

Uncovering the circular economy potential and opportunities for the textile and apparel sector in Kenya

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Abstract. The global textile & apparel industry is undergoing rapid change driven by fast fashion trends, shift of consumer preferences towards eco-products and intensified environmental and social welfare-motivated regulations. A comprehensive survey was undertaken to determine the baseline status of the uptake of sustainability practices and compliance requirements for the textile and apparel sector in Kenya. The primary objective is to assess the circular economy readiness, identify existing resource efficiency and cleaner production practices and identify barriers and opportunities that if implemented will enable the sector to effectively transition to green and circular economy status characterized with high productivity and competitiveness. The survey covered a total of 12 carefully selected textile and apparel manufacturers in Kenya. Data was collected using semi-structured questionnaires, face-to-face interviews and detailed in-plant assessments were undertaken to verify the authenticity of the provided data. The investigation revealed a high degree of variability among the companies in resource use efficiency and circular transition readiness. The survey recommends the integration of sustainability principles at all stages of the value chain to include sustainable procurement and interactive database enabled textile platforms that aid the monitoring, evaluation and research on how different textile waste streams can be diverted from the landfill.

Keywords: Circular Economy, Sustainability Transition, Textiles and Apparel, Eco-products, Kenya

1. Introduction

Textile & apparel is a vital sector for job creation, foreign exchange earnings, and supporting livelihoods in the various nodes of the value chains. Growth prospects in the textile & apparel industry are high as the industry is estimated to grow at a compound annual growth rate of 6.3 percent for the next 5 years, reaching a value of US\$1,600 billion in 2025(WTO, 2020). Global textiles trade in 2019 was valued at US\$305 billion, while apparels value was US\$492 billion (WTO, 2020). To date, apparel manufacturing remains one of the fastest growing businesses globally. The global value chains of textile manufacturing are expected to attract investments of over US\$350 billion by 2025 (Iribarren, 2016), hence offering large investment opportunities.

The Kenya Textile & Apparel industry is a key driver of the economy and has been contributing to growth of exports since the African Growth and Opportunity Act (AGOA) was signed in 2000(GOK, 2015). The textile and garment exports have significantly grown to roughly US\$415 million accounting for 30% of growth in total exports over the years according to the Kenya Industrial Transformation programme (GOK, 2015). Kenya is strategically positioned to grow this sector as it has been identified as a key player in the growth of exports under the manufacturing pillar of the 2018-2022 Presidency Big Four Agenda aimed at increasing the contribution of

manufacturing to Growth Domestic Product (GDP) by 20% by 2022(GOK,2018). According to Kenyan government reports, Kenya has a preferential access to global markets and buyers who seek to diversify their textile and garment sourcing base have a cost advantage if they invest in Kenya due to its cheaper labour costs¹ compared to Asia(GOK,2015) however, despite its advantage over other low-cost countries, Kenya still accounts for only 0.4% of the US\$84 billion American textiles market, Bangladesh, a low-cost competitor, is approximately 9% more expensive than Kenya but commands 6% of the US market (GOK, 2015). It is against this backdrop that Kenya has committed to capture these opportunities with natural competitive advantage by developing the textile and apparel value chain. The sector is crucial for employment creation, generation of export earnings, attraction of foreign direct investments, domestic market development and social impact by empowering women and youth through skills development and entrepreneurship initiatives. In recognition of this potential, the current administration under the Bottom-Up Economic Transformation Agenda (BETA), has prioritized the sector among other value chains where the government specifically seeks to promote backward integration, through development of textiles and cotton supply chain (GOK, 2023)

The Textile Industry is a sector struggling to address its contributions to the triple planetary crisis on climate

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change, nature loss and pollution. All year, the textile sector emits 2-8% of the world's greenhouse gases (Hole and Hole 2019). Garment manufacturing uses about five trillion litres of water annually for fabric dyeing and is responsible for approximately 20% of global industrial water pollution (WRI, 2017; Pandit et al., 2020). Textile resource consumption is projected to triple by 2050 if consumption continues at its current rate (WRI, 2017). Additionally, the value chain has deep social impacts, with textile workers at risk of exploitation, underpayment, cheap labour, health risks and abuse. Women are particularly vulnerable as they represent an average of 68% of the garment workforce, and 45% of the overall textile sector workforce. Transforming the textile value chain into one that is sustainable, and circular will go a long way in addressing these environmental and social impacts (UNEP, 2023)

