ABSTRACT

ZENG, LIAN. Promoting Sustainable Consumption: The Roles of Consumers' Domain-specific Environmental Knowledge and Personality Traits. (Under the direction of Dr. Marguerite Moore and Dr. Lori Rothenberg).

Environmentally sustainable development is gradually penetrating global society including commercial and non-commercial organizations, catalyzed by the United Nation's Sustainable Development Goals (SDGs) which were set forth in 2015 (UNDP, 2022). Negative environmental outcomes, such as water pollution, air pollution, microplastic pollution, resource wastes, drive the needs of environmentally sustainable development of textile and apparel (T&A) industry. The resource-intensive T&A industry faces numerous challenges for transitioning into an ecologically friendly market, which involves all stakeholders along the supply chain, from producers to final consumers. However, the consumer, as a critical driver of sustainability in the industry, is not well understood in terms of their environmental understanding, attitudes and behaviors. Moreover, the influence of domain-specific environmental knowledge has been underestimated or ignored outright in previous research. On the contrary, existing research demonstrate that the personal responsibility, beliefs and locus of control influence individuals' intentions or behaviors. This study adapted the Environmentally Responsible Behavior (ERB) model to evaluate consumers' sustainable consumption intention for T&A products.

There are two main goals of this research. Firstly, this research investigated the influence of consumers' domain-specific environmental knowledge (subjective and objective) on sustainable consumption intention for T&A products. Secondly, this research examined the influence of three types of personality traits (i.e., personal responsibility, general environmental beliefs-eco-centric and anthropocentric, and environmental locus of control-internal and external, on consumers' sustainable consumption intention for T&A products. An online survey was

conducted to collect consumers' knowledge, personality traits, and sustainable consumption intention data. A two-stage Partial Least Squares Structural Equation Modelling (PLS-SEM) was used to evaluate the measurement model, analyze final structural model and test hypotheses.

The findings suggested that subjective environmental knowledge of T&A industry, personal environmental responsibility and eco-centric environmental beliefs significantly influence consumers' sustainable consumption intention for T&A products. This research not only provides contributions to the existing literature on sustainable consumption behavior of T&A industry, but also provides T&A brands and retailers with insight into consumers' sustainable consumption. Further the findings suggest implications for educators, policy makers and additional stakeholders in pursuit of a more sustainable T&A industry.

Promoting Sustainable Consumption: The Roles of Consumers' Domain-specific Environmental Knowledge and Personality Traits

by
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DEDICATION

This dissertation is proudly dedicated to my beloved parents,

Dehua Zeng and Shuli Yang.

Thank you for your endless love, sacrifices, and support.

BIOGRAPHY

Lian Zeng was born in 1995 in Chongqing, China. She obtained Bachelor's degree in Fashion Design and Engineering from the college of fashion and design at Donghua University under the direction of Dr. Jun Li. Benefitting from the 3+X program between Donghua University and North Carolina State University, she came to the United States in 2017. She received Master's degree in Textile and Apparel, Technology and Management from the Wilson College of Textiles at North Carolina State University under the direction of co-chaired Dr. Lori Rothenberg and Dr. Kristin Thoney-Barletta in 2019. During her undergraduate and graduate study, she realized her passion for academic work and decide to pursue her doctoral degree in North Carolina State University. Her dissertation committee is co-chaired Dr. Marguerite Moore and Dr. Lori Rothenberg. Her current research interest includes sustainability, product development, product lifecycle management, consumer behavior, and supply chain management in the textile and apparel industry.

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CHAPTER 1: INTRODUCTION

1. Research Background

Earth is the only home for different living species which provides air, food, water, and additional resources needs. We all depend on the environment to survive. However, within the context of rapid global development, environmental equilibrium is disrupted due to the growth of human capabilities in recent centuries (Esmaeilpour & Bahmiary, 2017). The natural environment is increasingly deteriorating based on forces includes global warming, extreme weather conditions, sea level rise, freshwater depletion & contamination, biodiversity loss, ocean acidification, fertile soil loss, and additional drivers (Butler & McFarlane, 2017; Musova et al., 2021). NASA (2022a) reported that Earth's average surface temperature has risen about 1 degree Celsius since the late 19th century, mainly due to increased carbon emissions and other human activities. Along with climate change, the occurrence of extreme weather increased (World Wildlife Fund, 2022). Since 1993, global sea levels have risen 102 ± 4.0 mm, at nearly double the rate of the last century due to human-generated global warming (NASA, 2022b; Nerem et al., 2018). Moreover, many rivers, lakes and aquifers are disappearing or are seriously polluted, and more than half the world's wetlands will disappear since 1900 (World Wildlife Fund, 2022). 80 percent of the worlds' forests have been lost and 5-10 percent of tropical forest species will become extinct every decade due to deforestation (The World Counts, 2022). The climate crisis, energy crisis and food crisis brought about by environmental degradation have not only slowed the pace of technological and economic advancement, but also seriously threatened human survival.

Balancing environmental protection and human development poses a tough challenge for resources allocation. Brundtland (1987) first formally introduced the concept of sustainable

development, and characterized the concept as the development that can meet the needs of the present without compromising future generations' ability to meet their own needs. In order to simultaneously ensure society, economic and environmental prosperity, the Millennium Development Goals (MDGs) were launched by United Nation World Commission, which included eight international development goals for 2015. Among them, MDG 7 ("Ensure Environmental Sustainability") clarified the goal of environmental protection (UNEP, 2000). In 2015, the United Nation World Commission on Environment and Development set new global Sustainable Development Goals (SDGs) including 17 goals for further strengthening sustainable development (UNDP, 2022). SDG 6 ("Clean Water and Sanitation"), SDG 7 ("Affordable and Clean Energy"), SDG 13 ("Climate Change"), SDG 14 ("Life below Water"), and SDG 15 ("Life on Land") work concurrently to promote environmental sustainability by calling for integrating measures to mitigate the effects of climate change and more sustainable practices in using the earth's natural resources (UNDP, 2022).

Along with the increasingly serious environmental problems caused by industrialization, concerns among individuals, communities, and government have grown (Chiou et al., 2011). Not only market players, but also governments are constantly exploring new directions and new strategies to deal with the growing environmental challenges (Musova et al., 2021). Environmental issues have attracted a lot of attention from the public and as a result have become a critical societal priority (Howard-Grenville et al., 2014; Potocan et al., 2016). Policy makers introduced different environment protection policies, such as emission taxes, to regulate the market (Dewit & Leahy, 2015; Gao & Zheng, 2017). Today, more and more organizations including non-government organizations (NGOs) voice their commitment to pro-environmental behaviors, such as adopting strategies to pursue a circular economy, which exemplifies a new

development approach for partially solving the environmental problem (Frishammar & Parida, 2019; Musova et al., 2018; Nhat et al., 2019). A circular economy is an economy that maintains materials' highest value for as long as possible and reduces waste by restoration or regeneration in industrial processes and economic activities (Environmental Protection Agency, 2021). As the market actor who ultimately pays for goods and services, consumers are the main source of market demand. Research suggested that consumers are aware that their consumption behaviors may directly affect the environment (Abeliotis, Koniari, & Sardianou, 2010). Therefore, consumers consider the environment when choosing goods and services in the future marketing place. Many of them indicate willingness to pay higher prices for products that comply with environmental standards (Newton et al., 2015).

The textile and apparel (T&A) industry constitutes a diverse sector that plays an important role in the global manufacturing. Today, as a $2.4 trillion-dollar industry which employs 300 million people worldwide, the T&A industry is responsible for an estimated 2-8 percent of the world's greenhouse gas emissions (GHG), around 215 trillion liters of water consumption per year, 20% of all industrial water pollution worldwide, $100 billion-dollars in material loss and approximately 9 percent of microplastic pollution in the oceans per annum, due to underutilization of recycling (McFall-Johnsen, 2020; United Nations Alliance for Sustainable Fashion, 2022). These negative environmental outcomes drive the critical needs for T&A industry to change and seek an environmentally sustainable development path. The Global Fashion Agenda (2021) is committed to optimizing resource efficiency in the global fashion industry. Similarly, more and more apparel companies have joined the sustainable apparel coalition (SAC), a nonprofit trade organization founded by a group of leading apparel brands and retailers (e.g., Columbia, Patagonia, Levi's, Nike, Walmart, Amazon), to reduce the

environmental impact of products on the planet (Sustainable Apparel Coalition, 2022). These initiatives are consistent with the statement: "the apparel and footwear industry needs to transition to a sustainable and circular model. This requires a systemic change and hence a new legal framework (Carriere-Pradal, 2021)." In the T&A industry, consumers' awareness and demands for pro-environmental products have gradually increased (Nam, Dong, & Lee, 2017). When consumers became more aware of consumption-related environmental problems, they grew more cautious when purchasing products, and more eco-friendly products provides them with more options (Kilbourne & Pickett, 2008; Laroche et al., 2001).

2. Problem Statement and Research Purpose

Sustainability is becoming a megatrend in our society as sustainability becomes an increasing prerogative for society. The resource-intensive T&A industry faces the challenge to embrace sustainable consumption and transition to an ecologically friendly market (Mittelstaedt, 2014). In order to release the pressure brought by the growing popularity of sustainability around the world, scientists, philosophers, politicians, and policy experts have made an effort for decades to keep the balance among environmental protection, social equity and economic viability. Although literature devoted to the discussion of sustainable development has increased markedly and organizations increasingly voice their environmental concerns in recent years, these efforts are rudimentary steps forwards transforming the T&A industry which is heavily consumer driven (Desore & Narula, 2018; Nam, Dong, & Lee, 2017). There are two main marketing strategies in the T&A industry, including push marketing (product development prior to consumer's need) and pull marketing (consumer demand prior to product development) (Parrish et al., 2005). Parrish et al. (2005) argues that the T&A industry is traditionally more likely to be detected by consumers' wants and needs (Li, 2021). Hence, it is critical to pay more

attention to consumers and their behaviors for effective marketing strategies to sustainable development in the T&A industry.

However, sustainability transformation may require huge changes to human lifestyles and culture practice. Thus, the consumption patterns of consumers become unknown. Valuing and knowing the consumers is a prerequisite of changing consumer behavior towards greater sustainability, including understanding the sustainable consumption tendency of different consumers and the factors that influence sustainable consumption choices.

Although Hines, Hungerford, and Tomera (1986/1987) concluded that variables, such as knowledge of issues, knowledge of action strategies, locus of control, attitudes, verbal commitment, and personal responsibility, were most influential in promoting individuals to take environmentally responsible action through a meta-analysis, it is unknown whether these findings are still valid and accurate in the context on the T&A industry. Moreover, predictive power of environmental knowledge, particularly domain-specific environmental knowledge, is underestimated or ignored in environmental behavior studies (Geiger et al., 2019; Kaiser & Fuhrer, 2003). Substituting general environmental knowledge for specialized environmental knowledge to explain corresponding domain-specific performance is highly likely to be inaccurate (Geiger et al., 2019). In addition, Dunning and Helzer (2014) proposed that subjective knowledge and objective knowledge might impact behavior in different ways because of different psychological processes. But it is often limited to subjective self-report measures of ability or a mix of the two types of knowledge when environmental knowledge is studied (Duerden & Witt, 2010; Geiger et al., 2019; Milfont, 2012). In past studies of consumers' environmental behavior, studies of normative or attitudinal aspects, as opposed to the environmental knowledge, have dominated (Kaiser & Fuhrer, 2003). Recently, the focus of

consumers' environmentally responsible behavior research is mainly on psychological factors, including attitude, subjective norms, and beliefs (Li et al., 2019). The role of personal responsibility is also found to be influential in fostering a pro-environmental intention (Dasi et al., 2019).

The purpose of this study is to investigate the effects of consumers' domain-specific environmental knowledge and personality traits on their sustainable consumption intention for textile and apparel products. The specific research objectives are to:

1. Examine the influence of subjective and objective domain-specific environmental knowledge on sustainable consumption intention for textile and apparel products
2. Investigate the influence of personal environmental responsibility on sustainable consumption intention for textile and apparel products
3. Explore the influence of eco-centric and anthropocentric environmental beliefs on sustainable consumption intention for textile and apparel products
4. Explore the influence of internal and external environmental locus of control on sustainable consumption intention for textile and apparel products

3. Research Value

This study will provide empirically based insight into consumers' sustainable choice tendency toward the T&A products by 1) examining the relationship between consumers' domain-specific environmental knowledge and their sustainable consumption intention for T&A products and 2) examining the relationship between consumers' personality traits and their sustainable consumption intention for T&A products. The proposed study bridges two interdisciplinary and inter-related communities (i.e., sustainability and consumer behavior) and contributes to the emerging literature on consumer behaviors as it relates to the T&A products.

The results of this study also can help the T&A retailers better understand consumers and explore potential sustainable markets of the T&A industry by addressing who are more likely to be green consumers in this industry in what way or for what reasons. Then, the retailers can use this information to identify opportunities and develop marketing strategies.

Further, the results of this study can provide effective support for the sustainable development education by multidisciplinary and phenomenon-based perspectives instead of traditional discipline-focused areas (Seikkula-Leino et al., 2021). In addition, when policy makers are making political decisions, they should carefully weight the costs and benefits and strike balances on SDGs implementation: for example, between short-term and long-term needs; or among economic, social and environmental dimensions of sustainable development (Khan, 2022). The information provided by this study can guide them to better judge and assess the issues of synergies and trade-offs from proposed policy changes. Meanwhile, NGOs play important roles in building horizontal linkages, enhancing grassroots influence on policy, and disseminating new visions (Brown, 1991). The results of this study can better educate and promote NGOs to implement sustainable development strategies and carry out relevant activities. All these things can facilitate the sustainable development, especially for the T&A industry.

CHAPTER 2: LITERATURE REVIEW

In this chapter, a review of the literature related to the purpose of the study is provided. First, the review covers perspectives which express environmental sustainability's importance and urgency within textile and apparel (T&A) industry through consideration of the industry' major environmental challenges. Next the review considers consumers' sustainable consumption behaviors in the T&A industry which can be described as the efforts of business, government, and consumers to pursue a more sustainable industry. Subsequently, a prediction model of environmentally responsible behavior (ERB) is reviewed to provide theoretical support for this research. Following that, research on four influencing factors on ERB intention, including domain-specific environmental knowledge, personal environmental responsibility, environmental beliefs and environmental locus of control, and their relationship with ERB intention are presented respectively. Based on the entire review of literature and relative to the objectives of the study, several testable hypotheses are developed.

1. The Textile and Apparel Industry

1.1. The T&A supply chain

A supply chain is a coordinated network of all the individuals, organizations, resources, activities and technologies involved in developing, manufacturing and delivering the goods or services to the final consumer (Luther, 2021). Environmental issues in the T&A industry cannot be discussed without describing the long and complicated T&A supply chain. Each sector in the supply chain has an influence on the environment. The four sectors are textile production, apparel manufacturing, distribution and sales, and consumption and disposal (Amutha, 2017; Joung, 2013; Li, 2021; Ngai et al., 2014). Table 2.1 shows the four segments of the T&A supply chain and their respective operational processes.

Table 2.1. The Textile and Apparel Supply Chain

Segment	Process
Textile Production	• Fiber production • Fiber-to-yarn • Yarn-to-fabric • Fiber-to-fabric • Coloring and finishing • Transportation
Apparel Manufacturing	• Product design and development • Mass garment production (cut & sew) • Finishing and packaging • Transportation
Distribution & Sales	• Marketing • Transportation • Wholesaling and retailing
Product Consumption & Disposal	• Purchase and use • Disposal • Transportation

Note: Adopted from "The Impact of Communication on Consumers' Knowledge, Attitude and Purchase Intention Related to Sustainable Apparel [Doctoral dissertation, North Carolina State University]" by Li, Jitong, 2021, North Carolina State University Research Repository. Copyright 2021 by Li, Jitong.

The first stage is textile production. It starts with raw material (e.g., fibers) production and aims to turn them into finished textile products (e.g., yarns and fabrics) through various processes and technologies including converting fibers into yarns by spinners, throwsters, and/or texturizers and processing yarns into fabrics/cloths through weaving, knitting, or nonwoven process (Ngai et al., 2014; Şen, 2008). Fiber is the fundamental unit of textile product, classified

as natural fiber and manmade fiber (Cao et al., 2005; Li, 2021). Coloring and finishing may be applied to fiber/yarn/fabric for some specific effects (Ngai et al., 2014). Then the finished yarns/fabrics will be transported to other different mills for further steps to final textile products, such as apparel.

