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Sustainable Supply Chain in the Textile and Garment Industry of Vietnam

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Abstract

The textile and garment industry has contributed significantly to the Vietnamese economy. However, as it faces increasing pressure from importers who place more stringent requirements on product quality, the industry needs to adopt sustainable practices to stay competitive in the global market. This article examines the current state of the textile and garment supply chain in Vietnam using the sustainable development goals framework proposed by the World Commission on Environment and Development (WCED) regarding the economic, social, and environmental aspects. It also considers the five criteria for determining the sustainable supply chain throughout the production-to-distribution process in the textile and garment industry suggested by Shen (2014), which cover Eco-material Preparation, Sustainable Manufacturing, Green Distribution, Green Retailing, and Ethical Consumers. The article evaluates the achievements and challenges of the supply chain in Vietnam based on these criteria and, thereby, offers recommendations to various stakeholders, such as the government, ministries, sectors, associations, and enterprises, to foster a more sustainable textile and garment industry in Vietnam.

Keywords: Supply Chain, Sustainability, Sustainable Supply Chain, Textile, Vietnam

1. Introduction

The textile industry is generating \$2.4 trillion in revenue for the global manufacturing industry and employing 300 million people worldwide along the value chain. However, it also poses significant environmental challenges. The textile industry produces around 2 - 8% of the global greenhouse gas emissions. It also consumes 215 trillion liters of water annually, resulting in a \$100 billion loss due to underutilization. Furthermore, the industry is responsible for approximately 9% of the annual loss due to the microplastics in the ocean that originate from the laundering of synthetic textiles like polyester (Phuong My, 2022).

These impacts have prompted a growing call for “greening” or “sustainable development” of the textile and garment industry at the international, national, and corporate levels (United Nations Environment Programme (UNEP), 2019).

In Vietnam, the textile and garment industry is one of the core contributors to exports and gross domestic product. In 2022, it achieved a record-high export turnover of nearly \$44 billion USD, an increase of 8.8% from the previous

year. Vietnam has also signed many free trade agreements (FTAs), especially in 2020, creating new opportunities for market expansion for the textile industry. However, these FTAs also pose challenges as textile enterprises must comply with new ecological design criteria and standards. Therefore, the industry needs a green transformation to adopt an eco-friendly export strategy (Do & Tran, 2021).

Moreover, the industry is committed to reducing its emissions in line with the Vietnamese Government's pledge to the Net Zero Emissions by 2050 goal at the 2021 United Nations Climate Change Conference (COP26) (Dung Duc, 2022).

To achieve sustainability and circularity in the textile value chain, the industry has also innovated its development goals and technology, such as using clean raw and recycled materials and applying green and sustainable production methods that ensure environmental protection and social responsibility (Office of the Board of Directors of Vinatex, 2022).

The global textile and garment market is facing challenges such as supply chain disruptions, rising protectionism, and changing consumer preferences. Major importers from the US, Europe, and Japan are shifting their sourcing strategies to favor suppliers that can offer integrated, localized, and transparent production processes from raw materials to finished products. However, Vietnam's textile and garment industry suffers from a lack of supply chain linkages, which hinders its competitiveness and sustainability (Nhi Trang, 2023).

Therefore, this study aims to develop a sustainable supply chain for the textile and garment industry in Vietnam. The research objectives are as follows:

- To establish a theoretical framework for a sustainable supply chain in the textile and garment industry
- To assess the achievements and challenges of developing a sustainable supply chain in Vietnam's textile and garment industry
- To propose solutions for enhancing the sustainability of the supply chain for Vietnam's textile and garment industry

This study also presents several case studies of Vietnamese textile and garment enterprises that have implemented sustainable supply chain practices based on Shen's (2014) approach.

2. Theoretical framework

2.1. Definitions

2.1.1. Sustainable Development

The World Commission on Environment and Development (WCED) defined sustainable development in 1987 as follows: "*Sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (Clark & Harley, 2020). This definition implies that development should be compatible with the conservation of natural resources and ecosystems.

The concept of sustainable development was further elaborated at the United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit, held in Rio de Janeiro, Brazil, in 1992, and then reaffirmed in the World Summit on Sustainable Development (WSSD) in Johannesburg, South Africa, in 2002. The WSSD emphasized that sustainable development should be based on three interrelated and mutually reinforcing pillars: economic development (especially economic growth), social development (especially the realization of social justice, hunger eradication, poverty reduction, and job creation), and environmental protection (especially the treatment, restoration and improvement of environmental quality, the prevention of fire and deforestation, and rational exploitation and economical use of natural resources) (Ministry of Industry and Trade, 2020).

