

Life Cycle Logistics of Clothing and Textile Products and Their Impact on Developing Countries

Steadyman Chikumba

Department of Industrial Engineering & Engineering Management
School of Engineering and Built Environment
University of South Africa
Florida, 1710, South Africa
chikus@unisa.ac.za

Abstract

The importance of textiles to humanity cannot be understated. They are used for clothing, domestic furnishings and industrial applications. The selection and choice of textiles and clothing follow fashion trends. Unfashionable textiles are discontinued from production lines, discarded in landfills, burnt, or sold as second-hand items, often to poorer communities. The textile industry in less industrialized countries, especially in Africa, is facing a steep decline and, in some cases, the entire sector has collapsed, leaving the population relying on pre-owned products. Developed countries often sell pre-owned textile products to less developed nations. The uncontrolled influx of these products is causing deindustrialization due to local firms failing to compete and losing market share, unemployment, and environmental pollution as excess stock and degraded textiles end up in landfills and illegal dumpsites outside cities. Local industry needs to adopt new manufacturing technologies and strategies to revive and survive, considering these challenges. This paper takes a life cycle approach to investigating the problem of the declining textile industry in African countries and the impact of imported pre-owned textiles, and how the local industry can improve its manufacturing capability and responsiveness. This is exploratory research from literature sources. The life cycle logistics of textile products, and their economic and environmental impact in developing countries, are studied from literature sources. A framework for responsible production, use, recycling, and reuse methods is identified. Ways of improving the resilience of textile industries in developing nations, together with the required technology, are also prescribed.

Keywords

Preowned textile, Life cycle logistics, Impact, Developing countries, Capacity building

1. Introduction

In recent years, research on second-hand economies has been conducted in diverse disciplines, especially anthropology, history, geography, and sociology (Hansen & Le Zotte 2019). An example is the second-hand clothing market, which has a profound effect on developing countries. The textile and clothing market share of less industrialised countries in Africa is rapidly declining and facing collapse as traders resort to imported pre-owned clothing (EEA 2019). Preowned clothing imported into developing countries is often too used or of poor quality, which reduces the financial benefit of trading in them (Ralls 2024). The weight of global textile waste produced each year is 92 million tonnes and is projected to double by 2030 (Ralls 2024). At the beginning of the last century, clothing and textiles were made from natural, high-quality materials, easily biodegradable, while today they are made of thin polyester blends (eWASA Team n.d.). In 2021, a WEF report revealed that fashion was the third-most polluting industry after agriculture and construction (eWASA Team, n.d.). Due to competitiveness challenges in the textile sector, Africa imports most of its branded clothing and textiles, as well as footwear and leather. For example, South

Africa, although being the most industrialised on the continent, is a net importer of textiles and related products, of which R60.2 billion's worth were imported in 2022 (Green Cape 2023). Africa is in a strong growth phase with a young population of 1.3 billion people, which is set to double by 2050. According to the United Nations, by 2050, more than a third of the world's young people will live in Africa. The continent's fashion industry is estimated to be worth \$31bn, compared to a global industry worth about \$2.5 trillion (Allen 2024).

Euromonitor International research identified South Africa as the leading apparel and footwear industry in sub-Saharan Africa, with an apparel and footwear industry worth over \$11bn, and recorded the highest growth rate of 6% in 2023 (Bizcommunity 2024). There is also a growing importation of pre-owned textiles, clothing, and footwear across sub-Saharan Africa. Two major problems addressed in this paper are (a) the deindustrialisation of local textile industry negatively impacting livelihoods (b) the Pollution of urban environments from high volumes of disposed textile products. While these pre-owned textiles and clothing are affordable to poor communities, it is negatively impacting and stifling local manufacturing, causing job losses, destroying local economies, and increasing environmental pollution due to textile landfill disposal (EEA 2019). In this paper, the impact of textiles throughout their logistics life cycle is discussed. Origins of pre-owned clothing and the impact on developing countries is investigated with a particular emphasis on developing countries in Africa. Measures to reduce the impact of imported pre-owned textiles are discussed together with ways in which local textile manufacturing can build capacity and responsiveness to customer needs and ensuing challenges. It proposes how industry clusters can intervene to assist individual textile companies in their localities.