Apparel manufacturing, which follows textile production, contains product design and development, apparel production, finishing and packaging, and transportation (Ngai et al., 2014). Product design and development depends on the needs and wants of consumers and the market. Nowadays, some advanced technologies, such as Computer-Aided Design (CAD) systems, 3D scanning, and artificial intelligence (AI), improve product design and development. Based on the design, final garment products will be mass-produced in cut & sew factories, packaged and transported to retailers after finishing (Li, 2021; Şen, 2008).

After apparel manufacturing, the next stage is to distribute and sell final garment products. Final garment products are moved from the factories to the designated destinations where the final products are displayed and purchased by final consumers (Ngai et al., 2014). There are two main channels: wholesaling and retailing. Wholesaling involves two main activities. It firstly sells the merchandise/service to retailers and/or other resellers and then retailers and/or other resellers sell the merchandise/service to the final consumers. While retailing is the direct sale of merchandise/service to the final consumers (Ngai et al., 2014). The major functional activities of wholesaling and retailing include sourcing, marketing, maintaining and controlling the inventory, providing services to customers, and approaching and developing client bases (Ngai et al., 2014).

The last stage is product consumption and disposal. Consumers use and maintain the T&A products after purchase. Finally, the products will be disposed of when consumers no

longer need them. There are several main disposal methods including sending to landfills, recycling through drop-off, donation, resale, and reuse (Joung, 2013).

There are five parties involved in the whole T&A supply chain. They are yarn manufacturers, fabric manufacturers, garment manufacturers, distributors (sale outlets) and final consumers (Forza & Vinelli, 1997). The trends in globalization, customization, and outsourcing of T&A industry leads to different product flow and information flow, which makes the supply chain become more complex (Cao et al., 2005; Li, 2021). There are three T&A supply chain structures: 1) vertically integrated; 2) production outsourcing; 3) decentralized (Fung et al., 2021). In the vertically integrated structure, the apparel retailers own and have full control of every single step of the process starting from raw material production to product design, manufacturing, and launching. The production outsourcing structure is the traditional sourcing chain. The apparel retailers purchase products from independent manufacturers. In the decentralized structure, the retailers "decentralize" (e.g., outsource) the design and manufacturing to either third-party trading companies or original design manufacturers (ODM) (Cao et al., 2005; Fung et al., 2021).

1.2. Environmental issues of T&A industry

The T&A industry is one of the largest, most resource intensive industries in the world, which owns an ever-growing market (Global Fashion Agenda, 2022). According to the World Trade Statistical Review 2021 report published by the World Trade Organization (WTO) (2021), the global exports value of textile articles and apparel articles were approximately $353 billion dollars and $448 billion dollars respectively in 2020. The world's textile market value reached $993.6 billion dollar in 2021, while the world's apparel retail market reached $1206.2 billion dollar in 2020 (Lu, 2021; Grand View Research, 2022).

The size of T&A industry makes it impossible to ignore the environmental issues in it. Different stages of T&A supply chain cause significant environmental issues (Amutha, 2017). Four critical environmental issues in the T&A industry are water scarcity, carbon footprint emission, waste, and microplastic pollution.

Water scarcity. Water scarcity refers to the inability to meet standard freshwater demand, which is mainly caused by water consumption (especially in agriculture), water pollution and population growth (World Wildlife Fund, 2022). The T&A industry is the second largest consumer and main polluter of freshwater, from raw material cultivation to fiber production, to fabric manufacturing (wet processing), and finally to the T&A product care (Scott, 2020; World Bank, 2020). It accounts for 4% of global freshwater withdrawal annually mainly because of products production, including cotton cultivation, pretreatment processing (desizing, scouring, bleaching, and mercerizing), dyeing, printing, and finishing, as well as products washing (Islam, 2020; Nayak & Ratnapandian, 2018; Senthil Kumar & Grace Pavithra, 2019). Cotton is the most widely used natural fiber cloth in clothing and annually with over 250 billion tons of water required for global cotton production (The World Counts, 2021). The T&A industry is also responsible for about 20% of global water pollution (UNEP, 2019). There is considerable freshwater pollution through fertilizers and pesticides used during raw material cultivation, textile auxiliaries, textile chemicals, colorants and finishes used during wet processing operations, and organic solvents used during wet cleaning and washing (Cotton Incorporated, 2020; Holkar et al., 2016; Nayak & Ratnapandian, 2018; Senthil Kumar & Grace Pavithra, 2019; World Bank, 2019; World Wildlife Fund, 2022). On average, 90 - 95% of the water used by the factory ends up as effluent (Kiron, 2014).

Carbon footprint. Carbon footprint is a measurement of the greenhouse gas (GHG) emissions, expressed as carbon dioxide equivalent (CO2e). GHGs mainly include carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), which is caused by burning fossil fuels for electricity, heat, and transportation. GHGs trap heat and make the planet warmer (Environmental Protection Agency, 2022). The processes of T&A industry generate 10% of all GHG emissions (Beall, 2020; Li et al., 2019). According to a rough estimate, 1 ton of every 19.8 tons of the total carbon-dioxide (CO_2) is released from textile industries (Akhtar et al., 2017). The data from the Higg, Sustainable Apparel Coalition (SAC) and Textile Exchange showed that the apparel industry was responsible for roughly 2% of annual global GHG emissions in 2019. Raw material production accounts for over 50% of the total greenhouse gas emissions (Sadowski & Cummis, 2022). It is estimated that making 1 kg of fabric releases 20-23 kg of greenhouse gas on average. A polyester t-shirt emits an average of 5.5 kg CO2eq, which is equivalent to 13 miles driven by a passenger car. It is nearly 30% more than the average emissions from a cotton t-shirt (Kirchain et al., 2015).

Waste. The T&A industry is a resource-intensive industry requiring significant amounts of chemicals, water, energy, and other natural resources. However, it is estimated that 92 million tons of textiles waste is created each year globally, while only 12% of the material used for clothing ends up being recycled (Beall, 2020). According to data from the Environmental Protection Agency (2017), 4% of clothing ended up in landfills or incinerators. In 2018, 3.2 million tons of municipal solid waste (MSW) textiles was combusted. The amount was 9.3% of MSW combusted with energy recovery. And 11.3 million tons of MSW textiles was disposed of in landfills, The amount was 7.7% of all MSW landfilled (Environmental Protection Agency, 2017). GHGs and pollution is released into the air through burning. For the T&A wastes that are

buried in landfills, it needs more than 200 years to decompose. Meanwhile, greenhouse methane gas may be generated, and toxic chemicals and dyes may be released into the groundwater and our soil during the decomposition process (Lau, 2015; Niinimäki, 2020).

Microplastic pollution. Textile microfibers are a subcategory of microplastic (synthetic polymers <5 mm) which has been recently recognized as an important and abundant pollutant (Andrady, 2011). Microfibres from natural materials are able to break down relatively quickly, but those from synthetic materials need a long time to degrade (Napper & Thompson, 2016; Šajn, 2019). They are released throughout the life cycle of textile products, especially during laundering (Boucher & Friot, 2017). After entering the oceans, microfibers eventually end up in the food supply chain. Approximately 500,000 tons of plastic microfibers are discharged from washing clothes every year (Napper & Thompson, 2016; Šajn, 2019). An average 6 kg wash load of acrylic/nylon fabric can discharge 700,000 microplastic fibers (Belzagui et al., 2019; Napper & Thompson, 2016; Šajn, 2019). What's more, there is evidence of microfibers presence in multiple food products, such as seafood, tap and bottled water, and table salt (Belzagui et al., 2019).

1.3. Environmental sustainability transformation in the T&A industry

The T&A industry plays a crucial role in the process of sustainable development of the world. Environmental impacts, which are in different forms, such as the issues (water scarcity, carbon footprint, waste, and microplastic pollution) discussed in section 1.2 of Chapter 2, appear at different points in the supply chain. Moazzem et al. (2021) pointed out that one of the crucial trends in the T&A industry is addressing sustainability throughout its supply chain. Nowadays, the T&A industry has started working hard to be more environmentally sustainable in its production and consumption activities, including finding eco-friendly alternatives to cotton,

making washing and drying more efficient, increasing energy efficiency and the use of renewable energy, extending the longevity of T&A products and improving sorting and recycling (Brown, 2021; International Labor Organization, 2021; Šajn, 2019).

With the gradual filtration of sustainable development thinking into the T&A industry, many new concepts (e.g., slow fashion, on-demand production at point of sale, and sharing economy) and sustainable strategies (e.g., reuse, repair and recycling) are emerging (Brown, 2021). For example, retailers like H&M, Madewell, and The North Face are offering product recycling services to address the environmental issues related to resource depletion (Brown, 2021). Levi's invented the Water<Less® technique and launched a water-saving line of jeans to reduce water consumption in production (Levi's, 2018).

In addition, until now, governments, the private sector, civil society and international organizations have designed many initiatives, including tools, standards, capacity-building programs, audits, awareness-raising activities, or a combination of some or all of these activities, to improve the environmental sustainability of T&A value chain. Eleven important initiatives, that operate across multiple countries or regions and have a substantial focus on environmental sustainability of T&A industry, are listed in Table 2.2 below along with their main contents (International Labor Organization, 2021).

Table 2.2. Environmental Initiatives in the Textile and Apparel Industry

Initiative	Brief description
Better Cotton Standard System	Farm-level implementation of sustainable cotton standard. Licensed BCI farmers produce cotton with minimal negative effects of fertilizers and pesticides; care for water, soil health and natural habitats; and utilize decent work principles. The Better Cotton Standard is not applicable to the entire cotton supply chain.

Table 2.2. (Continued)

Initiative	Brief description
Higg Index	A suite of tools that enable apparel and footwear brands, retailers, and facilities to accurately measure and score a company or product's social or environmental sustainability performance.
Fairtrade Textile Standard	A standard for producing and purchasing Fairtrade textiles. Fairtrade engages all actors (businesses, suppliers and factories) in the supply chain to protect workers and environment. Fairtrade also engages brands to commit to fair terms of trade through license contracts.
Bluesign	A standard for sustainable processing and manufacturing for textile brand and manufacturers and chemical suppliers.
Global Organic Textile Standard (GOTS)	A processing standard for organic textiles and fibers, supported by independent certification of the entire supply chain.
Zero Discharge of Hazardous Chemicals (ZDHC)	A guideline, standard, certification and training on sustainable chemical management in textile, leather and footwear manufacturing with the goal to restrict the use of hazardous chemicals.
OEKO-TEX® Standards	A comprehensive certification system for brands, retail companies and manufacturers in the textile and leather industry by testing textiles and leather for harmful chemicals at all processing levels and certifying the environmentally and socially responsible production conditions of production facilities.
China Environmental Label	Eco-label for products, including textiles.
The Sweden Textile Water Initiative (STWI)	An initiative focuses on the reduction of water, energy and chemical use in textile and leather supply chain.
UN Fashion Industry Charter for Climate Action	Charter document containing principles to which signatories and supporting organizations commit to and implement through working groups including relevant stakeholders, experts and initiatives in the fashion and broader textile sector.

Table 2.2. (Continued)

Initiative	Brief description
UN Alliance for Sustainable Fashion	An initiative of United Nations agencies and allied organizations designed to contribute to the Sustainable Development Goals through coordinated action in the fashion sector.

Note: Adopted from "Greener clothes? environmental initiatives and tools in the garment sector in Asia" by International Labor Organization, 2021 (https://www.ilo.org/asia/publications/WCMS_800026/lang--en/index.htm). Copyright 2021 by International Labor Organization.

1.4. Consumers' sustainable consumption behaviors in the T&A industry

Global environmental problems are becoming more severe as consumption increases due to the growth of population and demand. Sustainable consumption cannot be separable from the SDGs. The Kilbourne, McDonagh, and Prothero (1997) defined sustainable consumption as a process minimized environmental influence, considered the needs of future generations, and was for the satisfaction of needs that produced a better quality of life. In the literature, definitions of sustainable consumption emphasize reducing negative impact of consumption on the environment and wider society when shaping and satisfying consumer needs (Tunn et al., 2019), or more generally as consumption which simultaneously achieves social, economic and environment friendliness (De Pelsmacker, Sriesen, & Rayp, 2006). For achieving sustainable consumption, different ways are suggested, including business model-based approaches (Tunn et al., 2019; Zarte, Pechmann, & Nunes, 2019), production-based approaches (Hapuwatte & Jawahir, 2021), marketing and communication-based approaches (Chamberlin & Boks, 2018), and consumption pattern-based approaches (Evers et al., 2018). Lorek and Spangenberg (2014) implied that it was insufficient for sustainable consumption to use the technology-based approach, while approaches based on consumption pattern, consumption level, and market size

can contribute to a strong sustainable consumption, which is in line with the claim of La Rosa and Johnson Jorgensen (2021).

Sustainable consumption does not mean to consume less, but consume better (UNEP, 2015). The connection of T&A industry with sustainable consumption is an important one due to the high pressure on the environment from T&A products production and consumption level and pattern. Consumers have a strong impact on the sustainable consumption in the T&A industry, since the T&A industry is highly consumer driven (Desore & Narula, 2018). McNeill and Moore (2015) suggested that nowadays, consumers do make some corresponding sustainable choice. However, they still have not fully embraced many categories of sustainable goods and practices (Harrison et al., 2005). In addition, many consumers only think of environmental problems from a supply perspective rather than the linkage between consumption and environmental degradation (La Rosa & Johnson Jorgensen, 2021). Youn, and Hye (2021) found that consumers were becoming more and more concerned about and sensitive to the negative environmental impact caused by the fashion industry and by consumers' high consumption of fashion. And the keywords "eco-friendly", "ethical", and "recycle" were often mentioned by them (Youn & Hye, 2021). Young consumers, particularly Millennials and Generation Z, have strong behavioral intentions to participate in sustainable consumption of T&A products (Mamalis et al., 2019; Su et al., 2019).

In the context of T&A industry, consumers' sustainable consumption behaviors refers to an individual's behavioral consideration of minimizing negative effects on the environment when purchasing, using and disposing of T&A products (includes services related to the T&A products) that improve the quality of life (Moisander, 2007; Soyer & Dittrich, 2021). These consumers' sustainable consumption behaviors could be put into three categories of sustainable

purchasing (rethinking, reusing, and reducing), using (retaining, repairing, and refurbishing) and disposing (reusing, recycling, and repurposing) of T&A products (Soyer & Dittrich, 2021). Consumers influence the sustainable consumption in the T&A industry through their product choice, including their purchase quantity, maintenance preference and product handling choice (Soyer & Dittrich, 2021). It is important to understand consumption patterns in all consumer phases of purchase, use and disposal to promote sustainable behavior (Soyer & Dittrich, 2021). However, most studies on consumers' sustainable behavior pay attention to sustainable purchasing, while few studies investigate consumers' sustainable usage and disposal practices in the T&A industry which is also critical to achieve environmental sustainability (Harris, Roby, & Dibb, 2016; Soyer & Dittrich, 2021). The research found consumers with a high sense of pro-environment were willing to pay 20% more for a sustainable clothing item (Ciasullo et al., 2017; Yue et al., 2020). In terms of research on consumers' sustainability practices, it mainly focuses on retaining or maintaining activities such as washing, drying, and ironing, and less on repairing, refurbishing and repurposing (Soyer & Dittrich, 2021). The prolongation of the lifetime of garments largely depends on consumers' behavior during the use phase. Clothing disposal involves disposal for reuse (such as donating, taking back, selling or swapping clothes), disposal for recycling (such as discarding clothes in recycling bins), and disposal for incineration and landfilling (Soyer & Dittrich, 2021). However, consumer performance in the use and disposal phases of T&A products is often nonideal. Researchers found consumers often lack relevant skills (such as repairing) and necessary knowledge (such as recycling method) on how to use and dispose of their apparel in a sustainable way (Gwilt, 2014; Joung & Park-Poaps, 2013).

2. The Model of Environmentally Responsible Behavior (ERB)

Environmentally Responsible Behavior (ERB) is a concept in environmental psychology, which is defined as any individual or group action aimed to remedy environmental issues/problems and protect environment (Cottrell, 2003). ERB is a complicated concept which can be explained as a combination of self interest and concern for other people, species, or ecosystems (Bamberg & Moser, 2007; Giuseffi, 2011). Hungerford et al. (1980) proposed five dimensions of environmental behavior, namely, eco-management actions (e.g., energy saving, garbage clean-up, and recycling), consumerism actions (e.g., purchasing daily utility products with eco-label), persuasion actions (e.g., persuading people to adopt positive environmental behaviors), legal actions (e.g., reinforcing or amending environment-related laws), and political actions (e.g., writing letters, making phone calls to convince government administrations to address environmental issues). Based on the location and extent of visibility, Stern (2000) proposed four types of ERB: environmental activism, non-activist behaviors in the public sphere (e.g., supporting for certain policy initiatives), private-sphere environmentalism (e.g., purchasing decisions) and other environmentally significant behaviors (e.g., influencing the actions of organizations).