2.1.2. Sustainable Supply Chain

A *Supply Chain* is the coordinated network of all the companies, facilities, and activities involved in the creation and delivery of a product or service to the end customer. Supply chain management is the practice of coordinating sourcing, manufacturing, inventory management, and shipping among all parties involved in the supply chain to maximize efficiency and customer satisfaction (idms.vn, 2022).

A *Sustainable Supply Chain* is a fully integrated series of transparent, ethical, and environmentally responsible practices into a competitive and successful model. It requires end-to-end visibility of the entire supply chain, from the sourcing of raw materials to the distribution, return, and recycling of products (idms.vn, 2022).

According to Masoumik et al. (2014), a *Sustainable Supply Chain* is "a supply chain that closes the loop of upstream and downstream flows of products and materials by recycling and recovering used items and re-entering them in production cycles and engages in sustainability-conscious practices taking goals from all three dimensions—economic, environmental and social—of sustainable development into account, which are derived from the customer and stakeholder requirements".

2.1.3. Sustainable Supply Chain in the Textile industry

A sustainable supply chain for the textile and garment industry entails a shift in the production and business models, from selecting sustainable materials to implementing a pollution-free and eco-friendly production process and delivering products and services that bear green labels to the customers (Vietnam Industry Agency, 2023).

The production process involves the use of inputs and outputs that are safe for humans and the environment. It starts with choosing green raw materials, such as organic cotton, hemp, bamboo, or recycled fibers.

The production process also aims to optimize the use of resources and minimize the generation of waste. It eliminates or reduces the use of hazardous substances and materials that pose risks to human health and the environment, such as toxic dyes, pesticides, or microplastics. Moreover, it adopts clothes designs that enhance their recyclability and reusability, and it utilizes renewable energy sources, such as solar, wind, or hydropower (Bich, 2022).

Based on these concepts, we propose the following approach: *A sustainable supply chain for the textile and garment industry is not confined to green labeling, but rather strives for resource efficiency and waste reduction, in alignment with the three main pillars of sustainable development: environment, society, and economy. Firstly, the sustainable production process requires the minimization or elimination of substances and materials that are detrimental to human health and the environment. Secondly, it involves designing clothes that can be reused and recycled and using renewable energy sources. Besides mitigating the environmental impacts, a sustainable supply chain for the textile industry also ensures the social well-being and working conditions of the employees.*

2.2. Criteria of a Sustainable Supply Chain in the Textile and Garment industry

The Sustainable Society Index (SSI) proposes three dimensions to measure the sustainability of a supply chain: human well-being, environmental well-being, and economic well-being. *Human welfare* refers to the social performance of the supply chain, such as meeting basic needs, fostering personal development, and ensuring social equity. *Environmental well-being* encompasses the ecological impacts of the supply chain, such as maintaining a healthy environment, reducing greenhouse gas emissions, and conserving natural resources. *Economic well-being* relates to the long-term viability and resilience of the supply chain, such as preparing for future challenges and opportunities and enhancing economic growth and stability.

Shen (2014) identifies five key factors that a sustainable supply chain for the textile and garment industry should address:

- Eco-material preparation

- Sustainable manufacturing
- Green distribution
- Green retailing
- Ethical consumers

2.2.1. Eco-material Preparation

One of the key aspects of sustainable fashion products is the use of organic fabrics, which require less water and harmful chemicals in their production. Moreover, sustainable fashion products can also incorporate materials that are reused or recycled from various sources, such as old clothes, manufacturing scraps, and bottles (Shen, 2014).

2.2.2. Sustainable Manufacturing

Sustainable production is a concept that emerged from the United Nations Conference on Environment and Development (UNCED) in 1992, which highlighted the link between sustainable development and the patterns of consumption and production. The conference identified the latter as the primary cause of global environmental degradation, especially in industrialized countries.

The Lowell Center for Sustainable Production (LCSP) defines sustainable production as "the creation of goods and services using processes and systems that are: non-polluting; conserving of energy and natural resources; economically viable; safe and healthful for workers, communities, and consumers; and socially and creatively rewarding for all working people."

