

**Developing Competitive Sustainable Manufacturing in the Indonesian Textile
Industry**

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[April 25, 2017]

Masters project submitted in partial fulfillment of the
requirements for the Master of Environmental Management degree in
the Nicholas School of the Environment of
Duke University

EXECUTIVE SUMMARY

As global consumers have become more aware of the environmental impacts and health risks inherent to textile and apparel productions, the public along with nongovernmental organizations (NGOs) and global consumers have been putting pressure on the textile and apparel industry to produce environmentally and socially conscious products. In response to this increasing pressure, the Government of Indonesia launched in December 2015 a voluntary sustainability standard for the textile industry called “Standar Industri Hijau (SIH)” or the Green Industrial Standard (GIS). The objective of this regulation is to improve the textile industry’s competitiveness in global markets by driving the development of sustainable manufacturing using GIS.

This study examines GIS by analyzing: (1) GIS criteria alignment with other existing global international sustainability standards, (2) the Indonesian textile industry readiness to adopt and implement sustainable manufacturing and, (3) the benefits of sustainable manufacturing practices in increasing company competitiveness in global markets.

Two different research methods were employed for this study: (1) the benchmarking of four different international sustainability standards and initiatives against GIS, and (2) the mixed method of quantitative surveys and qualitative interviews with 92 different organizations. The respondents are 85 textile and apparel manufacturers in Indonesia who are either export-oriented or exposed to export markets through their customers. Other participants included those representing international brands and retailers, government organizations, textile associations, and independent testing and certification companies. The results of this study does not apply to manufacturers who primarily serve the domestic market, especially small-medium companies without exposure to export markets, as responses from these types of companies were few. Further research would be needed to analyze the sustainability adoption for such companies.

This research finds that Indonesia’s GIS criteria are in alignment with international sustainability standards with one exception concerning social responsibility and labor standard compliance. With current criteria, GIS will be struggling to be recognized

internationally and that its criteria should be broadened to offer more competitive products globally. The study also revealed that there is a positive trend in manufacturing to adopt sustainability standards with two thirds of the companies having already implemented some of the criteria.

The quantitative survey results found that when implementing sustainability measures, over 85% of respondents believed that there was an increase in competitiveness and sales on the global market while over 75% of respondents agreed that competitiveness and sales increased in the domestic market. Furthermore, the qualitative interview results show that a majority of the respondents agreed with 5 sustainable manufacturing benefits as follows: (1) market expansion, (2) increased competitiveness, (3) increased sales, (4) minimized risk, and (5) increased customers trust which leads to becoming preferred suppliers to international brands and retailers.

However, barriers to compliance exist: it is recommended that the fostering of public-private partnership and collaboration with public organizations from other countries would offer more creative solutions to sustainable development while opening up global markets to Indonesia. Furthermore, the study revealed that the Government of Indonesia should offer a greater variety of both financial and non-financial incentives to manufacturers seeking to incorporate cleaner, greener technologies. The financial incentives could encompass tax incentives, low-interest loans, financial funding, or low import tariffs on green materials, chemicals, or technology. While, the non-financial incentives stated by respondents would be in the form of (1) expertise and training and an on-line information portal, (2) simplification of government documentation such as import and export documentation, and (3) access to technological innovations.

Overall, there is a need for more detailed revisions to GIS to extend to all types of textile and apparel manufacturing to foster international standard recognition. Moreover, with further support from the government, the Indonesian textile industry is ready to take advantage of cost saving sustainability practices and programs and to go beyond traditional manufacturing processes to produce more environmentally and socially conscious products that can compete on the global market.

ACKNOWLEDGEMENTS

I would like to thank everyone who made this project possible, especially my advisor, Erika Weinthal, PhD for her guidance throughout the development of the project; Elis Masitoh, Deputy Director of Directorate of Textile and Multifarious Industries of Ministry of Industry of Republic of Indonesia, Lintong Hutahaeen, Head of R & D Center for Green Industry and Environment, Ministry of Industry of Republic of Indonesia; and Hendra Indrawirawan, PhD - Managing Director of PT. Idaman Eramandiri for the ideas and discussion; my DEL classmates and faculty for the friendships and motivation; and everyone in the Indonesian Textile Industry who participated in both my quantitative survey and qualitative interviews.