By doing a meta-analysis of research in pro-environmental behavior, Hines, Hungerford, and Tomera (1986/1987) identified the cognitive, affective, and social situation variables associated with ERB and proposed a model of ERB (Figure 2.1) which described the relationship of variables in affecting and predicting ERB. In their model, ERB is influenced by the intention to act and situational factors. Personality, skills, and knowledge lead to the formation of a 'intention to act'. Furthermore, personality factors include attitudes, the locus of control and personal responsibility (Hines, Hungerford, & Tomera, 1986/1987).

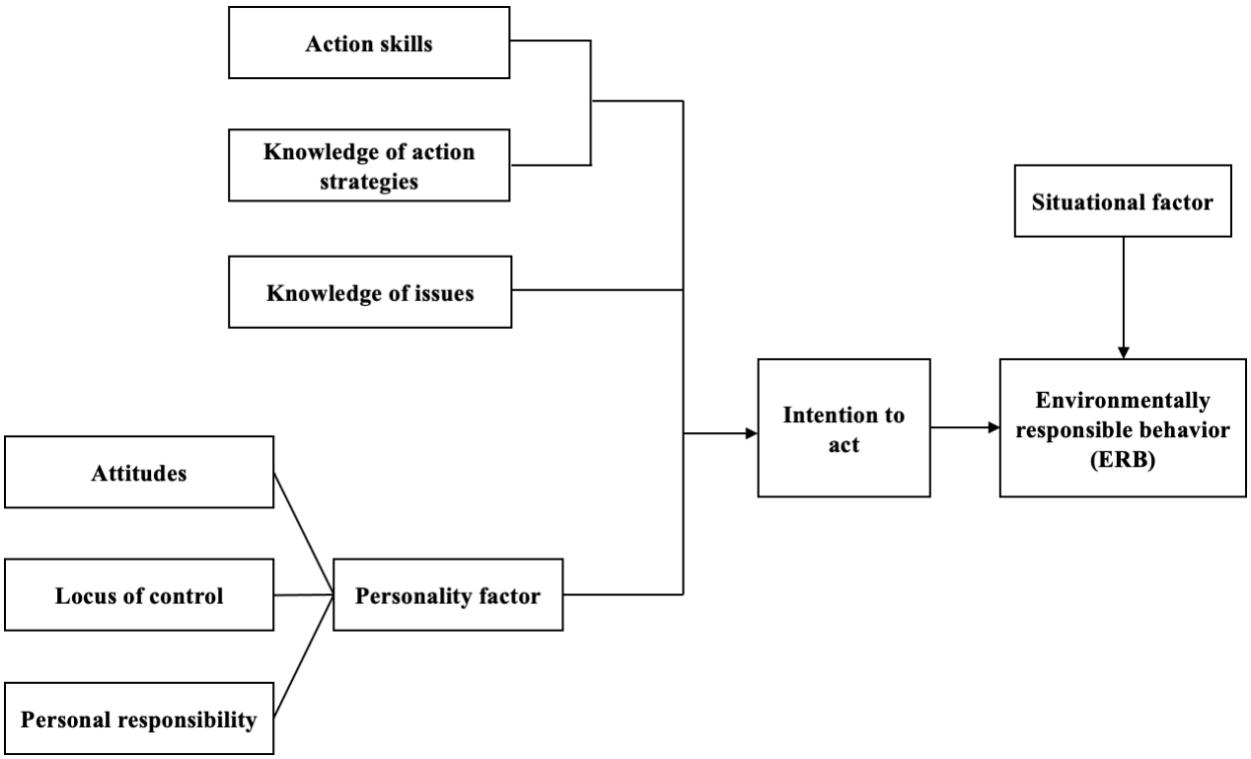

Figure 2.1. The Model of Environmentally Responsible Behavior

Note: Adopted from "Analysis and Synthesis of Research on Responsible Environmental Behavior: A Meta-Analysis" by Hines, J. M., Hungerford, H. R., & Tomera, A. N., 1986/1987, *Journal of Environmental Education, 18* (2), p 7. Copyright 2016 by American Psychological Association.

Knowledge of issues describes an individual's awareness level of the environmental issues. Knowledge of and skill in action strategies describe an individual's capability to solve the environmental issues. These three variables all belong to cognitive variables (Hines, Hungerford, & Tomera, 1986/1987). Hungerford and Volk (1990) further refined the Hines et al. model by classifying the knowledge variables into three levels: entry-level (environmental sensitivity and knowledge of general concept); ownership level (in-depth knowledge of the environmental issues); and empowerment level (knowledge of and skill in the environmental action strategies). Among the three variable levels, knowledge serves as an important part. It can be regarded as a

prerequisite variable to other variables (Giuseffi, 2011; Hines, Hungerford, & Tomera, 1986/1987; Hungerford & Volk, 1990). Before taking action on particular environmental issues, it is necessary to recognize the existence of the issues. Knowledge has an indirect effect on ERB through intention to act. The greater knowledge of environmental issues and/or knowledge of how to take action on those issue an individual possesses, the more likely he or she is to have reported engaging in ERB (Cheng & Wu, 2015; Gao et al., 2021; Hines, Hungerford, & Tomera, 1986/1987; Hungerford & Volk, 1990; Hwang et al., 2000).

There are four affective variables: attitude, personal responsibility, locus of control, and intention to act. Environmental attitude is defined as "a psychological tendency that is expressed by evaluating perceptions of or beliefs regarding the natural environment, including factors affecting its quality, with some degree of favors or disfavor (Eagly & Chaiken, 1993, p 1)". These positive and negative feelings regarding the environment include attitudes toward ecological and environmental concepts in general, attitudes towards specific environmental issues, as well as attitudes toward taking environmental actions, such as recycling or conserving water for example (Ajzen, 2001; Eagly & Chaiken, 1993; Hines, Hungerford, & Tomera, 1986/1987). Attitude is regarded as one of the most powerful variables contributing to ERB and a more positive attitude toward the environment has a stronger correlation with ERB (Bamberg & Moser, 2007; Hines, Hungerford, & Tomera, 1986/1987).

Personal responsibility is defined as an individual's feelings of duty or obligation reflected in the environment as a whole or in one facet (Hines, Hungerford, & Tomera, 1986/1987). Hines, Hungerford, and Tomera (1986/1987) argued that those individuals with some degree of personal responsibility toward the environment had higher probability of engaging in ERB than those individuals with no such feelings of responsibility.

Locus of control represents “an individual’s perception of whether or not he or she has the ability to bring about change through his or her own behavior” (Hines, Hungerford, & Tomera, 1986/1987, p 4). A person with an “internal locus of control” believes that his or her activities are likely to bring about change and have an impact, while a person with an “external locus of control” attributes change to chance or to powerful others (e.g., God, parents, government) rather than to their own activities and gives up the attempt to change (Hines, Hungerford, & Tomera, 1986/1987). Because those individuals with an internal locus of control believe their actions have the potential to create worthwhile change, they are much more likely to act in environmentally responsible ways than those individuals with an external locus of control (Hines, Hungerford, & Tomera, 1986/1987; Hungerford & Volk, 1990).

An individual’s intention to act presents his or her willingness to act, which is the strongest predictor of and the direct antecedent to ERB (Ajzen, 1991; Hines, Hungerford, & Tomera, 1986/1987). If a person intends to take some sort of action, that action is more likely to occur (Ajzen, 1991; Hines, Hungerford, & Tomera, 1986/1987; Hungerford & Volk, 1990).

Situational factors, such as economic constraints, social pressures and opportunities to choose different actions, explain the uncertainty involved in the prediction of ERB. Situation factors can directly influence the ERB. It may not only decrease, but also increase the incidence of ERB. (Hines, Hungerford, & Tomera, 1986/1987).

Furthermore, research on the ERB has made considerable progress since Hines, Hungerford, and Tomera’s model was introduced in 1986/1987. The meanings and applications of ERB are constantly deepening and expanding. This model is widely used in the research on predicting consumer’s ERB, in areas such as tourism and education (Cheng & Wu, 2015; Gao et al., 2021; Mobley et al., 2010). Researchers have included additional factors, such as

environmental sensitivity, environmental concern, personal values, and general beliefs, to broaden and enhance the existing ERB model (Bamberg & Moser, 2007; Cheng & Wu, 2015; Hungerford and Volk 1990; Olli et al., 2001; Stern & Dietz, 1994; Su-Lan et al., 2018). Several researchers have developed models to examine the interactions between cognitive, affective, and social situational predictors of ERB (Akintunde, 2017; Bamberg & Moser, 2007; Stern, 2000).

3. A Review of Influencing Factors on ERB Intention

This section reviews the influencing of domain-specific environmental knowledge and personality traits on ERB intention. Specifically, research on the relationships between subjective and objective domain-specific environmental knowledge and ERB intention are presented firstly. Then the relationship between personal environmental responsibility and ERB intention is explored. Following that, the effects of eco-centric and anthropocentric environmental beliefs on ERB intention are reviewed. Lastly, research on the relationships between internal and external environmental locus of control and ERB intention are presented.

3.1. Domain-specific environmental knowledge and ERB intention

Knowledge can be regarded as a result of an individual's lifelong learning process, such as the voluntarily accessible and organized accumulation of truthful information and experience (Geiger et al., 2019). It was proved that knowledge was a significant predictor of behavior (Levine & Strube, 2012; Kaiser & Fuhrer, 2003). In consumer behavior research, knowledge is always considered as a critical factor that impacts all the phases of the decision-making processes, as well as the manner consumers evaluate the products and services in the market (Ostergarrd & Bode, 2016; Wang et al. 2018). Environmental knowledge is defined as a kind of common knowledge, including environmental protection, natural environments, ecosystems, etc. (Fryxell & Lo, 2003), and measured based on knowledge and skills of ecology, environmental

science, environmental issues, and environmental action strategies (Hines, Hungerford, & Tomera, 1986/1987). Briefly, any knowledge related to people's life and the environment could be called environmental knowledge (Mantzicopoulos & Patrick, 2011). It not only reflects the degree of concern regarding natural environments (Huang & Shih, 2009), but also expresses the ability of individuals to recognize the environmental concepts, symbols, and behavior that are associated with pro-environmental goods and service (Ahmad & Thyagaraj, 2015).

Environmental knowledge had been defined as a major and meaningful variable in explaining pro-environmental behavior (Fryxell & Lo, 2003). Geiger et al. (2019) stated that the magnitude of environmental knowledge's effect depends on the methodology and measures proposed in the study. With regards to the role of knowledge in environmental behavior, mixed results were found in previous studies. Some studies reported a direct relationship between environmental knowledge and environmentally friendly behavior (Díaz-Siefer et al., 2015; Frick et al., 2004; Geiger et al., 2019; Saari et al., 2021; Zheng et al., 2018). In contrast, most studies supported an indirect role mediated via moral norms, feelings, sensitivity, concern, attitude, and/or intentions to behave in a pro-environment manner (Bamberg & Moser, 2007; Cheng & Wu, 2015; Feng & Reisner, 2011; Hines, Hungerford, & Tomera, 1986/1987; Kaiser and Fuhrer, 2003; Kollmuss & Agyeman, 2002). Also, many researchers agree that only a small fraction of pro-environmental behavior can be directly related to environmental knowledge (Wang, 2014). Although most researchers believed knowledge was not sufficient to facilitate environmental behaviors, it was a crucial distal variable and did influence these actions (Gkargkavouzi, Halkos, & Matsiori, 2019; Liu, Teng, & Han, 2020). Liu, Teng, and Han (2020) found environmental knowledge positively influenced behavior intention and impacted sustainable consumption behaviors through behavioral intention, which is consistent with the findings of Liao and Li

(2019), Gkargkavouzi, Halkos, & Matsiori (2019), and Wang et al. (2014). Adetola, Aghazadeh, & Abdullahi (2021) claimed that people with more environmental knowledge had higher intention to visit green hotels. Pan et al. (2018) also argued that environmental knowledge significantly positively affected environmental behavioral intentions, but this influence decreases when accounting for environmental sensitivity and environmental responsibility as mediators. However, the relationship between environmental knowledge and pro-environmental behavioral intentions is inconsistent in previous research. For example, Liao and Li (2019) found environmental knowledge was the best predictor of the separation of solid waste on campus intention amongst the variables they investigated (environmental knowledge, attitude, subjective norm, and perceived behavior control). Otto, et al. (2016) suggested that environmental knowledge was negatively related with pro-environmental intentions. In addition, the results of Ahmad and Thyagaraj (2015) suggested that there was no significant relationship between environmental knowledge and the purchase intention of green brands.

Previous studies on the impact of knowledge upon pro-environment behavior mainly focused on environmental knowledge in general, which is an excessively broad concept including different environmental information related to people and nature. However, it is difficult to accurately investigate the structure of knowledge and its predictive power on corresponding behavior without a precise definition of knowledge, such as action-related, procedural knowledge about possible actions for environmental protection, domain-specific knowledge about relative effects of different behaviors (Geiger et al. 2019). Li (2021) defined domain-specific environmental knowledge as the specific information associated with environmental sustainability in a specific context. Environmental knowledge can be considered as a specific domain of knowledge in general, and it can continue to be subdivided. The

influence of domain-specific environmental knowledge on pro-environmental behavior has been reported in various studies (Geiger et al., 2019). Polonsky et al. (2012) claimed that general environmental knowledge and specific environmental knowledge may bring about various types of behaviors. For example, Barber et al. (2009) pointed out that consumers' purchase of pro-environment products can only be explained by particular product ecological knowledge, but not by general environmental knowledge. Suryanda, Sigit, & Safitri (2021) also indicated that the more environmental pollution knowledge students have, the greener purchase intention they have. Wyles et al. (2013) found it was helpful to improve the marine environmental protection intentions of tourists by giving visitors more knowledge about marine conservation. Moreover, Brosdahl and Carpenter (2010) argued the knowledge of the environmental impacts of T&A production positively related to environmentally friendly consumption behaviors mediated via environmental concern.

Environmental knowledge can be divided into two categories: subjective knowledge, which is based on individuals' feeling of knowing about the environment, and objective knowledge, which is about actual knowledge (Kim et al., 2018). The studies in environmental research often use confidence or agreement ratings that assess subjective self-report measures of ability or conflate subjective evaluations of environmental issues (Bamberg & Moser, 2007; Duerden and Witt, 2010; Milfont, 2012). However, many studies showed there were some difference influences in an individual's decision-making process between subjective and objective environmental knowledge due to different psychological processes and different behavior (Dunning & Helzer, 2014; Kim et al., 2018). Kim et al. (2018) explored the influences of subjective and objective environmental knowledge on affiliation with nature and pro-environmental behavior among tourists at Jeju Island, Korea and the results showed a positive

significant relationship between subjective and objective environmental knowledge and environmental behavior. Furthermore, the influence of subjective environmental knowledge on environmental behavior was much stronger than that of objective environmental knowledge. Hence, the following hypotheses are developed in this study regarding the influence of subjective and objective environmental knowledge of T&A industry:

H1: Consumers' environmental knowledge of T&A industry will have a significant influence on sustainable consumption intention for T&A products. Specifically,

H1a: Subjective environmental knowledge of T&A industry will positively influence sustainable consumption intention for T&A products.

H1b: Objective environmental knowledge of T&A industry will positively influence sustainable consumption intention for T&A products.

3.2. Personal environmental responsibility and ERB intention

Conner and Armitage (1998) defined moral norms as one's own socially determined and socially validated value attached to a particular behavior. Stets and Burke (2000) explained the sense of responsibility as the meanings and expectations from a set of identity standards after self-categorization. In short, a sense of responsibility is an awareness of the obligations of one's social role, which is perhaps a narrower form of moral norm (Ernst, Blood, & Beery, 2015). In the norm activation model developed by Schwartz (1977), a sense of responsibility was the moral quality and mental state of an individual for altruistic acts under the constraint of personal norms. When people are aware of the consequences of his/her potential actions for others or when people ascribe the responsivity to the self, moral norms (or sense of responsibility) will influence actual behavior (Schwartz,1968). Subsequently, Tucker (1978, p 392) further described environmental responsibility as "another manifestation of impersonal or indirect socially

responsible behavior". And this responsibility cannot be simplistically translated into consistent behavior, which depends on the social context as well as the organized environmentalism (Eden, 1993). Eden (1993) sought to identify the role of individuals in terms of environmental responsibility. She found business and government encouraged individual responsibility regarding the environment and promoted moral obligation in decision making at the individual level but also at the structure level. In addition, environmental responsibility was most significant when ascribing it to individuals (Eden, 1993).