Some indicators of sustainable production related to the environmental dimension are the percentage of raw materials from renewable resources; the acidification potential, measured in SO₂ equivalent; the kilograms of emissions to the air; and the amount of energy used per unit of product or service (Veleva et al., 2001).

2.2.3. Green Distribution

The distribution of fashion products is a complex and dynamic process, as fashion products are subject to changing trends and have a short life span (Shen, 2014).

Nagurney and Yu (2012) propose a novel model that captures the trade-offs between manufacturing, transportation, and shortage costs in the fashion supply chain while taking into account emission reduction. Their results show that the adoption of environmental pollution-abatement technologies in distribution can improve the supply chain performance.

2.2.4. Green Retailing

Green retailing is more than just linking green products and marketing strategies. It also involves enhancing the customer experience and creating value through sustainability. Choi (2013) argues that green retailing should focus on clustering customers based on their preferences and behaviors and rethinking the value proposition of sustainable fashion products. Innovation of sustainable fashion products should target the ethical consumer market, which is growing in size and awareness. Sustainability is a key concept in marketing and branding, as it can increase customer interest and loyalty.

2.2.5. Ethical Consumer

Ethical consumption is a consumption behavior that considers the societal implications of purchasing decisions. Ethical consumers reflect on the social issues that are related to the production and consumption of goods and services and aim to benefit society through their choices.

A summary of a study on ethical consumption defines ethical consumption as follows: “A consumer practices ethical consumption when purchasing goods that are ethically produced and environmentally friendly. A basic example of ethical consumption behavior is when consumers refuse to use products created by businesses that exploit workers” (Vietnam Japan University, Vietnam National University, Hanoi, 2018).

3. Findings

3.1. Achievements

3.1.1. Achievements in the sustainable development of the garment and textile industry based on three central pillars

In terms of economics

- *Generating foreign currency revenue and initial accumulation*

The export turnover of the textile and garment industry reached \$39 billion USD in 2021 and \$44 billion USD in 2022, surpassing the pre-Covid level of 2019. The industry also achieved a remarkable average growth rate of 17% per year in the five-year period from 2015 to 2020. The textile and garment industry is the fifth largest industry in the Vietnamese industrial structure, with a continuously expanding and developing production volume. The industrial production index of the industry increased by an average of 10.7% per year in the period of 2016 - 2020, with the textile industry growing by 12.5% per year and the apparel production growing by 8.8% per year (Le, 2023). According to the Vietnam Textile and Apparel Association (VITAS), the textile and garment industry had a trade surplus of \$7.9 billion USD in the first six months of 2023 (Vu, 2023).

In terms of society

- *Contribute to job creation*

The textile and garment industry employs workers in most provinces and cities in Vietnam, reducing urban migration and maintaining security and order in localities (Phuong My, 2022). The monthly income of garment workers in Vietnam is 30-70% higher than that of competing countries (Vietnam's monthly labor income is approximately 250 USD, India: 220 USD, Cambodia: 180 USD, and Bangladesh: 150 USD). A study by the Ministry of Labor - Invalids and Social Affairs estimated that every \$1 billion USD worth of exports of the industry creates about 100,000 jobs, either direct or indirect, of which 50,000 people are directly involved in the textile and garment industry (Le, 2023). The textile and garment industry is also the leading industry in Vietnam in terms of recruitment, attracting up to 2 million workers. The average income of workers in the industry is about 8.5 million VND/ person/ month, amounting to 200,000 billion VND/year (about \$8.6 billion USD/year) (Ha Song, 2022).

In terms of the environment

The textile and garment industry in Vietnam has been proactive in adopting the circular economy model, which aims to reduce waste and reuse resources in the production and consumption cycles. Since 2017, the industry has established a Committee for Sustainable Development on Environment and Labor, which collaborates with various organizations around the world (Ha Song, 2022). The industry also recognizes the need to "green" its operations, as this is a global trend that can help achieve sustainable development goals and increase exports to large markets. According to the VITAS, green production is a common strategy for many Vietnamese industries to secure and expand their export markets, and the textile and garment industry is no exception. VITAS has set a greening plan for the industry, which aims to reduce energy consumption by 15% and water consumption by 20% by 2023 and to achieve a green textile and garment industry by 2030 (Nguyen, 2022).