1.1 Objectives

The aim of this study is to identify the extent to which preowned clothing flooding developing countries are affecting their textile industries, incomes of communities. It also seeks to investigate the impact of textiles products throughout their life cycle from processing to disposal on the environment, identify dangers posed to human health and the ecosystems. It also seeks to find ways to reduce economic and environmental impact of secondhand products that end up in the environment. Methods of promoting local textile manufacturing and raw material beneficiation through good practices in the textile industry by entrepreneurs and policy makers which promote sustainable and competitive manufacturing within the sector are discussed.

2. Literature Review

Textile industry is divided into output-based segments namely "yarn and fibre" and "processed fabric" or based on the sector, as "handloom and handicrafts" or as "organized spinning, weaving and garmenting" (Choubey & Agrawal 2016). Textiles are fibre-based materials such as yarns, filaments, and threads (Kadolph 1998). They are used in functional applications and aesthetics and are used in clothing, fabrics, footwear and many domestic, decorative furnishings and industrial applications (Choubey & Agrawal 2016). The last 20 years witnesses global fibre production increase from 58 million tonnes in 2000 to 109 million tonnes in 2020 (Textile Exchange 2021). Consumption of clothing and footwear is projected to rise by 63% by 2030 (EEA 2019). In the EU clothing constitutes the largest share of EU textile consumption at about 81% (EEA, 2019). The textile industry depends on globalised supply chains, and value chains spanning several countries while most consumption occurs in Europe, North America, China, and Japan which account for 79% of global consumption (Textile Exchange 2021). By contrast, Africa accounts for only 4%. Developed countries in North America and Europe dominate the consumption of new clothing textiles while most manufacturing is in Asia and the EU. Africa has an insignificant production base for clothing and accounts for 4% of consumption. Global clothes sales are rising year-on year and could increase by up to 65% by 2030, according to the World Bank (European commission 2022). African countries have relatively low labour costs, which presents opportunities for growth of local manufacturing in Africa for local consumption and exporting to lucrative markets (Acheampong & Vitenu-Sackey 2024).

Africa is at the bottom of the value chain (African Development Bank 2022). Currently, while most African countries focus on raw material exports, South Africa is its most industrialised country, together with Morocco, Egypt, Tunisia and Mauritius (Acheampong & Vitenu-Sackey 2024) due to focus on industry as a driver for economic development and protection from external shocks (KPMG 2024). Lack of infrastructure, political and economic instability, reliance of extractive industries such as mining and agriculture and poor investment in manufacturing technology are major limitations to industrialisation (African Development Bank 2022). Poverty and economic stagnation are exacerbating the demand for cheaper clothing and textile products and subsequent importation of preowned clothing items from developed countries (Trellis Group 2025).

The global clothing production which involves assembly of garments and consumption of textiles has not changed much in the last decade and in 2018 it is summarised in Figure 1. Asian countries continue to dominate textile manufacturing due to their labour costs, raw material supply and processing ability, access to technology and economies of scale when compared with other developing regions (Textile Exchange, 2021).