Pro-environmental behavior belongs to a special kind of altruistic behavior (Hopper & Nielsen, 1991). Therefore, based on the norm activation model, pro-environmental behavior could be explained by environmental responsibility. In the field of environmental behavior, including environmental education, environmental sociology and consumer behavior, environmental responsibility is regarded as the most basic and important psychological variable when individuals participate in pro-environmental activities (Rodrigues & Domingos, 2008; Wu & Yang, 2018). In previous studies, the ascription of environmental responsibility is usually divided into individual, business and government. Personal environmental responsibility is defined as the personal expectation of an individual's obligation to improve the environment and to behave pro-environmentally (Lee & Ju, 2020). It has been demonstrated by empirical studies that personal environmental responsibility will motivate an individual's pro-environmental behavior in different domains (Lee & Ju, 2020; Paço & Gouveia Rodrigues, 2016; Shahrin et al. 2020). In terms of gender, compared with male, females show higher levels of personal environmental responsibility toward environmental protection (Paço & Gouveia Rodrigues, 2016). Stern (2000) claimed that the sense of personal responsibility was important in translating thoughts about abstract goals into more concrete and specific actions. For example, Jakucionyte-

Skodiene & Liobikiene (2021) found personal environmental responsibility significantly and positively influenced almost all actions related to climate change mitigation, which was in line with the finding of Bouman et al. (2020) that it was critical to enhance the sense of personal responsibility to reduce climate change. Meanwhile, other authors have found that personal responsibility has the positive but weak effect on energy conservation (Boto-García & Bucciol, 2020). Moreover, Fuentes (2014) also revealed although consumers tended to be guided by environmental responsibility, they may also avoid their personal responsibility by choosing to buy and own less instead of doing everything while living greener, which was consistent with the finding of Zheng et al. (2021) that customers' green buying behavior was not primarily influenced by personal environmental responsibility. These results could be explained as the impact of personal responsibility may depend not only on an awareness of the consequences of one's actions, but also on a sense of efficacy and ability (Harland, Staats, & Wilke, 1999).

Many studies suggested that there was a significant and positive relationship between personal environmental responsibility and pro-environmental behavior intention (Ernst, Blood, & Beery, 2015; Singh et al., 2021). Lee and Ju (2020), and Yue et al. (2020) pointed out that higher levels of personal environmental responsibility may predict stronger green consumption intention, such as willingness to pay and even pay more for green products. Similarly, Patwary, Omar, and Tahir (2021) found consumers' environmental responsibility influences significantly on tourists' intention to visit green hotels. Based on the above literature, the following hypothesis can be developed:

H2: Consumers' personal environmental responsibility will have a significant and positive influence on sustainable consumption intention for T&A products.

3.3. General environmental beliefs and ERB intention

In social psychology, belief is defined as the lasting organization of perceptions and cognitions of the personal world (Krech & Crutchfield, 1948). In most cases, beliefs, along with thought and attributes that are associated with an object, are classified by scholars as the cognitive component of attitudes which refers to dispassionate facts (Abun & Racoma, 2017; Amérigo et al., 2007). According to Ajzen and Fishbein's (2000) research, there were three different beliefs that could drive human behavior and they were those about the possible consequences of behavior (behavioral beliefs), about the normative expectations of others (immaterial beliefs), and about the existence of factors that may further motivate or hinder implementation (control beliefs). Environmental beliefs are a form of behavior beliefs, which are viewed as a system of attitudes and beliefs that decide people's environmental behavior (Gray & Weigel, 1985). The beliefs of people towards the relationship between nature and humans are not only influenced by time, but also by culture (Bechtel, 2006). These beliefs are highly important regarding to the environmental situations, which can guide and influence how people judge and solve the environmental issues as potential predictors of conservation behavior (Corral-Verdugo, Bechtel, & Fraijo-Sing, 2003; Scott & Willits, 1994; Thompson et al., 1990).

Granco et al. (2019) pointed out that, consistent with beliefs, environmental beliefs were divided into general environmental beliefs (e.g., environmental worldview) and specific environmental beliefs (e.g., concern about water shortages) (Stern, Dietz, & Guagnano, 1995). Moreover, researchers found that general environmental beliefs would have an impact on the development of specific environmental beliefs, and this effect (promotion or inhibition) depended on the content of the general environmental beliefs (ecologism or anthropologism) (Granco et al., 2022). Five scales, including the Ecology Scale, the Environmental Concern

Scale, the Dominant Social Paradigm (DSP), Human Exception Paradigm (HEP), and the New Ecological Paradigm (NEP) scale, are used to examine or express the environmental beliefs (Corral-Verdugo, Bechtel, & Fraijo-Sing, 2003; Hawcroft & Milfont, 2010). The new ecological paradigm (NEP) scale developed by Dunlap et al. (2000), including the original NEP Scale, the shortened 6-item NEP Scale, and the revised NEP Scale, is one of the most widely used reliable instrument to assess general environmental beliefs since its publication in 1978 (Aguilar-Luzón; 2020; Corral-Verdugo, Bechtel, & Fraijo-Sing, 2003; Hawcroft & Milfont, 2010; Lundmark, 2007). Hawcroft and Milfont (2010) argued that there was no consensus on the dimensionality of general environmental beliefs. However, two-dimensional general environmental beliefs (eco-centric and anthropocentric perspectives) are widely accepted and studied for the relationship between human and nature by many researchers (Aguilar-Luzón; 2020; Amérigo et al., 2007; Granco et al., 2019; López-Bonilla & López-Bonilla, 2016; Pierce & Lovrich, 1980; Poortinga, Steg, & Vlek, 2002).

Thompson and Barton (1994) proposed two motives or values (eco-centrism and anthropocentrism) in environmental conservation to guide the person-environment relationship and underlie support for environmental issues. Eco-centric environmental beliefs value nature itself, which are pure environmentalism and mainly expressed by NEP. In contrast, anthropocentric environmental beliefs emphasize the materials or physical benefits that the natural environment brings to human beings, which are pure materialism and mainly under the guidance of HEP (Corral-Verdugo, Bechtel & Fraijo-Sing, 2003; Yu & Yu, 2017). Both eco-centric and anthropocentric individuals show positive attitudes toward environmental issues, however, their motives for supporting conservation are different. Eco-centric individuals value nature because of its own intrinsic value. While anthropocentric individuals protect the

environment because of its value in maintaining or enhancing the quality of life for humans (Thompson & Barton, 1994). Therefore, anthropocentric individuals will be less likely to act to protect the environment if their human-centered values (e.g., material quality of life) are damaged (Thompson & Barton, 1994).

According to relevant theories of environmental behaviors, environmental belief is a critical factor influencing green behaviors (Yu & Yu, 2017). Much of the previous environmental research show that the relationship between general environmental beliefs and environmental behavior may be direct (Gadenne et al., 2011; Scott & Willits, 1994) or indirect (Granco et al., 2022; Pickett-Baker & Ozaki, 2008; Ozaki, 2011; Steg, 2016). Li et al. (2021) indicated that environmental beliefs might positively influence pro-environmental behavioral intention. Similarly, Schultz et al. (2004) also asserted that an individual's intention to adopt pro-environmental behaviors would be inspired by their environmental beliefs in future work and life. In particular, Pickett-Baker and Ozaki (2008) found pro-environmental beliefs have a significantly positive influence on environmental oriented purchasing behavior. Furthermore, the literature suggested that, either eco-centric individuals or anthropocentric individuals might present positive attitudes towards the environment and its problems (Simsar, Doğan, & Sezer, 2021). Compared with anthropocentric individuals, people with eco-centric environmental beliefs are much more likely to protect the environment. And in different daily-life situations, the stronger eco-centric environmental beliefs, the higher the tendency to care for nature. This relationship is the opposite of anthropocentric environmental beliefs (Aguilar-Luzón; 2020; Amérigo et al., 2007; Kopnina, 2013; Thompson & Barton, 1994). However, such relations in the scale of anthropocentrism were not seen in a student sample (Amérigo et al., 2007). And the blue-collar are less eco-centric than the environmentalist and the white-collar (Hawcroft &

Milfont, 2010). Moreover, it is found that people in rural areas have stronger eco-centric environmental beliefs, which contributes to a higher ecological tendency and sensitivity than those with a permanent residence in urban areas (Ntanos et al., 2019). In light of these arguments, we propose:

H3: Consumers' general environmental beliefs will have a significant influence on sustainable consumption intention for T&A products. Specifically,

H3a: Eco-centric environmental beliefs will positively influence sustainable consumption intention for T&A products.

H3b: Anthropocentric environmental beliefs will positively influence sustainable consumption intention for T&A products.

3.4. Environmental locus of control and ERB intention

Based on the temporality, there are three types of conceptions which are associated with an individual's perceptions of personal control, including attributions (Bradley & Sparks, 2002), self-efficacy (Bandura, 1997), and locus of control (Rotter, 1966). Different from attribution, which is the assignment of causality to past events, the latter two concepts are future-oriented (Cleveland, Kalamas, & Laroche, 2012). However, self-efficacy refers to expectations of control about behavioral outcome, while locus of control refers to actual control beliefs about outcomes (Bradley & Sparks, 2002). To be worthy of attention, Ajzen (2002) introduced a concept, perceived behavior control, which consists of self-efficacy (the ease or difficulty of performing a behavior) and controllability (beliefs about the extent to which performance is up to the actor). Locus of control is similar to controllability, but the former emphasizes the control location (external or internal) while the latter highlights the control extent. Locus of control was initially developed and defined by Rotter (1966) as an individual's perception of whether the outcome of

an event is under or out of one's control. This concept is divided into the internal locus of control (believing that people can affect outcomes through their own actions) and external locus of control (believing that events happened due to external forces and therefore beyond individual's own control) (Bradley & Sparks, 2002), which has been widely used to explain individual's behavior or intentions in different contexts including work-related performances, such as work-life balance (Karkoulian, Srour, & Sinan, 2016), physical and mental health-related outcomes, such as body image concern of patients with incisional hernias (Hiatt et al., 2009), physical activity and moon of patients with Parkinson disease (Annesi, 2018), and consumer-related activities, such as the adoption of games (Koo, 2009) or the acceptance of regulations (Hoffman, Novak, & Schlosser, 2003).

Since the 1970s, the concept of locus of control has been applied in the context of environment (Kim, Reid, & Rickinson, 2022). Following the notion of locus of control, Cleveland, Kalamas, and Laroche (2005) conceptualized environmental locus of control (ELCO) as the belief that whether the environmental outcomes caused by self (internal) or others (external). In previous environmental studies, ELCO is identified as the most enduring and predictive construct for regulating pro-environmental actions, which can provide rich information to explain the discrepancy of consumers' environmental behavior or intention (Bamberg & Moser, 2007; Bradley & Sparks, 2002; Coşkun & Yetkin Özbük, 2019; Hines, Hungerford, & Tomera, 1986/1987; Hwang, Kim, & Jeng, 2000; Pratiwi & Pratomo, 2018; Trivedi, Patel, & Savalia, 2015). However, the predictive power of general measures of locus of control is often restricted when utilized in specific context and behavior (Bradley & Sparks, 2002; Cleveland, Kalamas, & Laroche, 2012; Yang & Weber, 2019). Levenson (1974) introduced multidimensional conceptualization into the locus of control construct and refined the

internal-external locus of control perspective proposed by Rotter (1966) to three distinct dimensions, including internal, powerful others, and chance, to predict an individual's behavioral intention (Levenson, 1974). Guagnano (1995) adopted Levenson's three-dimensional conceptual of locus of control to examine environmental behavioral intention, and the results showed internal locus of control significantly increased an individual's environmental protection intention in an indirect way. While the belief in powerful others leads to direct and positive impact on personal economic costs, its effect on behavioral intention is non-significant. In contrast, the belief in chance had a direct and negative influence on environmental intention. Subsequently, Cleveland, Kalamas, and Laroche (2005) developed ELOC scale into four sub-dimensions, including two sub-dimensions of internal locus of control (economic motivation and individual recycling efforts) and two sub-dimensions of external locus of control (biospheric-altruism and corporate skepticism). And the authors found economic motivation was the major determinant to affect EPB by examining the four ELOC dimensions to a variety of pro-environmental behaviors (Cleveland, Kalamas, & Laroche, 2005). Recently, ELOC has been extended to eight sub-dimensions, including four sub-dimensions of internal ELOC (green consumer, activist, advocate, and recycler) (Cleveland, Kalamas, & Laroche, 2012) and four sub-dimensions of external ELOC (governmental responsibility, corporate responsibility, high power, and natural earth-cycles) (Kalamas, Cleveland, & Laroche, 2014). In the eight sub-dimensions construct, the internal ELOC components suggest that people believe in the significant impact of their own functions as green consumer, activist, advocate, and recycler, while the external ELOC components indicate people believe in the impact of other institutions (Yang & Weber, 2019).

To date, in the environmental behavioral context, the viewpoint that "... consumers, driven by egoistic and altruistic motives, will feel more or less powerful to act in a pro-

environmental fashion and will thus internalize/externalize their share of responsibility, holding themselves and others more or less accountable" is widely adopted in current research (Cleveland, Kalamas, & Laroche, 2005, p. 200). In other words, both internal and external dispositions will coexist within consumers when they are facing environmental issues (Cleveland, Kalamas, & Laroche, 2005). However, individuals do not consistently behave in a pro-environmental manner (Yang & Weber, 2019). Specifically, people with internal ELOC should be motivated to intervene or do something pro-environmental because of attribution of self-responsibility and confidence in own ability (Cleveland, Kalamas, & Laroche, 2012; Pratiwi & Pratomo, 2018), while people with external ELOC should be little motivated to join in the same due to the feelings of hopelessness and helplessness (Kalamas, Cleveland, & Laroche, 2014; Kim, Reid, & Rickinson, 2022; Trivedi, Patel, & Savalia, 2015). It is consistent with the Hines, Hungerford, and Tomera' (1986/1987), and Giefer, Peterson, and Chen' (2019) results that "individuals who have an internal locus of control were more likely to have reported engaging in ERB than were individuals exhibiting a more external locus of control" (p. 5).

To date, most research focuses on the role played by an individual's internal ELOC, whereas scarce attention is paid to an individual's external facets of ELOC (Kalamas, Cleveland, & Laroche, 2014). As expected, the significant positive effects of internal ELOC on pro-environmental behavior or intention in different fields and situations are supported in most previous studies (Bradley & Sparks, 2002; Cleveland, Kalamas, & Laroche, 2012; Fielding & Head, 2012; Hwang, J. & Choi, 2021; McCarty & Shrum, 2001; Patel, Trivedi, & Yagnik, 2020; Priadi et al., 2018; Yang & Weber, 2019). Patel, Trivedi, and Yagnik (2020) revealed that there was a significant and positive relationship between consumers' tendency to self-identity and internal ELOC and green purchase behavior across collectivist and individualistic culture. In

addition, higher internal ELOC predisposition is found for males (Fiori et al., 2006; Hawthorne & Alabaster, 1999) and more external ELOC tendency is found for females (Kalamas, Cleveland, & Laroche, 2014). Meanwhile, Hawthorne and Alabaster (1999) argued that young and middle-class people had more internal locus of control. However, the direction of effects of external ELOC is controversial (Yang & Weber, 2019). For example, regarding the relationship between external ELOC and engagement of pro-environmental action, Fielding and Head (2012) found a stronger belief that it was the government's responsibility to protect the environment negatively influenced pro-environmental intention or behavior and positively impacted environmentally harmful intention or behavior. In contrast, Kalamas, Cleveland, and Laroche (2014) rejected this negative impact of external ELOC and suggested a different pattern of the impact of external ELOC. Specifically, they refined external ELOC into external ELOC-Powerful Others (beliefs in ascribing responsibility to government/corporation) and external ELOC-Chance/Fate (beliefs in ascribing responsibility to high powers/natural earth-cycle). And the results showed that external ELOC-Powerful Others was mostly positively related to pro-environmental behavior and external ELOC-Chance/Fate was mostly negatively associated with pro-environmental behavior. Kalamas, Cleveland, and Laroche (2014) pointed out people with high assessment of government/corporation power were also more likely to act environment-friendly even if they were in highly centralized countries. For the discrepancy from most earlier studies, Cleveland, Kalamas, and Laroche (2012) explained some externals regarded the efforts of government/corporation as additional budget, so they were willing to share environmental responsibility with powerful others. In addition, some consumers with high external ELOC-Powerful Others thought their efforts would only matter if supported by the pro-environmental actions of powerful others (Berger & Corbin, 1992). Newhouse (1990) also argued the inhibitory

effect of external LOC on pro-environmental behavior may be overcome by other cognitive factors, such as perceived social norms or moral obligations. Hence, the following hypotheses are developed regarding the relationship between ELOC and sustainable consumption intention:

H4: Consumers' environmental locus of control will have a significant influence on sustainable consumption intention for T&A products. Specifically,

H4a: Internal environmental locus of control will positively influence sustainable consumption intention for T&A products.

