported by technologies such as blockchain [6], the promotion of resale and rental platforms, active counteraction of greenwashing through verifiable data, and meaningful community engagement. LCA and OLCA provide the scientific foundation for making sustainability claims credible and comparable - while simultaneously protecting corporate reputation.

Conclusion

The textile industry is at a turning point. The transition to circular fashion is neither swift nor linear, but it is supported by scientifically mature tools and an increasingly stringent European regulatory framework. For this transition to be fair and inclusive, SMEs must be supported in adopting environmental monitoring methodologies, consumers must be educated and empowered to make informed choices, and companies must move decisively away from misleading communication in favour of transparency grounded in verifiable data.

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