Textile Recycling: Closing the Loop on a Greener Apparel Industry

Elizabeth Howlett, Office of Industry and Competitiveness Analysis

The global apparel industry has identified textile recycling as an important component of circularity initiatives to reduce its impact on climate change. A circular economic system, which is constructed to minimize waste while keeping products and materials in use at optimal value for as long as possible, provides a pathway for many of the sector's sustainability goals.[1] *Recycling provides a circular option for apparel waste and reduces carbon emissions associated with virgin textile fiber production; however, challenges with infrastructure, technology, and scalability have so far inhibited widespread adoption.*

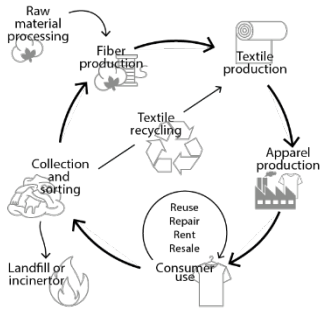
The fashion industry generates a significant carbon footprint

The global apparel industry was responsible for an estimated 1.8 percent of global greenhouse gas (GHG) emissions in 2021, with the production of upstream materials (i.e., textile fibers and fabrics) accounting for about 90 percent of total sector carbon emissions.[2] Moreover, the industry is projected to substantially exceed its 2030 carbon emissions target set under the Paris Agreement's "1.5°C pathway."[3] Consumers are buying more clothing than ever, and higher emissions due to growth in apparel production have offset any "greening" of the industry, such as organic cotton cultivation. To expedite the apparel industry's implementation of GHG-reducing practices, the United Nations, the EU, the Ellen MacArthur Foundation (EMF), and other stakeholders have proposed industrywide initiatives based on circular economics.[4]

Circularity supports decarbonization goals

The linear model that currently dominates the apparel industry follows a "take, make, waste" approach, and the lifespan of an article of clothing is often very short.[5] The "fast fashion" trend of inexpensive, low quality clothing that quickly cycles out of style has driven a rapid rise in apparel consumption, which doubled between 2000–15. Consumers discard about one-half of all fast fashion items within a year,[6] and about 85 percent of unwanted apparel in the United States ends up in landfills or incinerators.[7] In contrast, circular systems create a closed loop of materials used at their highest value, consuming fewer resources and creating less waste in the production cycle (figure 1). A circular apparel industry would include strategies to reduce clothing

Figure 1: Circularity in the apparel industry



Source: Compiled by USITC staff from various sources

[1] Ellen MacArthur Foundation (EMF), "Circular Economy Introduction," accessed May 23, 2023.
[2] Apparel Impact Institute (AII), *Taking Stock of Progress*, June 2023, 2, 9.
[3] The UN's Paris Agreement (2015) capped the global average temperature increase to 1.5°C over pre-industrial levels. UNFCCC, "The Paris Agreement," accessed May 26, 2023; AII, *Taking Stock of Progress*, June 2023, 9.
[4] UNEP, *Sustainability and Circularity in the Textile Value Chain,* 2020, 6–7; European Commission, "The European Green Deal," July 14, 2021; EMF, *Vision of a Circular Economy for Fashion,* 2020.
[5] EMF, *A New Textiles Economy*, 2017, 19–20.
[6] Resource Recycling Solutions (RRS), *Textile Recovery in the U.S,* June 30, 2020, 12.
[7] US EPA, "Textiles," December 3, 2022. This estimate is based on combined data for apparel and footwear. Of the remaining 15 percent, the majority is donated to charities or thrift shops, with small amounts recycled through municipal programs or returned to retailers through "take back" programs. An estimated 45 percent of the donated clothing is sold/reused as apparel domestically or abroad; 50 percent is used for lower-value textile products (e.g., industrial rags or stuffing); and at least 5 percent is disposed of as waste. Schumacher and Forster, *Facilitating a Circular Economy for Textiles,* May 2022, 14-15.

production by improved inventory management as well as through opportunities to extend the life of a garment, such as repair incentives, fashion rental programs, and resale platforms.[8] Advocates for the apparel industry's shift to a circularity suggest that it will, in part, lead to a decrease in production of virgin fibers, thereby reducing GHG emissions for the sector.[9]

Recycling as a circular strategy has potential for meaningful emissions reduction

Even with efforts to extend the life cycle of apparel, garments will eventually become unwearable and discarded as post-consumer textile waste. Less than one percent of unwearable clothing worldwide is currently recycled into textile inputs for new clothing, reflecting a significant circular opportunity loss.[10] According to one estimate, about 20 percent of clothing waste in the EU could be recycled back into new apparel by 2030, lowering carbon emissions by 4 million tons through reduced virgin fiber production.[11]

Why aren't more discarded clothes recycled back into apparel?

Post-consumer recycling faces many challenges. Few governments have mandated textile recycling, and worldwide only about 25 percent of discarded apparel is collected separately from other waste (in donation bins, curbside recycling, etc.).[12] As a result, the textile waste stream is insufficient to justify investment in facilities for collection and sorting, and the stream's inconsistency is problematic for fabric manufacturers looking for a reliable source of recycled fibers. Technology also constrains textile recycling. Mechanical recycling (shredding) is a cost-effective process, but it compromises fiber quality and is primarily limited to single-color cotton fabrics uncontaminated by finishes or other types of fiber. Advanced chemical recycling has the potential to produce fibers that are indistinguishable from virgin fibers, but at a high cost, which has limited uptake by the apparel industry. With low demand, producers have not achieved the economies of scale that would make chemically recycled fibers affordable for broad use in textile production.[13]

The use of recycled textiles offers a promising competitive advantage to apparel manufacturers

Despite the challenges, textile recycling could be a strong marketing tool and competitive strategy for firms. Consumers have a growing interest in sustainably-produced apparel, including items with recycled content. In one international survey, 62 percent of online fashion buyers agreed that recycled materials are important to them.[14] Moreover, young adult participants (aged 18-24) in a California survey indicated that they would pay a 14-percent premium for jeans with recycled fibers.[15] International harmonization of terminology – to allow brands to accurately describe sustainability features to consumers – as well as improved tools for transparency and traceability (e.g., digital labeling) – to ensure effective monitoring of the supply chain – would likely enhance the competitiveness of using recycled materials.[16]

---

[8] American Circular Textiles (ACT), "United States' Opportunity for Circular Fashion," 6, accessed April 24, 2023.
[9] Global Fashion Agenda (GFA) and McKinsey & Company, *Scaling Circularity,* 2021, 10.
[10] UNEP, *Sustainability and Circularity in the Textile Value Chain,* 2020, 22.
[11] GFA and McKinsey, *Scaling Circularity*, 2021, 9.
[12] GFA and McKinsey, *Scaling Circularity*, 2021, 18. The EU's Waste Framework Directive requires separate collection for discarded textiles by 2025. Implementation of the initiative, which aims to facilitate sorting for reuse and recycling, is at various stages across the EU.
[13] Schumacher and Forster, *Facilitating a Circular Economy for Textiles,* May 2022, 23–24.
[14] Avery Dennison and GWI, *Digital Consumer Behavior 2.0,* 2023, 7.
[15] In the same survey, among respondents of all ages, shoppers in the value (less than $40 per item) and mass ($40 to $99 per item) markets were more willing to pay a premium for jeans with recycled content compared to shoppers in higher end markets. McKinsey, *Increasing Fashion Circularity in California,* July 2022, 36–37.
[16] American Apparel and Footwear Association (AAFA), "Comments on Green Trade Themes," May 22, 2023.