https://doi.org/10.7250/CONECT.2026.080

ASSESSING CIRCULARITY POTENTIAL IN THE EAST-AFRICAN TEXTILE INDUSTRY: A CASE STUDY OF KENYA'S LEADING TEXTILE FACTORY

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Abstract – Over recent decades, the African textile industry has experienced a marked decline due to structural challenges, including outdated production technologies, low energy and resource efficiency and limited industrial policy support. A particularly significant factor has been the large-scale import of low-cost second-hand textile products from Europe and other highly developed regions, which has displaced locally manufactured textiles and undermined the competitiveness and economic viability of local producers. In response, improving resource efficiency through circular economy approaches has emerged as a potential pathway to revitalise the sector. This study assesses the potential for circularity in the East African textile industry through a case study of Rivatex, a prominent textile and garment manufacturer in Kenya. The research applies a mixed-methods case study approach, including systematic mapping of textile leftovers in the fabric manufacturing and garment production stages to quantify waste streams and identify opportunities for industrial-scale upcycling. In addition, factory-level waste upcycling was integrated with product-level life cycle assessment (LCA) to evaluate the environmental performance of circular textile products. The results indicate that approximately 7.2 % of total fabric production is rejected as defective leftovers and largely treated as waste, while in the garment manufacturing stage, around 38.8 % of fabric input is lost as cutting waste, highlighting substantial material inefficiencies in both production stages and significant potential for industrial upcycling. The main barriers identified were a lack of design knowledge, skills, and organisational arrangements for factory-based upcycling. To demonstrate the feasibility of this approach, two upcycled jackets were produced from production waste and compared with a conventionally manufactured jacket made from virgin cotton fabric. The comparative LCA indicates substantial environmental benefits for the upcycled products, with reductions in climate change impacts of 93 % and 78 % and reductions in fossil energy use of 93 % and 70 %, respectively. Even greater savings were observed for water and land use. Overall, the findings demonstrate the high potential of integrating industrial textile waste mapping with design-led upcycling and life cycle assessment to support circular production models in East Africa. Such approaches can significantly enhance resource efficiency, reduce environmental impacts, and create new economic opportunities, providing a viable pathway to improve the competitiveness and long-term sustainability of the East African textile industry.

Keywords – Circular economy; cotton; garment industry; life cycle assessment; textile waste; upcycling

ACKNOWLEDGEMENT

This research is funded by the Estonian Research Council project TEM-TA169, and the Estonian Environmental Investment Centre through the project "Transferring Upmade Know-how to Kenya" (Decision No. 1-25/1007).