Most importantly, I would like to thank my beloved husband, Stuart Dean, for always being right there, tirelessly helping me whenever I needed it since the beginning of the program. I wouldn't have done it without your continued supports. And to my parents who have always given me the freedom to choose what is best for me.

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GLOSSARY OF ABBREVIATIONS

ASEAN: Association of Southeast Asian Nations which comprises 10 different countries (Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam)

API: Asosiasi Pertekstilan Indonesia (Indonesian Textile Association)

Cd: Cadmium

Cu: Copper

GDP: Gross Domestic Products

GHG: Green House Gases

GIS: Green Industrial Standard

NGO: Non-Government Organizations

Ni: Nickel

Pb: Lead

PFOS: Perfluorooctanesulfonate

PVC: Polyvinyl chloride

PVDC: Polyvinyl dichloride

RSL: Restricted Substance List

REACH: Registration, Evaluation, Authorization and Restriction of Chemicals

SAC: Sustainable Apparel Coalition

STeP by OEKO-TEX: Sustainability Textile Production by OEKO-TEX

ZDHC: Zero Discharge of Hazardous Chemicals

1. INTRODUCTION

The textile and apparel industry is a highly integrated global market where companies seek to balance high quality with low cost of production. The industry involves long and diverse supply chains with different production processes from across the globe. In addition, the textile production and use of apparel throughout its life cycle put significant environmental impacts which include wastewater emissions from dyeing, finishing, and washing processes, increase in pollution, solid waste production, and significant depletion of resources from consumption of water, fossil fuels, and raw materials (Islam et al., 2014).

To make apparel, there are five different production stages: (1) fiber production (2) spinning (yarn) (3) weaving (fabric) (4) dyeing, printing and finishing, and, (5) assembling (sewing). The environmental impacts are varied across the stages, with the most impacts are coming from the dyeing and finishing processes which needs the most energy-, water- and chemically-intensive (Fletcher, 2008). Regardless of the type of fabric or composition, almost all fabrics have to go through wet processing, which consists of cleaning, bleaching, dyeing, and finishing to produce finished fabrics. Wet processing puts an enormous pressure on the environment as it requires great amounts of water and large volumes of toxic substances (Kirian-Ciliz, 2003), the latter of which may pose risks to human health and the environment.

Examples of the consumption of energy and water in the textile industry are outlined below:

- Energy – From synthetic fiber making to the making up of garments, all the processes rely heavily on energy. The range of total energy used to produce textiles is between 100 – 342MJ/Kg depending on the material composition (BSR, 2009).
- Water – Natural fiber plants (cotton plantations), and textile wet processes (pre-treatment, dyeing and finishing) are water intensive. For example, 1 kg of cotton fiber intensive production needs 7103 liters (L) of water (Velden, 2014). Further, it requires 2700 L to make one T-shirt (250 grams) or 10, 850 L for one pair of jeans (1000g) (Chapagain et al. 2005)

- Raw material acquisition – Synthetic fiber making uses fossil fuel derivative products and energy requirements for synthetic fiber production are high. Energy inputs in polyester fiber production are 125 MJ/kg of fiber (NRDC, 2011) and generates a CO₂ emission of 9.52 Kg per ton of polyester fiber (Ecotextiles, 2014).
- Human and environmental toxicity – Chemicals and dyestuffs used in textile production may harm humans and the environment (e.g., carcinogenic dyes, poor biodegradable surfactants, etc.)

The increase of global consumers' awareness of the environmental impacts and health risks from the textile and apparel productions raises the pressure and demand of environmentally and socially conscious products on the market. They expect the products they purchase to be ethically produced by using conservation-minded resources, reduced emission of pollutants, greater social commitment, and fair treatment of employees in production facilities (Keller et al., 2014). According to a Global CSR study in 2015, 91% of global consumers expect companies to do more than make a profit, but also operate responsibly to address social and environmental issues, and 84% say they seek out responsible products whenever possible (Cone Communication, 2015).