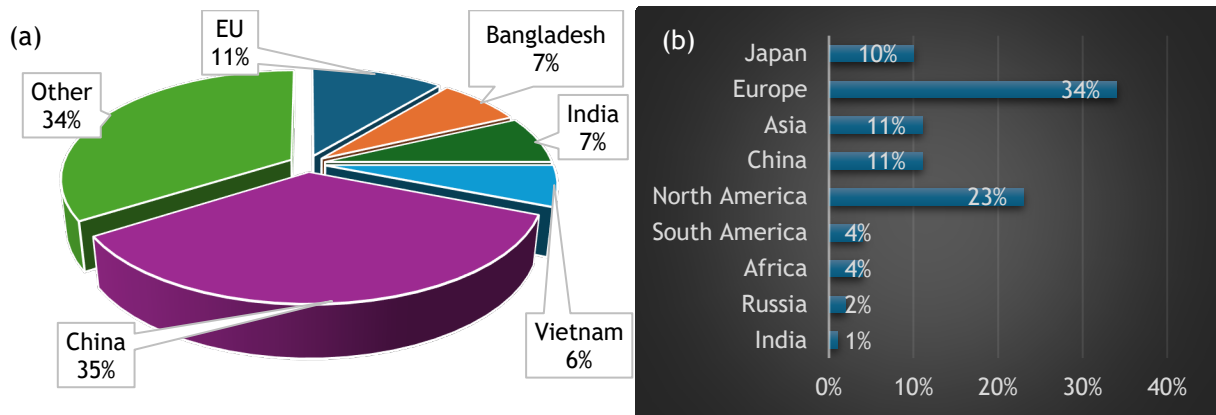


Figure 1. Graphical presentation of global (a) Assembly and (b) Consumption of textile products (Green Cape, 2023)

The fashion industry is increasingly adopting the “Fast fashion” business model producing quick and cheap clothing and textile products for a rapidly changing market and fashion trends leading to shortening life cycles and increased discarding of preowned clothing and other textile items (Qutubuddin 2023; Fischer & Balk 2022). Global fast fashion brands include Zara, H&M, and Forever 21 among others (Qutubuddin 2023). Fast fashion relies on an extensive global network of suppliers and manufacturers producing at low cost and retailers selling low price merchandise (Fischer & Balk 2022). The strategy is based on offering the market new and trendy clothes within weeks, and evolving designs to encourage customers to continue buying (Qutubuddin 2023). However, the use of poor quality fabrics with synthetic fibres of in blended form in fast fashion are at the heart of the problem (Fischer & Balk 2022). Overconsumption and oversupply are the main culprits behind the cities’ textile waste crisis, together with increasing trend in developed countries of using garments for ever shorter periods before disposal (European commission 2022). Although some countries such as Japan has been re-dyeing and reusing used garments, as part of post-consumer textile waste management (Sugiura 2018), most of preowned textiles end up being disposed of or resold. Fast fashion manufacturers industry is characterised by low wages and terrible conditions for workers, the need for economies of scale and more clothing produced equals more waste generated and excessive use of natural resources and greenhouse gas emissions (Hasiru Dala Innovations 2023).

2.1 Environmental Impact of textiles

Typical life cycle of textiles includes raw materials extraction, fibres into yarn processing, manufacturing of end products to end or intermediate users, use and disposal or recycling (Muthu 2016). Agricultural crops such as cotton are the main source of textiles which create natural fibres made by dry spinning methods (Peters, et al. 2016). The remainder are industrial synthetic textiles such as polyesters and nylon (Muthu, 2016). These synthetic fibres are manufactured by melt spinning, elastane by dry spinning, while viscose and lyocell through wet spinning. (Peters, et al., 2016). Global fibre production of was about 113 million tonnes in 2021. Of this tonnage, synthetic fibres made up a 64% with polyester contributing 54% of total, while plant based fibres made up 28% of total global production with cotton comprising 22% of the quantity (Textile Exchange 2021). In 2020, the global production volume of polyester was about 57 million tonnes. It was the most used fibre accounting for 52 percent of the global fibre market (Textile Exchange 2021). The market share of recycled polyester increased from 13.7 percent in 2019 to 14.7 percent in 2020 (Textile Exchange 2021). Polyamide had a market share of 5 percent of the global fibre market in 2020. Fossil based polyamide is technically challenging to recycle and fetches comparatively low prices in the market resulting in its share of polyamide fibre market being only 1.94 percent (Textile Exchange 2021). Studies in 2020 showed that of the global fibre market, pre- and post-consumer recycled textiles accounted for less than 0.5 percent. Similarly biobased polyester fibre was exceptionally low at around 0.03 percent of the polyester fibre market due to prices, availability, and sustainability of the biobased fibres (Textile Exchange 2021). The manufacture of clothing globally uses 97% virgin material comprising, 2% recycled feedstock, with 1% closed loop recycled. Loss during production is about

12%. After use 12% and about 73% are incinerated or disposed in landfills (Green Cape 2023). During their primary production, manufacturing and use textiles cause environmental impacts through energy consumption and waste generation which is a serious cause for concern for governments and communities alike (European commission 2022).