Figure 1: The goal of “greening” with the plan to 2023 (%)

Source: Vietnam Textile and Apparel Association (Nguyen, 2022)

Many businesses in the industry have also invested in building rooftop solar power systems and other energy recycling systems, replacing coal-fired boilers in dyeing plants with biomass materials such as rice husks, and using software tools to measure the environmental impacts from the initial stages of manufacturing. These measures aim to reduce emissions, enhance the efficiency of the production process, and use materials and technologies that have less impact on the environment (Nguyen, 2022).

3.1.2. Achievements in sustainable development of supply chain in the garment and textile industry based on the five criteria

Eco-materials Preparation

The global trend towards environmental sustainability has stimulated domestic suppliers to develop and produce new raw materials that meet the consumers’ demand for green products. According to VITAS, the localization and greening of raw materials are essential for Vietnamese businesses to compete in the global market (Vietnam Textile and Apparel Association, 2022).

Box 1. Green Materials

Faslink: Faslink Fashion Connection Joint Stock Company (Faslink) has been one of the leading green material suppliers in Vietnam since 2008. The company has invested in several factories with a total area of 10,000m², equipped with more than 300 modern machines and advanced stamping systems. It has also collaborated with many renowned global research centers to produce high-quality raw materials. Faslink’s green materials are derived from natural sources, environmentally friendly, safe for human use, multifunctional, and biodegradable. In 2021, Faslink supplied approximately 8 million meters of fabrics that met the green criteria (Vietnam Textile and Apparel Association, 2022). At the “Green Path” event on January 15th, 2022, Faslink organized a “Green Fabrics” exhibition with five types of natural fibers, including coffee, lotus, seashell, coconut, and minds. These fibers were processed by modern technology, achieving remarkable softness, durability, and fashionability (Vietnam Industry and Trade Information Centre, 2022).

Green Yarn and W.ELL FABRIC: Bao Lan established its first brand, Green Yarn, in 2012 with a mission to source, research, develop, and distribute green yarns to give Vietnamese factories a competitive edge. One of Green Yarn’s notable products is green yarns that meet the Global Recycle Standard (GRS) and Global Organic Textile Standard (GOTS), including Recycle Poly and Mélange. In 2019, Bao Lan launched another brand, W.ELL FABRIC, which specializes in researching and manufacturing green fabrics of natural origin, such as organic cotton, coffee, and bamboo, with additional protective features. It aims to diversify the Vietnamese garment market and make it easier for consumers to access green products (Son Tuan, 2022).

Sustainable Manufacturing

As major markets such as Europe, Japan, and the United States have imposed higher standards on imported textiles and garments, investing in green and sustainable production processes will give the Vietnamese textile and garment industry an edge over its competitors. To achieve the goal of greening the industry and moving towards

a circular economy model and sustainable development, many textile and garment enterprises have invested in and partnered with investment funds to install solar and other clean energy systems for their production.

Box 1. Cooperation Network of Sustainable Manufacturing and Consumption

Vinatex and its efforts in sustainable production and consumption

Vinatex is a major exporter of textile and fiber products, with an annual export value of about 4 billion USD. Since 2021, the corporation has undergone significant transformation to meet the demands of global buyers. According to Mr. Cao Huu Hieu, General Director of Vinatex, the corporation has collaborated with several provinces and cities in the North, Central, and South regions to obtain investment and land for building factories that comply with green standards and complete the supply chain. Vinatex aims to reduce 30% of post-dyeing wastewater and reuse 30% of post-treatment wastewater for washing and sanitation stages, to use at least 20% recycled polyester fiber and 15% organic cotton to reduce pesticide use, and to invest in solar power to generate 10% of the electricity from renewable sources. Bao Minh Industrial Park (Nam Dinh), a specialized industrial park for textiles in the North, is also transforming its production process to minimize pollution and to treat and reuse wastewater (Hoang The, 2023).

Cooperation network in sustainable production and consumption in Hanoi

On July 21, 2023, the Hanoi Department of Industry and Trade and the Ha Dong District People's Committee jointly organized the opening ceremony of the "2023 Cooperation Network in Sustainable Production and Consumption in the Textile and Fashion Industry" to promote the green economy at MELINH PLAZA Trade Center (To Hieu Street, Ha Cau Ward, Ha Dong District, Hanoi). Ms. Tran Thi Phuong Lan, Director of the Hanoi Department of Industry and Trade, stated that the department has cooperated with the Ministry of Industry and Trade to implement the National Program on Sustainable Production and Consumption effectively. The Program includes activities such as promoting sustainable production and consumption and green consumption, providing technical support for manufacturers and businesses to evaluate green production, and connecting producers and retailers of eco-friendly products. Through the Network, the Program aims to raise awareness and action on sustainable development, practice a "zero waste" lifestyle, and build a sustainable production model through clean production practices, sustainable product design, zero waste production, and reusable products with green labeling.

