Green Growth Adoption, Practices and Challenges in Selected Textile Industries in Kenya

By

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A THESIS SUBMITTED IN FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTERS IN ENVIRONMENTAL STUDIES AND COMMUNITY DEVELOPMENT IN THE SCHOOL OF AGRICULTURE AND ENVIRONMENTAL SCIENCES OF KENYATTA UNIVERSITY

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DECLARATION

This is my original thesis, and it has not been presented for a degree or other award at any other university.

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DEDICATION

I dedicate this research thesis to my father, Joshua Kawino; my mother, Teresa Kawino; my siblings, Bibian, Aska, and Joseph; and my dearest son, Gabriel, for their committed financial and moral support throughout my academic journey.

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ACRONYMS AND ABBREVIATIONS

AU:	African Union
AfDB:	African Development Bank
AGOA:	African Growth & Opportunities Act
AGSP:	African Green Stimulus Programme
BMI:	Better Mill Initiative
BCI:	Better Cotton Initiative
BOD:	Biological Oxygen Demand
BT:	Bacillus thuringiensis
CCW:	Carbon Constrained World
CDM:	Clean Development Mechanisms
CERs:	Certified Emission Reductions
COP:	Conference of Parties
CSR:	Corporate Social Responsibility
CTA:	Cotton, Textiles and Apparel
CTP:	Climate Technology Programme
EMCA:	Environmental Management and Coordination Act
EMS	Environmental Management Systems
EU:	European Union
FGD:	Focus Group Discussion
GGEI:	Global Green Economy Index
GE:	Green Economy
GESIP:	Green Economy Strategy Implementation Plan
GG:	Green Growth
GGCCC:	Green Growth and Climate Change Center
GHGs:	Greenhouse Gases
GIK:	Green Initiatives Kenya

GoK:	Government of Kenya
GOTS:	Global Organic Textile Standards
GRI:	Global Reporting Standards
IE:	Industrial Ecology
IPCC:	Intergovernmental panel for climate change
ISO:	International Organization for Standardization
KAM:	Kenya Association of Manufacturers
KEPRO:	Kenya Producer Responsibility Organization
MOIED:	Ministry of Industrialization and Enterprise Development
MPA:	Manufacturing Priority Agenda
PSE:	Private Sector Engagement
SDGs:	Sustainable Development Goals
STP:	Sustainable textile Product
TI:	Textile Industry
TM:	Textile Mills
TDS:	Total Dissolved Solids
UK:	United Kingdom
UN:	United Nations
UNEP:	United Nations Environment Programme
UNCED:	United Nations Conference on Environment and Development
UNGC:	United Nations Global Compact

ABSTRACT

Green growth practices are crucial for industries as they support the transition to sustainable environmental operations, safeguarding ecological services for future generations. This concept has gained prominence as a strategic framework to integrate sustainability into industrial operations, helping to mitigate pollution and optimize resource utilization. Although environmental sustainability and green growth initiatives have gained significant global attention across various manufacturing sectors limited focus has been directed toward Kenya's textile industry. The general objective of this study was to examine green growth practices in selected textile manufacturing industry mills in Kenya. The specific objectives were to assess the awareness and implementation of green growth principles in fostering sustainable practices, identify current green initiatives, investigate barriers to their adoption, and evaluate the extent of sustainability reporting within these textile mills. The study adopted the traveling model theory and employed a descriptive cross-sectional survey design. A sample of 90 respondents was determined using the Nassiuma 2001 sampling formula. A mixed-methods approach combining qualitative and quantitative techniques was utilized for data collection. Data analysis, conducted through SPSS version 24, included descriptive statistics such as means, standard deviations, percentages, and frequencies and inferential analysis Chi-square tests, correlation analyses, and regression models to explore relationships between key variables. Findings revealed that although green growth practices are increasingly recognized in the textile industry, sustainability reporting remains largely confined to internal use and is rarely shared publicly. Major challenges to adopting green growth practices include market limitations and the high costs of eco-friendly technologies and products. Overall, green growth practices contributed to 53% of the observed advancements in sustainability within the textile sector. The study concludes that while the adoption of green growth practices in the textile industry is progressing, it remains constrained by inadequate stakeholder support, weak institutional frameworks, and limited policy alignment. The study recommends strengthening strategic partnerships within the textile sector, establishing Environmental Management Systems and Sustainability Departments, enhancing public sustainability reporting, expanding markets for locally produced textiles, and implementing supportive government policies to foster a comprehensive and sustainable transition toward green growth.

CHAPTER 1: INTRODUCTION

1.1 Background of the Study

The textile sector, due to its substantial reliance on resources such as energy, water, and carbon-based inputs, has been a focal point in global environmental debates (Zimon & Madzik, 2019). Changing consumer expectations and the increasing demand for expedited product and service delivery continue to exert immense pressure on the sector, significantly influencing its environmental impact (Warwas et al., 2021). Criticism often targets unethical practices and environmentally detrimental activities within textile supply chains (Zimon & Madzik, 2019). Fischer and Pascucci (2017) underscore that this sector ranks among the leading global contributors to pollution. Furthermore, Warwas et al. (2021) estimate that the global carbon emissions resulting from the textile industry's product life cycles amount to approximately 3.3 billion tons of CO2 annually, a figure comparable to the combined carbon emissions of the 28 European Union member states, which total 3.5 billion tons.

The textile manufacturing sphere consumes considerable amounts of natural resources and contributes to nearly 5% of the global waste generated annually (Fischer & Pascucci, 2017). This is particularly evident given the tendency of fast fashion brands to introduce fresh collections on a monthly basis to cater to consumer demand (McNeill & Moore, 2015). Recent studies reveal that in countries like Great Britain, the Netherlands, and Nordic regions, 61% of used clothing is either incinerated or disposed of in landfills. Of the remaining 39%, 84% undergo recycling, while 16% are downcycled into items such as cleaning rags, which eventually meet the same fate of incineration or landfill disposal (Warwas et al., 2021). This highlights the insufficiency of textile waste recycling practices to establish a truly circular system. Adopting green growth strategies, therefore, seems to be the most viable pathway for textile businesses aiming to align with sustainable development goals (Zimon & Madzik, 2019).

Green growth, as articulated by the United Nations Environment Programme (UNEP), represents a development paradigm that prioritizes improving livelihoods and economic prosperity while simultaneously mitigating environmental harm and addressing ecological boundaries. The concept gained prominence during the Rio+20 United Nations

Conference on Sustainable Development in 2012, where it was a focal point of deliberations. These discussions culminated in the adoption of the declaration The Future We Want (Hickel & Kallis, 2020), which underscored the dual imperatives of sustaining economic advancement and transitioning toward an environmentally conscious economy. Following the intensifying challenges posed by climate change and ecological deterioration, the global adoption of green growth as a vital strategic framework has gained momentum (Dale et al., 2016). This approach posits that sustained economic expansion, often measured by metrics like GDP, can coexist with the protection and regeneration of Earth's natural systems, ensuring their long-term viability.

The concept of green growth theory has its roots in the broader discussions on sustainable development, originating from key milestones such as the Brundtland Commission and the early Rio Earth Summit. Earlier interpretations of this notion were framed using terminologies like Ecological Modernization (Ayres & Simonis, 1995) or the Environmental Kuznets Curve Model (Dasgupta et al., 2002), which sought to explain the interplay between economic development and environmental impacts. In contemporary discourse, influential international organizations advocate for green growth theory, positioning it as a cornerstone of both domestic and global policy frameworks (Hickel & Kallis, 2020). At its core, the theory asserts that economic expansion quantified through indicators like GDP can achieve complete separation from the consumption of natural resources and the emission of greenhouse gases. Moreover, it posits that this decoupling must occur at a pace sufficient to avert catastrophic climate disruptions and mitigate other critical environmental risks.

An essential component of fostering green growth within organizations is sustainability reporting. This process allows businesses to disclose their social, economic, and environmental impacts, alongside the measures they employ to minimize negative effects and promote positive contributions to society and the planet (Burhan & Rahmanti, 2012). Over the past few years, the textile industry has experienced a significant increase in the adoption of sustainability reporting practices. These reports function as vital tools for promoting transparency, enabling businesses and stakeholders to identify pressing environmental and social challenges and evaluate the policies designed to address them.

Additionally, they offer critical data to guide decision-makers in harmonizing economic goals with sustainable development principles (Garcia-Torres et al., 2017). Although some critiques highlight the limitations of these reports in advancing supply chain sustainability, global frameworks such as those provided by the Global Reporting Initiative (GRI) and other internationally recognized guidelines are being widely utilized by textile companies. Emphasizing sustainability reporting remains crucial for successfully embedding green growth strategies across the textile sector.

Various African countries have demonstrated their commitment to sustainable development and environmental conservation by adopting policies, programs, and financial investments aimed at fostering green growth. However, the extent of implementation and progress achieved varies significantly due to factors such as political will, institutional capacity, financial resources, and socioeconomic challenges. Kenya has made significant strides toward building a greener economy through various initiatives. It stands out as a leader in renewable energy production in Africa, with approximately 89.6% of its total electricity generation sourced from renewables (Seters, 2022). Furthermore, both the Kenyan government and private sector are increasingly prioritizing the adoption and promotion of circular economy principles. To effectively coordinate and scale up its green growth initiatives, the government has developed a detailed implementation plan and strategy for advancing the green economy.

The Kenyan government has developed frameworks aimed at combating climate change and fostering sustainable development through low-carbon growth initiatives. As part of the Greening Kenya Initiative (GKI), the government has also created a database cataloging circular economy projects, which cover areas such as sustainable manufacturing practices, clean energy technologies, eco-friendly labeling, waste management, and environmental preservation. Furthermore, Kenya's 2010 Constitution enshrines the right of all citizens to a clean and healthy environment, which entails the responsible use, stewardship, and conservation of natural resources to promote long-term sustainability (UNEP, 2014).

Kenya has adopted green economy related approaches and policies and is currently moving in that direction. Examples of these policies and approaches include the Green

Strategy Implementation Plan (GESIP) that highlights six set of principles to guide the country towards a green growth transitioning namely; the principle of sustainable consumption and production (SCP), principle is equity and social inclusion, principle of resource efficiency, precautionary principle, the principle of polluter- pay and good governance which guide the themes of the GESIP.

The GESIP seeks to enable the country to achieve a green economy transition, which requires resources such as finance, technologies, and capacity development. However, there is unrealized potential to pursue a development path that will support sustainable growth (GESIP, 2016-2030; UNEP, 2014). In Kenya, Green growth practices in the private sector are majorly championed under the Kenya Association of Manufacturers (KAM) which deepens industries' level interventions by promoting circular economy, climate change actions and financial linkages (KAM, 2018).

1.2 Statement of the Problem

Green growth is an economic path of development that promotes environmental sustainability without sacrificing social well-being (Merino-Saum *et al*., 2020; UNEP, 2011). According to UNEP's Environment Programme (UNEP, 2011), a green economy not only reduces environmental risks and resource scarcity but also improves people's social and economic well-being. As a result, the green growth concept includes three interconnected goals: social welfare, environmental well-being, and economic development functioning in consensus.

According to Muthama (2021), the adoption of green growth strategies in textile manufacturing industries yields numerous positive social and environmental benefits, making it essential for Kenya's textile sector to transition towards sustainable practices. Green growth plays a critical role in supporting a circular economy, which helps mitigate the industrial contributions to climate change (Muthama, 2021). By embracing green manufacturing approaches, Kenya can accelerate its sustainable development trajectory and achieve the goals outlined in its Vision 2030 within the projected timeframe. However, it is clear that this transition requires active collaboration between government bodies and businesses to ensure a cohesive and effective approach (Merino-Saum et al.,

2020). Moreover, a comprehensive understanding and integration of green growth principles are vital for driving their successful application across the textile sector.

Although environmental sustainability and green growth initiatives have gained significant global attention across various manufacturing sectors (Liu et al., 2023; Dogaru, 2021; Vazquez-Brust & Sarkis, 2012; Guo et al., 2018), limited focus has been directed toward Kenya's textile industry. While advancements in green growth research have been substantial in developed nations, similar progress has yet to be achieved in developing countries like Kenya (Qu et al., 2017). Current studies primarily address individual environmental aspects, such as renewable energy adoption and wastewater treatment, in the context of green growth strategies. For instance, Owino et al. (2016) examine how transitioning to renewable energy sources can help lower Kenya's carbon emissions. Although energy consumption plays a significant role in the textile sector, focusing solely on this aspect does not provide a comprehensive understanding of the industry's alignment with green growth principles.

While prior research has explored environmental concerns (Khan et al., 2014), circular economy practices (Saha & Papagiannaki, 2022), and sustainability reporting within the textile sector (Kumer & Radonjič, 2021), there remains a lack of focus on the specific challenges and opportunities associated with implementing green growth strategies in Kenyan textile mills (Omai, 2018). In Kenya, significant attention has been directed toward issues such as inefficient waste disposal, high water consumption, dependence on non-renewable energy sources, and air pollution (Owino et al., 2016; Kaudia et al., 2012; Muthama, 2021; Nadia & Jeske, 2022). However, there is paucity of sufficient data and documentation to the extent to which Thika Cloth Mill and Rivatex Mills have embraced green growth practices. As leading textile industries in Kenya, the absence of such information creates a gap in understanding their progress, challenges, and contribution toward sustainable industrial development. To bridge this research gap, this study explores the application of green growth principles in selected textile manufacturing mills in Kenya, offering actionable insights to enhance sustainability and advance the sector's environmental performance metrics.

1.3 Research Questions

1. How are green growth concepts and practices understood and used to facilitate the development of green growth practices in textile industries?
2. How do textile industries practice green growth?
3. How has sustainability reporting been adopted within textile industries?
4. Which challenges hinder the adoption of green growth practices in textile industries?

1.4 Research Objectives

1.4.1 General Objective

To examine green growth practices in selected textile manufacturing industry mills in Kenya.

1.4.2 Specific Objectives

1. To assess the understanding and adoption of green growth in supporting achievement of green growth practices in textile industries in Kenya.
2. To Identify the existing green growth practices in textile industries in Kenya.
3. To ascertain the extent to which Sustainability reporting has been adopted among textile industries in Kenya.
4. To evaluate challenges that hinder the adoption of green growth practices in textile industries in Kenya.

1.5 Significance of the Study

This research endeavors to expand academic and scholarly understanding of green growth practices within the textile manufacturing sector. It addresses gaps in existing literature by analyzing how green practices are adopted in textile milling operations and identifying the obstacles that hinder their effective implementation. Moreover, the study sheds light on the role of sustainability reporting as a transparency tool in the textile industry. By outlining strategies for transitioning the textile sector towards a greener economy, the

research offers actionable approaches for mitigating environmental pollution. Additionally, it aims to inform policymakers by presenting evidence-based recommendations to enhance sustainability regulations and promote environmentally responsible production and consumption within the textile sector.

1.6 Conceptual Framework

The study will adopt the following conceptual framework and operationalize the identified research variables as independent and dependent.