The resource intensity and fuel consumption nature of the textile production processes has consequently contributed to a commensurate increase in waste generation arising from production waste, pre-consumer waste and post-consumer waste. Production waste constitutes approximately 20% of the global textile waste (Vecchi, 2020) and despite numerous studies indicating about 100% inherent recyclability rate for most textile materials, the actual recycling rates remain low (Toprak et al., 2017). This being not exclusive to specific regions, for instance in Europe, approximately 10% of textile waste is recycled, with about 8% estimated to be re-used leaving the majority (57%) being land filled and about 25% being incinerated (Morlet et al., 2017). In the US, it is estimated that about 2.5 million tons of textiles were recycled in 2018, with approximately 3.2 million tons being combusted and about 11.3 million tons ended up in landfills (USEPA, 2021). The rate at which resources are consumed and waste are generated by the sector calls for a shift due to the accelerated depletion of resources and dwindling landfill space coupled with the devastating impacts of climate change (Velenturf et al., 2021). If the current state of resource exploration and subsequent disposal of waste from the sector continues, the consequences of stretching the planets carbon budgets, enormous accumulation of microfibres from textile waste in our oceans and overwhelming challenges in managing textile waste (Saha et al., 2024). This will affect businesses through decrease in earnings, reputational risks which in turn affect profitability and competitiveness, and thus, the call for a circular transition for the sector from the current linear and wasteful ways of production and consumption (Shevchenko et al., 2021).

The circular economy framework emphasises on maximizing on the longevity of a product or resources that make a product by circulating them within the system while keeping its value and repurposing it to make new products and use it to regenerate the ecosystem once its original purpose is achieved. This transition will not only lead to waste reduction but also ensure efficient resource utilization while lowering the

environmental footprint for the sector for a more sustainable future.

The operations of the Kenyan textile and apparel sector are wastefully linear (Khisa and Onyuka 2018). There are significant wastages at all stages of the value chains of both the textile mills and apparel operations. For the sector to boost its productivity and competitiveness, it must look for innovative ways of minimizing waste at source, with the inevitable residual waste being exchanged through waste and by-product exchange synergies. This wasteful and unsustainable use of natural resources is worsening the multiple planetary crises of resource scarcity, excessive pollution, changing climate regime, and loss of biodiversity (Tongji University and SWITCH-Asia RPAC (2021). At the global level, more than 100 billion metric tonnes of materials are consumed within our wasteful linear economy systems each year (Tongji University and SWITCH-Asia RPAC (2021). Out of this, less than 7.5% of these materials are recycled back into the economy with the remaining over 92.5% being released into the environment with serious environmental consequences (Circular Economy 2023). Consequently, our world is only 7.2% circular, leaving a massive circularity gap of over 92.8% (Circular Economy, 2023). As a result, the Circular Economy has emerged as an attractive model to challenge the current wasteful linear economic system that is based on unchecked resource extraction and unsustainable consumption and production patterns (UNEP, 2020). The textile and apparel sector in Kenya has a great potential for tapping into this circular opportunity for its improved productivity and competitiveness.

The objectives of the study are to:

1. Assess the circular economy readiness of the Kenyan textile and apparel sector.
2. Identify the already existing Resource Efficient Cleaner Production (RECP) technologies and techniques that are already in operation within the sector.
3. Identify barriers and opportunities that if addressed will enable the sector to effectively transition into a low-carbon and resource efficient development pathway.

The scope of this study covered two textile mills and 12 apparel companies that are operational in Kenya.

2. Methodology

Primary data collection was derived from participating companies through the administration of 12 checklist interviews with top management and production managers on aspects of environmental policy, enterprise organization, purchasing decisions, materials management, energy efficiency promotion, water use efficiency, water harvesting and storage for onsite reuse, waste management practices, management of hazardous materials, product packaging as well as occupational health and safety. Specifically, the questions sought to establish how the textile and apparel companies have transformed their corporate strategies to integrate the net-zero requirements; the utilization ratio of renewable

energy; whether the companies segregate or sort their wastes at source to help improve recyclability; records of the quantity and categories of generated wastes and other consumed utilities; monitoring of the qualities and quantities of the generated waste streams; utility consumption metering and sub-metering to establish hotspots; rainwater harvesting; treatment of wastewater for on-site reuse; re-organization of the management team to provide strategy and leadership around waste reduction and recycling efforts; whether the companies exchange wastes at a fee with other companies; visible waste minimization programs within the companies; whether the companies have functional environmental/sustainability policies; and the quantification of greenhouse gas (GHG) emissions. The adopted approach was one where the selected textile and apparel companies were requested to present their internal best practices that were then followed with clarification interviews with top management and technical managers, before the execution of diagnostic walk through in-plant RECP Assessments to help ground truth the reported findings.