The textile industry accounts for an estimated 8-10% of global emissions (Hasiru Dala Innovations 2023). Textile production uses a vast amount of natural resources, including water, energy, and raw materials (EEA 2019). In addition, the overproduction demands more cotton farming resulting in the uses about 2.5% of arable farmland and production of synthetic textiles which consume 342 barrels of oil annually according to the UN, exceeding aviation and shipping (Hasiru Dala Innovations 2023). However, most of fashion's environmental impact comes from the use of raw materials (Hasiru Dala Innovations 2023).

The fast fashion industry is responsible for a significant amount of pollution and waste including the textile dyeing and finishing industry is a major polluter of water globally (EEA 2019; Qutubuddin 2023; Peters, et al. 2016). By comparison with others, the textile manufacturing industry uses water intensive processes, annually demanding 79 trillion litres of water, and it contributes about 20% of industrial effluent often containing chemical dyes comprising aromatic and other compounds (Zhu et al. 2022). These chemicals are stable and not easily degradable in water bodies and are harmful to aquatic life and humans (Zhu et al. 2022). The chemicals used in the production of clothes, such as dyes and bleaches, are toxic and can cause harm to the environment (Hasiru Dala Innovations 2023). For example, Chemotechnique textile resins used in textiles, often release free formaldehyde in water and are known to cause contact allergies when concentration is above 75 ppm (Scheman, et al. 2007). When pigments and dyes are present in water, they are known to cause respiratory diseases, skin problems, and allergies over time (Scheman, et al. 2007). During production, use, and at end-of-life disposal, textiles, they release fibres that can harm the environment (Henry et al. 2019). Microfibres are about (<5 mm) and nanofibers (<100 nm). Currently two-thirds of all textile items are synthetic, mainly petroleum-based organic polymers such as polyester, polyamide and acrylic. They are often difficult to biodegrade and affect marine life and other animals alike (Henry et al. 2019; Fibre2Fashion 2013).

2.2 Life cycle analysis of products

To study the impact of textiles life cycle analysis can be applied just like any other product. Life cycle analysis (LCA) according to the ISO14040 is a process to investigate the impact of a product throughout its life from the cradle to the grave (International Standards Association 2022). ISO 14044:2006 defines guidelines for life cycle assessment (LCA) studies and life cycle inventory (LCI) studies (International Standards Association 2022). An important analysis is that of a product's carbon footprint throughout set boundaries of its life measured by carbon emissions. Goal and scope definition defines the functional unit, or a quantitative benefit offer by a product which is necessary for comparison of different products (Peters, et al.2016). Changes in the environment due to manufacturing process, a new product or distribution (Peters et al. 2016). Allocation of carbon emissions can be handled through partitioning or substitution (Peters, et al., 2016). Partitioning allocates the greenhouse gas emissions is allocated based on mass, volume, or market price (Sandin et al. 2015; Peters, et al. 2016). Substitution accounts for the reduction in emission due to core products (Peters, et al.2016). In textiles the processing and manufacturing steps dominate the contribution to the total carbon footprint (Peters et al.2016). LCA standards include GHG Protocol of 2011 from the World Business council for sustainable development, GRI from Global reporting initiative. PAS2050 from British standards institute of 2011 among others (Peters, et al. 2016). Standards differ in the way they treat land use change due to a product and thus consider substitutional allocation as a last resort (Peters, et al. 2016). LCA studies where the use and disposal are excluded are referred as Cradle to the gate studies (Peters, et al. 2016). Environmental impact elements are shown below in Figure 2.