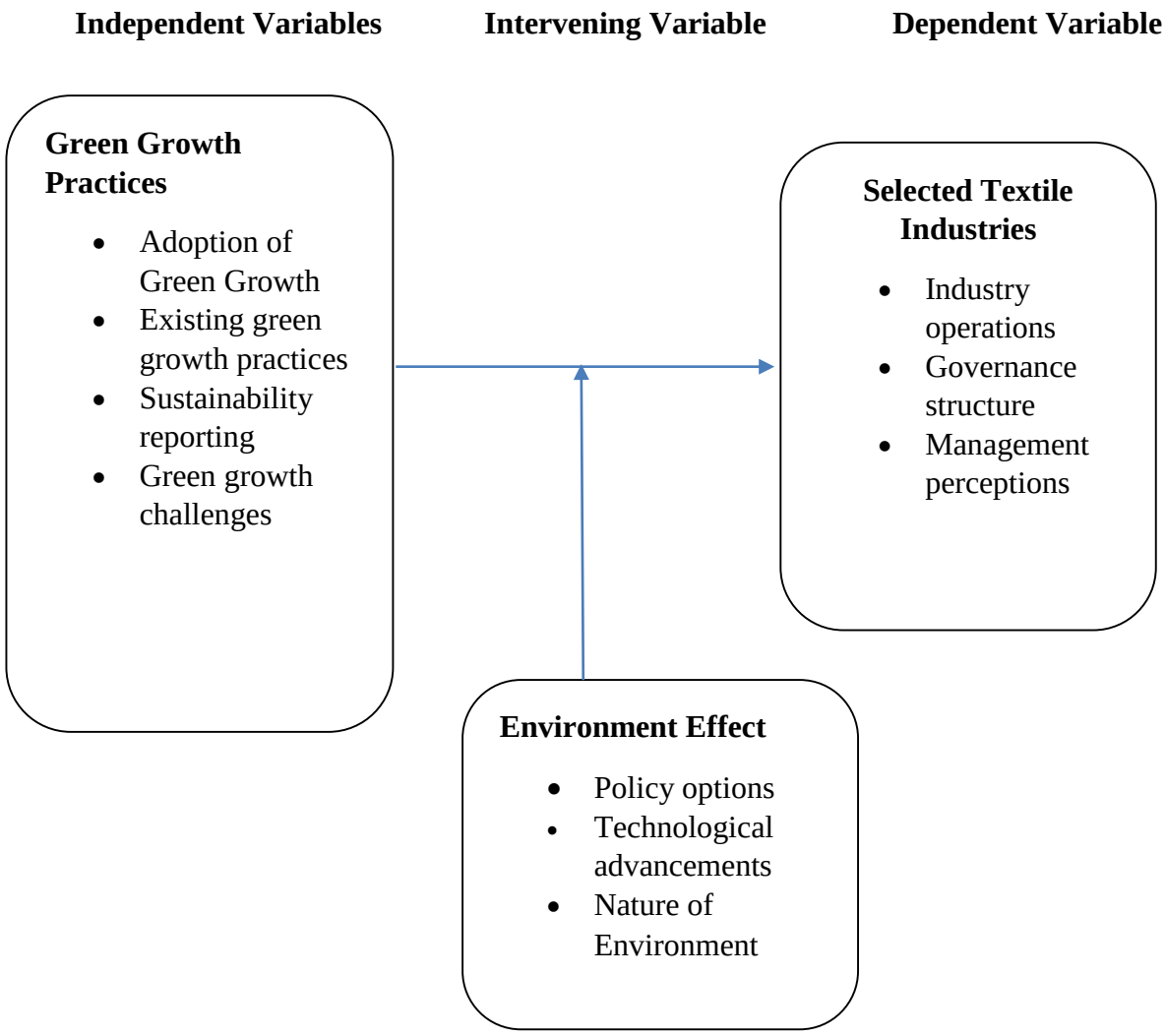


Figure 1.1: Conceptual Framework

The conceptual framework depicted in Figure 1.1 illustrates the relationship between independent and dependent variables in this study. Green growth practices (degree of adoption, specific existing practices, challenges to adoption and sustainability reporting) being the independent variables are assumed to have influence on the operations, governance structures, and management perceptions of selected textile industries in Kenya (the dependent variables). However, the effects of independent variables on dependent variables do not operate in isolation but are mediated by intervening environmental aspects such as policy options, technological advancements, and the nature of th environment.

For example, even if a firm has high awareness and is willing to embrace green growth practices, weak policy environments or outdated technology could weaken the impact on actual operations or may cause governance structures to be less responsive. Conversely, robust policies and supportive technological advances can amplify the positive effects of green growth practices on governance (like accountability, structure) and on the perceptions of management.

This conceptual framework is anchored on the technology-organization-environment (TOE) framework, which posits that technology adoption in firms is determined by three major context including technological (available infrastructure in the textile industry), organizational (governance structures in the firms) and environmental contexts (regulation and policies) (Baker, 2011).

1.7 Definition of Terms

Green growth: These are means of fostering growth and development that ensures environmental services are well taken care of for the well-being of the humans

Green Practices: These are means or actions that are created in form of systems and structures that enable ecological sustainability and preserve natural resources through a life cycle of development system

Textile Industries: These are companies that are basically concerned with the production process by converting raw materials into finished cloth

Industrial symbiosis: This is a subcategory of industrial ecology that explains how a network of varied organizations can promote eco-innovation and long-term cultural transformation, generate and distribute profitable transactions, and enhance technical and commercial procedures.

Circularity: The practice of reducing waste as much as possible while keeping the value intact for a long time.

Energy Audits: The process of assessing how much energy a building, factory, or industry uses and then figuring out where energy might be saved.

Sustainability reporting: Reporting on sustainability entails disclosing information regarding an entity's environmental, social, and governance (ESG) objectives, as well as outlining the measures implemented and the advancements achieved in fulfilling these targets.

Environmental footprint: An environmental footprint refers to measurable indicators that assess the extent of human consumption of natural resources.

Global Reporting Initiative (GRI): An autonomous global entity that facilitates organizations in transparently reporting and communicating their environmental impacts, particularly related to climate change.

Sustainability accounting standards: rules that guide organizations in disclosing industry-specific information about risks and opportunities related to sustainability. These factors could potentially influence an entity's financial performance, including cash flow, access to funding, or cost of capital, over varying time horizons short, medium, or long term.

Standards on Climate disclosure: Standards that give investors high-quality, globally comparable sustainability information.

Corporate social responsibility (CSR): an organizational approach that encourages organizations to intentionally work to improve society and the environment rather than harm them.

Patterns of sustainable production and consumption: To safeguard future generations, Sustainable Development Goal 12

highlights the importance of utilizing services and products that improve well-being and meet essential requirements while reducing reliance on harmful materials, conserving resources, and minimizing waste and pollution throughout their life cycle.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This section presents the theoretical foundation of the study, detailing the pertinent theories and their relevance to the research context. It is subsequently followed by an empirical analysis of literature aligned with the study's objectives, integrating perspectives from diverse sources on the primary variables of the subject. The review concludes with a summary that identifies the research gap, shaping the approach to methodology and data collection.

2.2 Global Green Growth Overview

The alarming climate change pandemic, pollution crisis, and damage to our natural fauna and flora are leading causes of the ongoing worldwide "green economy" boom. A green economy considerably reduces environmental scarcities while also enhancing human welfare and social fairness, according to (UNEP, 2014). However, two decades after the Rio conference, we faced the challenge of balancing our natural capital, the growing population, and the profitability of our countries' economies. The environmental pressures have reached a critical point due to industrialization, the demanding population, and the endless needs of these new millions of people. Problems are becoming regional and continental rather than local (Johnson, 2008). The United Nations Environmental Programme (UNEP) indicates that for us to green our manufacturing industry increased public policy support is required to expand present initiatives, including eco-labeling, recycling and reusing, and creating eco-friendly products (UNEP, 2014).

The global textile manufacturing industry faces significant challenges in addressing sustainability, primarily due to the heavy reliance on textile fibers, while the natural resources essential for their production remain finite. Polyester, derived from petrochemical byproducts, and cotton, grown through agricultural methods, are the two most widely used fibers, accounting for a substantial portion of global fiber production. The production of cotton demands considerable water resources, approximately 8,000 liters per kilogram, and competes with other agricultural needs for limited arable land. In contrast, polyester is sourced from petroleum-based hydrocarbons, contributing to

environmental degradation. The growing dependency on these fibers compounds the environmental issues associated with textile manufacturing, further highlighting the need for sustainable practices in the industry (Boström & Micheletti, 2016; Manickam & Duraisamy, 2019). These challenges reinforce the critical importance of integrating green growth strategies to mitigate the sector's environmental impact.

As noted by the United Nations Environment Programme (UNEP), a key objective in East Asia is to implement green growth strategies that support sustainable economic development, emphasizing low-carbon initiatives and social inclusivity. This approach complements broader ecological sustainability goals. Similarly, European countries such as France, Norway, Denmark, and Germany have adopted the concept of a "Green Economy," advocating for its integration into national policies. Initiatives like the "Green New Deal" and efforts by international organizations such as the Organization for Economic Cooperation and Development (OECD) have further pushed for the implementation of green growth strategies. These frameworks, endorsed by both the UN and the EU, serve as examples of forward-thinking policies aimed at achieving economic progress, environmental sustainability, and social fairness (Vazquez-Brust & Sarkis, 2012).

According to Hamdouch and Depret (2010), a green economy spans several sectors, including renewable energy markets, the conservation of natural resources (such as reforestation to maintain water and soil quality), sustainable production methods, advancements in environmental technologies (like carbon capture, fuel cells, and the development of innovative materials), and enhancements in service sectors. However, the central aim of green growth initiatives is to tackle economic challenges rather than solely focusing on environmental preservation. These initiatives encourage the redirection of financial investments toward environmentally responsible goods and services, while also protecting vital ecosystems, such as forests, aquatic ecosystems, and biodiversity (Lane, 2010). In light of the climate crisis, emerging environmental industries are called upon to create both skilled and unskilled job opportunities.

Developed economies such as those in the European Union and Japan advocate for green growth initiatives in international negotiations (Hamdouch & Depret, 2010; Luke, 2008).

Conversely, emerging economies like China, India, and South Korea are at the forefront of this movement (Berkhout et al., 2010). The political agendas of these countries clearly reflect their commitment to sustainability. In the European Union, the "Green New Deal," Japan's "National Energy Strategy," and South Korea's "Green Growth and Environmental Policy" all emphasize state-led strategies that integrate green growth into national competitiveness frameworks. These strategies place a strong focus on promoting sustainability as a cornerstone for global economic competitiveness.

According to the OECD (2009), Green growth represents a specific aspect of sustainability, emphasizing the development of policies that address current challenges while clarifying operational uncertainties linked to sustainability. Certain companies are now adopting comprehensive and transformative green innovations, focusing on reimagining business models and exploring alternative ways to deliver goods and services (OECD, 2009). Green innovation is more likely to be explored by businesses with a track record of success in radical discoveries.

2.3 Adoption and Understanding of Green Growth Practices

Omai (2018) examined how supply chains shape the adoption of sustainability practices within Kenya's textile industry. The study applied a cross-sectional design and utilized census sampling due to the relatively small number of textile companies in the country. Data was collected from 59 key informants representing 59 textile firms. The findings highlighted the need for further exploration into the comparative effects of different supply chain approaches, particularly those emphasizing environmental sustainability, on the operational efficiency of the textile sector. The current research focuses specifically on textile milling industries in Kenya that incorporate BT cotton into their production processes.

The link between environmentally friendly supply chain and organizational capacity was the focus of research by Amirbaghei (2019). The study reveals that a large amount of work is required in organizations to become environmentally friendly in some contexts, according to the research findings, there are many problems and differences in the management and implementation of greening supply chains. Desore & Narula's (2017)

research looked at the sustainability-related motives, challenges, and responses of enterprises in the textile industry. Their study's findings showed that previous research on the textile industry had completely ignored managerial challenges.

2.4 Green Growth Practices

Choudhury (2018) highlights the growing significance of incorporating sustainable fibers in clothing, driven by consumer preference for environmentally friendly materials derived from biodegradable, non-toxic sources such as cotton, flax, hemp, and jute. Singh et al. (2020) note that synthetic textiles, including rayon, acrylic, polyester, nylon, and spandex, release microplastics into aquatic ecosystems. Since the 1990s, the textile industry has been dominated by synthetic fibers like polyester and nylon, a trend that persists today (Sahoo and Dash, 2023). Cotton production constitutes 24% of the global output, while the remaining 76% consists of other fibers like flax, wool, silk, and cellulosic types (Rahaman et al., 2024). Manufacturing synthetic fibers through methods like dry, wet, or melt spinning demands considerable energy input (Rahaman et al., 2024).

The textile and fashion industry considers various factors, such as market growth, production efficiency, garment standards, and ecological footprint. Zhao et al. (2022) emphasize that recycling clothing becomes challenging when natural and synthetic materials are blended to form composite fibers. Meanwhile, there is increasing interest in renewable and biodegradable fibers derived from sources such as bamboo, soy, and bananas as alternatives to non-recyclable synthetic options. Bamboo, for instance, is known for its superior durability, moisture absorption, and longevity compared to cotton. According to Rahman et al. (2024), important properties to assess include moisture regain (8.0%), moisture content (7.5%), thermal decomposition characteristics, solubility, surface texture, and fiber dimensions (10-13 μm). Ramadan et al. (2024) further observe that while longer, coarser bamboo fibers exhibit high tensile strength (63.74–138.63 N/Tex), their extensibility is relatively low (2.06–2.46%).

Ramadan et al. (2024) emphasize the growing shift in textile industries toward integrating renewable energy into their sustainability strategies. Traditionally, most modern textile and garment machinery has depended on energy derived from petroleum and natural gas.

These non-renewable energy sources, however, are depleting and pose significant environmental risks, including waste generation and air pollution from combustion processes (Vachon and Klassen, 2008). To address these challenges, advancements in engine design, modifications to fuel compositions, and transitions to cleaner energy alternatives such as liquefied petroleum gas (LPG) and compressed natural gas (CNG) are being prioritized. Dehshiri et al. (2023) highlight solar thermal energy as a viable replacement for conventional fossil fuels. Additionally, cotton ginning residues have shown potential as an innovative energy resource. For instance, a textile enterprise in northern Greece has successfully utilized energy produced from these residues, thereby reducing reliance on fossil fuels and minimizing environmental impacts. Biomass energy systems have also gained traction, with research indicating that a 5 MW bioenergy unit could economically supply up to 52% of the textile sector's thermal energy requirements (Zabaniotou & Andreou, 2010).

Physiochemical approaches to cleaning textiles have emerged as a key component of sustainable practices in the industry. Pre-weaving operations, such as winding, warping, and sizing, often produce hazardous residues and chemicals that require careful management. Traditional sizing methods typically involve harmful substances, necessitating costly and complex wastewater treatments. As a greener alternative, environmentally friendly agents like polyvinyl alcohol (PVA) are being utilized to minimize ecological harm (Rahaman et al., 2024).

Chan and Wong (2012) highlight the introduction of advanced manufacturing techniques, such as 3D seamless garment production, which significantly reduce the need for intermediate steps like fabric weaving, knitting, and cutting. This streamlined process cuts down production times, energy use, material waste, and labor costs by approximately 30%, while enhancing efficiency (Herva et al., 2008; Chan and Wong, 2012). Water usage remains a critical environmental concern in textile manufacturing, with estimates showing that processing one kilogram of fabric requires anywhere between 250 to 350 liters of water. This substantial consumption contributes to significant wastewater generation, amplifying environmental issues such as pollution, noise, and the discharge of heavy metals, particularly in developing regions where regulatory frameworks are

often inadequate (Liang et al., 2013). According to Ness et al. (2007), the unregulated release of pollutants from textile industries has resulted in declining air and water quality, underscoring the need for stricter environmental controls.

Niinimaki and Hassi (2011) estimate that textile chemical processing involves the use of approximately three thousand distinct chemicals and auxiliary agents, many of which pose serious environmental risks. Sustainable technologies such as biotechnology and enzymatic processes are increasingly utilized to address these challenges. For example, bacterial cellulose can be incorporated into textile production, and microbes can be harnessed to create natural dyes. Certain bacterial pigments are now being developed for applications across industries, including food, pharmaceuticals, cosmetics, and textiles. Gobalakrishnan et al. (2020) report that microbial pigments are viable as textile dyes, offering a sustainable alternative to traditional chemical dyes. Muthu and Gardetti (2020) emphasize the significant advancements in sustainable textile design, where microorganisms play a pivotal role in producing eco-friendly materials and colors.

Many of the chemicals, dyes, and pigments utilized in the textile industry can be recycled, making effluent treatment an effective method for recovering a substantial portion of these substances (Rahaman et al., 2024). Employing sustainable detergents, colorants, and pigments, along with greener industrial processes, can significantly reduce water, energy, and chemical waste in wastewater. Processes such as washing, sizing, bleaching, and using reactive dyes are designed to consume fewer resources. Compared to direct dyes, reactive dyes on cotton fabrics offer advantages like enhanced durability, cost efficiency, and reduced wastewater contamination (Rahaman et al., 2024). Innovations like digital textile printing also contribute to sustainable practices. This technology, which functions as a Computer-Aided Design (CAD) tool, eliminates the need for traditional wet processes by utilizing inkjet print systems. Traditional methods typically rely on large quantities of water and dyes, which pose environmental risks. Digital printing uses inks such as pigments, acids, and dispersions, enabling applications on various synthetic and natural fibers. However, synthetic dye waste remains a major environmental challenge, with approximately 10,000 metric tons of synthetic dyes being manufactured globally each year (Forgacs et al., 2004). The adoption of eco-friendly pigments and sustainable

practices can significantly minimize wastewater pollutants, reduce resource consumption, and lower operational costs, offering a more sustainable alternative to conventional effluent treatment systems.

The utilization of eco-friendly detergents, dyes, and pigments, alongside sustainable industrial practices, can significantly decrease the presence of water, chemicals, and other pollutants in wastewater. Processes such as washing, sizing, bleaching, and the application of reactive dyes consume fewer resources, including water, chemicals, and energy. Reactive dyes used on cotton fabrics provide superior color durability, are more cost-effective to produce, and contribute to a lower environmental footprint by generating less pollutant-laden wastewater (Rahaman et al., 2024).