On the circularity front, the questions were asked to textile and apparel operators to help establish the percentages of recycled products in the making of final textile products; the extent of secondary materials usage as a substitute to the use of virgin raw material inputs; whether the textile and apparels companies were embracing design for zero waste, design for circularity, design for zero toxicity, design for energy and resource use efficiency, and design for self-sufficiency; promotion of the reuse of textile waste in other sectors of the economy; adoption of sustainable textile manufacturing practices; general standardization of waste management from collection to source segregation before final recycling; the existence of interactive multi-user web platforms for the textile value chain; adoption of green and circular business models; and citizen education efforts on textile waste recovery through source segregation

Secondary data on the textile and apparel sector was derived from institutional databases, The Kenya Association of Manufacturers, textile and apparel reports from the Ministry of Investments, Trade, and Industry (MITI); Development Agencies; and Research Publications on the textile and apparel sector. The focus was to determine the sector's current sustainability status, identify their operational constraints and make recommendations with a view to improving the sector's sustainability status.

3. Results and discussion

3.1 Resource Use Efficiency and Circular Economy Readiness

Whereas most textile companies are ready and willing to embrace resource efficient cleaner production (RECP) due to its simple methodological approach, their level of appreciation of the economic and environmental benefits of the circular economy concept is very low. The most ideal approach is first for the textile companies to embrace RECP that will enable them minimize waste at source. Since a company cannot operate at 100%

efficiency, the inevitable residual waste and by-products should be exchanged through industrial symbiosis. All the surveyed apparel companies recorded over 80% of fabric to final products conversion efficiency. Due to their high flexibility, micro and small apparel businesses can push this conversion efficiency to 98%. Their fabric offcuts are innovatively converted into patched up dresses, bags, key tags, airplane neck support system, and small fabric stuffed animal souvenirs. The ratio of the total number of garments shipped vs the total number of garments cut is known as cut to ship ratio (Gugnani & Yugal, 2021), and it indicates wastage in manufacturing process and is calculated style wise for the styles shipped in a particular month.

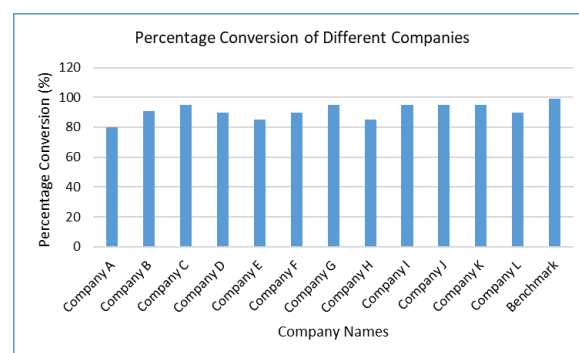


Fig. 1: Textile Fabric Conversion Efficiencies

The percentage textile conversion to the desired product for the sample companies ranged from 80% to 95% against the best practice benchmark of 99% (Gugnani & Yugal, 2021) as illustrated by figure 1 above. Companies that were able to use their waste on site managed to increase the conversion efficiencies to an impressive 98%. This involved using the waste as an input for another process or simply recovering the waste for use in making patched up bags, dresses, and a wide range of gift souvenirs. It appears that smaller companies have greater flexibility for innovation and experimentation than big corporates. Source segregation of waste will aid the value recovery process of the various fabric waste types

3.2 Material recovery from fabric waste

Apart from optimizing the lay planning design and fabric cutting process to minimize the quantity of generated fabric off cuts, majority of the Kenyan Textile and Apparel Companies are yet to appreciate fully that waste has value that is recoverable as illustrated by Fig. 2 below. Treating waste as a resource will enable these companies to start segregating it at source, and then going further to repurpose, refurbish, and remanufacture the separated waste streams. The potential for waste recovery in Kenyan textile and apparel firms is huge but largely remains untapped.