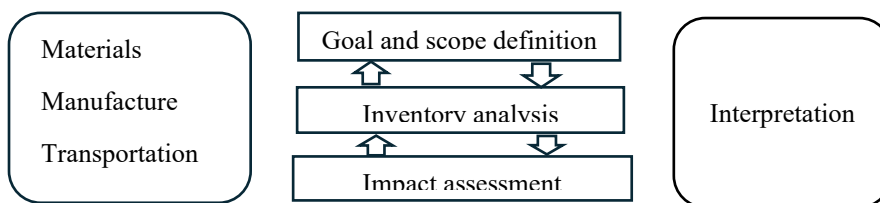


Figure 2. Elements of life cycle impact assessment (Peters, et al., 2016)

3. Methods

This study is an exploratory study through literature sources on the textile industry. The production and consumption of textiles is carried out investigate the scale of global textile production and consumption trends. The environmental and economic importance and impact of the clothing industry is investigated. It looks at environmental and socio-economic impact of textile products throughout their life. Focus is particularly placed on developing countries and how it is impacting the environment and economies particularly viability of domestic textile industry. The end of life of textiles and how the discarded textiles are impacting economies and textile industry in African countries is investigated. It proposes what can be done to overcome the challenges at government level, community level, industry level, company level. Ways of improving local industry resilience and strategies to meet their markets are proposed based on technology available within the manufacturing industry.

4 Results and Discussion

In 2024 Africa’s revenue in the apparel market is expected to be US\$70.58 billion of which 4% is from second hand clothing. The projected growth in second hand apparel is shown in Figure 3 (Statista Market Insights 2024). In 2021, more than 40 per cent of global used clothing exports came from China (17 per cent), the United States (16 per cent), and the United Kingdom (8 per cent). Among these China’s exports of second-hand clothing to Africa increased 131 per cent during the period 2020-2021 and it became the largest exporter by exporting \$624 million (Fibre2Fashion, 2022). Reported annual exported of second hand clothing to Africa from 2015 to 2021 is presented in Figure 3 while reported projected annual growth of the second hand market in Africa is presentation graphically in Figure 4 (Fibre2Fashion 2022).