Traditional textile printing methods consume large quantities of water and dyes, which can negatively impact the environment. Conversely, digital textile printing, which employs inkjet technology, minimizes water and dye usage. This innovative technique supports the use of diverse inks, such as pigments, acids, dispersions, and reactive dyes, while enabling printing on various types of fibers, both man-made and organic. Globally, significant quantities of synthetic dyes are manufactured each year, posing notable environmental concerns (Forgacs et al., 2004). Adopting environmentally friendly pigments can significantly lower effluent concentrations, offering a sustainable alternative to effluent treatment systems and reducing resource consumption.

Adjustments to process parameters can eliminate hazardous chemicals during washing and dyeing. Techniques such as continuous dyeing, optimized color absorption and fixing, and innovative low material-to-liquid ratio processes are critical in achieving sustainability. The plasma method, for instance, is capable of creating multifunctional textiles with waterproof and antistatic properties, all while utilizing less water and energy compared to traditional approaches (Karn and Harada, 2001). This method also enhances microbial resistance, decoration, and dye uptake of textiles without compromising their inherent properties. Furthermore, thermal treatments such as curing and coating provide additional benefits, including flame and microbial resistance, without producing effluent.

Modern advancements in digital textile printing eliminate the need for substantial amounts of water, solvents, thickeners, and other environmentally harmful chemicals. Additionally, enzymes are increasingly employed in textile wet processing, dyeing, and washing, offering a safer alternative to conventional chemical treatments. For example, cellulase enzymes can remove shrinkage-inducing substances and loosen fibers during fabric washing. Enzymes play a crucial role in processes such as scouring, bleaching, mercerization, dyeing, printing, and washing by enabling these operations to occur at lower temperatures and over extended durations. This method not only reduces resource usage but also helps preserve the quality of fabrics by limiting surface damage (Robinson et al., 2001).

Eco-friendly wastewater treatment is a crucial green growth practice within the textile sector, addressing the environmental impacts of chemical-intensive operations (Nakhate et al., 2020). Wastewater generated during textile processes such as washing and dyeing undergoes treatment to ensure its safe return to the environment or its reuse. The presence of chemicals, dyes, and pigments in these effluents significantly alters their quality and composition, complicating the treatment process. Effective treatment typically begins with a combination of primary and preliminary processes, including techniques like screening, sedimentation, neutralization, and mechanical flocculation, which are designed to eliminate suspended particles. Secondary treatment methods employ advanced oxidation, trickling filters, and both aerobic and anaerobic processes to address a majority of organic and inorganic pollutants.

Tertiary treatment methods further enhance the process by incorporating technologies such as adsorption, heat evaporation, ozone treatment, ion exchange, UV filtration, and membrane-based techniques, which enable wastewater reuse (Mostafa, 2015). Ultrafiltration, in particular, has gained popularity due to its precision and energy efficiency, making it effective for recycling auxiliary chemicals and non-soluble pigments. This approach aligns with long-term sustainability goals by mitigating eutrophication risks, which are exacerbated by nutrient-rich discharges into aquatic ecosystems. Such nutrient oversupply, often linked to wastewater from the textile and apparel industries, poses significant global environmental and health challenges (Pratta

et al., 2023). Enhanced circulation of treated water also reduces freshwater demand in agricultural and domestic applications.

Additionally, the textile industries are increasingly focusing on producing environmentally sustainable clothing. Patternmaking, as the foundational step in garment production, offers significant opportunities for minimizing waste. Adopting innovative techniques such as zero-waste patternmaking addresses waste management challenges by ensuring designs utilize fabric without generating scraps (Okai-Mensah et al., 2022). This approach integrates sustainability into garment production at the design phase, allowing for the creation of patterns that maximize material use (Rissanen & McQuillan, 2015). However, downstream processes such as fabric spreading, cutting, stitching, and ironing are energy-intensive and contribute substantially to manufacturing costs.

Transitioning to energy-efficient machinery can help reduce utility consumption and environmental impact, while optimizing the efficiency of operations (Alay et al., 2016; Jena et al., 2015). Additionally, incorporating sustainable practices during garment finishing and packaging offers opportunities to repurpose waste effectively. For instance, technical advancements in energy-saving tools and water-efficient systems help reduce the consumption of resources such as water, fuel, and chemicals, aligning with industry sustainability goals (Habib et al., 2016). Lean manufacturing, which focuses on continuous improvement and the elimination of inefficiencies, has also emerged as a critical framework for enhancing inventory management, minimizing waste, and driving sustainability in textile production processes. Its adoption supports long-term environmental and economic benefits for the industry.

2.5 Sustainability Reporting

Textile sector has experienced a significant rise in the adoption of sustainability reporting frameworks in recent years. Organizations are increasingly leveraging standards like the Global Reporting Initiative (GRI) to improve transparency (Kozlowski et al., 2015). Sustainability reporting provides companies with tools to establish goals, monitor advancements, and introduce operational changes that enhance sustainability practices. Through such frameworks, businesses can evaluate and disclose their societal, economic,

and environmental impacts, fostering a more comprehensive understanding of their overall sustainability efforts (Garcia-Torres et al., 2017). Advanced approaches, such as Integrated Reporting (IR), further integrate organizational strategies, governance, and performance with external environmental factors, promoting long-term value creation across short- and medium-term goals. These frameworks also align with the United Nations Sustainable Development Goals (SDGs), encouraging stakeholders within the supply chain to collaborate and achieve shared sustainability targets (Garcia-Torres et al., 2017).

More and more textile firms are publishing reports outlining their sustainability activities for the public to view. Corporate websites, reporting as part of annual financial reporting, and standalone sustainability reports are all viable ways these firms use to disseminate sustainability information. However, the textile industry's sustainability reports mostly focus on energy and water consumption rates, ignoring other essential variables. Also, although apparel firms report on a wide range of significant sustainability challenges, textile sector sustainability reports often focus on supply chain concerns. Furthermore, participation in sustainability reporting is fully voluntary, and firms have a wide range of options regarding what information to reveal in their reports (Stacchezzini *et al*., 2016).

A research study conducted by Saygl et al. (2019) examined sustainable practices in Turkey's textile sector, specifically analyzing the Environmental, Social, and Governance (ESG) disclosures of 34 companies. These reports were evaluated in terms of profitability, environmental initiatives, and social responsibility, with the analysis guided by the Global Reporting Initiative (GRI) standards. Key findings highlighted recurring concerns such as workforce management, water conservation, product and market dynamics, supplier relationships, education, energy efficiency, and waste reduction. Additionally, the study revealed that many companies undertook environmental and social initiatives, reflecting their commitment to diversity, equal opportunities, and strategies related to marketing and labeling. Despite these insights, the research did not explore the depth or comprehensiveness of sustainability reporting efforts. Likewise, Kozlowski et al. (2015) identified ongoing ambiguity within the textile and apparel industry regarding a universally accepted definition of "sustainability."

2.6 Challenges Hindering Green Growth Practices

Concerns regarding the environmental impacts of fast fashion and excessive apparel consumption have increasingly focused on textile fibers. Sigaard and Laitala (2023) emphasize that consumers should prioritize sustainable and circular textiles, though reducing both manufacturing and consumption can yield a more significant environmental impact. The issue of textile and apparel waste, both pre- and post-consumer use, continues to exacerbate environmental concerns linked to the growing demand for garments (Mathiyazhagan et al., 2019). Manufacturers in less developed countries may prioritize cost-effective, value-added production over adherence to environmental standards (Connolly and Shaw, 2006). This disregards the natural balance between living organisms and the inanimate elements of the environment. Adherence to various ISO (International Organization for Standardization**)** standards is essential for ensuring ecologically responsible management (Clark, 2008; Connell, 2010).

The textile industry's long-term viability is increasingly threatened by various economic challenges that must be addressed. The upfront expenses associated with transitioning to more Eco-friendly methods, which often involve investments in new technologies, retraining personnel, and updating machinery, present a significant obstacle. Although these investments have the potential to yield long-term environmental benefits, they may place financial strain on Textile producers in the near term. Additionally, the adoption of green materials and practices may face hurdles if their costs exceed those of conventional alternatives. Organizations that prioritize sustainability may encounter difficulties due to limited clarity about customer demand for eco-friendly products. Designing with environmentally conscious materials in mind is an essential approach to evolving in response to the economies of post-industrial and newly industrialized nations (Dudin et al., 2015). Despite the increasing relevance of sustainability, significant barriers persist in establishing this "new style" of textile manufacturing as the standard.

For example, conventional buildings in Jordan are approximately 20% to 25% more affordable than those with LEED Silver certification. While LEED-certified buildings can contribute to lower operational costs, many stakeholders in Jordan are often inclined to allocate an additional 5-10% of their budget for environmental sustainability

considerations (Nasereddin and Price, 2021). The machinery used in manufacturing demands a significant initial capital outlay and incurs elevated ongoing maintenance expenditures. For instance, an alternative that incurs higher costs is the use of machine oil, commonly employed as a coolant to regulate temperature. In the context of modern green manufacturing, it is increasingly important to explore alternatives to conventional cooling agents and lubricants used in machining processes (Ramanathan et al., 2021). Machines are capable of modifying the dimensions, structure, and surface quality of materials by fragmenting them into smaller components (Ma and Liu, 2007). Traditional cooling systems generally rely on either mineral or synthetic oils, which present several disadvantages, including substantial upkeep requirements, persistent undesirable odors, and the necessity for constant monitoring by operators (Samatham et al., 2016).

Many digital and infrastructural challenges hinder sustainable textile manufacturing. The high energy and water consumption associated with traditional textile production complicates the funding and implementation of water-saving technologies and renewable energy sources (Taseska et al., 2023). The process of building or renovating factories to incorporate innovative technologies demands substantial time and financial investment. Additionally, textile waste collection, sorting, and processing can be logistically and physically demanding in certain regions. Inefficiencies and negative environmental impacts may intensify in the absence of a reliable transportation network for delivering finished goods and sourcing sustainable raw materials. Collaborative efforts can address these challenges and lay the foundation for a more sustainable future. Research has shown that the cost difference in average construction between residential buildings with green building certification and non-certified structures is only 1.58%. Achieving gold or diamond-level green building certification can lead to a cost increase of 6.7-9.3% for residential construction (Sun et al., 2019).

Saricam et al. (2017) observed that a general lack of awareness among consumers regarding sustainable growth practices can significantly impede their adoption. The growing presence of environmentally friendly products and brands that champion corporate responsibility has the potential to inspire more sustainable choices in apparel (Sillanpaa & Ncibi, 2019). Nonetheless, a critical challenge lies in the insufficient

understanding of these practices, which often deters individuals from embracing them, despite their willingness (Okur & Saricam, 2019). Environmentally conscious buyers tend to prefer sustainable products when they are well-informed about the environmental consequences and the sources of materials used (D'Souza et al., 2006). Moreover, research suggests that customers are prepared to pay extra for items that include detailed labels, providing comprehensive insights into the fibers' origin, composition, and production processes (Hustvedt & Bernard, 2008). While considerations like cost, quality, and overall value dominate purchasing decisions, consumers often place less emphasis on a brand's efforts toward social responsibility (Page & Fearn, 2005). Even when aware of the importance of sustainability, some individuals erroneously perceive eco-friendly clothing as either too costly or not fashionable (Connell & Kozar, 2014). Tumpa et al. (2019) identified limited consumer interest and a lack of governmental backing as key obstacles to the integration of green supply chain practices.

2.7 Theoretical Framework

This research was grounded in the traveling model theory, originally introduced by Rottenburg (2002) in his book Far-Fetched Facts. The theory explains how social concepts or practices move across cultural boundaries, often influenced by political dynamics. According to Rottenburg (2009), these ideas or frameworks are separated from their original context during the transfer process and adapted to new environments to meet localized needs. The extent to which these adaptations occur plays a pivotal role in determining the effectiveness of the model in the new setting. Within the framework of green growth, this theory underscores how the concept is tailored to address the distinct demands of various countries or sectors.

Behrends et al. (2014) describe a model as a traveling tool designed for interventions that have already achieved broad recognition, allowing researchers to examine global change processes. The concept of green growth, widely adopted across various industries worldwide, aligns with this framework. According to Behrends et al. (2014), while certain elements of embodied knowledge and norms remain static during the model's transition between contexts, the model often requires recreation within its new environment. This

adaptation typically occurs through experiential and experimental practices, ensuring relevance to the specific challenges of the implementation site.

Thus, in line with Behrends *et al*. (2014), this study's investigation begins with the assumption that green growth is a travelling idea. The Green Growth Strategy Tool was released by the OECD in 2011 to help green economies keep a healthy balance of natural resources (Morssy, 2012). Green growth is a travelling idea because sustainability is a point of concern globally and the aspect of green growth is spreading widely in many countries due to its impact on socio-ecological change. Based on the travelling model, green growth is a standardized intervention strategy that aims to bring about social change by supporting environmentally friendly manufacturing practices and assisting governments in incorporating these practices into textile industry management to combat the industry's tendency to deter sustainability. This study will therefore discuss green growth practices in the textile industries in Kenya with the understanding that green growth is a travelling idea that has to be re territorialized to fit the specifications of these industries in Kenya. This is because different countries implement green growth practices differently based on the available resources.

2.8 Research Gaps

The importance of environmentally conscious practices within manufacturing industries has been extensively studied, with significant attention directed toward their integration throughout production processes. Existing research underscores the pivotal role such practices play in fostering ecological sustainability across global supply chains, particularly within the textile sector. While numerous studies have examined the adoption of environmentally friendly practices across various industries in Kenya, there remains a noticeable gap in exploring their application specifically within the textile industry. Furthermore, much of the available literature prioritizes evaluating the influence of these practices on supply chain performance, leaving a limited focus on the circularity of products developed through sustainable methodologies. Similarly, despite the increasing recognition of sustainability reporting as a driver for adopting eco-conscious practices, most scholarly efforts have predominantly concentrated on the practices themselves, rather than the reporting aspect. In light of these identified gaps, this study seeks to

examine how sustainable growth practices are applied in selected textile manufacturing industries in Kenya and to evaluate their role in advancing both sustainability and sustainability reporting.

Table 2.1: Summary of Literature Review

Researcher	Research Topic	Findings	Gaps
Omai (2018)	The effect of managing supply chains on sustainability of Kenya's textile sector. The study involved 59 key stakeholders from various textile industries.	The study revealed that the outcomes of the textile industry's operations within the chain of supply in Kenya was positively influenced by the adoption of modular-based manufacturing, effective relationship management Across the supply chain, cohesive integration of processes, and improved responsiveness within supply chain operations. The findings emphasize the need for textile and apparel companies in Kenya to implement advanced supply chain practices to strengthen the sustainability and efficiency of their supply chains.	The study was limited to sustainable supply chains while this study explored green growth practices, understanding and perception of green growth among the operators of mills and sustainability reporting in the manufacturing textile milling industry.
Amirbaghei (2019)	A detailed analysis exploring the connection between green supply chain management strategies and organizational effectiveness seeks to understand how sustainable and eco-friendly supply chain strategies impact the overall effectiveness and success of organizations.	The study established that managing and executing a supply chain provides a wide range of challenges and peculiarities, and that there is often a lot to be undertaken to make it more environmentally sustainable.	The study was limited to green supply chain and organizational performance. The present study explored green growth practices in manufacturing industries in Kenya, hence filling the conceptual and contextual gaps in literature
Desore & Narula (2017)	An overview of corporate actions taken in the textile sector to address sustainability concerns.	It was determined that research is necessary to comprehend aspects of textile operations, including managerial commitment, views of environmental issues and how they are managed through strategies, and internal resource limits.	The current research examined the comprehension and implementation of sustainable growth approaches in textile manufacturing facilities.