H4b: External environmental locus of control will positively influence sustainable consumption intention for T&A products.

CHAPTER 3: METHODOLOGY

The methodology is separated into four sections. The purposes of this research, followed by research design including research arrangement and questionnaire design, are illustrated in detail in the first three sections. A two-stage PLA-SEM analysis method used in this research are introduced in the last section of this chapter.

1.Research Proposed Model

This study aims to investigate the influence of consumers' both forms of domain-specific environmental knowledge and three relevant personality traits (i.e., personal environmental responsibility, two-dimension general environmental beliefs, and two-dimension environmental locus of control) on their sustainable consumption intention for textile and apparel (T&A) products. Figure 3.1 depicts the relationships as proposed in the hypotheses.

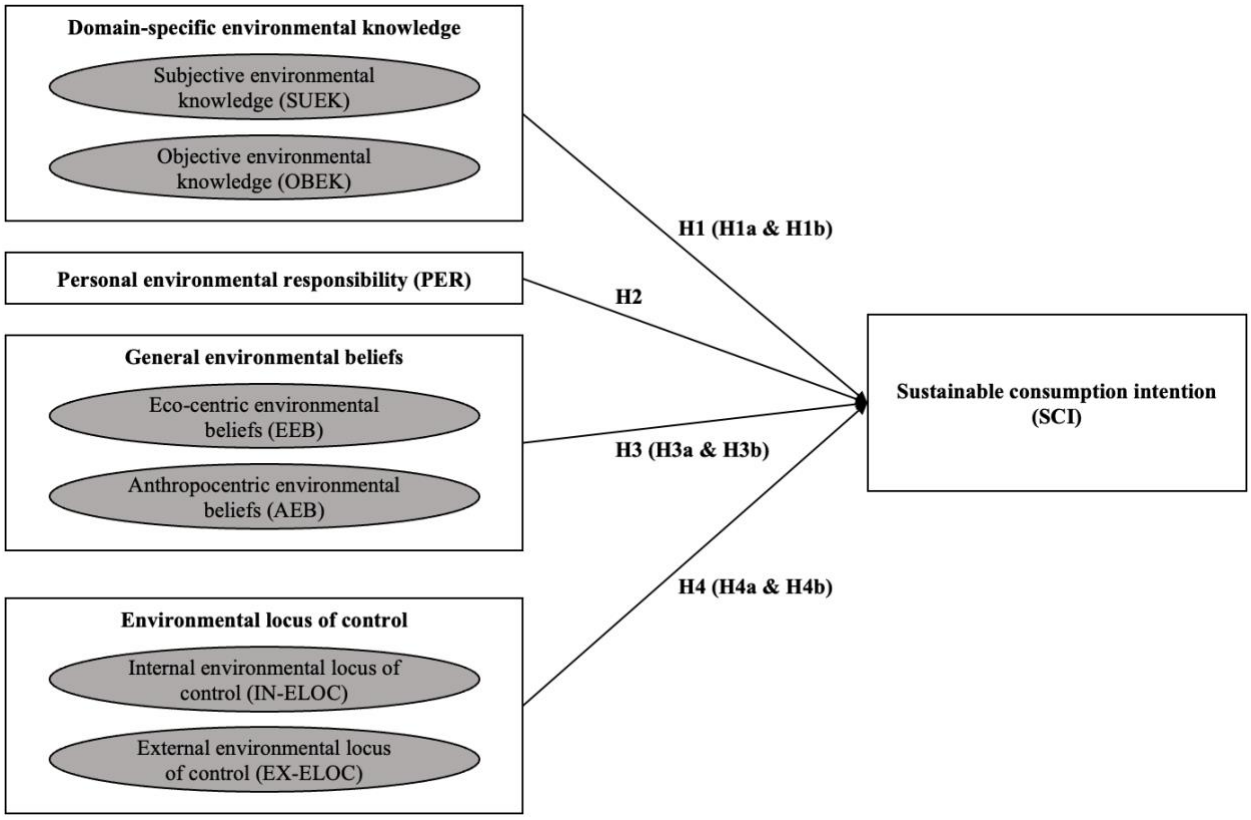

Figure 3.1. Research Proposed Model

2. Research Design

An online survey was used to collect quantitative data to test the proposed model built upon the literature review. A survey (Appendix A) was conducted with IRB approval (Appendix B) obtained through North Carolina State University prior to survey distribution. Qualtrics, an online survey software and questionnaire tool, was used to create the online survey. Then a web-link to the questionnaire was provided to prospective respondents using Qualtrics. The survey includes total 53 questions in five sections. The duration for completing the survey is estimated to total approximately 15 min. Qualtrics automatically records responses for data analysis. Data collection took place over a three-week period from 01/02/2023 to 22/02/2023. The target population of this study was college students at NC State University aged 18 years old or older. This sampling frame was selected because they represent the emerging segment that will dominate buying behavior in the future; they are likely to have been exposed to sustainability initiatives in the NCSU environment based on the University Mission; and they tend to be more homogenous than non-students based on their lifestyles and life stages. Homogenous samples are useful in behavioral research for reducing measurement error due to extraneous factors associated with subject heterogeneity (age, education level, income etc.). The goal is to obtain a total of 200 completed questionnaires.

3. Survey Instrument

Established scales was adopted outright or adapted to the context of study to measure the following variables: domain-specific environmental knowledge (i.e., subjective environmental knowledge, objective environmental knowledge), personal environmental responsibility, general environmental beliefs (i.e., eco-centric environmental beliefs, anthropocentric environmental beliefs), and environmental locus of control (i.e., internal environmental locus of control,

external environmental locus of control), and sustainable consumption intention for T&A products. All items are measured using a seven-point Likert scale ranging from one (strongly disagree) to seven (strongly agree). Basic demographic information of consumers will be also collected. The measures used to assess the key constructs are as follows:

3.1. Domain-specific environmental knowledge measurement

Domain-specific environmental knowledge refers to consumers' possession of specific environmental sustainability related information about the T&A products and is classified into subjective environmental knowledge and objective environmental knowledge in this study. This study adopts a revised measure on consumer subjective and objective environmental knowledge of sustainable apparel, which is developed by Li (2021). This measurement scale consists of three items for subjective environmental knowledge (Seen Table 3.1) and fourteen items for objective environmental knowledge (Seen Table 3.2). Sample questions for subjective environmental knowledge from this scale are as follows: "I am familiar with sustainable materials used in textile and apparel products", "I am familiar with the environmental issues (i.e., water) in the textile and apparel industry", and "I am familiar with how to extend the life of textile and apparel products". By contrast, the questions for objective environmental knowledge represent nine different dimensions, including water consumption (item 1, 2, 3), water pollution (item 4, 5, 6), carbon footprint (item 7), waste (item 8, 9), consumers (item 10), materials (item 11), products (item 12), commitment (item 13), and certification (item 14).

Table 3.1. Subjective Environmental Knowledge Measurement

Subjective Environmental Knowledge (Li, 2021)	SUEK1. I am familiar with sustainable materials used in textile and apparel products.
	SUEK2. I am familiar with the environmental issues (i.e., water) in the textile and apparel industry.
	SUEK 3. I am familiar with how to extend the life of textile and apparel products.

Table 3.2. Objective Environmental Knowledge Measurement

Objective Environmental Knowledge (Li, 2021)	OBEK1. Production and processing of natural fibers such as cotton does not consume large quantities of water. (False)
	OBEK2. Dyeing and finishing processes use a lot of water.
	OBEK3. There are water-saving and chemical-saving technologies in the textile and apparel industry, such as form dyeing.
	OBEK4. The textile and apparel industry is one of the major polluting industries in the world.
	OBEK5. Chemical pollutants are not produced during cultivation of natural fibers such as cotton. (False)
	OBEK6. Microfiber pollution is related to the textile and apparel industry.
	OBEK7. The textile and apparel industry is a large contributor to greenhouse gas emission.
	OBEK8. Natural fibers can decompose in landfills, so that sending natural fibers into landfills will not be harmful to the environment. (False)

Table 3.2. (Continued)

Objective Environmental Knowledge (Li, 2021)	OBEK9. With the help of companies' take-back programs, global annual textile and apparel waste is decreasing. (False)
	OBEK10. Consumers do not contribute to the environmental issues associated with the textile and apparel industry. (False)
	OBEK11. BCI cotton, organic cotton, and recycled cotton are three kinds of sustainable cotton.
	OBEK12. Only the production of fast fashion products will cause environmental issues. (False)
	OBEK13. Some companies in the textile and apparel industry have made commitment to be more sustainable.
	OBEK14. There are certifications in the textile and apparel industry to ensure products' environmental sustainability.

Note: The false item will be reverse scored.

3.2. Personal environmental responsibility measurement

Personal environmental responsibility is the personal expectation of whether an individual's behavior is desirable, guiding consumers to act pro-environmentally. Personal environmental responsibility is measured using five items from Manzo and Weinstein (1987) (Seen Table 3.3).

Table 3.3. Personal Environmental Responsibility Measurement

Personal Environmental Responsibility (Manzo & Weinstein, 1987)	PER1. I should be responsible for protecting our environment.
	PER2. Environmental protection starts with me.
	PER3. I have taken responsibility for environmental protection since I was young.
	PER4. Environmental protection is the responsibility of my government, not me.
	PER5. Environmental protection is the responsibility of the environmental organizations, not me.

Note: Item PER4 and item PER5 will be reverse scored.

3.3. General environmental beliefs measurement

General environmental beliefs are attitudes and beliefs concerning the human-environment and how they affect people's environmental behaviors in two roles: eco-centric environmental beliefs (nature-centered) and anthropocentric environmental beliefs (human-centered) in this study. Eco-centric environmental beliefs are measured using a total of five items from New Ecological Paradigm (NEP) scale (Dunlap et al., 2000) (Seen Table 3.4). The questions for eco-centric environmental beliefs represent four different dimensions, including the reality of limits to growth (item 1), the fragility of nature's balance (item 2), rejection of exemptionalism (item 3), and the possibility of an eco-crisis (item 4, 5). While anthropocentric environmental beliefs are measured using Human Exemptionalism Paradigm (HEP) scale (Dunlap et al., 2000) (Seen Table 3.5).

Table 3.4. Eco-centric Environmental Beliefs Measurement

Eco-centric Environmental Beliefs (Dunlap et al., 2000)	EEB1. The earth is like a spaceship with very limited room and resources.
	EEB2. The balance of nature is very delicate and easily upset.
	EEB3. Despite our special abilities humans are still subject to the laws of nature.
	EEB4. Humans are severely abusing the environment.
	EEB5. If things continue on their present course, we will soon experience a major ecological catastrophe.

Table 3.5. Anthropocentric Environmental Beliefs Measurement

Anthropocentric Environmental Beliefs (Dunlap et al., 2000)	AEB1. Humans have the right to modify the natural environment to suit their needs.
	AEB2. Plants and animals have as much right as humans to exist.
	AEB3. Humans were meant to rule over the rest of nature.

Note: Item AEB2 will be reverse scored.

3.4. Environmental locus of control measurement

Environmental locus of control is expressed as an evaluation of an individual's ability to influence environmental outcomes through actions and is divided into internal environmental locus of control (believe that life is controlled by oneself) and external environmental locus of control (believe that life is controlled by outside forces) in this study. A total of four items from Cleveland, Kalamas, and Laroche (2012) are adopted to measure internal environmental locus of control (Seen Table 3.6). The questions for internal environmental locus of control represent four different dimensions, including the green consumer (item 1), the activist (item 2), the advocate (item 3), and the recycler (item 4). External environmental locus of control is measured by four

items from Kalamas, Cleveland, and Laroche (2014) (Seen Table 3.7). The questions for external environmental locus of control include four different dimensions. They are the government responsibility (item 1), the corporate responsibility (item 2), the God/higher powers (item 3), and the natural earth-cycles (item 4).

Table 3.6. Internal Environmental Locus of Control Measurement

Internal Environmental Locus of Control (Cleveland, Kalamas, & Laroche, 2012)	IN-ELOC1. By buying greener products, I can make a difference in helping the environment.
	IN-ELOC2. By making donations to pro-environmental groups (such as Greenpeace), I can help make a positive difference on the state of environment.
	IN-ELOC3. I am able to convince a friend to change his/her conservation habits.
	IN-ELOC4. By recycling, I am helping to reduce pollution.

Table 3.7. External Environmental Locus of Control Measurement

External Environmental Locus of Control (Kalamas, Cleveland, & Laroche, 2014)	EX-ELOC1. Governments have the power to deal with local environmental challenges (such as air quality in cities).
	EX-ELOC2. Companies need to take the lead in promoting environmental responsibility.
	EX-ELOC3. The state of environment is ultimately under control of higher powers.
	EX-ELOC4. Some of the global climate changes we are witnessing are due, in part, to earth's normal cycles.

3.5. Sustainable consumption intention measurement

Sustainable consumption intention refers to minimizing the negative environmental effects throughout the lifecycle of T&A products in this study. It is measured by nine items adopted from Soyer and Dittrich (2021) (Seen Table 3.8) including three different dimensions: sustainable purchasing (item 1, 2, 3), sustainable using (item 4, 5, 6), and sustainable disposal (item 7, 8, 9).

Table 3.8. Sustainable Consumption Intention Measurement

Sustainable Consumption Intention (Soyer & Dittrich, 2021)	SCI1. I will refuse buying clothes that are harmful to the environment.
	SCI2. I am willing to buy second-hand clothes.
	SCI3. I intend to buy quality clothes because they last longer.
	SCI4. I will wash garments carefully to extend the lifetime of it.
	SCI5. I am willing to repair small defects in garments myself.
	SCI6. When a garment is damaged, I intend to use it for a different purpose (cleaning cloth for instance).
	SCI7. I intend to give clothes away to friends or family.
	SCI8. I intend to donate garments in recycling bins (purpose is recycling).
	SCI9. Before discarding clothes, I intend to remove items such as labels, buttons and zippers with the intention to use these again.

4. Data Analysis

Prior to the analysis, the data were thoroughly screened for completeness and suitability. Incomplete surveys and surveys completed in an obviously careless manner were removed from the dataset. Descriptive analysis (i.e., frequencies) was conducted to describe respondents'

characteristics and background information regarding their shopping criteria. Next, a two-stage Partial Least Squares Structural Equation Modelling (PLS-SEM) approach was used to analyze the measurement model and the structural relationships among constructs (Anderson & Gerbing, 1988).

In recent years, the number of published articles using PLS-SEM has increased significantly compared with covariance-based structural equation modeling (CB-SEM) which has been the dominant method for assessing the relationship between latent constructs (factors) for many years (Hair et al., 2019). Because the PLS-SEM approach "enables researchers to estimate complex models with many constructs, indicator variables and structural paths without imposing distributional assumptions on the data (Hair et al., 2019, p3)", it is increasingly appealing to researchers in many social science domains including: air transport management (Farooq et al., 2018), international management (Richter et al., 2015), human resource management (Ringle et al., 2019), information systems management (Ringle et al., 2012), marketing management (Alonso-Garcia, 2023), supply chain management (Khan & Ponce, 2022), strategic management (Hair et al., 2012), and accounting (Nitzl, 2016). In addition, the PLS-SEM approach is preferred when research is exploratory in situations whereby the central aim extends existing theory into new contexts (Hair et al., 2019). Though the conceptual model includes several established constructs with existing measurements (i.e., responsibility, locus of control), both forms of environmental knowledge as well as both environmental belief constructs lack established measurement precedents in the literature. Perhaps most importantly, the overall context of sustainable consumption is an evolving phenomenon that is neither understood by consumers nor additional stakeholders. The highly contextual nature of the research focus and

the corresponding developmental nature of measurements justify use of the PLS-SEM approach to test the focal hypotheses.