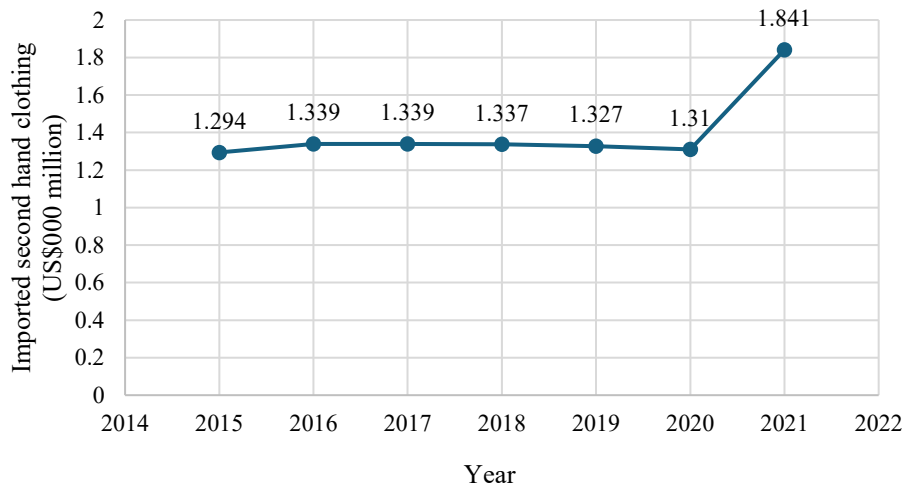


Figure 3. Exports of second hand apparel to Africa by value

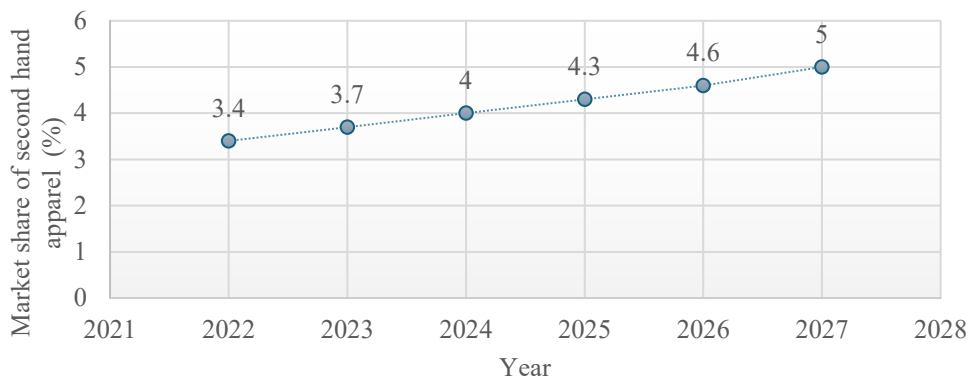


Figure 4. Projected growth of second hand clothing

4.1 Logistics costs

Transportation and handling second hand clothing costs money to the developing countries. After collection and sorting the items are packed in bales for shipping. In order to reach the end user, the goods are shipped from USA and Europe to Africa. Transportation cost is considerable as shown below for a 6 m long container. The average shipping time ranges from 47 to 60 days (Zimbabwe Mail 2022). Shipping costs for containers on selected routes to Mozambican ports from various shipping ports range from USD 2 800 to USD 4500. Upon arrival at the seaports, the bales are traded and transported inland. An example of a thriving second-hand clothing market in Mozambique's Gabo area of Chimoio, where bales are traded and couriered into Zimbabwe (Zimbabwe Mail 2022). Transportation of bales weighing 45kgs and above cost between US\$20 and US\$25. The retail value of a bale of clothing items the final retailer costs around \$300.

4.2 Waste generation from second hand clothing

Studies in Germany have shown that fabrics disposed of during the period 2013 to 2018 grew from 1 million to 1.3 million tonnes with a considerable amount exported to developing countries (Fischer & Balk 2022). These discards are exported to intermediate wholesalers in Poland and Netherlands, who later export to developing countries including those in Africa (Fischer & Balk 2022). Companies that collect and sort often realise a profitable if they find 60 % collected preowned clothing sellable (Fischer & Balk 2022). The same applied for retailers in developing nations who import the second-hand textile items. As a result, they purchase large volumes of textile items some of which they discard. The Tony Blair Institute for Global Change reported that in 2019, an estimated that, globally of more than 65 million tons of second-hand clothing shipped about 40% were unsold due to poor quality and were disposed in landfills. Annually, 11.3 million tons of textile waste are landfilled. In Kenya 4,000 tons of waste every day is generated from clothing waste (The Green Side of Pink, 23). In the City of Cape Town in South Africa of the ~1.1 million tonnes of waste disposed of at municipal landfills in 2022, about 6.38% is textile amounting to about 70 300 tonnes compared to plastics which made 190 500 tonnes or 17.29% (Green Cape 2023). Ghana imports approximately 15 million items of second-hand clothing each week, making it the world's largest importer of used clothes and in 2021 alone, the country imported \$214 million worth of second-hand garments (Johnson 2023).

The threat of adverse impact to urban environments from textiles cannot be underestimated. About 5.8 million tonnes of textiles discarded annually by the EU, are equivalent to about 11kg per person, while every second somewhere in the world a truckload of textiles is landfilled or incinerated (EEA 2019). After plastic and paper, textiles are the third-largest source of waste in many countries such as India (Hasiru Dala Innovations 2023). Kantamanto, located in Accra, one of the world's largest second-hand clothing markets stocked preowned clothing brands. However, around 40% of the clothing within an average bale is classified as waste, resulting in the daily disposal of 100 tonnes of unsellable clothes (Prempeh 2023). The growing demand for cheap and disposable clothing is the main cause of the decline in overall garment quality, resulting in an increase in pollution in our seas and waterways due to textile.

4.3 Countering influx of preowned clothing through local production

There is significant impact on economies of developing countries due to textile trade. Fast fashion and preowned textiles are negatively impacting local economies, particularly in developing countries. The Global textile industry is dominated by a few large multinational corporations that have a monopoly on the market which dictate the terms of trade, leading to unfair wages and working conditions for workers in troubled domestic industries (Qutubuddin, 2023). Many local retailers are resorting to imports rather than local manufacturing in many developing countries. A solution to the textile waste problem is the adoption of a circular economy approach where products, components, and materials at their highest use and / or value are kept as for as long as possible. This circularity promotes local manufacturing and localising supply chains by cycling secondary products, components, and materials close to the market (European commission, 2022). Currently textile industry depends on globalised supply chains, with value chains that span borders, and with consumption taking place largely in Europe, North America, China, and Japan (Textile Exchange 2021).