Li *et al*. (2019)	Stakeholder Engagement, Sustainable Manufacturing, and Operational Performance: Empirical Insights from Fashion Enterprises in China.	The findings revealed that corporate stakeholders exert a substantial positive impact on the effectiveness of sustainable manufacturing practices. Moreover, in this context, sustainable manufacturing demonstrates a notable beneficial impact on the effectiveness of the practices implemented.	The study was a case of one of the fashion businesses. The present study was carried in manufacturing firms in Kenya hence filling conceptual, contextual and methodological gaps.
Saygılı *et al*. (2019)	Sustainability disclosures in the textile sector in Turkish textile and garment businesses. The study sought disclosures of 34 companies' economic, environmental, and social sustainability using GRI standards.	The findings indicated that the most prevalent sustainability concerns included workforce issues, water usage, products, markets, suppliers, education, economic factors, energy consumption, and waste management. Most businesses provided financial reports related to performance and competitive practices, environmental reports focused on resource utilization such as energy and water, and social and governance reports addressing inclusivity, equal opportunities, advertising, and product labeling.	The study was done for textile businesses. The present study was done in private sector textile manufacturing mills. Information was gathered using both qualitative and quantitative approaches thus filling conceptual, contextual, theoretical and methodological gaps in literature.
Tumpa *et al*., (2019)	The study investigated the difficulties faced in embracing environmentally sustainable supply chain strategies in Bangladesh. Data was collected using a survey targeting 30 professionals from the Bangladeshi textile industry, specifically those working in the management of operations and supply chains roles.	The findings revealed 15 barriers to the adoption of green supply chain management. According to the findings, the major barrier in implementing green supply chain efforts is the lack of consumer demand and the absence of government laws.	The study was done among textile operators and was limited to textile supply chain management division in the textile organizational performance. The present study explored green practices, stakeholder's involvement and challenges in implementing GGPs.

Stacchezzini et al., (2016).	Sustainability Governance and Disclosure: The Significance of Integrated Reporting in Conveying Corporate Sustainability Practices.	The findings revealed that while sustainability reporting in the fast-fashion industry is well-developed in terms of analysis, it falls short in translating insights into actionable strategies.	The study found a gap in the type of sustainability information included in the sustainability reporting of textile industries.
Kozlowski et al., (2015)	Sustainability Disclosure Practices in the Apparel Sector.	The study found that firms lack consistency in the sustainability indicators in their sustainability reporting	The study discovered a gap in proper utilization of sustainability reporting tools.
Vazquez-Brust, & Sarkis, (2012).	Sustainable Development: Navigating the Shift Towards Eco-Friendly Economies.	The findings highlighted the necessity for transformative economic reforms incorporating sustainable growth practices to address the ongoing stagnation from the financial crisis and shift global economies towards a more sustainable path.	This study identified a gap in the implementation of green growth practices in the textile manufacturing industries

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Study Area

This study was done in two main textile milling factories in Kenya. The mills are located in Uasin Gishu County and Kiambu County. In Kiambu County the Milling industry selected is the Thika Cloth Mill. In Uasin Gishu County the textile mill selected is the Rivatex. Thika and Uasin Gishu represent two distinct socio-economic and biophysical settings within Kenya's textile industry landscape. Thika, located in Kiambu County within the Nairobi metropolitan region, is a highly urbanized and industrialized town with well-developed infrastructure, easy market access, and proximity to the capital. The area hosts diverse manufacturing industries, including textiles, owing to its reliable transport networks, skilled labor force, and access to utilities such as electricity and water. The climate in Thika is generally warm and sub-humid, supporting moderate agricultural activity alongside industrial development.

Uasin Gishu County on the other hand is largely agricultural, forming part of Kenya's grain basket with extensive maize and dairy farming. The region's biophysical environment is characterized by fertile highland soils, cool and wet conditions, and abundant natural resources, providing opportunities for agro-based industries, including textile production using locally available raw materials such as cotton and wool. Socio-economically, Uasin Gishu exhibits a blend of rural and urban characteristics, with emerging industrial zones and a growing labor base, making it an ideal complement to the more urbanized and industrial Thika in understanding regional variations in green growth practices.

Thika Cloth Mills employs around 650 employees while Rivatex employs approximately 600 employees. This is a cumulative sum including casual employees who are employed depending on the factory's demand. The employees include several individuals with over 10 years of experience, though this group is relatively small. Many workers have accumulated an average of 5 years of service in the factories.

The two textile factories were chosen because they are Kenya's leading and most established textile manufacturers, representing significant capacity and influence within

the sector. Their scale of operations, workforce experience, and regional representation provide a suitable basis for assessing green growth adoption, practices, and challenges in the country's textile industry. Additionally, these textile firms were willing to participate in the study.

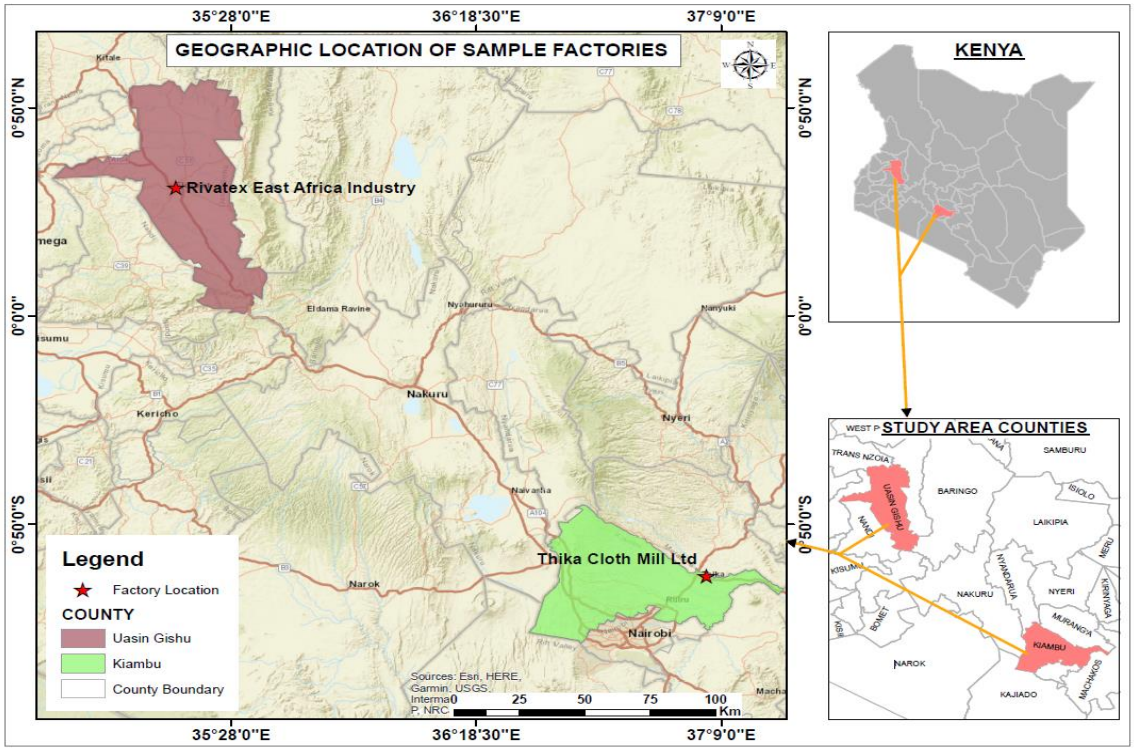


Figure 3.2: Map of Kenya, showing Rivatex and Thika Textile Mills (Arc Map 10.8)

3.2 Research Design

In this research, a cross-sectional quantitative method was utilized. Wang & Cheng (2020) highlight that cross-sectional studies are valuable for understanding relationships in research contexts. This design was particularly beneficial for exploring the link between the adoption of Green Growth practices and the level of knowledge and understanding of these practices among workers in textile manufacturing mills. The study adopted a mixed-methods approach, combining both qualitative and quantitative techniques. The qualitative approach is more exploratory, enabling the researcher to gather rich, detailed data and provide a comprehensive understanding of the phenomenon under investigation. In contrast, the quantitative method relies on statistical tools to test

hypotheses and measure variables systematically (Mugenda & Mugenda, 2003; Kothari, 2004).

3.3 Target Population

This study's population constituted those employees that are working in the two selected industries both at Kiambu County and Uasin Gishu Country. The population also incorporated those who are part of the management of the textile industry departments at different levels. The population working in the industries is approximated to be at 850 employees according to the records from the finance department from the two textile industries (Researcher Reconnaissance)

3.4 Sampling Techniques

Given the heterogeneity of the population in this research project, a stratified random sampling strategy by Mugenda & Mugenda (2003) was used. The strata were based on departments and job categories within the factories, including management, supervisory staff, technical/production staff, and support staff. This was necessary to ensure representation across all functional areas of the organizations. Purposive sampling to select individuals (key informants) who possess specialized knowledge and insights relevant to green growth practices and policy implementation within the textile mills.

3.5 Sample Size

The Nassiuma's formula (2001) was utilized to determine the sample size drawn from a population of 850 persons. Because the study area is small and contains about 850 persons working in the textile industry, this formula is applied to a population size of fewer than 10,000 people.

$$n = \frac{NCV^2}{(CV\ 2 + (N-1)\ e2)}$$

Where n= Sample size

N= Population

CV = Coefficient of variation (take 0.5)

e = Tolerance of the desired level of confidence, take 0.05% at 95% confidence level

Therefore,

$$n = \frac{NCV2}{(CV2+(N-1)e2}$$

So,

$$n = \frac{850\ X\ (0.5)2}{(0.5)2+(850-1)(0.05)2}$$

$$n = \frac{212.5}{0.25+2.1225}$$

$$n = \frac{212.5}{2.3725}$$

$$n = 89.57$$

n= 90 Respondents

Therefore, this study involved 90 workers.

3.6 Pretesting

To validate the validity and reliability of the survey instruments, a pilot study was carried out, and any inconsistencies in the research instruments were found and fixed prior to data collection. Mugenda & Mugenda (2012) claim that 1% to 10% of the questionnaires are sufficient for piloting and produce accurate data. Based on this claim, the study used 10% (9) of the questionnaires for pretesting focusing on workers and their supervisors at Thika Cloth Mill. The sampled workers were requested to fill the questionnaires while those with supervisory roles were asked to fill the interview schedule questions. According to Taherdoost (2016) research instruments are considered valid and reliable if the respondents clearly understand all the questions and answer them with some degree of accuracy and consistency. These were the main elements that were scrutinized during the pre-survey and the results were as summarized on the validity and reliability subsections below. The respondents participating in the pre-testing were omitted from the

final survey. These participants had their names and identification details captured during this pilot phase so that they are excluded from the main sampling frame used for collecting data.

3.7 Validity

A validity test is used to verify whether the data collection tools produced information relevant to the study's objectives (Taherdoost, 2016). The study employed a content validity approach for the questionnaire where Kenyatta University supervisors and green growth experts from different industries were requested to review and rate the contents of the questionnaire. Experienced researchers were asked to double-check the data collection instruments for ambiguity, clarity, and applicability of the items that were used to operationalize each variable thus achieving construct validity. All the gaps and recommendations made by the subject-matter experts were put in consideration before data collection.

3.8 Reliability

According to Taherdoost, (2016), the consistency of a study's results over time and how well they reflect the entire group under study are two basic characteristics of reliability. This, according to Mohajan (2018), can be assessed using three main methods namely internal consistency, split half, and test re-tests. In their argument, a study can only be reliable if its results can be replicated using a similar technique. This study tested the reliability of the research tools using Cronbach Alpha technique. In this study, an alpha coefficient of above 0.9 is considered excellent, an alpha coefficient of between 0.6 and 0.7 is considered acceptable, and an alpha coefficient of below 0.5 is unacceptable (Sigudla & Maritz, 2023).

The Findings as shown in table 4.2 indicated that the questions selected for testing the understanding and adoption of green growth had an alpha coefficient of .802, the existing green growth practices had an alpha coefficient of .782, the extent to which Sustainability reporting has been adopted had an alpha coefficient of .765, and the challenges that hinders adoption of green growth practices had an alpha coefficient of .758. All the three

variables generated an average alpha coefficient of .777 which is above .700 therefore the questionnaire was reliable.

Table 3.2: Reliability test results

Variable	Items	α >0.7	Comments
Understanding and adoption of green growth	4	.803	Reliable
Existing green growth practices	4	.782	Reliable
Extent to which Sustainability reporting has been adopted	4	.765	Reliable
Challenges that hinders adoption of green growth practices	4	.758	Reliable
Average	**4**	**.777**	**Reliable**

3.9 Data Collection Techniques

3.9.1 Questionnaires

Both structured and unstructured questions were employed by the researcher. The questionnaire captured respondents' social and demographic characteristics, understanding and adoption of green growth practices, challenges associated with the adoption of these practices, sustainable reporting of green initiatives, and the implementation of green practices within the industries. A Likert scale was used to capture the data on a four-point scale from excellent to poor. The researcher administered the questionnaires to the employees given out by trained enumerators to ensure the reliability of respondents.

Table 3.3: Sample distribution

Category	**Thika Cloth Mill (Kiambu)**	**Rivatex (Uasin Gishu)**	**Total**
Management Staff	5	4	9

Supervisory Staff	10	8	18
Technical/Production Staff	25	20	45
Support Staff	10	8	18
Total	**50**	**40**	**90**

3.9.2 Key Informant Interviews Guide

The researcher carried out interviews with significant stakeholders within selected textile manufacturing mills such as Energy officers, Staff, Sustainability officers, Heads of department, weaving directors, processing directors, Environmental social governance leaders, spinning officers and waste plant treatment officials. An appropriate time was booked prior by the researcher and schedule interviews. Interviews were conducted until saturation (22 interviewees) where no new information emerged.

3.9.3 Observation Guide

Observation guide containing a list of different monitoring scenarios covering both behavioral and non-behavioral occurrences was used. Here, the researcher must first specify the behaviors that were investigated before developing an in-depth behavior checklist. Each checklist was checked off by the researcher when it occurred during data collection.

3.10 Data Analysis

The accuracy of the data gathered was verified and cleaned to ensure data quality before coding. Data was then entered and analyzed using IBM SPSS (version 25). Data was then subjected to statistical tests of significance to determine validity before any conclusion. Descriptive statistics like mean, median, and standard deviation were used to analyze the quantitative data. Additionally, the association between the variables was evaluated using chi square statistics and analysis of variance (ANOVA), while the degree and direction

of the relationship were determined using correlation and regression analysis.

3.11 Ethical and Logical Considerations

Participation in this study was voluntary, and no one was forced to provide information or complete questionnaires. Respondents were informed that the study was strictly for educational reasons to uphold their privacy (Alay, Duran & Korlu, 2016). Respondents were not asked for any information that could have been used to identify them individually. Additionally, Kenyatta University Graduate School wrote an introductory letter, and the National Commission for Science, Technology, and Innovation (NACOSTI) approved the research to be conducted in Selected Textile Industries as shown in Annex 1.

CHAPTER 4: RESULRS AND DISCUSSION

4.1 Introduction

This chapter presents the results of the study, addressing four key objectives: understanding and adopting green growth practices, identifying existing green growth practices in textile industries, examining the extent of sustainability reporting adoption, and exploring the challenges hindering the adoption of green growth practices in textile industries.

4.2 Response Rate

The workers at Thika cloth mill were presented with a total of 50 questionnaires and the ones at Rivatex were presented with 40 questionnaires each leading to a total sample size of 90. However, some respondents did not give feedback while others did not complete the survey and therefore a response rate of 100% was not achieved. As shown in Table 4.1, the total number of complete questionnaires was 42 out of 50 for Thika cloth mill, 36 out of 40 for Rivatex, and a total of 78 out of 90 respondents. This represents a response rate of 84 % for Thika cloth mill, 90 % for Rivatex, and a total response rate of 87 %. This is a sufficient response rate because according to (Morton et al., 2018) a response rate of above fifty per cent is considered adequate for generalization of the findings.

