

INTEGRATING CIRCULAR ECONOMY PRACTICES TO ENHANCE SUSTAINABILITY IN THE TEXTILE INDUSTRY

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Abstract The textile and apparel industry is a central pillar of the global economy, employing over 60 million people worldwide. It is also among the most environmentally intensive sectors, responsible for approximately 8–10% of global greenhouse gas emissions. This impact is largely driven by a linear “take–make–dispose” model, marked by short production cycles, high resource consumption, and accelerated garment disposal. Circular economy (CE) strategies are gaining traction, yet recent research highlights eco-design as the most effective approach to reduce the sector’s environmental footprint. Eco-design involves integrating durability, reparability, disassembly, recyclability, and low-impact materials at the design stage. Life-cycle assessments (LCA) indicate that doubling a garment’s lifespan can cut its climate impact by up to 44%, and reusing one kilogram of clothing may prevent roughly 25 kilograms of CO₂-equivalent emissions. Policy is beginning to reflect this evidence. The European Union’s proposed Ecodesign for Sustainable Products Regulation would require durability and recyclability for all textiles placed on the single market, signalling a shift toward design-led circularity. However, despite increasing interest, comprehensive analyses of eco-design implementation remain limited. Much of the literature focuses on individual materials or product types, rarely addressing systemic barriers, enabling conditions, or broader sustainability outcomes. To address this gap, this study conducts a systematic review of literature published between 2021 and 2025. The review draws from peer-reviewed journal articles indexed in Scopus and Web of Science, and institutional reports from UNEP, ILO, the European Environment Agency, and the Ellen MacArthur Foundation. The SPAR-4-SLR framework ensures a rigorous, transparent, and replicable methodology for study identification, selection, and analysis. Initial searches yielded articles in Scopus and in Web of Science. After removing duplicates, remaining studies were screened using established exclusion criteria. The review is guided by six research questions: (1) What CE practices, especially eco-design and recycling, are adopted in textiles? (2) How are closed-loop supply chains and circular business models applied? (3) What barriers and enablers affect CE integration? (4) What environmental, economic, and social benefits result? (5) What research is needed to scale CE adoption? (6) How is LCA used to assess CE outcomes? This review synthesises current evidence to offer practical insights for policymakers, industry, and researchers. It identifies high-impact eco-design strategies, systemic mechanisms to promote adoption, and the role of integrated assessment tools in supporting the transition to a low-carbon, resource-efficient textile industry.