In response to these pressures, many countries along with international brands and retailers have established or collaborated with other organizations to create stricter sustainability requirements for their supply chains to follow. In fact, many voluntary initiatives to reduce the environmental footprint of textiles have been developed or are in the pipeline. Public and private organizations are pushing global retailers and international brands to adopt their initiatives (RFS, 2013). Some well-known initiatives and standards on the global market include: the Sustainable Apparel Coalition (SAC), the EU Eco-Label, the Nordic Swan, STeP by OEKO-TEX®, and Thai Green Label among others. In addition, international brands and retailers have developed their own sustainability initiatives such as Nike Responsibility, Adidas Sustainability, and H&M Conscious Action to improve their supply chains to become more environmentally friendly and socially responsible.

In December 2015, the Indonesian Government also launched a voluntary sustainability standard for its textile industry called "Standar Industri Hijau (SIH)" or the Green Industrial

Standard (GIS) whose objectives are to develop sustainable manufacturing by minimizing the use of raw materials, energy, water, and reducing production waste, and emissions in order to improve the Indonesian textile industry competitiveness in global markets.

This study responds to the Indonesian Ministry of Industry's newly launched GIS by comparing it to four other sets of international sustainability standards and assessing possible relationships between the development of sustainable manufacturing through the adoption of GIS criteria with the increase in competitiveness of the Indonesian textile industry in global markets.

It should be noted that GIS is actually limited to only one of the five processes namely, dyeing, printing and finishing as these are believed to have the greatest environmental impact compared to other production stages in textile supply chain. Nevertheless, this study is extended to all production stages to include fiber making, spinning yarn and garment production to examine the possibility of the Indonesian government to expand GIS to include every production stage in textile industry in the future.

2. BACKGROUND

2.1. Indonesian Textile and Apparel Industry

The textile and apparel industry is one of the most important industries in the world and is valued at 3 trillion dollars accounting for 2 percent of the world's Gross Domestic Product (GDP). In addition, in 2014, it employed 57.8 million globally with 24.8 million people working in apparel manufacturing and 33 million people in textile manufacturing¹.

In Indonesia, the textile and apparel industry is also one of the most important industries as it contributes 1.2% to the Indonesian Gross Domestic Product (GDP) with exports valued at US\$ 12.28 billion or 8.2% of the total Indonesian export value (API, 2016). This makes Indonesia one of the leading textile exporters in the world (WTO, 2015). Indonesia's textile and apparel manufacturing's three biggest export market destinations are the United States (32%), Europe (14.6%), and Japan (9.8%) (API, 2015). Furthermore, in 2015, the

¹ <https://fashionunited.com/global-fashion-industry-statistics>

Indonesian Textile Association (API) recorded a total of 5,273 companies in its textile industry database and this accounted for the employment of about 1.51 million people. The total Indonesian textile industry production is about 6.2 million tons of textile with a value equivalent to US\$ 18.7 billion (2014). A seven year overview of statistics of Indonesian textile and apparel industry is shown in Table 1 below.

These statistics prove that the textile and apparel industry is one of the top ten priority industries of the Indonesian presidential development master plan as stipulated in regulation No.14 Year 2015 as part of the Master Plan of National Industrial Development (Rencana Induk Pembangunan Industri Nasional/RIPIN) Year 2015-2035. This master plan is used as a guide to develop strategies to grow and empower major industries over the next twenty years (Ministry of Industry, 2015).

Table 1. Overview of the Indonesian Textile and Apparel Industry

Description	Unit	2009	2010	2011	2012	2013	2014 *)	2015 **)	%Change 2015/14
Number Of Company	Unit	4,777	4,824	4,881	4,937	5,178	5,258	5,273	4.9%
Value of Investment	Rp (Bn)	146,170	150,947	161,191	172,070	199,324	223,330	234,334	4.9%
Men Power	People (Mn)	1.20	1.35	1.42	1.51	1.58	1.55	1.51	-2.0%
Export									
Value	Million US\$	9,262	11,223	13,359	12,460	12,679	12,741	12,285	-3.6%
Volume	'000 Ton	1,760	1,969	1,941	1,953	2,100	2,279	2,296	0.8%
Import									
Value	Million US\$	4,171	6,186	8,430	8,144	8,473	8,566	7,977	-6.9%
Volume	'000 Ton	1,294	1,537	1,578	1,894	1,961	2,069	1,981	-4.2%
Net Export									
Value	Million US\$	5,091	5,036	4,928	4,316	4,207	4,175	4,308	3.2%
Volume	'000 Ton	466	432	363	60	140	210	315	50.0%