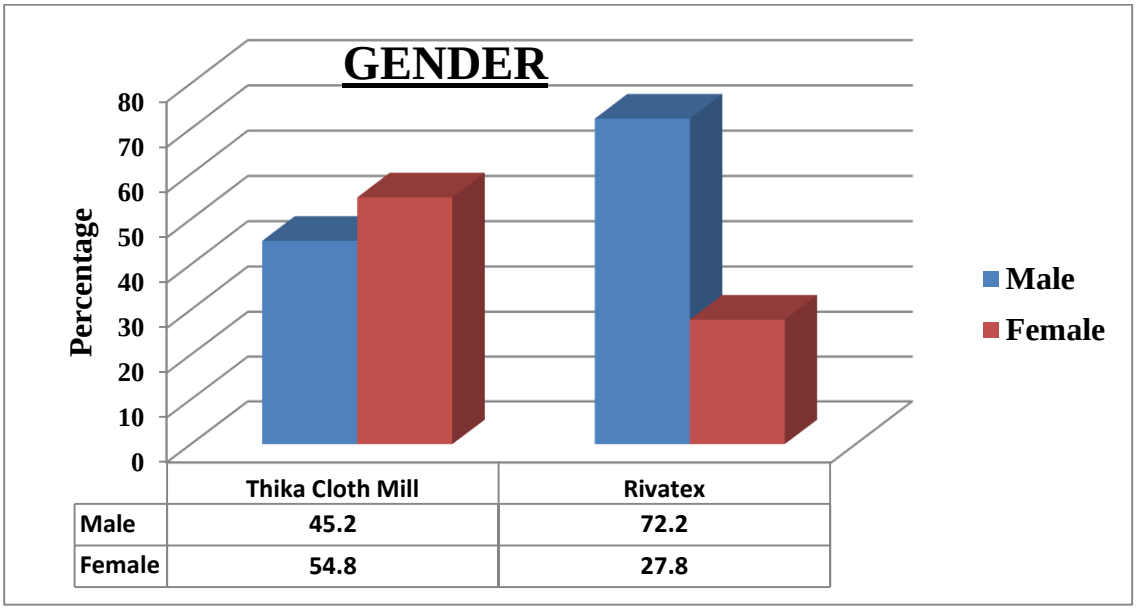
Table 4.4: Response Rate

	Thika Cloth Mill	**Rivatex**	**Total**	**Response rate**
Target sample size	50	40	90	100 %
Incomplete Questionnaires	4	3	7	8 %
Unreturned Questionnaires	4	1	5	5 %
Completed & returned	**42**	**36**	**78**	**87 %**

4.3 Demographic Analysis

The textile industry is to some male extent dominated with majority (57.7%) of the respondents being male and the minority (42.3%) being female. At Rivatex, the gap was wider with 72.2 % of the workers being male and 27.8% being female compared to Thika Cloth mill where there was some balance with male workers at 45.2% and female workers at 54.8%. In an interview with the representatives of the companies, it was commented that despite 90% of the operations being automated, women are still viewed as weak due to lack of technical expertise and therefore are only considered for roles such as procurement, packaging, human resource and quality control. This is consistent with the findings of Shukla et al. (2021) that the textile sector has over time attracted male workers since female workers fear the health and safety risk associated with the sector especially exposure to biological agents. A crosstabulation between gender and understanding of green growth further indicated that more female (76%) than males (43%) are aware and some inadvertently practice the green growth practices. This is because females often more engaged in day-to-day operational and environmental management activities and tend to show positive environmental attitudes than men (Zelezny, Chua, & Aldrich, 2000; Lee, 2009).

4.3.1 Gender

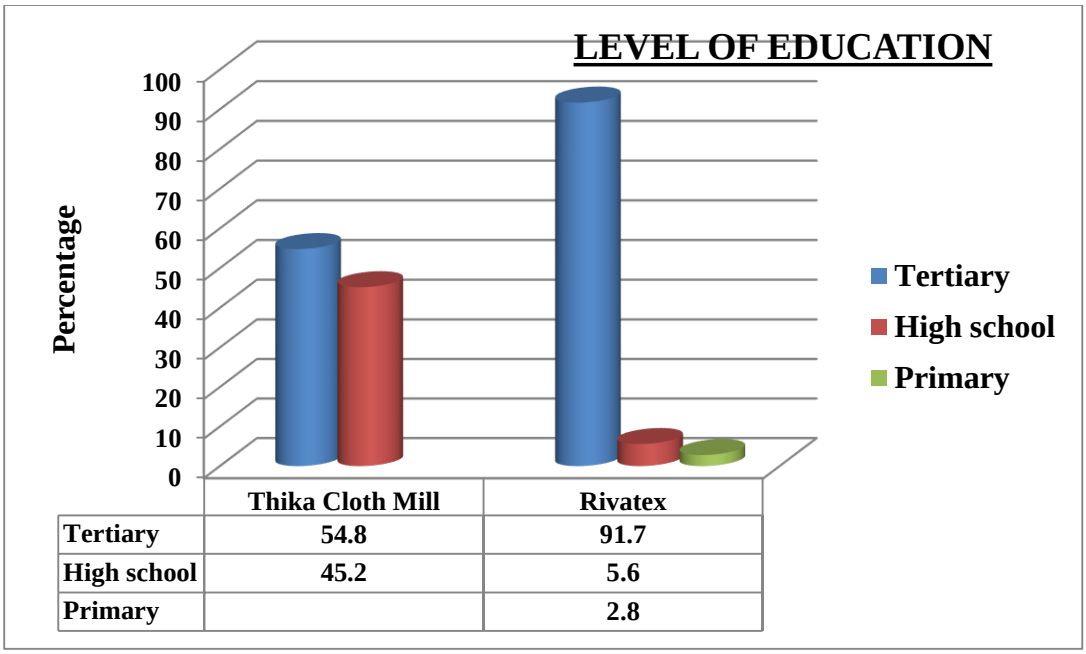


	Thika Cloth Mill	Rivatex
Male	45.2	72.2
Female	54.8	27.8

Figure 4.3: Gender Distribution

4.3.2 Level of Education

Majority of the workers (71.8%) had achieved a tertiary level of education while only (28.2 %) had a secondary level of education and below. At Rivatex, 91.7 % of the workers had received tertiary education. This was significantly high compared to Thika Cloth mill where only 54.8% of the workers had achieved tertiary education. It was observed that the conceptualization of the concept of green growth and sustainability of the textile industry was higher among very learned workers especially those with education and training experiences outside Kenya. The companies have however invested in industrial training to equip their staff with basic skills on green growth practices in textile industries. This echoes the findings of a study conducted by Gull & Rehman, (2022) that emphasized the role of green training and ecological sustainability within the textile sector in Pakistan

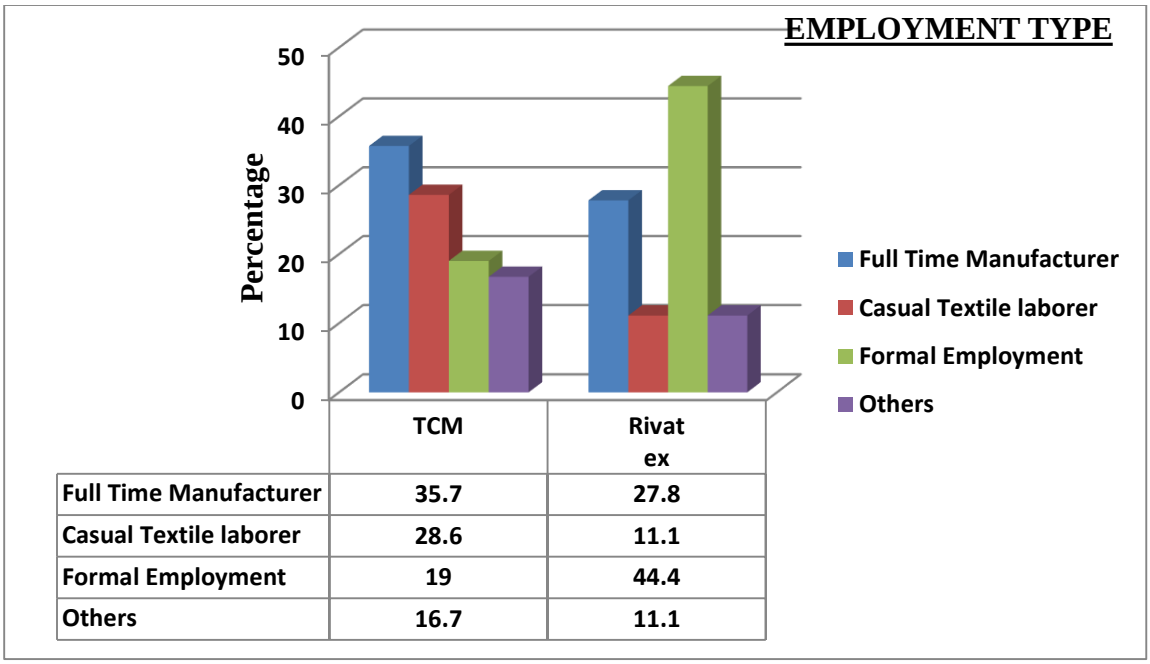


	Thika Cloth Mill	Rivatex
Tertiary	54.8	91.7
High school	45.2	5.6
Primary		2.8

Figure 4.4: Highest Level of Education

4.3.3 Type of Employment

Full time manufacturers formed the majority of the workforce at 32.1% followed by formal employees at 30.8% and casual textile laborers constituting 20.5% of the labor force. At Rivatex, the majority of the workers (44.4%) were in formal employment while majority of the workers at Thika Cloth mill (35.7%) were full time manufacturers. A crosstabulation between the type of employment and adoption of green growth practices indicated that more management staff (67%) than casual laborers (48%) are more aware of the concept of green growth practices and sustainability reporting. The companies have however put in place training and certification programs on green growth and Sustainable textile practices mostly targeting casual laborers and fulltime manufacturers.

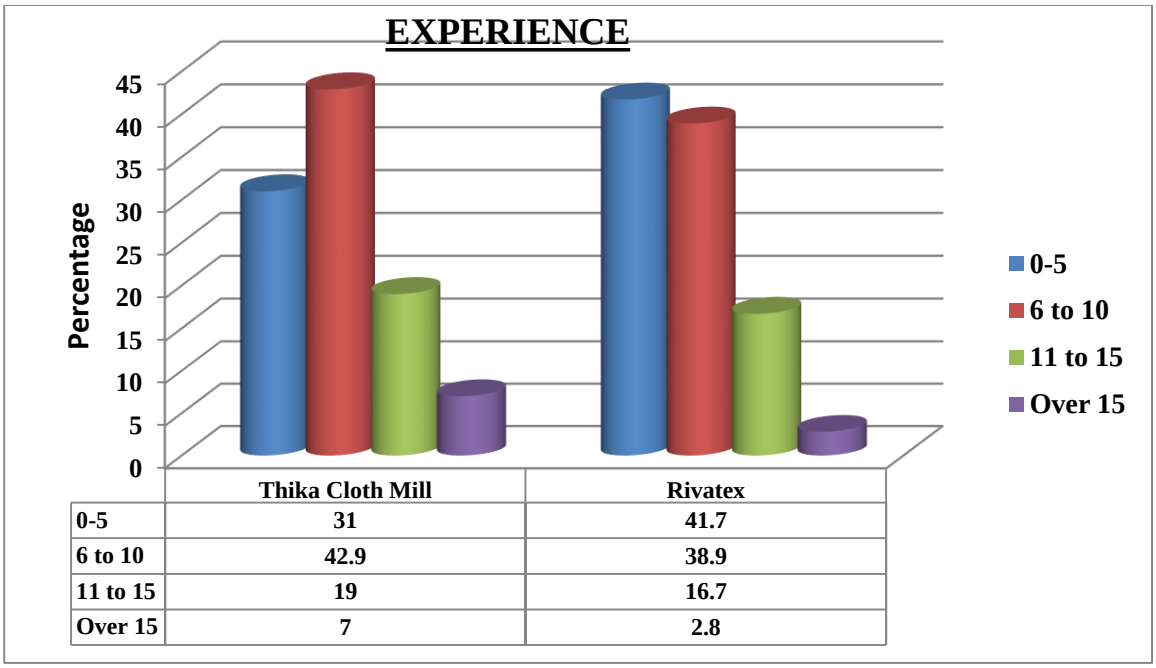


	TCM	Rivatex
Full Time Manufacturer	35.7	27.8
Casual Textile laborer	28.6	11.1
Formal Employment	19	44.4
Others	16.7	11.1

Figure 4.5: Employment Type

4.3.4 Experience

Majority (76.9%) of the workers had worked in the textile industry for less than 10 years. The workers mainly consist of youths with 0-5 years of experience (35.9%), 6-10 years of experience (41%) and 23% of them above 10 years of experience. At Rivatex, majority (41.7%) of the workers had experience of less than 5 years while at Thika Cloth mill, majority (42.9%) of the workers had experience of 6-10 years. Majority of employees who had worked for more than 10 years within the textile industry (60% at Rivatex and 53% at Thika Cloth Mill) explained the transformation from manual processing within the textile industries to the automated systems which according to them have saved on time, resources and energy use as well as facilitated clean production.



	Thika Cloth Mill	Rivatex
0-5	31	41.7
6 to 10	42.9	38.9
11 to 15	19	16.7
Over 15	7	2.8

Figure 4.6: Work Experience

4.3.5 Influence of the Demographic Characteristics on Green Growth

Gender exhibited a statistically significant correlation with allocation of duties in textile industries ($x^2 = 21.301$, df = 78, p= .002) with more male workers (54.6%) performing technical and heavy duties and more females (62.8%) performing light and official duties. The level of education of the workers was established to have a statistically significant impact on the understanding of green growth ($x^2 = 13.803$, df = 78, p= .006) with majority (52.6%) of the very educated employees (degree holders) easily conceptualizing the concept of green growth and sustainability. Occupation had a statistically significant effect on green growth within the textile industries ($x^2 = 17.602$, df = 78, p= .004) and influenced aspects such as training and certification on green growth and sustainability. The level of experience of the workers had a statistically significant effect on their perception of the company's green growth transition ($x^2 = 19.431$, df = 78, p= .012) with majority of the very experienced workers indicating that there has been notable improvement in terms of energy and resource use due to automation. Both companies maintained a balanced workforce in terms of gender, education, type of employment, and experience. Where gaps were identified, deliberate actions were taken to bridge these gaps.

Table 4.5: Demographic Characteristics Influence on Green Growth

Variable	Pearson Chi-Square	Df	Asymp. Sig. (2-sided)
Gender	21.301	78	.002
Level of education	13.803	78	.006
Occupation	17.602	78	.004
Experience	19.431	78	.012

4.4 Understanding and Adoption of Green Growth

The Study aimed to determine the Understanding and adoption of green growth in supporting achievement of green growth practices in textile industries. Workers of the two selected textile industries (Rivatex and Thika Cloth Mill) were asked to indicate their opinion on statements relating to understanding and adoption of green growth on a scale of 1 to 4 (where 1= fair 2= Good 3= Very good 4= Excellent) and tick the option that best represented their opinion in a questionnaire administered to the selected workers. The results were as tabled below

Table 4.6: Descriptive Statistics on Understanding and Adoption of Green Growth

Statement	**Fair**	**Good**	**Very good**	**Excellent**	**Mean**	**STD DEV**
Rate your understanding of green growth	23.1%	41.0%	20.5%	15.4%	2.28	.992
Rate your understanding of Textile Industry policy on green growth practices	29.5%	50.0%	14.1%	6.4%	1.97	.837
Rate your overall environmental awareness	46.2%	30.8%	12.8%	10.3%	1.83	.998
Rate your employees' commitment to green growth Practices	19.2%	33.3%	30.8%	16.7%	2.45	.989
Average score rating	**29.50%**	**38.78%**	**19.55%**	**12.20%**	**2.14**	**.954**

A significant portion of participants (41.0%) reported having a good understanding of green growth, while only 15.4% indicated an excellent grasp of the concept. The resulting mean score of 2.28 and standard deviation of 0.992 suggest that knowledge of green growth in textile industries is relatively moderate, yet slightly above average. Regarding the adoption of green growth practices, half of the respondents (50.0%) rated their organization's policy on these practices as good, whereas only 6.4% considered it excellent. This yielded a mean score of 1.97 and a standard deviation of 0.837, indicating that green growth policies are somewhat implemented within textile industries. When evaluating the performance of green growth audit committees, the majority (46.2%) rated their performance as fair, and only 10.3% believed the committees were highly effective. These results led to a mean score of 1.83 and a standard deviation of 0.998, highlighting a lack of confidence in the effectiveness of the existing green growth audit committees in executing policies.

In terms of employees' commitment to green growth practices, majority (33.3%) of the workers indicated that it was good and 16.7 % of them indicated that it was excellent. This resulted to the highest mean of 2.45 and a standard deviation of .989 showing that the employees are to a great extent committed to green growth. The average score rating resulted to a mean and a standard deviation of 2.14 and .954 respectively indicating that the understanding and adoption of green growth practices in textile industries is relatively good and slightly above average. This mirrors the findings of a research conducted by Cheng et al, (2018) in China that green growth in textile industries is relatively a new concept in textile industries that attempts to solve energy and carbon challenges

4.4.1 Observation on Understanding and Adoption of Green Growth

Data collected from interviews with the line managers and observation checklist indicated that the Selected Textile Manufacturing Mills comply with the National Environment Management Authority (NEMA) standards and regulations on, Air and chemical emissions regulations, Effluent treatment plant (ETP) requirements and general waste management policies. This demonstrated understanding and adoption of green growth practices. Thika Cloth mill has invested heavily in use of posters to indicate their

environmentally friendly practices, while Rivatex invested in environmental conservation alternatives in energy sourcing and material sourcing of fiber.

