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

ASSESSING CIRCULARITY POTENTIAL IN THE EAST-AFRICAN TEXTILE INDUSTRY: A CASE STUDY OF KENYA'S LARGEST 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recent decades, the African textile industry has experienced a marked decline due to structural challenges, including outdated production technologies, low energy and resource efficiency, and limited industrial policy support.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 countries, displacing locally manufactured textiles and undermining 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. However, limited recycling infrastructure, insufficient data on industrial textile waste, and gaps in design and organisational capacity constrain the adoption of circular practices. This study assesses the potential for circularity in the Eastern African textile industry through a case study of Rivatex, one of the largest vertically integrated textile and garment manufacturers in Kenya. The research applies a mixed-methods case study approach, including systematic mapping of textile waste and fabric leftovers across all production divisions 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 show that the factory generates approximately 600 tonnes of textile waste annually. Around 20 % of this material could be used directly in the factory to produce new textile products without requiring technological upgrades or capital investment. 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 designed and 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 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 textiles; industrial upcycling; life cycle assessment; textile waste

ACKNOWLEDGEMENT

This research has been supported by the Estonian Environmental Investment Centre within the project "Transferring Upmade know-how to Kenya" decision No. 1-25/1007.