Note: p= very preliminary figures. For Export/Import data in 2004 to 2006 based on DEPDIAG, and data for 2007 and 2010 based on the Bank Indonesia by SITC (Number of Company, Value of Investment & Men Power) revision data from Ministry of Industry of RI, *) preliminary Data **) very preliminary Data

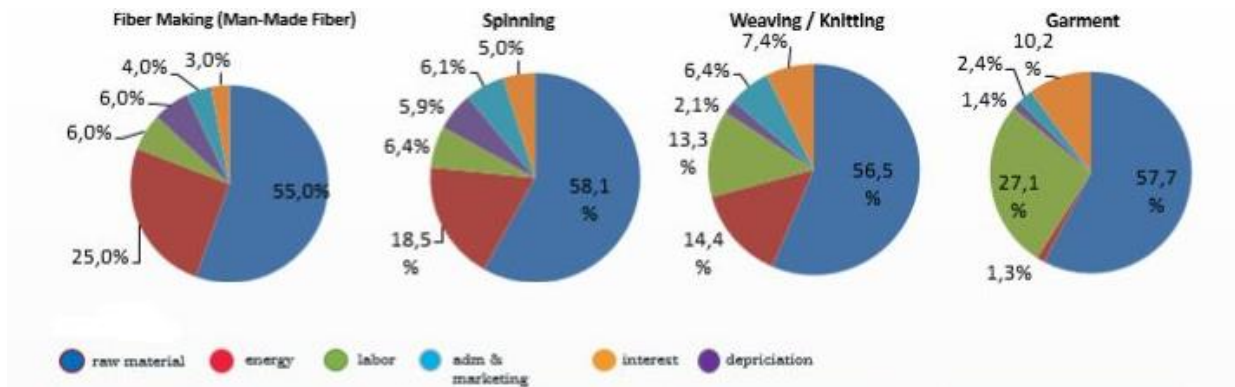
Source: Indonesian Textile Association (2016)

2.2. The Indonesian Green Industrial Standard (GIS)

The textile and apparel industry in Indonesia faces challenges in moving up the value-added chain as it strives to fulfill demand from overseas customers and international brands and retailers while providing quality products which are produced in environmentally and socially sustainable ways. At the same time, customers are pushing for lower prices, forcing manufacturers to increase productivity and reduce production costs. According to data analysis of the Indonesian Ministry of Industry, the cost structure of textile products in

Indonesia is still highly dominated by both raw material and energy usage at every production stage (see Figure 1). Thus, to reduce production costs and lower product prices, the industry needs to minimize the use of raw material and energy and reduce production waste in a way that is sustainable both environmentally and socially. This would, in turn, increase profit margins while allowing the Indonesian textile industry to become more competitive in the global market.