Source: Hien Thanh, 2023

Green Distribution

The green distribution network in Vietnam, especially in the textile industry, has shown many positive developments.

In terms of the Government,

The Vietnamese Government has committed to the United Nations Climate Change Conference (COP26) and has implemented many measures to reduce CO₂ emissions. The Party and the Government of Vietnam, as well as other authorities, have paid more attention and given more priority to sustainable practices, including the development of **green logistics**. The Government has issued several legal documents and policies to create a favorable legal framework for **green logistics**.

In terms of business

According to a survey by the Editorial Board of Vietnam Logistics Report 2022, a high percentage of Vietnamese enterprises, both providers and users of logistics services, are concerned about green and sustainable logistics activities. More than 73.2% of the surveyed companies said that they integrated **green logistics** into their business strategy. This is a remarkable example of the high awareness of businesses about the role of **green logistics** in sustainable development (Pham, 2023).

Green Retailing

The domestic market in Vietnam offers a variety of fashion brands that cater to the young generation, such as CANIFA, BOO, EM Wear, SSSTUTTER, and Coolmate. Besides these well-known brands, some local brands have also gained popularity among young people, such as Dirty Coins, now Saigon, Bo Bui, Grimm DC, Degrey,

HADES, SWE, TSUN, Hanoi Boyz Swagg (HBS), and Freakers. These brands are known for their unique and creative designs, inspired by street culture, urban lifestyle, and social issues. Some also collaborate with local artists and celebrities to promote their products and messages.

Box 2. Green Retailing

A study by (Dang, 2023) reveals that only BOO Trading Co. Ltd. (BOO), Hoang Duong Co. Ltd., and CANIFA Joint Stock Co. (CANIFA) have green production and marketing activities to promote green consumption in Vietnam. These activities include:

CANIFA: Is committed to green development with Vietnamese people in thoughts and actions.

- *Green operation:* CANIFA Van Giang Complex is a pioneer in obtaining the Leadership in Energy and Environmental Design (LEED) international certificate for energy saving and positive impact on the living environment.

- *Green cooperation:* CANIFA selects Cotton USA as its main raw material supplier, which follows the sustainability indicators of American agriculture, such as water saving and zero tillage technique to protect the soil.

- *Green products:* CANIFA pays special attention to research and quality control of input materials and output products, meeting the strictest requirements of the world's most prestigious certificates (e.g., Oeko Tex, Woolmark, and WD). CANIFA is the first fashion brand in Vietnam to receive the Woolmark certificate, which is the world's leading organization for the development and quality control of wool.

BOO: Aims at manufacturing and selling green products from an early stage with specific activities such as:

- *Green destination:* When visiting BOO's stores, customers can participate in activities that contribute to environmental protection, such as donating old clothes or recycling to receive eco-friendly sedge bags, collecting batteries and milk cartons, saying no to bags to get 10,000 VND deducted per bill for social projects, and using solar-powered devices at shops.

- *Green production:* 100% of BOO's T-shirts use US cotton with a weight of 200-220 grams per square meter (gsm). BOO also uses water-based ink that is environmentally friendly, produces tote bags from fabric scraps, uses clothing tags made of recycled paper to be reused, and reduces plastic bags.

- *Power up your sustainable style:* In 2020, BOO organized a program with the slogan "Choose carefully - Use long - Wear green - Live sustainably" to spread awareness about sustainable consumption.

Source: Dang, 2023

Ethical Consumer

Customer perception in Vietnam has changed positively in recent years. Consumers have become more aware and prefer to consume goods and products that are delivered by green logistics services. Since customers are the ultimate goal of every supply chain, the change in consumer attitudes toward green logistics is a strong incentive for businesses to implement these activities. Moreover, according to a survey by Vietnam Logistics Report 2022, more than 30% of customers support the use of eco-friendly vehicles, fuels, and materials, and more than 10% of customers are willing to pay extra costs for green logistics services (Pham, 2023).