These regions account for 78% of global consumption of newly manufactured textiles. Only the contrary, Africa accounts for only 4% of new textile consumption. However, Africa is a dominant market for second hand textile products (Prempeh, 2023; Zimbabwe Mail 2022) which is destroying textile industry in many countries. Local production is vital to local economies by creating jobs by supporting growth of small businesses and promoting economic growth at the same time reducing the carbon footprint and (Qutubuddin 2023). In order to develop localised production in developing countries manufacturing must be capacitated through government sector wide funding to

promote design capabilities, lower cost production, innovative research and development of textile designs as well as better manufacturing technology. Emphasis should be placed on sustainable fashion, which focuses on producing clothes in an environmentally and socially responsible manner by using organic and natural materials, recycling, upcycling, and reducing waste (Qutubuddin 2023). An example of such an initiative is by EU which started in March 2022 the 'Strategy for Sustainable and Circular Textiles' which is a forward-thinking initiative to reduce over-consumption and over-production by promoting resource-efficient manufacturing processes and circular business models to reduce textile waste by 2030 (Borgen Project 2024).

Process automation in garment manufacturing improves quality as well as reduces cost in textile production if adopted by manufacturers in developing countries. This will enable them to deliver cheap local products that their citizens and reduce demand for imported second hand textile products. The world market today guarantees a manufacturer's survival in its competition of apparel industry if it possesses advanced technology, automation, and robotics, from product design to production, handling and transportation to the market (Jindal 2021; Techpacker 2024). Robotics can minimise human efforts in labour-intensive processes (Jindal 2021). Automation ensures consistent quality and high productivity in the mills and garment industry leading to low unit production cost (Choubey & Agrawal, 2016). However, uptake of automation often causes job losses at low skill level. To compensate for this loss unskilled workers can be reskilled to take up more qualified jobs are created in complementary fields, such as design, marketing, retail and management (Cesario & de Noronha 2012).

Automation can be adopted throughout the supply chain in stages such as cotton picking and ginning which were completely manual (Choubey & Agrawal 2016). Machinery used in these processes often use ultraviolet, optic, and acoustic technologies to detect and elimination of contaminant of any colour, size and nature of the fibres and improve the overall quality of the final yarn produced (Jindal 2021). Automation is already available for spinning in ring spinning, air-jet spinning, rotor spinning, vortex spinning machines (Choubey & Agrawal 2016). Machine vision assist in yarn fault detection to improve production flow and ensure uniform yarn quality while yarn knots are now substituted by joints using splicing techniques such as air splicing, wet splicing, hot air splicing and moist air splicing. Automation solutions facilitate package collection from the spinning mills, palletizing, and packaging (Choubey & Agrawal, 2016). Dyeing process has multiple stages namely de-sizing, scouring, bleaching, printing and finishing (Jindal, 2021). It is improved through precise control of critical parameters such as pressure, temperature, time of treatment and water level (Jindal 2021). Robots can pick the yarn bobbins and transport them to the dyeing and drying machines where they also assisting in the unloading process (Jindal, 2021; Fibre2Fashion 2013). Cutting tables can be automated using automatic unloading, intelligent transportation system, manufacturability prediction, and cutting blade control (Fibre2Fashion 2024).

Integration of sustainable practices throughout their raw material development and production increases long term profitability (Techpacker, 2024). Leading global brands which include H&M, Adidas, and Puma are exploring new methods of producing sustainable clothing and non-textile materials (Fibre2Fashion 2024). They are developing smart textiles, applying nanotechnology, creating biodegradable textiles, and hybrid materials so as to achieve sustainability (Fibre2Fashion 2024). Agility of manufacturing processes is also increasing being achieved using rapid data analysis for quick adaptation. This approach enables businesses to quickly adapt their business fragments and supply chains quickly and efficiently by using large amounts of data to support this adaption using software tools allowing factories to receive real-time feedback and alerts from partner companies about defects or damaged goods (Fibre2Fashion, 2024; Techpacker, 2024). Mobile technology is improving access to markets through eCommerce platforms using mobile devices and digital wallet payment options such as Google Pay and Apply Pay securely using fingerprint and facial recognition (Techpacker 2024).

