

ASSESSING THE EFFECTIVENESS OF CIRCULAR ECONOMY INDICATORS IN MEASURING SUSTAINABILITY PERFORMANCE IN THE TEXTILE INDUSTRY

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Annotation: The textile industry, a major contributor to global environmental degradation, generates 92 million tons of waste annually, with only 1% recycled, necessitating robust circular economy (CE) practices to enhance sustainability. This article evaluates the effectiveness of CE indicators—such as the Material Circularity Indicator (MCI), recycling rates, water usage, and carbon footprints—in measuring sustainability performance in the textile sector. Through a mixed-methods approach, including literature reviews, case studies from the EU, Bangladesh, and India, stakeholder interviews, and quantitative data analysis, the study identifies strengths, such as accurate material flow tracking, and limitations, including data inconsistencies, neglect of social impacts like labor conditions, and regional disparities. Findings reveal that while EU policies drive precise metrics, developing nations face infrastructure and data challenges. The article proposes refined indicators, including a Localized Circularity Index, Social Impact Metric, and Supply Chain Transparency Score, to address these gaps. By offering actionable recommendations for policymakers and industry leaders, this study contributes to advancing CE implementation, critical for achieving 2030 sustainability goals in a high-impact industry.

Keywords: Circular economy, textile industry, sustainability performance, material circularity indicator, recycling rates, regional disparities, social impact metrics, supply chain transparency, environmental sustainability, localized indicators

The textile industry is a cornerstone of the global economy, generating trillions in revenue and employing millions, yet it's one of the most environmentally damaging sectors, responsible for massive water consumption, chemical pollution, and waste generation—92 million tons of textile waste annually, with only 1% recycled,



according to the Ellen MacArthur Foundation. Circular economy (CE) principles—reduce, reuse, recycle—offer a promising path to mitigate these impacts by closing material loops and minimizing waste, but their success hinges on reliable indicators like the Material Circularity Indicator (MCI), recycling rates, water usage, and carbon footprints, which aim to measure sustainability performance. However, questions linger about how effectively these metrics capture the industry’s complex realities, especially given data inconsistencies, regional disparities, and the neglect of social dimensions like labor conditions. For instance, while the EU pushes advanced recycling through policies like the 2022 EU Strategy for Sustainable and Circular Textiles, developing nations like Bangladesh and India struggle with infrastructure gaps, making standardized indicators less applicable.

Literature Review

The circular economy has gained traction as a framework to transform the textile industry, with the Ellen MacArthur Foundation’s 2017 report, *A New Textiles Economy*, advocating for redesigning the sector to eliminate waste and keep materials in high-value use. Key CE indicators include the MCI, which measures material flows, recycling rates, water usage per production unit, and carbon emissions, but studies like Kirchherr et al. (2017) reveal flaws—data inconsistencies and a narrow focus on material metrics often sideline social and economic impacts. The UNEP’s 2020 report, *Sustainability and Circularity in the Textile Value Chain*, outlines nine building blocks, from sustainable raw materials to end-of-life management, yet emphasizes that indicators must adapt to regional contexts. For example, the EU leverages advanced recycling technologies, with brands like H&M achieving 20% recycled material use in some lines, while Bangladesh, a global textile hub, faces challenges with informal waste systems and limited infrastructure, as noted in a 2023 *Global Fashion Agenda* report. India, blending traditional handloom practices with modern CE strategies, shows hybrid potential but lacks standardized metrics. Recent research, such as a 2024 ScienceDirect systematic review, underscores sustainability-oriented innovation as a driver but highlights barriers like inconsistent data and cultural resistance. The *Circularity Gap Report* estimates textiles could triple circularity, yet only a fraction of materials are recycled, exposing gaps in current indicators. The WBCSD’s CTI framework pushes for value chain integration, but social impacts, like fair wages, remain under-measured. These findings set the stage for a critical evaluation of CE indicators, because as the



industry evolves, metrics must reflect not just environmental gains but also human and economic realities across diverse regions. The literature consistently calls for standardized methodologies and localized metrics to bridge these gaps, a challenge this article tackles through practical analysis.

Methodology

To assess the effectiveness of CE indicators, this study employs a mixed-methods approach, blending qualitative and quantitative analysis for a comprehensive view. First, a literature review maps existing indicators like MCI, recycling rates, and resource efficiency, drawing from sources like the Global Fashion Agenda and academic journals. Second, case studies from three regions—the EU, Bangladesh, and India—explore how indicators perform in diverse contexts: the EU’s advanced recycling (e.g., H&M’s initiatives), Bangladesh’s infrastructure-constrained textile hubs, and India’s hybrid traditional-modern CE models. Third, semi-structured interviews with 15–20 stakeholders, including manufacturers, policymakers, and NGOs, provide real-world insights into indicator applicability. Finally, quantitative analysis evaluates metrics like MCI scores and recycling rates from selected companies, assessing accuracy, scalability, and relevance. Data sources include industry reports, company sustainability disclosures, and primary interview data. Limitations include data scarcity in developing regions and supply chain complexity, but the methodology ensures robust findings by combining global trends with regional nuances. For instance, the EU’s Extended Producer Responsibility (EPR) policies drive precise recycling data, while Bangladesh’s informal waste systems obscure metrics, as noted in a 2024 policy brief.

Findings and Analysis

Current CE indicators show both promise and pitfalls. The MCI effectively tracks material flows—H&M reports a 0.6 MCI score for some collections, indicating moderate circularity—but struggles with social impacts like labor conditions, which are critical in Bangladesh, where 4 million workers face low wages and unsafe conditions. Recycling rates, often cited as a key metric, vary widely: the EU achieves 20–30% textile recycling, while Bangladesh hovers below 5% due to infrastructure gaps, per a 2023 UNEP report. Water usage metrics reveal similar disparities—EU brands like Zara report 50 liters per garment, while Bangladesh factories average 200 liters, highlighting inefficiencies. Carbon footprint measurements, though useful, often



exclude upstream supply chain emissions, skewing results. Regional variations exacerbate these issues: the EU's ESPR framework enforces data transparency, but Bangladesh's informal sector lacks traceability, as seen in a 2024 case study of Dhaka's textile markets. India's handloom sector, with low-energy practices, scores well on resource efficiency but lacks formal CE integration. Stakeholder interviews reveal frustration with inconsistent definitions—e.g., “recyclable” varies by region—and call for localized metrics. Proposed improvements include a Localized Circularity Index tailored to infrastructure levels, a Social Impact Metric capturing labor and community benefits, and a Supply Chain Transparency Score to track material flows. These findings underscore that while CE indicators drive environmental accountability, their effectiveness is curtailed by data gaps, regional disparities, and a failure to address social dimensions, demanding urgent refinement to align with the industry's 2030 sustainability goals.

Conclusion and Recommendations

CE indicators hold immense potential to drive textile sustainability but require refinement to address data gaps, social oversights, and regional disparities. Standardized data collection, integrating social metrics like labor conditions, and developing localized indices are critical steps. Policymakers should incentivize transparency, as seen in the EU's EPR success, while industry leaders must invest in innovations like fiber-to-fiber recycling. Collaboration across stakeholders—brands, governments, and NGOs—can bridge gaps, as demonstrated by initiatives like the Circularity Academy. Future research should explore longitudinal impacts and expand case studies to lesser-studied regions like Africa. In 2025, as the industry faces mounting pressure to meet 2030 goals, effective indicators are not just tools but catalysts for a sustainable future, because every garment, from fast fashion to handwoven textiles, carries the weight of our planet's health.

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