A report on sustainability by Nielsen (2016), a market research company, also confirms the high level of support for sustainable development among Vietnamese consumers. The report shows that 86% of Vietnamese consumers are willing to pay more for products from companies that have a positive impact on society and the environment. This rate is higher than the average rate of Southeast Asia at 76%. The report also indicates that a business's commitment to environmental protection influences the purchasing decisions of 62% of Vietnamese consumers (Nga Thuy, 2021).

Box 3. Ethical Consumers

According to Nielsen's "The Millennials - Unlocking a Generation of Potential" (2016) report, 73% of Millennials in Vietnam are more willing to pay more for sustainable brands, compared to 51% of Baby Boomers. The "Into the

Minds of Millennial Shoppers” report by Kantar Worldpanel (2018) also suggests that Millennials are familiar with digital technology and can influence communication media and other generations. Millennials used green products mainly for environmental protection (37.8%) and based on recommendations from others (19.3%). Additionally, customer incentive programs also motivate them to use green products (6.7%).

Source: Pham et al., 2020

3.2. Challenges of the textile and garment industry of Vietnam

3.2.1. Lack of support industry

One of the major challenges of the textile and garment industry in Vietnam is the lack of support industry. Due to environmental concerns, some localities are reluctant to invest in textile and dyeing projects. Moreover, investing and developing raw materials production requires substantial capital and advanced technology, which is a challenge for small and medium-sized businesses (Nghiep An, 2022).

Another challenge is the dependence on foreign sources for raw materials. Most of the production lines and equipment of the industry are imported from South Korea and Taiwan (China). Vietnam imports up to 80% of fabrics for garment export (e.g., cotton, fiber, fabric, accessories), spending more than 2 billion USD each month on raw material imports, most of which originate from China (Vu, 2022).

Specifically, Vietnam can only supply 0.2% of the cotton demand and 30% of the fiber demand, while the rest has to be imported from the US, China, and Taiwan. The yarn output reaches 1.4 million tons a year, but more than 70% of it does not meet domestic demand and can only be exported due to low quality (Vietnam Textile and Apparel Association, 2022).

Moreover, there is no planning for the development of large industrial parks with centralized wastewater treatment for the dyeing stage, which poses a serious environmental problem (Anh Phuong, 2022).

3.2.2. Low technology

As 70% of Vietnamese textile and garment enterprises are small and medium-sized, the industry faces significant challenges in adopting modern technology. Only 30% of enterprises, including foreign-invested and large domestic ones, have applied automation in each production stage, and less than 5% have plans to deploy connected automation technology. It is a huge challenge for domestic companies to meet the requirements of the Fourth Industrial Revolution, especially for small and medium enterprises. Moreover, the skill and capability of human resources in the industry are fairly low (with 84.4% of the workers having a high school education and 0.1% having a university degree) (Nguyen, 2022).

3.2.3. High outsourcing rate

In recent years, the industry has realized the need to achieve sustainable development by shifting from pure outsourcing (CMT) to original equipment manufacturer (OEM), original design manufacturer (ODM), or original brand manufacturer (OBM). However, until now, over 80% of the small and medium enterprises are still outsourced, with CMT being the main method (65%), FOB accounting for 25%, and ODM and OBM products only accounting for 10% (Le, 2019).

The reason is that the industry still has bottlenecks, such as product design, material production, and product commercialization. For example, the supply of raw materials and accessories largely depends on the customers' orders, the design capacity is still limited, and the trading and commercial stages are not yet effective. As a result, the industry can hardly meet the demands of customers who order outsourcing and exports and fail to compete in a fierce market environment (Dinh, 2021).

3.2.4. Competition from other markets

- *Domestic fashion market*

Vietnamese textile and garment enterprises have not established a strong brand name among domestic consumers, as they have not invested sufficiently in product design and quality. They also have to compete with big foreign brands, such as Zara, Mango, Topshop, etc., that have entered the Vietnamese market (Vu, 2022).

- *Foreign fashion market*

Besides the domestic market, Vietnamese textile and garment enterprises also compete with enterprises from many other countries, especially China and Bangladesh. These two countries are gradually meeting the strict requirements of high-class and demanding import markets, such as quality, environmental impact, traceability, recycled content, and labor standards.