Figure 1. Cost Structure of Textile Manufacturing in Indonesia



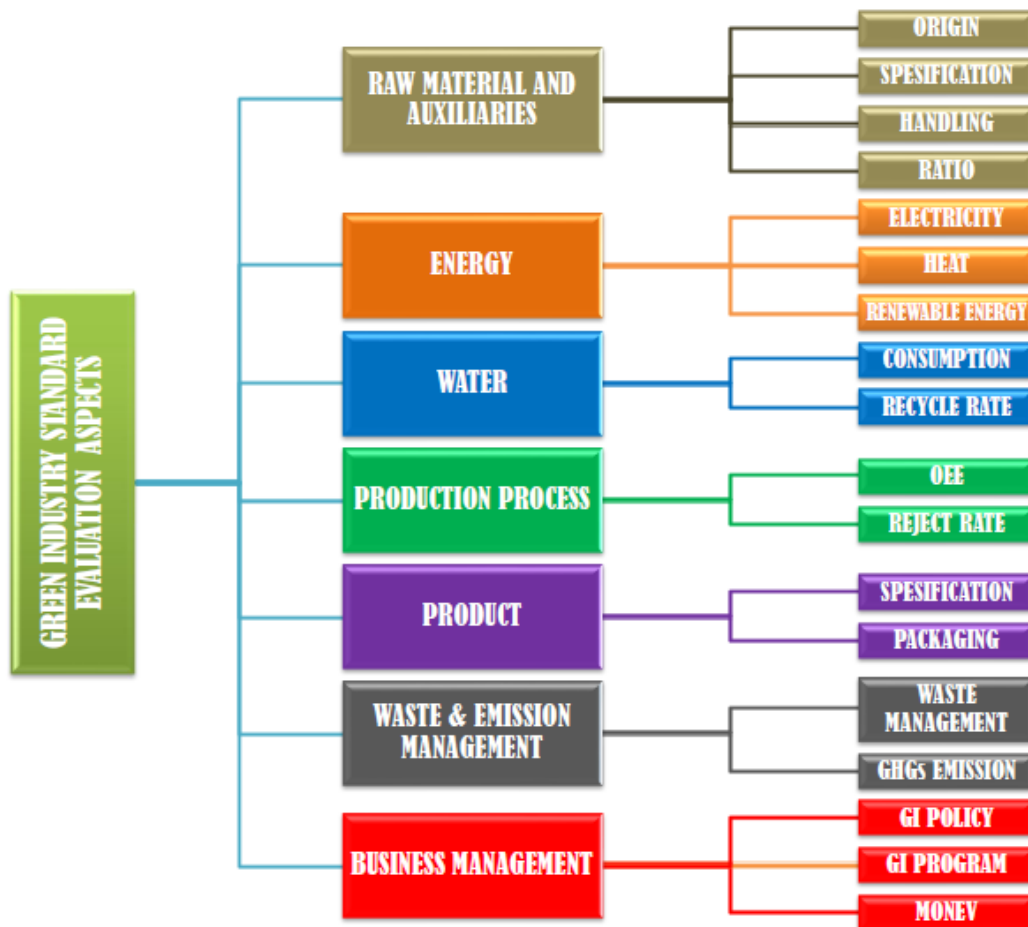
Source: Indonesian Ministry Industry (2016)

The development of GIS by the Indonesian government is mainly to help textile and apparel manufacturers meet these demands and increase the competitiveness in global markets. GIS is defined as a voluntary textile industry standard to establish a high priority on efficiency and effectiveness in using the natural resources to harmonize the industrial development with environmental conservation for the benefit of communities. The standard came into effect under the Ministry of Industry decree no. 515/M-IND/Kep/12/2015 in December 2015 and covers only dyeing, printing and finishing stage which is believed to generate the greatest environmental impacts in the textile production life cycle analysis (excluding the usage phase). GIS offers guidelines to assist textile manufacturers in assessing and managing its raw materials, energy, and water consumption while reducing production waste and emissions in production. In addition, it is in accordance with Indonesia's commitment to reduce greenhouse gas emissions by 26% by 2020 in Business as Usual (BAU) level (UNFCCC, 2011).

GIS was developed by a technical team set up by the Head of Research and Development of the Ministry of Industry. The members of the technical team encompass representatives from all stakeholders, including textile producers and associations, consumers, the Center for Green Industry and Environment Assessment, regulators from the Directorate of textile, leather, footwear and multifarious related industries, and experts in relevant fields.

GIS assesses ten different aspects including: (1) raw material (2) dyestuffs and auxiliaries (3) energy (4) water (5) production process (6) products (7) packaging (8) waste (9) CO2 Greenhouse gases and, (10) management requirements (see Figure 2).

Figure 2. GIS Criteria Requirements



Source: Center for Green Industry and Environment, Ministry of Industry, Republic of Indonesia (2017)