The PLS-SEM approach began with the assessment of measurement model (i.e., referred to as the "outer model"). The outer model assessment included examination of construct reliability and validity. Hair et al. (2019) recommend indicator loadings > .708 as an acceptable threshold for item reliability. In order to assess internal consistency, composite reliability (C.R.) as well as Cronbach's alpha (α) were considered. Hair et. al. (2022) suggest that composite reliability values > .700 indicate sufficient internal consistency. Cronbach's alpha is a widely accepted approach to evaluating internal consistency, whereby an alpha coefficient > .700 is deemed acceptable (Cronbach, 1951). Measurement validity is evaluated from convergent and discriminant perspectives. Convergent validity refers to the extent to which the construct converges to explain the variance of its items (Hair et a., 2022). Within a PLS model, average variance extracted (AVE) associated with each construct is used to examine convergent validity. Hair et al. (2022) recommend AVE values > .500 as the threshold for convergent validity (Hair et al., 2022). Discriminant validity refers to the extent in which the model's constructs vary from one another, which is typically assessed using the Fornell-Larcker criterion. The Fornell-Larcker criterion compares the AVE square root value with the construct correlation value, indicating the highest value in any column or row compared to the highest correlation value of any other construct (Fornell & Larcker, 1981; Hair et al., 2022). Discriminant validity is considered to be present when the square root of each construct's AVE value is greater than the correlations value of other latent constructs (Fornell & Larcker, 1981; Hair et al., 2022). The heterotrait-monotrait (HTMT) ratio of the correlations, developed by Henseler et al. (2015), is a second measure of discriminant validity. As a rule of thumb, HTMT values > .85 indicate a potential lack of

discriminant validity (Hair et al., 2022). Variance inflation factors (VIF) were examined to identify collinearity prior to measuring the hypotheses. Hair et al. (2019) recommends that VIF values greater than three indicate potential presence of collinearity (Hair et al., 2019). Finally, throughout the PLS procedure paths with poor fit are removed and the model is refit and evaluated until an acceptable model is achieved.

Following assessment of the outer model, assessment of structural model (inner model) was undertaken. Again, following the recommendation of Hair et al. (2019) the structural model was evaluated using the R-squared value to examine overall explanatory power, Q-squared to examine predictive relevance and path coefficients (i.e., β value) to determine statistical significance.

Rigdon (2012) describes R-squared as in-sample predictive power. Higher R-square values indicate greater explanatory power. As a rule of thumb, R-squared values > .75, .50 and .25 are considered to reflect substantial, moderate and weak levels of explanatory power respectively (Henseler et al., 2009; Hair et al., 2011). Q-squared is a measure of predictive accuracy of structural model (Geisser, 1974; Stone, 1974), which provides additional evidence to support the structural model. Q-squared is also referred to as combination of out-of-sample prediction and in-sample explanatory power (Shmueli et al., 2016; Sarstedt et al., 2017). Higher Q-squared values indicate a higher predictive accuracy. As a rule of thumb, Q-squared values greater than zero indicate predictive accuracy of the structural model. Hair et al. (2019) suggested that Q-squared values > 0, .25 and .50 imply small, medium and large predictive model accuracy, respectively.

CHAPTER 4: RESULTS AND DISCUSSION

The first section of this chapter provides the sample description. The results regarding the assessment of measurement model, including reliability and validity analyses, are reported in the second section. The third section reports the final structural model testing results, and a summary of the hypothesis tests. The final section of this chapter presents a discussion of the observed PLS-SEM model including an initial interpretation of findings compared to existing literature.

1. Sample Description

A total of 2,500 potential subjects were contacted via email. A total of 308 surveys were returned, of which 96 responses were eliminated from the dataset. Ninety responses were eliminated due to excessive missing values associated with key constructs, while the remaining six responses were removed due to common response bias (i.e., respondents selected the same choice for every question). The final sample size included 212 completed surveys which were retained for the data analysis.

The demographic characteristics are summarized in Table 4.1 and Table 4.2. Among the final sample (N = 212), there were 123 female respondents (58.02%), 83 male respondents (39.15%), and six additional gender descriptions (2.83%). Sample ages ranged from 18 to 47 years old (M = 23.50; SD = 4.76). In terms of college representation, the top four colleges in the sample include: The College of Engineering (N = 56, Percentage = 26.42%), Wilson College of Textiles (N = 43, Percentage = 20. 28%), College of Humanities and Social Sciences (N = 22, Percentage = 10.38%), and College of Sciences (N = 22, Percentage = 10.38%). Ethnic background information revealed that, more than half of the respondents were white, followed by 37.74 percent Asian. The remaining respondents were Black or African American, or Mixed Race. Regarding the area of residence, close to half of the respondents lived in semi-urban, while

just over 40 percent reported urban locations while fewer (9.9%) reported that they lived in rural areas.

Table 4.1. Sample Characteristics

Demographic Variable		**Count (N)**	**Percentage (%)**
Gender	Female	123	58.02
	Male	83	39.15
	Other	6	2.83
Age	18	14	6.60
	19	27	12.74
	20	29	13.68
	21	17	8.02
	22	19	8.96
	23	15	7.08
	24	17	8.02
	25	16	7.55
	Over 25	58	27.36
College	College of Agriculture and Life Sciences	16	7.55
	College of Design	5	2.36
	College of Education	12	5.66
	College of Engineering	56	26.42
	College of Humanities and Social Sciences	22	10.38
	College of Natural Resources	6	2.83
	Poole College of Management	12	5.66
	College of Sciences	22	10.38
	Wilson College of Textiles	43	20.28
	College of Veterinary Medicine	2	0.94
	Other	16	7.55
Ethnicity	American Indian or Alaska Native	0	0.00
	Asian	80	37.74
	Black or African American	4	1.89
	Native Hawaiian or Other Pacific Islander	0	0.00
	White	117	55.19

Table 4.1. (Continued)

Demographic Variable		Count (N)	Percentage (%)
	Other	11	5.19
Area of Residence	Urban	87	41.04
	Semi-urban	104	49.06
	Rural	21	9.91
Total		212	100

Table 4.2. Sample Characteristics - Age Distribution

	Mean	Min	Max	Standard Deviation
Age	23.50	18	47	4.76

In addition to demographic characteristics, respondents were asked to indicate which attributes they consider as important when they purchase textile and apparel (T&A) products (Figure 4.1). Based on the responses, high quality (N = 59, 27.83%), stylish (N = 56, 26.42%), and low cost (N = 52, 24.06%) represent the top three general criteria respondents consider when purchasing T&A products. Additional attributes for T&A product choices noted among respondents included: easy to care/maintenance (N = 23, 10.85%), preferred brand (N = 12, 5.66%), eco-friendly (N = 7, 3.30%), and easy to purchase (N = 4, 1.89%).

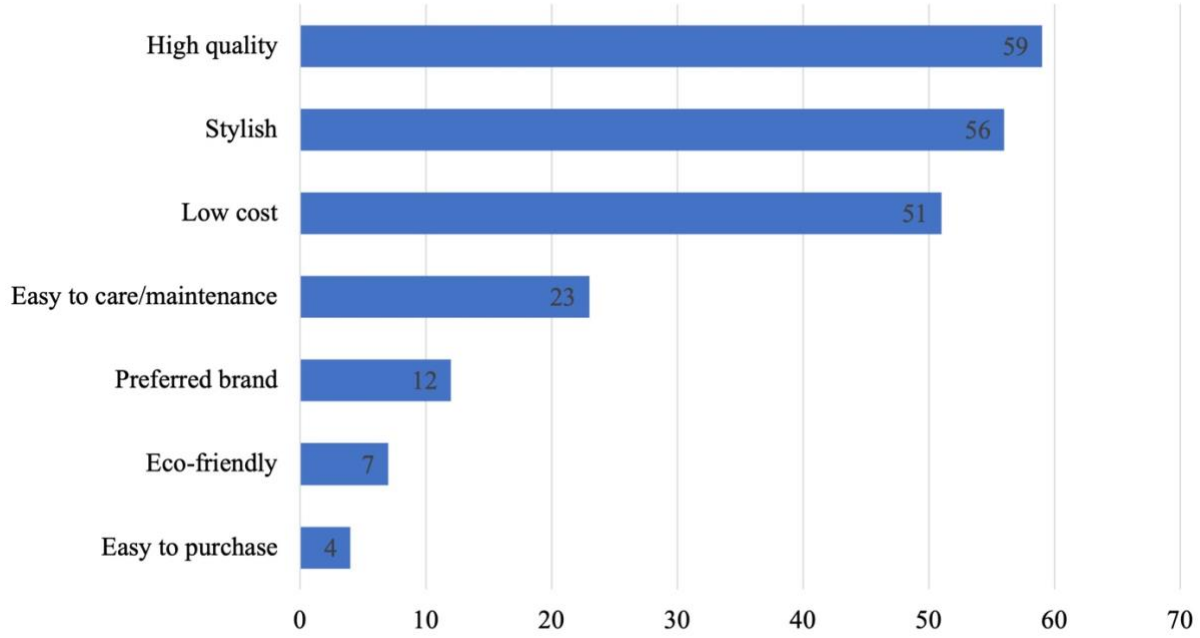

Figure 4.1. Respondents' Purchasing Criteria for T&A Products

2. Assessment of the Measurement Model

Consistent with previous research using PLS-SEM, all constructs including subjective environmental knowledge (SUEK), objective environmental knowledge (OBEK), personal environmental responsibility (PER), eco-centric environmental beliefs (EEB), anthropocentric environmental knowledge (AEB), internal environmental locus of control (IN-ELOC), and external environmental locus of control (EX-ELOC), sustainable consumption intention (SCI), were assessed for their factor structure, reliability, convergent validity, and discriminant validity in order to evaluate the measurement model. Based on the guidelines of Hair et al. (2019), indicator loadings were examined and measurement item with loadings < .708 were removed from the model. Subsequently, reliability and validity analyses were performed. Results revealed that, all constructs except Anthropocentric Environmental Beliefs (AEB) reflected acceptable composite reliability (C.R.) value and Cronbach's alpha (α) value. The measure for AEB, which is a relatively new concept which lacks documented measurement in past research, was removed

from the analysis based on the results of reliability test (Cronbach's α_{AEB} = .522 < .700, C. R.$_{AEB}$ = .530 < .700). Average variance extracted (AVE) value of all remaining constructs exceeded the minimum criterion (> .50). The results demonstrated that the measurement model was internally consistent, indicating convergent validity for each latent variable. Complete results for evaluating reliability and convergent validity for the constructs are presented in Table 4.3.

Table 4.3. Reliability and Convergent Validity of Constructs

Constructs	Items	Factor Loadings λ	Cronbach's α	C. R.	AVE
SUEK	SUEK1	.912	.834	.900	.751
	SUEK2	.854			
	SUEK3	.831			
OBEK	OBEK4	.836	.823	.892	.734
	OBEK6	.831			
	OBEK7	.902			
PER	PER1	.842	.723	.842	.640
	PER2	.800			
	PER3	.756			
EEB	EEB3	.718	.797	.881	.714
	EEB4	.901			
	EEB5	.902			
IN-ELOC	IN-ELOC1	.814	.740	.845	.645
	IN-ELOC2	.779			
	IN-ELOC3	.816			
EX-ELOC	EX-ELOC1	.908	.794	.907	.829
	EX-ELOC2	.913			
SCI	SCI4	.752	.745	.846	.648
	SCI5	.854			
	SCI6	.805			

In addition, the Fornell-Larcker criterion was used to evaluate the discriminant validity, which is presented in Table 4.4. Bold values in Table 4.4 demonstrate that the observed square

root of AVE for all constructs are greater than the squared correlations (R^2), implying acceptable discriminant validity for the proposed measurement model.

Table 4.4. Discriminant Validity (Fornell-Larcker Criterion)

	SUEK	OBEK	PER	EEB	IN-ELOC	EX-ELOC	SCI
SUEK	**.867**						
OBEK	.316	**.857**					
PER	.328	.269	**.800**				
EEB	.208	.381	.339	**.845**			
IN-ELOC	.267	.238	.575	.342	**.803**		
EX-EXOC	.201	.238	.249	.619	.254	**.911**	
SCI	.363	.233	.429	.425	.352	.354	**.805**

Note: Values in the bold are square root of AVE. The squared correlations (R^2) for constructs appear on the off-diagonal.

Moreover, HTMT ratio of correlations was also examined, and the results showed all HTMT values exceeded the threshold (observed values, < 0.85), which indicates further support for discriminant validity (Table 4.5). Overall, these results meet the recommended criteria for establishing the reliability and validity of the measurement model. Further, VIF metrics did not indicate evidence of collinearity in the model (Table 4.6).

Table 4.5. Discriminant Validity (HTMT Ratio)

	SUEK	OBEK	PER	EEB	IN-ELOC	EX-ELOC	SCI
SUEK							
OBEK	.434						
PER	.420	.355					
EEB	.248	.457	.441				
IN-ELOC	.305	.292	.803	.469			
EX-EXOC	.244	.281	.313	.767	.337		
SCI	.459	.284	.574	.542	.448	.455	

Table 4.6. Collinearity Diagnostics

Constructs	Items	VIF
SUEK	SUEK1	2.629
	SUEK2	1.927
	SUEK3	1.853
OBEK	OBEK4	2.234
	OBEK6	1.532
	OBEK7	2.343
PER	PER1	1.992
	PER2	1.950
	PER3	1.172
EEB	EEB3	1.360
	EEB4	2.428
	EEB5	2.311
IN-ELOC	IN-ELOC1	1.850
	IN-ELOC2	1.890
	IN-ELOC3	1.234
EX-ELOC	EX-ELOC1	1.768
	EX-ELOC2	1.768
SCI	SCI4	1.370
	SCI5	1.541
	SCI6	1.443

3. Final Structural Model Analysis and Hypothesis Test

Following evaluation of the measurement model, the final structural model was generated and assessed. The results indicate that the model's proposed predictors account for 32.4 percent of the variance associated with the depended variable for sustainable consumption intention (R^2 = .324). Likewise, the observed Q-squared (Q^2 = .245) reflects medium predictive relevance (Hair et al., 2019). The explanatory power and predictive relevance of constructs are presented in Table 4.7.

The structural model indicated an associate R-squared of .324, suggesting that the model collectively accounts for approximately 32.4% of the variance in respondents' sustainable consumption intention (Table 4.7). The associated Q-squared value of .245, supports the underlying assumption of this research, that the endogenous construct (i.e., sustainable consumption intention) indicates predictive relevance. Hence, evaluations of overall predictive power and relevance support reasonable model structure.

Table 4.7. Explanatory Power and Predictive Relevance of Constructs

Predictors	Outcome	R^2	Q^2
SUEK OBEK PER EEB IN-ELOC EX-ELOC	SCI	.324	.245

A summarized overview of PLS-SEM results of final structural model is displayed in Table 4.8, Table 4.9 and Figure 4.2. Regarding the influence of domain-specific environmental knowledge on sustainable consumption intention for T&A products, the hypothesis test associated with the relationship between subjective environmental knowledge (SUEK) and sustainable consumption intention (SCI) indicates a significant t-statistic ($\beta = .215$; $t = 3.609$; $p = .000 < .001$), which supports the hypothesized relationship of H1a. Therefore, higher levels of subjective environmental knowledge led to higher levels of sustainable consumption intention in the T&A context. In contrast, the test for H2b which examines the impact of objective environmental knowledge (OBEK) on sustainable consumption intention (SCI) does not indicate a significant effect ($\beta = -.033$; $t = .463$; $p = .644 > .05$), thereby providing no support for this hypothesis.

With respect to the influence of personal environmental responsibility (PER) on sustainable consumption intention (SCI) for T&A products (i.e., H2), the path estimate indicates a positive and significant relationship between PER and SCI ($\beta = .224$; $t = 3.282$; $p = .001 < .01$), providing support for H2. The test for H3a which focuses on the relationship between eco-centric environmental belief (EEB) and sustainable consumption intention (SCI) is both positive and significant ($\beta = .229$; $t = 2.482$; $p = .013, < .05$). Based on a significance level of .05, H3a is supported by the observed sample data.

Lastly, when considering the impact of environmental locus of control on sustainable consumption intention for T&A products, the proposed relationship between internal environmental locus of control (IN-ELOC) and sustainable consumption intention (SCI) is non-significant ($\beta = .068$; $t = .885$; $p = .376 > .05$), which does not support the hypothesized relationship of H4a. Similarly, H4b which posits a positive impact of external locus of control (EX-ELOC) on sustainable consumption intention (SCI) ($\beta = .103$; $t = .207$; $p = .027 > .05$) is not supported.