Virtual Reality's is enabling customers to virtually try on outfits using customized measurement functionality, and augmented reality technology (Techpacker 2024). Block chain technology is allowing easier management of business processes offering transparency, traceability, and efficiency within the supply chain. Block chain technology connects, all its members, including carriers, banks, intermediaries and suppliers, allowing them to exchange information, documents, and data, directly and securely (Techpacker 2024). In South Africa and many developing countries efforts are being made to increase localisation of the clothing textile and footwear manufacturing sector, though promotion of an industry wide upstream production, taking cognisance of the localisation of waste (Green Cape 2023). Other initiative to the waste problem is the provision of an alternative to retailers and residents other than landfill disposal of pre-used and post-used clothing to establishing thrift programme directing tax deductible clothing donations to a network of shelters or to charity stores that employ previously homeless people (Green Cape 2023). Many countries

lack meaningful textile waste related data that can be used for monitoring and solving textile waste problem in their localities. It is important for local authorities and textile related businesses to monitor the tonnages of textile waste by types of fibre waste generated. Incentives must be offered by governments through tax credits in companies engaging in textile recycling projects. Policymakers and practitioners can adopt extended producer responsibility policy (EPR) to meet sustainability targets which requires producers to cover the costs associated with collecting, treating, and recycling their end-of-life products. Extended Producer Responsibility (EPR) rules are widely applied in plastic, batteries, tyres, (Hasiru Dala Innovations 2023). Use of life cycle assessment tools can assist in the investigation, monitoring, and control of environmental impact of textiles in communities. Examples of ISO standards are ISO14040, ISO14044 and ISO14064 provide the frameworks for auditing, measuring, monitoring and mitigation of impacts of not only textiles but a products and activities (Peters, et al., 2016). Standards provide a scientific evaluation of the environmental impact of any business activity and will allow a fact and quantitative analysis of such impacts. From the quantitative analysis solutions can be crafted.

The survival of local textile manufacturing depends on sustained domestic market growth as well as long term value chain localisation (WDTIC 2020). By value chain transformation through a supporting institutional environment domestic technical industry can reduce costs, remain competitive and be adapting to a changing market demands and trends. Enabling value chain regulations and policies are not enough but the industry must implement sector monitoring and evaluation and continuous improvement programmes in design, technology acquisition, manufacturing, marketing.

5. Conclusion

Production of textile has an impact on land use, energy consumption, water consumption, economic wellbeing of societies globally. While most of the production and consumption of textile products is in the developed countries, less industrialised countries participate in the production supply chain and end of life logistics and markets of textiles. In less developed countries the problems of second hand clothing while it is offering cheap textiles it is leading to deindustrialisation of textile sector and pollution of the environment. Policies to promote sustainable local production and industrialisation are required to reduce the problem while environmental life cycle management tools can evaluate the impact, monitor, and control it. Localised production equipped with design and production skills and expertise as well as investment in technology can build capacity of textile manufacturers in developing countries. Adoption of modern design techniques such as computer aided design, virtual reality in design, research in new textiles, and smart technologies and automation in manufacturing will improve competitiveness customisation and responsiveness of textile manufacturers in developing countries. Local production will localise the waste problem. Reducing textile waste can be achieved through reselling, swapping, and repairing.

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Biography

Dr Steadyman Chikumba is a Senior Lecturer of Industrial Engineering in Department of Industrial Engineering and Engineering Management at University of South Africa at the Florida Campus in Johannesburg. Prior to his current position, he lectured industrial and manufacturing engineering at the National University of Science and Technology in Zimbabwe and operations management at Rhodes University located in Grahamstown in South Africa. He holds an MBA, M. Eng in Industrial Engineering and a PhD in Physics. He researches in lean manufacturing, supply chain management, advanced alloys and manufacturing processes. In addition to academic work, he interacts

closely with the industry through student work integrated learning programmes. He is an associate member of Southern African Institute of Industrial Engineering and a professionally registered engineer with the Engineering Council of South Africa.