For example, China is focusing on the area with the highest profit margin in the textile industry, such as recyclable materials (e.g., recyclable polyester). Similarly, Bangladesh has 9 out of 10 factories rated as green factories with the highest standards of the US Green Building Council in 2021 (Vietnam Industry and Trade Information Centre, 2022). In 2023, the textile and garment industry in Vietnam lost orders to Bangladesh because customers from Europe highly valued the environment, which was well-performed by factories in Bangladesh. 153 factories there have met LEED standards, and 500 factories are currently applying for this certification (N, 2023).

3.2.5. Lack of coherence among components in the supply chain

At present, Vietnamese textile and garment enterprises have not been proactive in many stages of the supply chain. Firstly, in the stage of searching for orders and manufacturing, businesses face great pressure from outsourcing customers. According to Vu (2023), exports in the first five months of 2023 to major markets have decreased: the US by 27.1%, the EU by 6.2%, Japan by 6.6%, South Korea by 2%, Canada by 10.9%, etc. The orders for garments are small and sporadic. Businesses have to accept orders that are not their strengths: weaving businesses do knitting and vice versa, shirt orders replace pants orders, etc. Moreover, the unit price has dropped significantly. Some products have their outsourcing rate reduced by 50% compared to the same period last year. For example, a shirt that used to cost 1.7-1.8 USD now only costs 85-90 cents.

Secondly, in the stage of product distribution, businesses encounter difficulties in cash flow and inventory management. Customers delay receiving goods after they are produced, leaving businesses with unsold stocks. At the same time, the logistics factor is also a big barrier to exporting Vietnamese textile and garment products compared to other competing countries. According to Vietnam Credit, the average logistics cost per total revenue of Vietnamese enterprises is now nearly 17%, higher than that of other countries (Vu, 2023).

3.2.6. Environmental problems

The textile and garment industry in Vietnam is facing increasing pressure from the import markets to adopt sustainable practices. However, sustainable development often involves increased initial costs, which discourages many businesses, especially the small and medium-sized that lack determination or have insufficient resources (Vu, 2022). Another environmental challenge is the lack of coherence between the policies that encourage investment in the textile and dyeing industry and those that restrict polluting industries. Unlike investment in the garment sector, which only requires a large workforce, low labor and equipment costs, and flexible production facilities for a high return on investment, investment in textile, dyeing, and finishing factories is demanding in terms of capital, technology, human resources, and strict environmental requirements, while capital recovery is slow. Printing and dyeing factories use a lot of chemicals that need a standard wastewater treatment system for disposal, but only a few provinces in the country agree to build such factories with proper wastewater treatment systems. This poses a challenge for businesses that want to invest in this industry, especially in the current context of high interest rates. As a result, the number of textile and dyeing enterprises is significantly lower than that of garment enterprises. Out of 3,700 enterprises, only 21% of them are textile and dyeing enterprises (Dang & Dinh, n.d.).

4. Proposed solutions for sustainable supply chain in the textile and garment industry of Vietnam

4.1. Attracting investment capital in the sector

4.1.1. Support and facilitation from the Government, associations, and organizations

To sustainably develop the textile and garment industry, it is essential to attract green projects in producing raw materials, establishing supporting industries, and digitalizing the manufacturing process. However, since most of the Vietnamese textile and garment enterprises are small and medium-sized, they need support from the Government and the industry associations to mobilize investment capital.

First, the Ministry of Industry and Trade and the Government should leverage foreign trade to explore and expand the import, export markets, and identify potential investors from countries such as the US, Norway, Iceland, and Sweden.

Second, the Government and the banking system should create favorable credit conditions for businesses (such as preferential interest rates, deposit support, and grace periods) so that businesses can overcome cash flow difficulties and have more capital for green investment projects. The Government also needs to reintroduce recovery packages for businesses after COVID-19 and review their effectiveness. Based on that, the Government can focus on supporting businesses in the best way.

Third, VITAS should actively connect with enterprises to develop a comprehensive development strategy towards greening production, protecting the environment, and meeting the criteria of green investment projects according to the Law on Environmental Protection as a basis for accessing effective green credit policies.

4.1.2. The initiative of the textile and garment enterprises to attract capital

Businesses should take advantage of their high import rate of raw materials as an opportunity to attract foreign investment into fabric and yarn production in Vietnam. This would help them to be more proactive in the production of raw materials, which would make the production process more coherent, cost-saving, and eco-friendly. In general, businesses should focus on attracting FDI projects because they can increase production capacity and export scale quickly.