Table 4.8. Path Coefficients between Latent Variables

Path	Standardized Estimates (β)	T Statistics	P Value
SUEK ->SCI (H1a)	.215***	3.609	.000
OBEK ->SCI (H1b)	-.033	.463	.644
PER -> SCI (H2)	.224**	3.282	.001
EEB -> SCI (H3a)	.229*	2.482	.013
IN-ELOC -> SCI (H4a)	.068	0.885	.376
EX-ELOC -> SCI (H4b)	.103	1.263	.207

Note: *P < .05, **P < .01, ***P < .001

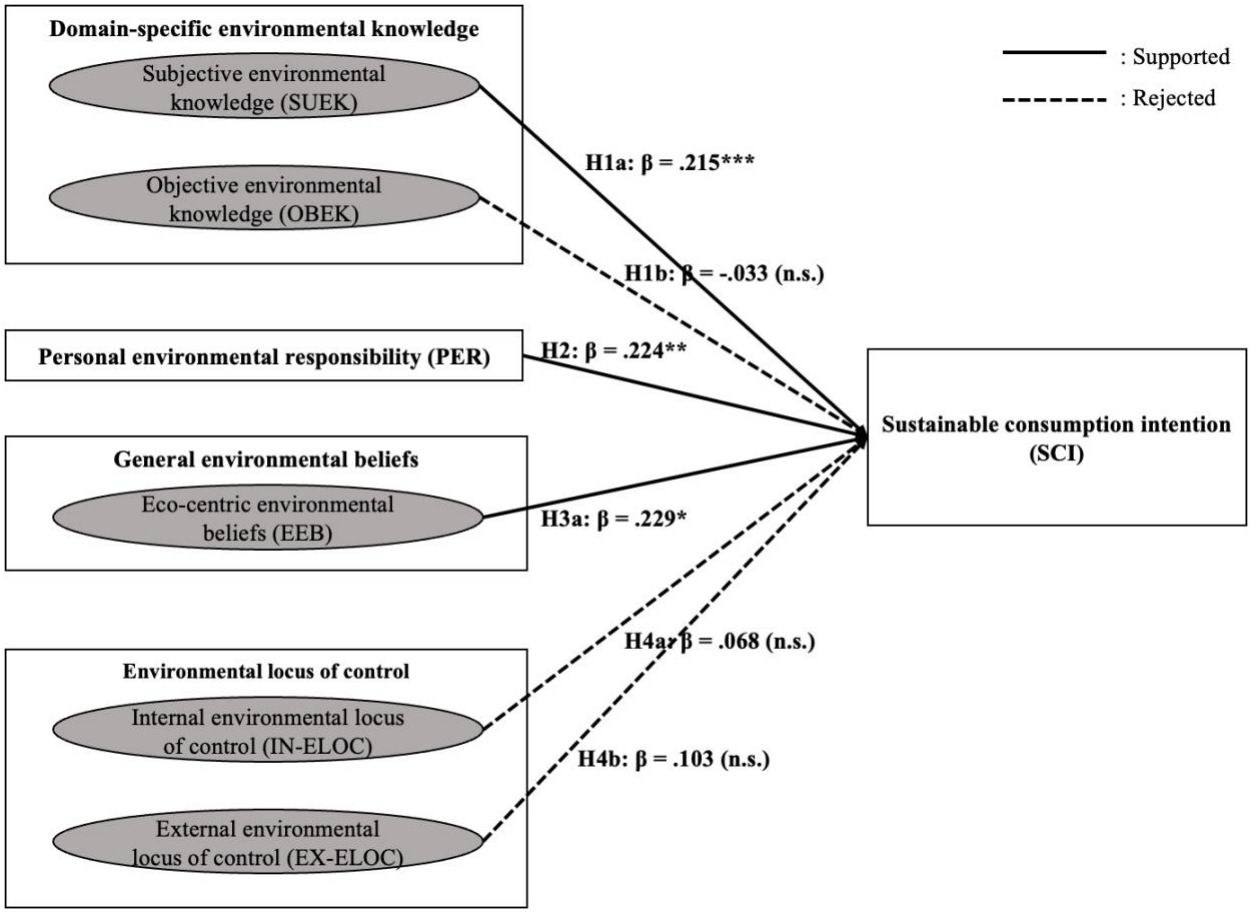

Figure 4.2. Findings of Final Structural Model

Table 4.9. Summary of Hypotheses Testing

Hypothesis	Statement of Hypothesis	Results
H1	Consumers' environmental knowledge of T&A industry will have a significant influence on sustainable consumption intention for T&A products.	Partially Supported
H1a	Subjective environmental knowledge of T&A industry will positively influence sustainable consumption intention for T&A products.	Supported
H1b	Objective environmental knowledge of T&A industry will positively influence sustainable consumption intention for T&A products.	Rejected

Table 4.9. (Continued)

Hypothesis	Statement of Hypothesis	Results
H2	Consumers' personal environmental responsibility will have a significant and positive influence on sustainable consumption intention for T&A products.	Supported
H3	Consumers' general environmental beliefs will have a significant influence on sustainable consumption intention for T&A products.	Partially Supported
H3a	Eco-centric environmental beliefs will positively influence sustainable consumption intention for T&A products.	Supported
H4	Consumers' environmental locus of control will have a significant influence on sustainable consumption intention for T&A products.	Rejected
H4a	Internal environmental locus of control will positively influence sustainable consumption intention for textile and apparel products.	Rejected
H4b	External environmental locus of control will positively influence sustainable consumption intention for T&A products.	Rejected

4. Discussion

Consumers can play an important role in the potential transformation of T&A industry from an offender to a promoter of sustainability, due to their market power. This research aims to illustrate the underlying mechanisms that facilitate consumers' sustainable consumption decisions. Previous research (e.g., Cheng & Wu, 2015; Gao et al., 2021; Mobley et al., 2010) proved that Environmentally Responsibility Behavior (ERB) model performed well in predicting individuals' pro-environmental behaviors in the tourism and education contexts. Based on this finding, incorporation of ERB into understanding environmental consumption of T&A products appears to have been an important component for explaining intended sustainable consumption behaviors.

The existing environmental behavior research suggests that environmental knowledge and individual personality characteristics represent the key determinants of environmentally responsible behavior (Hines, Hungerford, & Tomera, 1986/1987). The findings of this research

largely correspond with this general assertion. Specifically, based on the outcome model, The model suggested that domain-specific environmental knowledge and personality traits (i.e., personal environmental responsibility, general environmental beliefs, and environmental locus of control, as a cognitive influential factor and affective influential factors) influence consumers' sustainable consumption intention for T&A products.

Domain-specific environmental knowledge (i.e., environmental knowledge related to the T&A industry) significantly influenced consumers' sustainable consumption intention for T&A products, which is consistent with previous studies in that specific environmental knowledge tend to induce corresponding willingness of environmental protection behaviors (Suryanda, Sigit, & Safitri, 2021; wyles et al., 2013). Consumers systematically use environmental knowledge as a basis for to differentiate good and bad environmental choices (Frick, Kaiser, & Wilson, 2004). Consumers with more specific environmental knowledge are more likely to concern relevant environmental issues and be motivated to engage in relevant environmental behaviors.

The results demonstrated a significant positive influence of subjective environmental knowledge related to the T&A industry on consumers' sustainable consumption intention for T&A products; however, there was no association with objective environmental knowledge related to the T&A industry. Different psychological mechanisms behind subjective and objective environmental knowledge may lead to different outcomes in the decision-making process (Dunning & Helzer, 2014; Kim et al., 2018). Han (2019) also found that that subjective knowledge impacted pro-environmental behavior for organic apparel, but objective knowledge did not influence behavior. Perhaps T&A consumers who are confident in their personal environmental knowledge also reflect stronger intended behaviors that are responsible, regardless of the accuracy of their knowledge. The relationship between subjective

environmental knowledge and sustainable consumption intention indicates that when consumers believe that they have enough environmental knowledge related to the T&A industry, they are more likely or more willing to take action in the sustainable consumption in T&A industry. Conversely, if consumers think that they do not have sufficient ability and relevant knowledge, potential pro-environmental actions could be suppressed or reduced.

Based on previous studies (Kim et al., 2018; Aertsens et al., 2011), objective environmental knowledge also posed explanatory challenges of pro-environmental behaviors from a different dimension. Objective environmental knowledge was expected to positively impact sustainable consumption intention for T&A products, but no significant influence was revealed, which is in fact consistent with the result of House et al. (2004) research. House et al. (2004) research claimed higher levels of subjective knowledge generated stronger willingness to accept environmentally friendly food, but objective knowledge was not. Further, this result was also likely impacted by the developmental measurement for objective environmental knowledge (Li, 2021). The complexity of the knowledge concept brings great challenge to the prediction of behaviors. The result of objective environmental knowledge could also be explained by the possibility that merely having knowledge of environmental problems and their consequences may not be enough to motivate consumers to generate relevant environmental protection intention, even reduce their willingness due to the widening gap between cognition and ability as knowledge increases. Knowledge of how to take action on a particular environmental problem may give consumers more direction and guidance, thereby inducing and encouraging them to have a willingness to protect the environment (Wyles et al., 2013). Only when consumers perceived themselves having the ability to face and solve the environmental issues, will they have willingness to challenge the problems.

In addition to subjective domain-specific environmental knowledge, personal environmental responsibility (PER) positively impacted consumers' sustainable consumption intention for T&A products. This finding suggests that consumers who report stronger feelings of personal responsibility towards environmental protection also indicate stronger intentions to engage in sustainable consumption in the T&A purchasing context. A number of related studies demonstrate similar outcomes when examining PER and behavioral intentions (e.g., Lee & Ju, 2020; Yue et al., 2020). Hopper and Nielsen (1991) suggest that sustainable consumption in the T&A context, represents a form of voluntary altruism which is voluntary and focuses on the welfare of others. Therefore, carrying out pro-environmental behaviors from this perspective is consistent with assuming a moral obligation. Individuals are responsible for thinking about their influence on the environment and meeting needs with less environmentally damaging means (Cohen, 2021). Individual environmental responsibility, as the foundation of other forms of environmental responsibility (e.g., collective environmental responsibility) (Cohen, 2021), plays an important role in environment protection.

Consistent with previous research (e.g., Gadenne et al., 2011; Li et al., 2021; Yu & Yu, 2017) the findings of this study suggest significant, positive influence of general environmental beliefs on consumers' sustainable consumption intention for T&A products. Repeated empirical observation of this relationship suggests that environmental beliefs appear to be a consistent determinant of environmental behavior. Environmental beliefs represent the cognitive component of attitude, through which individuals form perceptions of environmental phenomena. Therefore, environmental beliefs logically influence individual judgment and approaches to solving environmental problems.

Specifically, eco-centric environmental beliefs positively influenced consumers' sustainable consumption intention for T&A products. In the context of this study, this relationship suggests that consumers who value nature over the pursuit of material interests with a focus on maintaining or improving the quality of human life are more likely to show pro-environmental behavioral intention. Consistent with existing research (e.g., Aguilar-Luzón; 2020; Pickett-Baker & Ozaki, 2008), finding further supports the positive relationship between eco-centric environmental beliefs and positive environmental behavioral intentions. Consumers who hold eco-centric environmental beliefs directly acknowledge the negative impacts of human activity on the natural environment. Eco-centric believers espouse the laws of nature and emphasize resource conservation. They believe that lack of consideration for nature will lead to human suffering and therefore prioritize commitment to protecting environmental equilibrium for societal wellbeing.

Contrary to expectation, consumers' environmental locus of control, including internal and external environmental locus of control, did not positively influence consumers' sustainable consumption intention for T&A products. Previous research found that environmental locus of control has a significant positive impact on pro-environmental behaviors (e.g., Trivedi, Patel, & Savalia, 2015). Moreover, when consumers confront environmental issues, they internalize/externalize their share of responsibility by judging the degree of control they have over pro-environmental actions (Cleveland, Kalamas, & Laroche, 2005). Therefore, a significant relationship between environmental locus of control and sustainable consumption intention was expected. Specifically, internal environmental locus of control, which reflects the personal belief that one's actions can impact environmental outcomes, should impact sustainable consumption intention for T&A products. Likewise, external environmental locus of control was expected to

positively influence sustainable consumption intention. Some previous research claimed that individuals are less likely to take environmental actions when they believe the external forces (i.e., government or organizations) have more power on environmental outcomes over themselves. But Kalamas, Kalamas and Laroche (2012) found that, some individuals with external environmental locus of control regard the power of external forces as additional support. They believe their own efforts are also meaningful and influential and they are willing to protect environment.

The non-significant results associated with environmental locus of control should not necessarily be interpreted as locus of control having no influence on customers' sustainable consumption intention for T&A products. One possible explanation is that the influence of internal and external environmental locus of control may be overshadowed by the much greater influences of the other variables when analyzing all of the latent variables together in the PLS-SEM analysis. Moreover, Üzümçeker (2016) pointed out that the relationship between locus of control and behaviors might be different from the theory's expectation due to the controversial dimension of construct. Another possible explanation for the non-significant result of external environmental locus of control is the feelings of hopelessness and helplessness brought from the effect of external environmental locus of control may create great uncertainty about ultimately environmental behavior intention.

CHAPTER 5: CONCLUSIONS

The textile and apparel (T&A) industry traditionally adopts the consumer-driven model which asserts that the wants and needs of consumers drive industry structure, strategy and behavior. Based on this assumption and common sense, sustainability reform in T&A industry cannot be accomplished without consumers. There are still many uncertainties regarding consumers' sustainable consumption behaviors in the T&A context due to the required changes in lifestyle that a sustainable T&A industry requires. From the consumer perspective, this research explored the drivers of sustainable consumption intentions of T&A products by examining the impact of consumers' both forms of domain-specific environmental knowledge and three relevant personality traits (i.e., personal environmental responsibility, two-dimension general environmental beliefs, and two-dimension environmental locus of control). This chapter first provides an overview of the study followed by a disposition of the academic and practical implications based on the findings. The dissertation concludes with presentation of the study's limitations and recommendations for future research.

1. Overview

Sustainable development has become a global trend, gradually penetrating in various industries and fields. Environmental sustainability is heavily emphasized in the United Nations' Sustainable Development Goals (SDGs) which was set in 2015 (UNDP, 2022). Negative environmental outcomes, such as water pollution, air pollution, microplastic pollution, resource wastes, drive the critical needs of the resource-intensive T&A industry to seek an environmentally sustainable development path. Sustainable transformation of T&A industry involves all components of the supply chain, from production to consumption (United Nations, 2015). Governments, corporations, and additional stakeholder organizations are beginning to

outwardly promote sustainability through implementing related standards, activities, and initiatives (International Labor Organization, 2021). The consumer, as the critical driver of T&A industry, are only beginning to explore in terms of their pro-environmental behaviors (Desore & Narula, 2018; Harrison et al., 2005; McNeill & Moore, 2015).

Past research usually underestimated or ignored the predictive power of domain-specific environmental knowledge (Geiger et al., 2019; Kaiser & Fuhrer, 2003). Moreover, the roles of personal responsibility, beliefs, and locus of control were found to be influential in generating individuals' intentions or behaviors (Dasi et al., 2019). Therefore, the objective of this research is to investigate the effects of domain-specific environmental knowledge and three relevant personality traits (i.e., personal environmental responsibility, general environmental beliefs, and environmental locus of control) on consumers' sustainable consumption intention for T&A products. The Environmentally Responsible Behavior (ERB) model was adapted for T&A context in the research model. The study's sample consisted of NC State University students aged 18 years old or older in 2023. Data related to the hypotheses, including consumers' demographics and their subjective and objective environmental knowledge on T&A industry, personal environmental responsibility, eco-centric and anthropocentric environmental beliefs, internal and external environmental locus of control, and intention to sustainable consumption of T&A products, were collected from online survey. A two-stage PLS-SEM approach was used for the assessment of measurement model, the analysis of final structural model and hypothesis tests.

A total of 212 completed and effective survey were retained for the data analysis. Participants come from different colleges of NC State University. High quality, stylish, and low cost were found to be the top three criteria for purchasing T&A products within participants. According to the hypothesis testing results, hypotheses related to subjective environmental

knowledge (H1a), personal environmental responsibility (H2), and eco-centric environmental beliefs (H3a) were accepted. In other word, consumers with higher level of confidence in environmental knowledge related to the T&A industry are more willing to engage in sustainable consumption in the T&A purchasing context; Consumers with stronger feelings of personal responsibility towards environmental protection also show stronger sustainable consumption intention for T&A products. Consumers with natural-centered values or beliefs are more likely to show pro-environmental behavioral intention.