Despite these steps in adoption of green growth practices, the textile industry, data from the observation checklist and interview schedule indicated lacks sufficient knowledge of sustainable development goals, industrial Eco-friendly practices, industrial symbiosis, wastewater recycling and lessening power costs through utilization of renewable energy which are potential areas of improvements. The textile mills are also currently not aware nor part of eco certification and circular textile initiatives such as Blue sign, oeko tax certifications, the Higg index, Textile Exchange global recycling standards among others indicating major gaps in the understanding and adoption of green growth practices.

Thika Cloth Mill's boiler supervisor showed understanding of the standards that NEMA has stipulated for Air and effluents emissions such as sludge and offcuts. The produced offcuts for instance are later sold to sofa set makers and adopted as a repurposing green practice. At Rivatex, the offcuts are used in their Workshop and tailoring department to make products that are later sold in their shops such as bags, hats, caps, dresses among other products designed by the tailors thus creating green jobs for fashion designers. Both Thika Cloth Mill and Rivatex Mill use maize starch and Urea in yarn spinning in the weaving preparation department.

4.5 Existing Green Growth Practices in Textile Industries

The second aim of the study was to determine the Existing green growth practices in textile industries. The employees of Rivatex and Thika Cloth Mill were requested to provide their perspectives on statements relating to existing green growth practices on a scale of 1 to 4 (where 1= fair 2= Good 3= Very good 4= Excellent) and tick the option that best represented their opinion in a questionnaire administered to the selected workers. The results were summarized in the table below.

Table 4.7: Descriptive Statistics on Existing Green Growth Practices

Statement	Fair	Good	Very good	Excellent	Mean	STD DEV

Rate energy Audit performance for your company	15.4%	34.6%	33.3%	16.7%	2.51	.950
Rate your company's investment towards sustainability and green growth trainings, awareness' and Capacity building	24.4%	46.2%	20.5%	9.0%	2.14	.893
To what extent does your company promote green growth through the Reduce, Reuse, Recycle methods	12.8%	33.3%	43.6%	10.3%	2.81	.849
Rate the company's use of Eco-friendly solar technologies and CLF bulbs	5.1%	24.4%	34.6%	35.9%	3.01	.904
Rate the Industry's Environmental improvement made in the past three years	21.8%	37.2%	28.2 %	12.8%	2.32	.960
Average score rating	**15.90%**	**35.14%**	**32.04%**	**16.94%**	**2.50**	**.911**

The study established that some of the existing green growth practices in textile industries include clean energy, sustainability and green growth trainings, awareness' and Capacity building, Reduce, Reuse, Recycle, use of Eco-friendly solar technologies and CLF bulbs. When asked to rate the performance of the energy audit in their respective companies, majority of the management staff (34.6% and 33.3%) indicated that it was good and very good respectively. This generated a mean and a standard deviation of 2.51 and .950 respectively showing that the energy audit programs in place are making significant progress. The company's investment in sustainability, green growth training, awareness' and capacity building was rated as good by majority (46.2 %) of the management staff but only (9.0%) of them indicated that it was excellent. This resulted to a mean and a standard deviation of 2.14 and .893 respectively showing that the company's investment in sustainability is average.

Majority of the management staff (43.6%) rated their company's green growth through the Reduce, Reuse, and Recycle methods as very good while only (12.8%) rated it as fair. This resulted to a mean and a standard deviation of 2.81 and .849 respectively showing that Reduce, Reuse, and Recycle methods are among the most employed green growth practices in textile industries. The Company's use of Eco-friendly solar technologies and CLF bulbs which save up to 80% of electricity was rated as excellent by majority of the

workers (35.9%) and only (5.1%) rated it as fair. This generated a mean and standard deviation of 3.01 and .904 respectively indicating that use of Eco-friendly solar technologies and CLF bulbs is the most applied green growth practice in textile industries.

Majority of the management staff (37.2%) rated the progress made in terms of Industry's Environmental improvement in the past three years as good while only 12.8% rated it as excellent. This yielded a mean and a standard deviation of 2.32 and .960 respectively indicating that in the last three years, textile industries have made significant progress in environmental improvement although with some gaps. The average score rating of existing green growth practices in textile industries (mean of 2.50 and a standard deviation of .911) indicate that the application of green growth practices is above average.

4.5.1 Observed Existing Green Growth Practices

An analysis of the interviews and observations from the field survey of both Rivatex and Thika Cloth Mill shows that the most commonly applied green growth practices in both industries include; use of imported viscose and polyester which is a by-product of fossil fuel, daily recording of water usage, recycling and treatment of waste water, use of starch and Urea to strengthen the thread, sourcing of heat alternatives for boiler systems from Kenya Nut Company where macadamia nuts are sold, use of saw dust, coffee, rice and croton husks as sources of heat, greener material sourcing of cotton fiber, Environmental interpretive signs for staff compliance such as save energy, save water and separate waste and use of solar energy. Despite these initiatives there are some gaps in their implementation especially lack of environmental management systems and a well-structured sustainability workforce across all the departments.

At Thika Cloth Mill waste management is properly done through waste separation in containers just outside the industry. The containers are classified into Fabric waste, plastic waste, clean polythene waste, dirty polythene waste and coffee husks. All these wastes are used again directly or indirectly either through industrial symbiosis or circularity. Rivatex has attempted to use green dye in small scale from Mexican marigold weed courtesy of research partnership with Moi University Eldoret. The company also uses briskets in the boiler plant that supports the processing department. Both Rivatex and

Thika Cloth MillS contribute to cotton farmer sensitization programs that support famers in Kenya through giving them free cotton seeds and trainings in various counties. Both Thika Cloth mill and Rivatex carry out daily monitoring of energy and fuel consumption through tracking of fuel used in the thermal boilers and daily recording of water use. They also perform energy audits after every 3years.

4.6 Sustainability Reporting

The study's third objective was to establish the extent to which Sustainability reporting has been adopted among textile industries. The employees of Rivatex and Thika Cloth Mill were asked to indicate their opinion on statements relating to Sustainability reporting and its adoption among textile industries on a scale of 1 to 4 (where 1= fair 2= Good 3= Very good 4= Excellent) and tick the option that best represented their opinion. The results were summarized in the table below.

Table 4.8: Descriptive Statistics on Sustainability Reporting

Statements	Fair	Good	Very good	Excellent	Mean	STD DEV
Rate your you understanding of sustainability reporting	71.8%	21.8%	3.8%	2.6%	1.37	.686
Rate your awareness on SDG 12 (sustainable consumption and production patterns)	50.0%	39.7%	3.8%	5.1%	1.64	.793
Rate your company's sustainability reports production	64.1%	25.6%	9.0%	1.3%	1.47	.716
Rate your dedication to reducing your industry environmental footprint to help achieve the sustainability targets	15.4%	30.8%	35.9%	15.4%	2.53	.945
Aggregate score rating	**50.33%**	**29.48%**	**13.13 %**	**6.10%**	**1.75**	**.785**

Sustainability reporting was established to be a fairly new concept in textile industries with majority of the workers (71.8%) rating their understanding of the concept as fair and only 2.6% rating it excellent. This generated a mean and a standard deviation of 1.37 and .686 respectively showing that the concept of sustainability reporting has not been understood by many textile companies. When asked to rate their understanding of SDG

12 on ensuring sustainable consumption and production patterns, which is a key pillar of sustainability reporting, majority of the workers (50.0%) indicated that it was fair and only 5.1% indicated that it was excellent. This generated a mean and a standard deviation of 1.64 and .793 respectively indicating low awareness on SDGs relating to sustainability reporting. Majority of the workers (64.1%) indicated that their company's sustainability reports' production rate was fair and only 1.3% indicated that it was excellent. This resulted to a mean and a standard deviation of 1.47 and .716 respectively indicating that textile industries rarely write and submit sustainability reports.

Majority of the workers (35.9%) rated their dedication to reducing their industry environmental footprint to help them achieve the sustainability targets as very good and only 15.4% rated their commitment as fair. This generated a mean and a standard deviation of 2.53 and .945 respectively showing that despite their low level of awareness on sustainability reporting, the workers are committed to ensuring that their companies meet their sustainability targets. The Aggregate score rating (Mean of 1.75 and a standard deviation of .785) show that sustainability reporting has not yet received the attention it deserves in textile industries. This coincides with an economic, environmental and social sustainability assessment using Global Reporting Initiative (GRI) standard by Saygili et al, 2019 which revealed that sustainability reporting is a new concept not just in textile industries and only focuses on a few aspects of the environment such as water and energy.

4.6.1 Observation on Sustainability Reporting

Sustainability reporting is yet a new concept in the Textile mills. The industries are positive about sustainability reporting even though they are not aware of available reporting frameworks and standards such as the global reporting initiative (GRI), Environmental and Social Governance standards, Sustainability accounting standards and climate disclosure standards. However, textile mills produce reports and keep short copy files containing their environmental, social, and governance impacts.

Thika Cloth Mill is still in its early stages of formulation of sustainability and environmental standards. The human resources office showed various documents such as mini-reports for support to women within their textile mill with sanitary towels, the

various events they donate to schools and children's homes within the community of Thika. The company supports its female staff with free sanitary towels every month, has an internal Sacco that supports the staff with financial assistance and encourages savings and investments.

At Rivatex, sustainability reporting is practiced but the reports are only made available within the managers and directors offices. Departments in Rivatex such as strategy, training and operations partner to produce the internal sustainability reports. The components of Rivatex Sustainability report include modernization, environmental issues, human resources issues such as staff health cover, Sacco, employee work environment such as fresh air, PPE's and air conditioning systems. Rivatex mill undertakes corporate social responsibility (CSR) through supporting needy students, garments relief programs and provide seedlings to be planted by cotton famers however, most of this information is shared on their social platforms and their internal sustainability report.

4.7 The Challenges of Green Growth Practices Adoption

The study sought to establish the challenges that hinder adoption of green growth practices in textile industries. The workers of Rivatex and Thika Cloth Mill were asked to indicate their opinion on statements relating to challenges that hinder adoption of green growth practices on a scale of 1 to 4 (where 1= fair 2= Good 3= Very good 4= Excellent) and tick the option that best represented their opinion. The results were summarized in the table below.

Table 4.9: Descriptive Statistics on the Challenges Facing Adoption of Green Growth Practices

Statements	Fair	Good	Very good	Excellent	Mean	STD DEV
How would you rate green growth transition in your company	14.1%	52.6%	29.5%	3.8%	2.23	.737

Rate the support you receive from Kenya Association of Manufacturers to reduce Textile environmental waste	19.2%	42.3%	26.5%	9.0%	2.28	.881
Rate the availability of cotton for your productive manufacturing processes	32.1%	44.9%	19.2%	3.5%	1.95	.820
Rate the affordability and accessibility of Green growth of technologies	41.3%	24.3%	12.2%	2.6%	1.74	.804
How do you rate the market for textile products produced using green growth practices	21.5%	34.3%	31.3%	14.3%	2.36	.783
Aggregate	**25.64%**	**39.68%**	**23.72%**	**6.64%**	**2.11**	**.805**

Majority of the employees (52.6%) rated the green growth transition in their company as good while only 3.8% rated it as excellent. This generated a mean and a standard deviation of 2.23 and .737 respectively indicating lack of confidence towards green growth transition within the industries. Lack of support from other partner organizations such as the Kenya Association of Manufacturers was cited as one of the main barriers to adoption of green growth in textile industries with the majority of the employees (42.3%) rating the support as good and only 9% rating it as excellent. The majority of the respondents (44.9%) rated the availability of cotton for manufacturing as good while only 3.5 rated it as excellent. This generated a mean and a standard deviation of 1.95 and .820 indicating that lack of readily available cotton is a major challenge in textile industries.

Majority (41.3%) of the workers indicated that affordability and accessibly of green growth technologies is a major challenge in textile industries. This generated a mean and a standard deviation of 1.74 and .804 respectively indicating that the green growth technology is expensive and not easily available. Lack of readily available market for textile products produced using green growth practices was cited by some employees (34.3%) a major barrier to adoption of green growth. This generated a mean and a standard deviation of 2.36 and .783 respectively showing that there are genuine concerns on the market for green growth products. The Aggregate score rating on the major challenges affecting green growth in textile industries generated a mean of 2.11 and a

standard deviation of .805 showing that there are major concerns in the adoption of green growth in textile industries. This mirrors the findings of Khattak, (2019) that adoption of green growth in textile industries faces challenges such as lack of a policy and regulatory framework and the initial design of textile mills not being structured to accommodate green growth.

4.7.1 Observation on Challenges Facing Green Growth

Interviews with the management of both Rivatex and Thika Cloth Mill textile industries indicated that the barriers in adoption of green growth in textile industries is mainly related to the fact that green growth is still a new concept and the fact that textile mills in Kenya once collapsed and are still gaining back their market strength in production and profit making. According to the interviews with the management of the selected mills; the most common challenges affecting adoption of green growth revolve around difficulties in acquisition of green growth technologies which are mostly exported and procured from Italy, Germany and India, lack of awareness and technical expertise on transition to green growth as well as lack of circularity bodies supporting textile industry transition to circularity and lack of green growth courses in colleges and universities offering textile engineering.

The market for textile products especially the ones produced using green growth practices was cited as a major challenge by the management of both companies. For instance, Rivatex manager stated that there is stiff competition between second hand clothing and local textile industry products (Fabrics). The cotton in Kenya is still at minimal production and most cotton is bought from Tanzania and Uganda making it difficult to compete with the local second-hand clothing due to high cost of production. Also, Local consumption of textile products is minimal compared to second hand clothing and foreign fabrics whose prices are cheap and therefore are preferred by Kenyans compared to locally made textile garments and products. There are few eco consumers in Kenya who are conscious about the environmental impact of their textile consumption. At Thika cloth Mill, customers from abroad are mostly the ones who choose to buy pure cotton made fabrics that have not gone through processing while at Rivatex the local market for textiles

is slowly picking up with a substantial number of Kenyan buyers gaining interest in the locally produced textile products.

4.8 Inferential Analysis

This section of the data analysis chapter presents the correlation and the regression results on the relationship between the independent variables (green growth practices) including the understanding and adoption of green growth, Existing growth practices, Adoption of Sustainability reporting and green growth challenges and the green growth development of Selected Textile Industries (Industry operations, Governance structure and Management perceptions)

4.8.1 Correlation Analysis

The study sought to identify whether there was a correlation between the green growth development in Selected Textile Industries (Y) and green growth practices (X) **(**the understanding and adoption of green growth, existing green growth practices, Sustainability reporting and green growth challenges) and how strong or significant the correlation was. The independent variables were represented as: Understanding and adoption of green growth = X1, Existing green growth practices = X2, Sustainability reporting = X3, and the challenges that hinders adoption of green growth practices = X4. The results were summarized in table 4.10 below.

Table 4.10: Correlation Matrix

		Y	X1	X2	X3	X4
Y	Pearson Correlation					
	Sig. (2-tailed)					
X1	Pearson Correlation	.521**	1			
	Sig. (2-tailed)	.008				
X2	Pearson Correlation	.622**	.401**	1		
	Sig. (2-tailed)	.004	.062			

X3	Pearson Correlation	.714**	.401**	.221**	1	
	Sig. (2-tailed)	.000	.076	.056		
X4	Pearson Correlation	.692**	.167**	.313*	.176**	1
	Sig. (2-tailed)	.000	.035	.041	.023	
	N	**78**	**78**	**78**	**78**	**78**

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

The correlation analysis results indicated a strong positive relationship between the dependent variables and the independent variables. Understanding and implementing green growth were strongly positively correlated with the development of the textile manufacturing industry (r = .521, p = .008) suggesting that 52.1% of the variation the green growth development of selected textile industries can be explained by the understanding and adoption of green growth. For instance, in both the selected mills, workers who were more aware of green growth took more deliberate actions such as efficient use of water, turning of lights when not in use and proper disposal of different types of waste compared to those with less knowledge about the concept.

There was also a strong positive relationship between the green growth development of selected textile industries and the existing green growth practices (r = .622, p = .004) indicating that 62.2% of the variations in the green growth development of selected textile industries can be explained by the existing green growth practices employed. For instance, the management of both companies indicated that the existing green growth practices significantly lowers the cost of production thereby improving the profit margins.

Sustainability reporting and the green growth development of selected textile industries generated the highest Pearson correlation coefficient (r = .714, p = .000) indicating the strongest positive correlation. This further suggests that 71.4% of the variations in the green growth development in selected textile industries can be explained by sustainability reporting with companies that are more active in producing sustainability reports recording more green growth developments compared to those that do not. For instance, according to an interview with Rivatex production manager, it was revealed that

sustainability reporting provides transparent and accountable manufacturing process in line with government policies and SDGs thereby fostering a culture of sustainability.