At the same time, textile and garment enterprises should direct investment flows toward meeting the requirements of the new FTAs, such as CPTPP and EVFTA. For example, regarding the rules of origin, yarns and fabrics must be produced and used in Vietnam or in FTA countries to receive preferential tariffs.

4.2. Technology application in production

4.2.1. Promoting technological innovation in the textile industry

The Government should prioritize reviewing and developing more solutions for technological innovation, especially in the textile, dyeing, and finishing process, to foster the supporting industry and gradually fill the supply gap. Development should be prioritized for products of the supporting industry including natural fibers (e.g., cotton, jute, hemp, silk, and synthetic fibers), fabrics, chemicals, auxiliaries, dyes, and accessories (e.g., buttons and zippers). The Vietnam Textile and Apparel Association should also support businesses in reporting, proposing recommendations, and calling for support from the Government, Ministries, and local authorities.

4.2.2. Proactive investment in machinery and technology upgrades by enterprises

To enhance the greening process of the industry and ensure the sustainability of the supply chain, businesses need to actively invest in upgrading their machinery and technology. Technological innovations in the dyeing step should be prioritized to solve the problem of fabric supply in the industry. For example, green production

technology can help reduce fuel and water consumption. Enterprises need to ensure that their production technology meets the trend of using green products, nanomaterials, and functional materials.

At the same time, enterprises should keep up with the trend of using digitalized and automated textile equipment (e.g., smart factories, 3D printing, 3D knitting), especially in yarn production, weaving, dyeing, and basic sewing for a transparent connection throughout the supply chain. For the simple and highly repetitive phases like cutting fabric, businesses should use digital technology or robots to save labor and materials. Utilizing equipment can also help to increase the accuracy in the production process, such as increasing the Right First Time (RFT) rate in the textile dyeing stage from 70-80% to 95-98%.

4.3. Establishing the textile and garment industrial clusters

4.3.1. Planning and investment in the textile and garment clusters by the Government

The Government should plan and invest in the supporting industry clusters that have complete infrastructure and provide “green” raw materials for the production and distribution stages. The construction of a large textile and garment industrial complex is crucial as it will help connect activities in various stages and avoid disruption of the supply chain.

The Vietnam Textile and Apparel Association should also petition the Government to approve the development strategies of the industry, such as the “*Development strategy for textile, garment and footwear industry to 2030, with a vision to 2035*”, to facilitate the formation of large industrial complexes with centralized wastewater treatment and advanced, green technology.

4.3.2. Actively participation in the textile industry clusters

Enterprises should actively participate in the textile industry clusters to increase coherence within the supply chain. For example, an industrial cluster in Ho Chi Minh City, which contributes more than 40% of the country’s export turnover, has businesses at different production stages that participate in the ecosystem to ensure the main features of the supply chain, such as design training, raw materials preparation, brand promotion, and accommodation for employees and to drive the industry forward.

Another example is that an industrial zone that focuses on producing raw materials should have standard wastewater treatment systems, convenient roads, and access to the seaport system. It should also connect with garment factories in the region. The formation and development of textile and garment industry clusters in Vietnam will help boost the productivity and efficiency of businesses through increased access to services and raw materials, speed, and reduced transaction costs. In addition, the clusters will help businesses access information easily, thereby promoting trade and innovation. In short, the industry clusters will help businesses increase competitiveness, strengthen cooperation, and make a greater impact on the development of the entire industry.

5. Conclusion

Environmental protection is increasingly becoming a focal point in socio-economic development. Therefore, the textile and garment industry should innovate its development goals and technology to create sustainable supply chains. These include using clean and recycled materials, producing green products that protect the environment and social responsibility, distributing and retailing products in an eco-friendly way, and reaching ethical consumers who value sustainability. A sustainable textile supply chain helps companies improve their brand image and attract more ethical consumers. Therefore, for businesses, sustainability is a way to demonstrate their responsibility towards society and the environment and gain a competitive edge in the market. Although Vietnam’s textile and garment export has achieved many remarkable achievements in recent years, the industry still faces many difficulties and challenges in the production process. Developing and maintaining a sustainable supply chain is one of the urgent requirements for businesses to compete in a fast-changing world of technology and consumption trends.

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