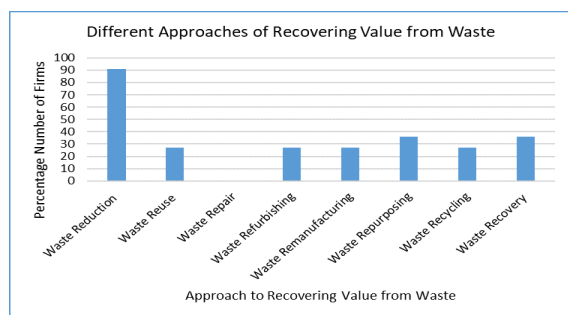


Fig. 2: Different Approaches of Recovering Value from Waste

It was also observed that only 15% of the surveyed textile and apparel companies recorded and trended machine efficiencies. The same companies also monitored and analysed the levels of rejection and reworks against a set improvement target. All the surveyed companies had difficulties knowing all their sources of waste and their associated costs. Auditing waste is the first step in waste reduction. It is important to know the real cost of waste that includes the costs of wasted water, energy, raw materials, wasted labour, treatment, and disposal costs. Adding up all these costs makes waste a real source of concern. Measuring and monitoring consumption of water, energy, and raw materials are initial steps in RECP promotion. Only 15% of the surveyed companies were aware of the standard prevention techniques for generating cleaner production improvement options. The survey revealed that there is need for skilling, re-skilling, and upskilling of company employees in emerging contemporary areas such as Environmental, Social and Governance (ESG) promotion, resource efficient cleaner production (RECP), waste and by-product exchanges through Industrial symbiosis, green and circular economy innovation promotion, sustainability reporting, lean manufacturing, Gemba Kaizen, and hazardous waste management.

3.3 Strategic and shared vision

85% of the surveyed companies did not have a strong and clear sustainability vision/mission strategy statements. This means that the top management of Kenyan textile and apparel firms will need to strategize and formulate the sustainability direction of their enterprises, create an ambition and milestones towards the set sustainability promotion goals. Such a sustainability vision should be stated in a manner that can be objectively assessed and monitored over time. None of the surveyed companies sets objectives and targets for minimizing waste, reduction of resource depletion, and loss of products. Such objectives and targets should be realistic, acceptable to those who work to achieve them and flexible enough to adapt to changing requirements. Targets should be measurable over time and should be used to monitor if the company is proceeding as planned. 60% of the surveyed textile and apparel enterprises had well written environmental policies that are routinely reviewed and signed by top management. A good environmental policy should call for continual environmental improvements through the

application of a proactive strategy to the production processes, products, and services offered by the company. The policy should stress the commitment of the top management. However, no company out of those surveyed claimed possession of a sustainability policy. A few surveyed companies, however, claimed that they do promote some sustainability principles without necessarily having them written down. 100% of the surveyed companies had occupational health and safety policies that in some cases were not properly drafted and overtly displayed. Only one company out of those surveyed had appointed a senior sustainability manager. His main responsibility was to help and guide the company in embracing the principles of sustainability across the company's supply chain. On the national front, Kenya has an adequate number of green transformation policies and strategies that can be leveraged upon to help create the desired transformation. However, the policies have a few gaps that will need to be addressed. There is a lack of systematic and more industry-specific supporting policies, systems, and standards, which need to be further improved to provide strong guarantees for the textile and apparel industry to enable it to accelerate the transformation.

3.4 International standards and best practice

Only one out of the 12 companies were both ISO 9001(QMS) and ISO 14001(EMS) certified. The momentum for World Responsible Accredited Production (WRAP) accreditation is gathering steam within the Kenyan textile and apparel sector. Three of the surveyed companies were fully WRAP accredited with a majority planning to follow suit. One company was working towards the accreditation of OEKO TEX Standard 100 label (safety tests for the presence of harmful substances on textile products) for the purpose of enabling it to penetrate the international market. A few other companies have started plans for HIGG Platform on Sustainable Apparel Coalition (SAC); and Global Recycling Standard; SEDEX Members Ethical Trade Audit (SMETA) certification.