The challenges that hinder adoption of green growth practices and the green growth development of selected textile industries had a strong positive relationship ($r = .692$, $p = .000$) indicating that 69.2% of the variations in the green growth development of selected textile industries can be explained by the challenges that hinder adoption of green growth practices. For instance, lack of market for market for locally manufactured textiles due to infiltration of secondhand clothes and the high cost of green growth technology were established as the main challenges hindering development of more green growth practices in the selected textile industries according to the respondents.

4.8.2 Multiple Regression Analysis

The research sought to establish a supported relationship between the green growth development of Selected textile Industries (Y) and green growth practices (X) **(**the understanding and adoption of green growth, existing green growth practices, Sustainability reporting and Green growth challenges) The independent variables are symbolically represented as the understanding and adoption of green growth = X1, Existing green growth practices = X2, Sustainability reporting = X3, and Green growth challenges = X4. The results were as shown in the model summary in table 4.9 below.

Table 4.11: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.789a	0.231	0.530	1.406

a. Independent variables: (Constant): X1, X2, X3, and X4

As indicated in the model summary, there was enough statistical evidence to suggest that development in green growth of the selected textile industries was associated with their commitment to green growth practices. The analysis shows that the green growth practices (the understanding and adoption of green growth, existing green growth practices, Sustainability reporting and Green growth challenges) account for 53.0% of the development in green growth of the selected textile industries ($R^2 = .530$). This also suggests that 47.0% of the green growth development in the selected textile industries is

caused by other factors that are not related to green growth practices. This aligns with the findings of Roy et al. (2020), which indicate that green growth enhances environmental performance and ratings withing textile industries by effectively addressing challenges related to lack of raw materials, water, and energy.

4.8.3 Regression Coefficients

The study sought to establish the contribution of the green growth practices (X) (the understanding and adoption of green growth, existing green growth practices, Sustainability reporting and green growth challenges) to green growth development of Selected textile Industries (Y). The results of the regression of coefficients is shown in table 4.12.

Table 4.12: Regression of Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta (β)		
1	(Constant)	.304	.462		3.222	.006
	X1 (Understanding and adoption of green growth)	.321	.079	.326	.406	.008
	X2 (Existing green growth practices)	.372	.109	.387	1.396	.004
	X3 (Sustainability reporting)	.485	.106	.516	.735	.000
	X4 (Challenges that hinders adoption of green growth)	.413	.086	.467	.912	.000

a. Dependent Variable: Green growth development in textile industries

As shown in table 10 above, understanding and adoption of green growth generated a standardized beta coefficient of ($\beta 1 = .321$, $P = .008$) implying that an increase in understanding and adoption of green growth by a single unit will lead to an increase of .321 units in the green growth development of textile industries. Existing green growth practices generated a standardized beta coefficient of ($\beta 2 = .372$, $P = .004$) implying that an increase in the existing green growth practices by a single unit will lead to an increase

of .372 units in the green growth development of textile industries. Sustainability reporting generated a standardized beta coefficient of (β3 = .485, P = .000) implying that an increase in sustainability reporting by a single unit will lead to an increase of .485 units in the green growth development of textile industries. The challenges that hinder adoption of green growth generated a standardized beta coefficient of (β4 = .413, P = .000) implying that a decrease in challenges that hinders adoption of green growth by a single unit will lead to an increase of .413 units in the green growth development of textile industries. Cumulatively, the aggregate standardized beta value of .398 suggests that an increase in the four green growth practices by a single unit will result in an increase in the green growth development of textile industries by .398 units. The model below can thus be used to calculate and predict the green growth development of textile industries based on the green growth practices applied by the textile industries.

$$\boldsymbol{Y = \beta 1 * X1 + \beta 2 * X2 + \beta 3 * X3 + \beta 4 * X4 + \varepsilon}$$

Where:

Y= the green growth development of textile industries

β1, β2, β3 and β4 = Standardized Beta coefficients

X1 = Understanding and adoption of green growth

X2= Existing green growth practices

X3 = Sustainability reporting

X4 = Green growth challenges

ε = Standard Error

Therefore:

The green growth performance of textile industries =

*(0.321 * Understanding and adoption of green growth + 0.372 * Existing green growth practices + 0.485 * Sustainability reporting + 0.413 * Green growth challenges) + 0.05*

CHAPTER 5: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Findings

The study identified several demographic factors that impact the perception and adoption of green growth practices within textile industries. Although the textile industry was established to be male dominated to some extent, gender played a key role in influencing distribution of roles within textile industries and consequently affected adoption of green growth practices. The textile industry is male dominated with many men being allocated technical roles while women are allocated supportive roles such as procurement, packaging and human resource. This leads to a higher percentage of men understanding green growth practices as they are more engaged in the manufacturing process than women hence the male gender understands and adopts the green growth practices at a higher rate than women.

The study also revealed that the education level of employees plays a significant role in the understanding and implementation of green growth practices within the textile industry. Employees who have attained higher educational qualifications, particularly those beyond tertiary education, generally possess a better understanding of green growth concepts. As a result, they are more likely to adopt green growth practices compared to their counterparts with lower educational levels. This study also found out that the type of employment affected the understanding and adoption of green growth practices. Moreover, the training initiatives on green growth by the textile industries proved to be effective in building the skills and awareness of the employees on the concept of green growth in textile industries. Full time and formal employees who receive targeted green growth training and certification understand green growth and are at a better position to adopt the practices as opposed to casual employees who don't receive training. However, all workers require green skills to contribute to green growth. For green growth to be effective, it requires a whole institutional approach. This study further discovered that work experience affects the understanding and adoption of green growth practices. Employees who have worked in a textile industry for over ten years have experienced the

evolving nature of the manufacturing process towards sustainability and easily adopt green growth practices compared to newly employed staff.

The majority of workers in the studied textile industries demonstrate a strong understanding of green growth practices. However, the extent of their implementation is limited, as only a few green practices are actively applied within these industries. Additionally, it was found that the practice of conducting green growth audits is not prioritized, which contributes to the slow adoption of sustainable practices. Despite this, a significant proportion of employees show a high level of commitment to green growth. Overall, while the understanding and adoption of green growth practices in the textile sector is promising, it remains somewhat moderate and shows room for further development.

The study established that some of the existing green growth practices in textile industries include clean energy, sustainability and green growth trainings, awareness' and Capacity building, Reduce, Reuse, Recycle, use of Eco-friendly solar technologies and CLF bulbs. The companies have effective energy audit process contributing to clean energy practices. The companies have invested in sustainability, green growth trainings, awareness and capacity building at a higher rate. The findings further indicate that Reduce, Reuse, and Recycle methods are among the most employed green growth practices in textile industries. Also, eco-friendly solar technologies and CLF bulbs is another most applied green growth practice in textile industries. The findings indicate that there is significant progress in environmental improvement in the textile industry with above average application of green growth practices in the industry. The major gap in adoption of green growth in textile industries was established to be lack of environmental management systems and sustainability departments.

The study found that sustainability reporting has not been fully integrated into textile industries, with limited focus on documenting and disclosing sustainability practices. While companies acknowledge their social and environmental impacts through internal reports and social media, these reports are typically restricted to senior management and are not shared with the broader public. This lack of transparency limits opportunities for

evaluation, knowledge sharing, and scaling of best practices, ultimately hindering the industries' ability to fully benefit from consistent sustainability reporting.

Additionally, a significant portion of employees in textile industries show limited awareness of sustainable consumption and production patterns, which are essential components of effective sustainability reporting. Despite this, workers remain dedicated to helping their organizations achieve sustainability goals. These results align with previous research (Saygili et al., 2019), which suggests that sustainability reporting is still emerging in many sectors, including textiles, and often addresses only a narrow range of environmental issues, such as energy and water usage.

In terms of the barriers impeding the implementation of green practices growth in textile industries, the main challenges revolved around inconsistent supply chain of raw materials, lack of market for locally produced textiles and the green growth technology being too expensive, plus lack of greening in the procurement and human resource departments. Despite the companies trying to find home-grown solutions to these challenges such planting their own cotton and forming research partnership, their interventions might not entirely address these challenges. The study established that green growth practices are key in building the sustainability of textile industries. A growth in adoption of green growth practices was also established to significantly improve the performance of textile industries and therefore these practices should be integrated in all textile industries.

5.2 Conclusion

Green growth is a dynamic concept, and its integration into the textile industry necessitates adaptation to the specific characteristics and challenges of this sector. While the adoption of green growth practices in the textile industry is relatively positive, the absence of support from key stakeholders within the sector poses significant barriers. Several green growth strategies, including the use of clean energy, sustainability initiatives, green training, awareness programs, capacity building, the implementation of reduce, reuse, recycle principles, and the adoption of eco-friendly technologies like solar power and CFL bulbs, have been embraced. However, the absence of Environmental

Management Systems (EMS) and dedicated Sustainability Departments in many textile companies hampers the effective and sustained application of these practices. Despite its potential contribution to the expansion of green growth initiatives, sustainability reporting has not been prioritized within the textile industry. A strong emphasis on sustainability reporting enables companies to pinpoint both successes and areas for improvement in green growth performance, thereby facilitating better decision-making and progress. Green growth holds significant promise for transforming the textile sector into a more profitable and environmentally responsible industry. Nevertheless, the widespread adoption of green practices is impeded by challenges such as inconsistent raw material supply, limited markets for locally produced textiles, high costs of green technologies, and insufficient greening in procurement and human resources. Addressing the root causes of reluctance among textile producers and resolving their key concerns will unlock the full potential of green growth. Furthermore, it has become evident that green growth in the textile industry is not only an economic, social, or environmental matter but also a policy challenge. As such, aligning existing policies and fostering political support are critical for advancing green growth in the sector.

5.3 Recommendations

- Lack of support in adoption of green growth from other development partners within the textile sector was cited as one of the challenges hindering the transition to green growth. Textile industries should thus form strategic partnerships among themselves so as to push the government through the Kenya Association of Manufacturers to support green growth initiatives.
- Textile industries should implement Environmental Management Systems and Sustainability Departments to ensure the integration of green growth practices into daily operations, ensuring a systematic approach to environmental management.
- Textile industries should develop and implement comprehensive sustainability reporting mechanisms that go beyond internal documentation and are accessible to the general public. The sustainability reports done by the companies were only

internal, did not follow the universally recommended formats and did not cover the full scope of green growth. Textile industries should consult sustainability reporting experts and make their sustainability reports available to the public. This will boost their accountability, their brand image and consequently their market base.

- Textile industries should actively seek to create and expand markets for locally produced textiles. This could involve partnering with retailers, government agencies, and industry associations to promote the benefits of locally sourced and sustainable textiles to consumers. Due to competition from imported second hand clothes, low local consumption of textiles and high cost of textile products; there is inadequate market for locally manufactured textile products. The government should craft policies that favor locally produced textiles and discourage importation of cheap second-hand clothes to increase the market for locally produced textiles. Companies can also leverage marketing and branding strategies to differentiate their products in the market and highlight their commitment to sustainability.

- Study recommends that the government and industry stakeholders promote local innovation and technology transfer through partnerships with research institutions and international manufacturers. The government can also introduce incentives including tax reductions, import duty waivers, and funding schemes to make green technologies more affordable and accessible to textile industries in Kenya.

5.4 Areas for Further Studies

- The study has demonstrated that green growth practices are essential for fostering the development of the textile industries. However, other influential factors, particularly government policies, have not been explored. Therefore, an investigation into the impact of government policies and regulations on green growth in the textile sector is warranted.

- The study focused on textile industries and therefore may not be applicable to other types of industries. A comparative or an integrated study focusing on all types of industries could thus be done to establish the differences between green growth in textile industries and in other types of industries.
- The financial implication of adoption of green growth in textile industries could also go a long way in quantifying the economic impacts of this adoption.

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APPENDICES

Appendix 1: Questionnaire

Green Growth Practices in selected Textile Mills in Kenya

My name is **Dinah Awino Kawino**. I am a postgraduate student at Kenyatta University pursuing a Master's programme in Environmental Studies and Community development. I am currently a research on *Green growth practices and the private sector Textile Manufacturing industries*. I therefore request for your assistance by responding to my questionnaire that I may conclude this study successfully. The purpose of this questionnaire is to gather data about what the textile industry has done or undertaken in relation to the green growth practices. You have been selected as a respondent for this study. Any information you give will be treated with confidentiality. Wherein options are given, tick in the current box of your choice. The key given here will apply to sections A,B, C, D & E.

KEY: 5 -Excellent, 4- Very good, 3- Good, 2-Fair, 1-Poor

SECTION A: General Information

1. Name:……
   Company:…….
2. Gender: Male……. Female…….
3. Level of Education: (i)Tertiary/University( ) (ii) High school ( ) (iii) Primary ( )
4. Occupation / Professionalism?

(i) Full Time Manufacturer (ii) Casual Textile laborer ( ) (iii) Formal Employment ( ) (iv) Business ( ) (v) Other, Specify:……

SECTION B: Adoption and Understanding of Green Growth Practices (GGPs)

Key: 4- Excellent, 3- Very good, 2-Good. 1-Fair,

Statements	4	3	2	1
1. Rate your understanding of green growth?				
2. Rate your Textile Industry policy on Green growth practices				

3. Rate your overall environmental or Green growth audit committee				
4. Rate your employees commitment to Green growth Practices				
5. Rate your Sustainability reporting progress				

6. How long have you worked in this company?

   (i) 0-5 years ( ) (ii) 6-10 years ( ) (iii) 11-15 years ( ) (iv) Over 15 years

7. Have you received any training and certification related to Green growth and Sustainable textile practices?

If Yes,

(i) Who trained and certified your textile industry?

……..

8. Which of the following Sustainability Metrics are you aware of?

   I. Tripple Bottom Line approach

   II. Environmental Social Governance

   III. Sustainable Development Goals

SECTION C: Green Growth Practices (GGPs)

Key: 4- Excellent, 3- Very good , 2-Good. 1-Fair,

Statements	1	2	3	4
1. Rate your energy Audit performance for your company?				
2. To what extent does your company promote Green growth through the Reduce, Reuse, Recycle methods?				
3. Rate your company's investment towards sustainability and green growth trainings, awareness' and Capacity building?				
4. Rate the company's use of Eco-friendly solar technologies and CFL bulbs (save up to 80% of Electricity)				

5. Rate the Industry's Environmental improvement made in the past three years?				

6. Does your company implement green productivity in its processes such as end-pipe techniques?

   (i) Yes ( ) (ii) No ( )

If Yes

   (ii) Give 2 examples of how your company contributes to (or impedes) the conservation of the earth's natural capital

(i): ……

(ii): ……

SECTION C: Identification of Challenges hindering adoption of GGPs in the Textile Manufacturing Industries

Key: 4- Excellent, 3- Very good, 2-Good, 1-Fair

Statements	1	2	3	4
1. How would you rate green growth transition in your company?				
2. Rate the support you receive from Kenya Association of Manufacturers to reduce Textile environmental waste?				
3. Rate the availability of cotton for your productive manufacturing processes				
4. Rate the affordability and accessibility of Green growth of technologies				
5. How do you rate the market for textile products produced using green growth practices				

6. What eco-friendly textile manufacturing technologies are available?

   ……

7. How affordable are they?

   (i)Very Affordable…… (ii) Less Affordable …….

SECTION D: Sustainability Reporting in Textile Industries for Green growth Practice (GGPs)

Key: 4- Excellent, 3- Very good, 2-Good, 1-Fair

Statements	1	2	3	4
1. To what Extent do you understand sustainability reporting?				
2. Are you aware of SDG 12?				
3. To what extent do you produce Sustainability reports?				
4. To what extent are dedicated to reducing your industry environmental footprint to help achieve the sustainability targets				

5. Do you practice circular Business Model in?

SECTION E: Application of (Green growth practices) GGPs in the Textile Industries

Key: 4- Excellent, 3- Very good, 2-Good, 1-Fair

Statements	1	2	3	4
1. To what extent do you produce fabrics using green technologies				
2. To what extent does your textile industry practice green procurement				
3. To what extent do you practice selective separation and extraction of waste in Waste Water including recycling waste water?				

4. How could Kenya's Industrialization policy encourage the textile local development towards a green economy?

……
…

……
…

Appendix 2: Interview Schedule

Green Growth Practices in Selected textile mills in Kenya

My name is Dinah Awino Kawino. I am a postgraduate student at Kenyatta University pursuing a Master's programme in Environmental Studies and community Development. I am currently undertaking a research on green growth practices and private sector Local Textile manufacturing Industry for my thesis. I therefore request for your assistance by responding to my interview questions so that I may conclude my studies successfully.