2. Implications

The findings of this research provide implications for academic researchers as well as stakeholders in the public sector. Academic implications are discussed based on the relevant theories and literatures. Practical implications for business operation, educational program development, and activities/initiatives implementation within government and organizations, are also discussed.

2.1. Academic implications

From an academic perspective, the findings of this research enhanced the academic understanding of consumer sustainable consumption in T&A industry and filled some research gaps identified based on previous research. Firstly, this research added values to the existing Environmentally Responsible Behavior (ERB) model. In addition to tourism and education areas (Cheng & Wu, 2015; Gao et al., 2021; Mobley et al., 2010), this current research successfully extended ERB model into the T&A industry context for predicting consumers' pro-environment intention. In addition, ERB model was developed in current research by introducing a more specific knowledge (i.e., subjective and objective environmental knowledge of T&A industry) instead of general knowledge and beliefs (i.e., anthropocentric and eco-centric environmental

beliefs) into existing model to further study consumers' environmental behaviors. The findings of this current research proved the positive relationship between knowledge and intention, responsibility and intention, and beliefs (cognitive component of attitude) and intention by providing some empirical insights into Environmentally Responsible Behavior (ERB) model.

Secondly, this research's finding of domain-specific environmental knowledge was additional evidence of that knowledge should be treated as a multidimensional construct (Han, 2019). Most previous studies did not categorize the construct of knowledge into distinguishable types (subjective and objective) (Park & Lessig, 1981). However, present research found a positive influence of subjective domain-specific environmental knowledge on consumers' sustainable consumption intention, while no effect of objective domain-specific environmental knowledge was shown. As Selnes and Gronhaug (1986, p86) mentioned that "objective measures seem preferable when focusing on ability differences among consumers, while subjective measures should be preferred when focusing on motivational aspects of product knowledge", subjective knowledge and objective knowledge are not interchangeable and different from each other. Hence, it is necessary to consider the structure of consumer knowledge when evaluating the effect of consumers' knowledge on related intention or behaviors.

A potential related implication arises from measuring environmental knowledge. Accepted norms regarding good versus bad environmental behaviors have not yet emerged in the current environment. By that token, measuring consumer knowledge, particularly from an objective standpoint, continues to be a challenge for researchers, particularly in multi-variate consumer surveys that do not accommodate insight beyond the written scale. Subjective environmental knowledge appears to manifest as a form of consumer confidence based on their self-perceived understanding of the environmental impacts of sustainable T&A consumption,

which as vulnerable to the objective knowledge gap. Researchers in marketing can begin to address this gap by addressing sustainability claims made by companies for their accuracy. For example, widespread sustainability claims associated with man-made cellulosic fibers suggest a need to examine whether these claims are reasonable. Until the field establishes common acceptance of sustainability practices, subjective knowledge will likely have to suffice as a proxy for knowledge in the T&A purchasing context.

This research bridges two communities: sustainability and consumer behavior. Under the guidance of the concept of sustainable development, consumer behavior models (i.e., ERB model) was used to predict relevant environmental protection intention (i.e., sustainable consumption intention). The combination of the two disciplines not only promoted the interdisciplinary development of consumer behavior theories, but also explored sustainable development in the T&A industry, which continues to seek ways to integrate sustainable practices.

2.2. Practical implications

In addition to the academic implications, this study also offers several practical implications. Firstly, the hypothesis testing results about the theory of environmentally responsible behavior confirmed that consumers' subjective environmental knowledge of T&A industry, eco-centric environmental beliefs, and personal environmental responsibility, all positively influence their sustainable consumption intention for T&A products. Therefore, T&A companies need to simplify their environmental messaging so that consumers can quickly and clearly evaluate their claims and subsequently make decisions based on their attitudes and understanding. Moreover, the T&A companies could improve brand image and enhance the brand's exposure through continuous pro-environmental promotion to attract green consumers.

Meanwhile, increasing the sense of participation of consumers could be another marketing strategy to meet consumers' needs for environment protection.

Secondly, although previous research implied that domain-specific environmental knowledge could positively influence consumers' sustainable consumption intention for T&A products, the results suggest that knowledge does not consistently impact intention. The effects rely on knowledge forms (i.e., subjective and objective) and knowledge categories (i.e., knowledge of environmental issue and knowledge of strategic actions). In this case, a multidisciplinary and phenomenon-based perspective is more effective to solve or explain the issues of real world than traditional discipline-focused perspective (Seikkula-Leino et al., 2021). Hence, in the sustainable development education, it is necessary to pay attention to the education of different categories of knowledge and relevant skills, and to emphasize the importance of solving problems from multiple perspectives.

Lastly, previous research showed significant effect of external environmental locus of control on the sustainable consumption intention. However, the relationship in current research was non-significant. A possible explanation was proposed, which is the great uncertainty due to the feelings of hopelessness and helplessness reduced the predictive power of external environmental locus of control. If this assumption holds true, in order to address passive feelings, policy makers and non-government organizations (NGOs)should focus on the development of complete and detailed relevant environment standards, regulations, and laws to guide individuals' effective implementation of SDGs in the T&A industry. These stakeholders can also design public service initiatives to promote individuals' pro-environment actions. A healthy long-term SDGs implementation requires a balanced efforts among stakeholders in civil society, government and business.

3. Limitations and Future Research

Despite the implications of this study presented above, this study also has limitations that require future research. Firstly, the study's sample is limited to college students from NC State University. Therefore, the findings of this research are not applicable to the general US consumer population. Future research should be undertaken to collect data from additional consumer groups with diverse demographic profiles.

Secondly, as mentioned in the implications, several measurements employed in the research lack a robust literature-based record of scale validation tests and modification (i.e., subjective and objective environmental knowledge, sustainable consumption intention). Several measurement items and one construct (i.e., anthropocentric environmental beliefs) were deleted to improve model fit, which raises the validity and reliability concerns related to the measurement of these constructs. Hence, scale development to measure cognitive (i.e., knowledge) and affective (i.e., responsibility, beliefs, and locus of control) constructs in the T&A context are advised in Future research. Moreover, the evaluation of knowledge is complex. The environmental knowledge assessment instruments of this research only included the knowledge on environmental issues, which ignored other type of environmental knowledge (i.e., knowledge on how to act on issues) (Hines, Hungerford, & Tomera, 1986/1987). What's more, the topic of environmental sustainability within the T&A industry context is complicated and dynamic. Therefore, for better assessment of consumer knowledge, the knowledge assessment instruments should be modified and refined by involving more representative measurement items, as well as following topic trends.

Thirdly, this research didn't take the potential effects of demographic variables, such as gender, ethnicity, area of residence, into considerations. In order to obtain a comprehensive

understanding of the factors that shape consumers' sustainable consumption intention for T&A products, future research could consider the role of demographic variables on the independent variables by using multi-group analysis.

Fourthly, according to the SDGs, the production of T&A companies is under two sustainable practice which are environmental sustainability and social sustainability throughout the supply chain (Kozar & Connell, 2013). This research only focused on the environmental aspect of consumers' sustainable consumption behaviors in the T&A industry. Future research could explore consumers' perception and choice of T&A products produced under socially sustainable practices.

Lastly, researchers acknowledge the disconnection between intention and actual behaviors in social and health psychological research (e.g., Marteau, Hollands, & Fletcher, 2012; Sheeran & Webb, 2016). The intention-behavior gap suggests that intention rarely translates into action (Papies et al., 2022). Although this research suggested that higher levels of subjective environmental knowledge, personal environmental responsibility, and eco-centric environmental beliefs increased sustainable consumption intention, there is no evidence that stronger intentions will translate into actual behavior. Therefore, future research could expand the scope of this research's findings by further exploring the relationship between sustainable consumption intention and actual sustainable consumption behaviors. Situational factors, such as economic constraints, social pressures and opportunities to choose different actions, may also be considered as moderators to expand practical and theoretical understanding (Hines, Hungerford, & Tomera, 1986/1987).

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APPENDICES

Appendix A: IRB Form for Approval of Surveying

Dear Lian Zeng:

Date: November 17, 2022
IRB Protocol 25406 has been assigned Exempt status
Title: Promoting Sustainable Consumption: The Roles of Consumers' Domain-specific Environmental Knowledge and Personality Traits
PI: Moore, Marguerite Murray

The research proposal named above has received administrative review and has been approved as exempt from the policy as outlined in the Code of Federal Regulations (Exemption: 46.101. Exempt d.2). Provided that the only participation of the subjects is as described in the proposal narrative, this project is exempt from further review. This approval does not expire, but any changes must be approved by the IRB prior to implementation.

1. This committee complies with requirements found in Title 45 part 46 of The Code of Federal Regulations. For NCSU projects, the Assurance Number is: FWA00003429.
2. Any changes to the protocol and supporting documents must be submitted and approved by the IRB prior to implementation.
3. If any unanticipated problems or adverse events occur, they must be reported to the IRB office within 5 business days by completing and submitting the unanticipated problem form on the IRB website: http://research.ncsu.edu/sparcs/compliance/irb/submission-guidance/.
4. Any unapproved departure from your approved IRB protocol results in non-compliance. Please find information regarding non-compliance here: http://research.ncsu.edu/sparcs-docs/irb/non-compliance_faq_sheet.pdf.

Please let us know if you have any questions.

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NCSU IRB Office

Appendix B: Survey Questionnaire

You are being invited to complete a survey for research purposes. The survey is about the effects of domain-specific environmental knowledge and personality traits on sustainable consumption intention for the textile and apparel products. Completing this survey is voluntary and you can stop at any time by leaving the online survey page.

You must be 18 years of age or older to participate in this study.

There are minimal risks associated with your participation in this survey. You will not receive any payment for completing this survey.

Please note that you are participating in this research via Qualtrics. Qualtrics will not have access to your responses on the survey. Your information will not be associated with your responses.

If you have any questions about the survey, how it is implemented, or the research study, please contact the student researcher, Lian Zeng, at lzeng6@ncsu.edu and 919-917-1417. You can also contact the faculty advisors for this research, Dr. Moore, at mmmoore4@ncsu.edu and Dr. Rothenberg, at lfrothen@ncsu.edu. Please reference the study number 25406 when contacting anyone about this project.

If you have questions about your rights as a participant or are concerned with your treatment throughout the research process, please contact the NC State University IRB Director at IRB-Director@ncsu.edu, 919-515-8754, or fill out a confidential form online at https://research.ncsu.edu/administration/participant-concern-and-complaint-form/

If you consent to complete this survey, please select 'yes' below in order to proceed to the survey. Otherwise, please select 'no'.

1) Yes
2) No

Section One: General questions

- In general, which of the following items is most important to you when buying clothing for yourselves?

  1) Stylish

  2) High quality

  3) Low cost

  4) Easy to purchase

  5) Preferred brand

  6) Eco-friendly

  7) Easy to care/maintenance

Section Two: Domain-specific Environmental Knowledge

Directions: *Please indicate your agreement on the following statements on a 7-point scale, with 1 = strongly disagree and 7 = strongly agree.*

Q1: Subjective Environmental Knowledge	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SUEK1. I am familiar with sustainable materials used in textile and apparel products.							
SUEK2. I am familiar with the environmental issues (i.e., water) in the textile and apparel industry.							
SUEK3. I am familiar with how to extend the life of textile and apparel products.							

Q2: Objective Environmental Knowledge	**1**	**2**	**3**	**4**	**5**	**6**	**7**
OBEK1. Production and processing of natural fibers such as cotton does not consume large quantities of water.							
OBEK2. Dyeing and finishing processes use a lot of water.							
OBEK3. There are water-saving and chemical-saving technologies in the textile and apparel industry, such as form dyeing.							
OBEK4. The textile and apparel industry is one of the major polluting industries in the world.							

OBEK5. Chemical pollutants are not produced during cultivation of natural fibers such as cotton.							
OBEK6. Microfiber pollution is related to the textile and apparel industry.							
OBEK7. The textile and apparel industry is a large contributor to greenhouse gas emission.							
OBEK8. Natural fibers can decompose in landfills, so that sending natural fibers into landfills will not be harmful to the environment.							
OBEK9. With the help of companies' take-back programs, global annual textile and apparel waste is decreasing.							
OBEK10. Consumers do not contribute to the environmental issues associated with the textile and apparel industry.							
OBEK11. BCI cotton, organic cotton, and recycled cotton are three kinds of sustainable cotton.							
OBEK12. Only the production of fast fashion products will cause environmental issues.							
OBEK13. Some companies in the textile and apparel industry have made commitment to be more sustainable.							
OBEK14. There are certifications in the textile and apparel industry to ensure products' environmental sustainability.							

Section Three: Personality Traits

Directions: *Please indicate your agreement on the following statements on a 7-point scale, with 1 = strongly disagree and 7 = strongly agree.*

Q1: Personal Environmental Responsibility	**1**	**2**	**3**	**4**	**5**	**6**	**7**
PER1. I should be responsible for protecting our environment.							
PER2. Environmental protection starts with me.							
PER3. I have taken responsibility for environmental protection since I was young.							
PER4. Environmental protection is the responsibility of my government, not me.							

PER5. Environmental protection is the responsibility of the environmental organizations, not me.							

Q2: Eco-centric Environmental Beliefs	**1**	**2**	**3**	**4**	**5**	**6**	**7**
EEB1. The earth is like a spaceship with very limited room and resources.							
EEB2. The balance of nature is very delicate and easily upset.							
EEB3. Despite our special abilities humans are still subject to the laws of nature.							
EEB4. Humans are severely abusing the environment.							
EEB5. If things continue on their present course, we will soon experience a major ecological catastrophe.							

Q3: Anthropocentric Environmental Beliefs	**1**	**2**	**3**	**4**	**5**	**6**	**7**
AEB1. Humans have the right to modify the natural environment to suit their needs.							
AEB2. Plants and animals have as much right as humans to exist.							
AEB3. Humans were meant to rule over the rest of nature.							

Q4: Internal Environmental Locus of Control	**1**	**2**	**3**	**4**	**5**	**6**	**7**
IN-ELOC1. By buying greener products, I can make a difference in helping the environment.							
IN-ELOC2. By making donations to pro-environmental groups (such as Greenpeace), I can help make a positive difference on the state of environment.							
IN-ELOC3. I am able to convince a friend to change his/her conservation habits.							
IN-ELOC4. By recycling, I am helping to reduce pollution.							

Q5: External Environmental Locus of Control	**1**	**2**	**3**	**4**	**5**	**6**	**7**
EX-ELOC1. Governments have the power to deal with local environmental challenges (such as air quality in cities).							

EX-ELOC2. Companies need to take the lead in promoting environmental responsibility.							
EX-ELOC3. The state of environment is ultimately under control of higher powers.							
EX-ELOC4. Some of the global climate changes we are witnessing are due, in part, to earth's normal cycles.							

Section Four: Sustainable Consumption Intention

Directions: *Please indicate your agreement on the following statements on a 7-point scale, with 1 = strongly disagree and 7 = strongly agree.*

Q1: Sustainable Consumption Intention of Textile and Apparel Products	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SCI1. I will refuse buying clothes that are harmful to the environment.							
SCI2. I am willing to buy second-hand clothes.							
SCI3. I intend to buy quality clothes because they last longer.							
SCI4. I will wash garments carefully to extend the lifetime of it.							
SCI5. I am willing to repair small defects in garments myself.							
SCI6. When a garment is damaged, I intend to use it for a different purpose (cleaning cloth for instance).							
SC7. I intend to give clothes away to friends or family.							
SCI8. I intend to donate garments in recycling bins (purpose is recycling).							
SCI9. Before discarding clothes, I intend to remove items such as labels, buttons and zippers with the intention to use these again.							

Section Five: Demographics

- Which of the following best describes your gender?

  1) Male

  2) Female

  3) Other

  4) Prefer not to say

- Please specify your age.

  1) 18

  2) 19

  3) 20

  4) 21

  5) 22

  6) 23

  7) 24

  8) 25

  9) Over 25

  Please specify ____

- Select your college from the list below

  1) College of Agriculture and Life Sciences

  2) College of Design

  3) College of Education

  4) College of Engineering

  5) College of Humanities and Social Sciences

  6) College of Natural Resources

  7) Poole College of Management

  8) College of Sciences

  9) Wilson College of Textiles

  10) College of Veterinary Medicine

  11) If you have declared major, please share that by typing the name of your field below.

  ____

- Please specify your ethnicity.

  1) American Indian or Alaska Native

2) Asian

3) Black or African American

4) Native Hawaiian or Other Pacific Islander

5) White

6) Other

Please specify ____

- Please select the option that most closely represents the place you grow up.

1) Urban

2) Semi-urban

3) Rural