3.5 Adoption of renewable energy and energy efficiency

Majority of the surveyed enterprises had switched from the use of fossil fuels to the use of biomass energy derived from agricultural waste for steam generation driven by economic reasons. Such a switch has resulted in some cases up to 60-75% energy cost savings as per communication from the companies. However, for optimal performance, these biomass boilers needed to be properly sized against the steam requirements of the firm as an oversized boiler leads to unnecessary wastage. It is worth noting that 100% of the surveyed enterprises had operational boiler steam condensate recovery mechanisms. These boilers need to be regularly monitored for operational efficiency. 17% of the surveyed companies had fully switched to the use of solar energy for lighting and overall textile machine running. 23% of the surveyed companies are partially using solar to meet 25 – 30% of their energy needs with plans in place to start using 100% solar. It is promising that the solar revolution is taking place in the Kenyan

textile and apparel sector. Apart from the solar switch lowering the operational costs, it also lowers the carbon footprint of the company in question. Most solar investments have been made with the help of the Energy Service Companies (ESCO) model. The solar adoption revolution is gathering steam with the Kenyan apparel and textile sector. 60% of the surveyed companies have switched to energy saving LED green lighting solutions.

3.6 Use of alternative/renewable water sources and water use efficiency.

30% of the surveyed companies reported to be embracing water use efficiency as well as rainwater harvesting to augment their operational water security. The water efficient companies have invested in water metering and sub-metering, execution of routine water audits, and strict adherence to good housekeeping principles of avoiding leakages, overflows, and spillages. The harvested rainwater can be used for flushing toilets, lawn irrigation and general cleaning.

Other findings included a weak measurement culture and inadequate bench marking across the sector. Only 20% of the surveyed companies had embraced the culture of metering and sub-metering of utility consumption (water, energy, effluent, oil, gas) as well as materials. Such metering and sub-metering will yield production records that should be analyzed and trended to enable informed decision-making. There is also a need for the development of key performance indicators (KPIs) that can be used for benchmarking and continual improvement efforts. There is need for a computerized system for data acquisition, storage, and reporting. Competitive companies are those that have a good input/output, waste, and by-product measurement culture. The derived records should be analyzed and trended to inform decision-making. Although most companies keep operational records, they hardly analyze them to help inform decision-making.

4. Conclusion

The improved competitiveness of the Kenyan textile and apparel sector will depend on the sector's ability to effectively incorporate sustainable, green, and circular principles. The proven approaches to sustainable manufacturing in Kenya are eco-innovation; resource efficiency and cleaner production (RECP), life cycle management, industrial symbiosis, and the adoption of the principles of circularity. Some barriers will need to be overcome for this desired sustainable transition to happen. These include issues of impending regulations, inability to strictly enforce the environmental regulations, insufficient knowledge and green skill sets, insufficient collaboration in supply chains and between sectors, limited demand for green and circular products and services, institutional weaknesses, current prices and taxation favoring linear practices, limited capacity building and knowledge dissemination, limited skills in the eco-design know-how, limited incentives for extended textile use life and recyclability, lack of accurate waste generation data, low-quality and low-durability garments that are unsuitable for reuse and

recycling, sustainability not being the consumers' most important purchasing decision driver, low maturity of scalable high-quality recycling technology, and underdeveloped collection, sorting, and recycling infrastructure. Adoption of sustainability principles will enable the Kenyan textile and apparel sector to access new environmentally conscious markets, stay ahead of emerging stringent environmental regulations, access green financing, reduce operational costs, improve the product quality, and boost its competitiveness and profitability.

5. Recommendations

For the textile and apparel sector in Kenya to embrace circularity, there is need for the development of a textile and apparel circular strategy that focuses on longevity, modularity, and recyclability. Development of an enabling legal, policy and regulatory framework for the textile and apparel sector in Kenya that will incentivize and operationalize textile circularity through the development of supportive guidelines that promote sustainable practices along the entire value chain will be useful. Investment in textile and apparel-based research & development that will permit the development of new technologies and processes and material innovation that support textile circularity such as alternative fibres, zero waste pattern cutting, upcycling, and remanufacturing. Collaboration and partnerships in form of public-private-academic partnerships, centres of excellence, pilot projects, and 'living labs' focused on de-risking innovation, and bringing solutions to scale is recommended in Kenya for a sustainable and circular future of the textile and apparel industry.

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