1. Name: …….

   County: ……

   Station: …….

   Position in the Industry: ……

2. What are the main activities in you undertake in this textile mill?

   I. ……

   II. ……..

3. What are your customer's preferences on the textile Fabrics you produce? Do you work with eco-sensitive clients?

   …….

4. Does your Industry participate in forward-thinking Textile industry initiatives/events/partnerships that drive sustainability in standards, policies and attitude needed to achieve circularity in the textile industry?

   (I) YES ( ) (II) NO ( )

5. How do you dispose waste water from your dyeing and finishing processes?

   ……

6. What are the challenges' your textile industry faces when implementing green growth practices?

   …….

7. Do you work with Sustainability consultants?

   Yes ( ) No ( )

8. Does your textile manufacturing mill source cotton 100% sustainably?

9. Have you adopted new approaches to reduce energy/electricity use in your textile mill?

   ……

10. How regularly do you contribute to regular audits and reporting on environmental and social governance (ESG) performance for this Mill?

    ……

11. Have you adopted green fibers for your manufacturing production?

12. Which of these six Green growth areas do you practice?

Product; Sustainable materials, recycled raw materials,	
Carbon Footprint; Waste management, end-pipe-methods, Life cycle	
Water; Water use, waste-water	
Energy Efficiency; Renewable and solar technologies	
Hazardous chemicals	
Reporting/ Audits; Sustainability reports	

Thank you for your time

Appendix 3: Observation Guide

1. **TITLE PAGE**

Title: Observation Checklist for Green Growth Adoption, Practices, and Challenges in Selected Textile Industries in Kenya

Researcher: Dinah Awino Kawino

Date of Observation:

Location:

Study Context: This study aims to investigate the adoption of green growth practices in selected textile industries in Kenya with special refence to energy efficiency, water usage, waste management, and chemical usage in the industries. The study further investigates the aspect of sustainability reporting and the challenges hindering adoption of sustainability practices in these industries.

2. **OBJECTIVE OF OBSERVATION**

To evaluate the extent to which selected textile industries in Kenya have adopted green growth practices in their operations and identify the challenges affecting implementation of green practices.

3. OBSERVATION CHECKLIST

A. General Information

Observer's Name: Dinah Awino Kawino

Observer's Role: Researcher

Setting Description: Thika Cloth Mills is among the leading textile manufacturers in Kenya. It is committed to customer service through the production of high-quality products. It has the capacity to produce above 1 million meters of fabric per month in different colours, prints and blends. Thika Cloth Mills produces blended Polyester Viscose, s 100% cotton fabrics, and Polyester Cotton fabric & textiles.

Rivatex East Africa Limited is a vertically integrated textile facility that uses a number of techniques to transform cotton lint into finished fabrics. Rivatex uses cotton and cotton blends to make a variety of textiles. It has set up a cutting-edge garment

and apparel manufacturing plant that uses cutting-edge machinery to create a wide variety of clothing.

Time of Observation: [Start Time - End Time]

B. Checklist Items

Category	Observation item	Criteria/indicator	Rating scale	Comments
Energy efficiency	Energy efficient production	Availability of machinery that are energy efficient Availability of low energy dying	Yes [ ] No [ ] Yes [ ] No [ ]	
	Renewable energy sources	Presence of solar panels, wind turbines, or biogas production	Yes [ ] No [ ]	
	Energy saving practices	Presence of enhanced HVAC, LEED lighting systems	Yes [ ] No [ ]	
Water usage	Water recycling system	Availability of functional water recycling system Percentage of recycled water	Yes [ ] No [ ] <25% [ ] <50% [ ] <75% [ ] 75-100% [ ]	
	Water saving devices	Presence of low-flow faucets and efficient dyeing systems	Yes [ ] No [ ]	
Waste management	Waste segregation	Availability of waste segregation bins	Yes [ ] No [ ]	

	Waste recycling	Presence of waste recycling programs	Yes [ ] No [ ]	
	Textile waste management practices	Use of textile waste management methods like fabric remnant recycling and zero-waste patternmaking techniques	Yes [ ] No [ ]	
Chemical usage	Ecofriendly chemicals	Use of biotechnology and enzymes, sustainable dyeing practices, plasma technology, and eco-friendly thermal treatments	High [ ] moderate [ ] Low [ ]	
Sustainability reporting	Sustainability reporting practices	**Availability of sustainability reports**	Yes [ ] No [ ]	
	Transparency of the sustainability reports	**Extent of transparency of sustainability reports with regard to water, energy and supply chain aspects**	High [ ] moderate [ ] Low [ ]	
Environment certification	Green certification	Availability of any green certification in the company	Yes [ ] No [ ]	

C. Additional Observations

Unplanned Events:

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Observer Reflections:

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4. POST-OBSERVATION NOTES

Summary of Finding

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Follow-Up Actions:

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Additional Notes:

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5. SIGNATURES

Observer's Signature: _____

Date: _____

Appendix 4: Gallery

Cotton waste to be reused

Use of firewood as the main source of heat

An effluent treatment plant for liquid waste

Solid waste management (Sorting and re-using)

Appendix 4: Work Plan

Academic Year	**Academic Year 2020 - 2022**												**Academic Year 2022 - 2024**							
Main Activity	**Proposal Drafting (2020/2021)**						**Data Collection (2021/2022)**						**Data Analysis and Thesis Refining**							
Months	***Sept-Nov***	***Nov - Dec***	***Dec - Apr***	***Apr-May***	***May-July***	***July-Sep***	***Sep-Nov***	***Nov-Feb***	***Feb-Mar***	***Mar-June***	***Jun-Aug***	***Aug-Sep***	***Sept-Dec***	***Dec-Feb***	***Feb-Aug***	***Aug-Dec***	***Dec-Feb***	***Feb-Apr***	***Apr-Sep***	***Sep-Dec***
Tasks																				
Topic selection and consultation																				
Developing the concept note and review																				
Research Proposal writing																				
Survey tools development																				
Proposal Draft 1 compiling and formatting																				
Proposal defense and corrections																				
Proposal review and submission																				
Application of Research permits																				
Study piloting																				
Review of research instruments																				
Data collection																				
Data organization and preliminary findings																				
Data analysis 1: Pre-survey results (Reliability and validity), Response rate and Demographic characteristics																				
Data analysis 2: Descriptive statistics (General analysis of the responses)																				
Data analysis 3: Inferential (Relationships between variables)																				
Analysis compiling, review, consultation and interpretation																				

Chapter 5: Summary of findings, Discussions, Recommendations and areas for further studies																				
Thesis Formatting, Proofreading and refining																				
Thesis submission and defense																				
Thesis final reviews, printing and submission																				
Due Graduation	**July 2025**																			

Appendix 5: Proposed Budget

ITEM/ACTIVITY	QUANTITY	COST PER UNIT	TOTAL (Ksh)
Equipment (laptop)	1 laptop	100,000	100,000
Communication (Airtime)	30 days	2000/day	60,000
Transport	At least 60 days	1000/day	60,000
Thesis write-up	Lump Sum	Lump Sum	50,000
Research permit	Lump Sum	Lump Sum	15, 000
Research induction and training	Transport of the researcher	5000 per day for travelling and accommodation	15, 000
Pilot Survey	Transport	5000 per day for travelling and accommodation	50, 000
Questionnaire printing	100 @Ksh 10/page	10pages/questionnaire	20,000
Research assistants	1 enumerator	30000/month(1mth)	30,000
Software Packages (SPSS)	1	70,000	70,000
Contingencies	Miscellaneous expenses	10% of total expenses	47,000
Grand Total			**517,000**

Appendix 6: NACOSTI Letter

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **393969**

Date of Issue: **14/April/2023**

RESEARCH LICENSE

This is to Certify that Miss.. Dinah Awino Kawino of Kenyatta University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kiambu, Uasin-Gishu on the topic: GREEN GROWTH PRACTICES IN SELECTED TEXTILE MANUFACTURING MILLS IN KENYA for the period ending : 14/April/2024.

License No: **NACOSTI/P/23/25115**

393969

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Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

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See overleaf for conditions

Appendix 7: Kenyatta University Research Approval

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Internal Memo

FROM: Executive Dean, Graduate School **DATE:** 15th February 2023

TO: Diana Awino Kawino **REF:** N50/28108/2018
C/O Environmental Studies and Community Development

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

This is to inform you that Graduate School Board, at its meeting on **15th February 2023**, approved your Research Proposal for the M.Envs Studies. Degree entitled, ***Green Growth Practices in Selected Textile Manufacturing Mills in Kenya."***

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission for Science, Technology & Innovation and Ethics Review Committee, Kenyatta University.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking and Progress Report Forms per semester. The Forms are available at the University's Website under Graduate School webpage downloads.

Also, please ensure that you publish article(s) from your thesis before submitting it to Graduate School for examination as per the Commission for University Education and Kenyatta University guidelines.

Thank you.

REUBEN MURIUKI
FOR: EXECUTIVE DEAN, GRADUATE SCHOOL

CC. Chairman, Environmental Studies and Community Development

Supervisors:

1. Dr. Dorcas Beryl Otieno
   C/o Environmental Studies and Community Development
   Kenyatta University

2. Dr. Eric Kioko
   C/o Environmental Studies and Community Development
   Kenyatta University

RM/cnw

Appendix 8: Kenyatta University Research Authorization Letter

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Our Ref: N50/28108/2018

DATE: 15th February 2023

Director General,
National Commission for Science, Technology and Innovation
P.O. Box 30623-00100
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR DIANA AWINO KAWINO – REG. NO. N50/28108/2018

I write to introduce Ms. Diana Awino Kawino who is a Postgraduate Student of this University. She is registered for M.Envs. degree programme in the **Environmental Sciences and Education.**

Ms. Diana Kawino intends to conduct research for a M.Envs. Thesis Proposal entitled, ***"Green Growth Practices in Selected Textile Manufacturing Mills in Kenya."***

Any assistance given will be highly appreciated.

Yours faithfully,

PROF. ELISHIBA KIMANI
EXECUTIVE DEAN, GRADUATE SCHOOL

Appendix 9: Rivatex Acknowledgement

RIVATEX EAST AFRICA LIMITED

4744-30100 Eldoret, (053)-2030901/2/4, (053)-20311511

info@rivatex.co.ke www.rivatex.co.ke

OUR REF: REAL/HR/2023/RP/004

DATE: 30TH NOVEMBER 2023

Kenyatta University Main Campus
Department of Environmental studies and community development
School of Environmental Studies and Agriculture
P.O. Box 43844-00100 Nairobi, Nairobi, Kenya
Ref: N50/28108/2019

Dear Sir/ Madam,

Re: Acknowledgement and successful completion of Research data Collection/ Validation process between Rivatex Textile Mill and Master's student Kawino Dinah Awino of Kenyatta University

This letter serves as a successful Research engagement acknowledgement letter for the above named Kenyatta University student pursuing her masters at the Kenyatta University Main Campus, department of Environmental studies and community development, in the school of environmental studies and Agriculture. Ms. Dinah Awino Kawino conducted an academic research data collection in Rivatex East Africa Limited in 2023 in the spinning, weaving and processing departments. Ms. Awino whose topic focused on *Green growth in selected textile manufacturing mills in Kenya* where Rivatex East Africa limited Textile Company was among the sampled manufacturing industries.

As Rivatex East Africa Limited, we jointly participated in the research and allowed Ms. Awino to conduct a validation workshop with the Rivatex staff after her data collection processes. The student administered questionnaires and interview scheduled to the supervisors and managers of the mentioned departments in the industry. We would like to thank Ms. Awino for the seamless research academic engagement with us and the Kenyatta University. We wish her the best and hopefully this study brings forth great reforms in steering our textile industry in Kenya green.

Yours faithfully,

RIVATEX EAST AFRICA LTD. 01 DEC 2023 HR OFFICE P.O. BOX 4744, ELDORET 30100

JOSEPH KETER
HUMAN RESOURCE MANAGER.

OUTLETS

MAIN OUTLET	NAIROBI	NAKURU	KISUMU	MOI UNIVERSITY	MUPEN	MTRH	RVTTI
Off Kisumu Road Along Kipkaren Road Tel No. 0740594268 0202030902	Moi Avenue Biashara Street Bazaar Building Tel No. 0759677869 0202030903	Moi Road Utalii Arcade Bldg Opp. Tower One Bldg Tel No. 0797150438 0202030905	Paul Mboya Road Rehemtulla Bunja Bldg Tel No. 0759949622 0202030904	Main Campus - MOI Kesses Tel No. 0796821993 0202030908	Ronald Ngala Street Mupen Building Tel No. 0796812094 0202030907	Memorial Wing Entrance Tel No. 0795563870 0202030901	RVTTI College Off Kaptagat Road Tel No. 0796821993 0202030906
showroom@rivatex.co.ke	nairobioutlet@rivatex.co.ke	nakuruoutlet@rivatex.co.ke	kisumuoutlet@rivatex.co.ke	moioutlet@rivatex.co.ke	mupenoutlet@rivatex.co.ke	mtrhoutlet@rivatex.co.ke	rvttioutlet@rivatex.co.ke

@rivatex_ltd Rivatex East Africa Ltd rivatexeastafrica

Appendix 10: Reconnaissance letter

KENYATTA UNIVERSITY
School of Environmental Studies
Department of Environmental Studies and Community Development
P.O. Box 43844-00100, GPO Nairobi. Tel: +254-020-810901-19, ext. 3812
www.ku.ac.ke email: chairman-envcd@ku.ac.ke

4th August, 2022

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: A RESEARCH RECONNAISSANCE LETTER FOR DINAH AWINO KAWINO REG.NO.N50/28108/2018

This letter confirms that the above named is a student (Dinah Awino Kawino, Registration Number N50/28108/2018). The following student is a bona fide student of Kenyatta University at the Department of Environmental Studies and Community Development in the School of Environmental Studies. She is a masters pursuing Master of Environmental Studies and Community Development. Her thesis is titled: *Green growth and Private sector a study of textile manufacturing mills in Nairobi, Kenya.*

Currently, she is undertaking a thesis research reconnaissance in the above research area as she awaits clearance of post graduate school at Kenyatta University main campus. I therefore request for any assistance that can be accorded to her study. The Department supports her reconnaissance towards the completion of her studies.

Thank you.

04 AUG 2022

DR. JOSEPH K. KURAUKA
CHAIRMAN, DEPARTMENT OF ENVIRONMETAL STUDIES AND COMMUNITY DEVELOPMENT

Appendix 11: Informed Consent Sample

KENYATTA UNIVERSITY
OFFICE OF THE CHAIRMAN ETHICS REVIEW COMMITTEE

My name is Dinah Awino Kawino. I am a Masters student from Kenyatta University. I am conducting a study titled "Green Growth practices in selected textile manufacturing mills in Kenya." The information will be used to broaden appreciation of the drivers of sustainability in textile industries and to guide textile companies' managers in understanding the influence of the green practices they adopt and the implementation strategies they use on sustainability in the textile sector.

Procedures to be followed

Participation in this study will require that I ask you some questions on the green practices adopted by your company, the strategies you use to implement the green practices and sustainability in the hotel in terms of the environment, the economy and the society. I will record the information you provide in a questionnaire.

Voluntarism

Participation in this study is voluntary. You have the right to refuse to participate in this study. You may ask questions related to the study at any time. You may refuse to respond to any questions and you may stop an interview at any time. You may also stop being in the study at any time without any consequences to the services you receive here or any other organization now or in the future.

Reward

There are no rewards or any payment to you if you participate.

Confidentiality

The interviews will be conducted in a private setting within the hotel. Your name will not be recorded on the questionnaire. The questionnaires will be kept in a safe place. Everything will be kept private and only shared with the study team.

Contact Information

If you have questions about the study call Elizabeth Ndunge Luu Kamunzyu on 0725838174 or Prof. Kihima on 0725829717 or Prof. Makopondo on 0703866356 or Dr. Opondo on 0721417888.

However, if you have questions about your rights as a study participant: You may contact Kenyatta University Ethical Review Committee Secretariat on chairman.kuerc@ku.ac.ke

Participant's statement

The above information regarding my participation in the study is clear to me. The study has been explained to me and I have been given a chance to ask questions and my questions have been answered to my satisfaction. My participation in this study is entirely voluntary. I understand that my records will be kept private and that I can leave the study at any time. I understand that I will not be penalized in any way whether I decide to leave the study or not and my decision will not change the services I receive here or any other organization now or in the future.

Name of Participant:

_____

_____ _____

Signature or Thumbprint Date

_____ _____

Name of Representative/Witness (where necessary) Relationship to Sub