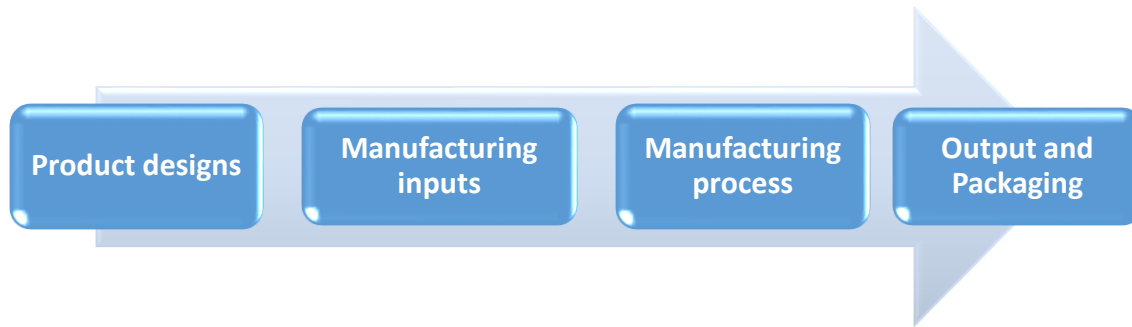
2.3. Sustainable Manufacturing

Until now, there has been no absolute definition for the terms sustainable or sustainable development in manufacturing enterprises, although new terminologies such as environmentally conscious manufacturing, green manufacturing, and reverse manufacturing are related to sustainability (Garbie, 2016). The U.S. Department of Commerce defines sustainable manufacturing as “the creation of manufactured products that use processes that minimize negative environmental impacts, conserve energy and natural resources, are safe for employees, communities and consumers and are economically sound” (USDC, 2009). Sustainability in manufacturing enterprises is generally accepted as encompassing the social, economic, and environmental aspects of decision-making (Barder et al. 2012). It includes components such as making products that use less energy and materials, produce less waste, and use fewer hazardous materials as well as products that have greener attributes such as recyclability or lower energy use. Sustainable manufacturing practices can range from very simple process improvements to large investments in new technologies and product design (USDC, 2011).

For this research, the sustainable manufacturing practice (SMP) in the textile and apparel industry includes product design, manufacturing input, manufacturing process, output and packaging. These types of processes are common practice within the Indonesian textile industry. Many textile and apparel manufacturers in Indonesia who produce products based on customers’ orders have even fewer production stages as they do not design their own products since the final designs are created and sent to them by their customers as outlined in Figure 3.

Competitive advantage in this research is defined as the extent to which an organization is able to create a defensible position over its competitors. It comprises capabilities that allow an organization to differentiate itself from its competitors and is an outcome of critical management decisions (Li et al., 2006).

Figure 3. Manufacturing Process for Indonesian Textiles and Apparel



2.4. Global Sustainability Initiatives, Standards, and Certifications

The textile and apparel industry is one of the world's highly integrated global markets as one simple shirt can involve manufacturers from different countries across the globe as efforts to seek high quality and low cost of products. It makes textile and apparel manufacturing processes more complex compared to some other product manufacturing processes. For example, if we look at one shirt made in Vietnam and sold in a store in Europe, the cotton fiber was imported from the United States to spinning mills in India to produce yarn. Then, a Chinese manufacturer imported this yarn to produce fabric that was exported to garment manufacturers in Vietnam. In addition, the garment manufacturer in Vietnam might import some additional smaller components such as buttons, sewing thread and labels before all the components are assembled to create a ready-made shirt. With so many different products and actors being involved in product manufacturing, there is no one simple policy to measure for everything.

As the pressure from NGOs, regulators, and consumers on textile and apparel manufacturers increases, many international brands and retailers are collaborating with public or independent organizations to establish stricter sustainability requirements for their supply chains to follow that address environmental impact and poor social and safety treatment of their workers. Further, legislators in some countries require companies to create more sustainable products, by prohibiting certain harmful dyestuffs (Keller et al., 2014). A whole variety of voluntary and mandatory tools which can be used to measure and minimize harm to the environment, end-user health, and worker health are available to textile and apparel

manufacturers and products (IPP, 2016). These standards and certifications of sustainability performance have become integral in communicating manufacturers' sustainability efforts to their consumers.

The push for environmental safety in textile production took root primarily in Europe, and began around 1992 when the European Economic Council adopted Council Regulation No. 880/92 establishing a Community Eco-Label award scheme. Textiles were one of the first product groups for which Eco-Label criteria was established. Criteria was mainly targeted at concerns regarding environmental pollution and human health and safety (Golden, 2010). Since then, dozens of standards and certifications have become available on the market.

For this study, four global textile sustainability initiatives and certifications, STeP by OEKO-TEX®, EU Ecolabel, Adidas and Higg Index sustainability standard have been chosen as benchmarks to compare with GIS. To provide a wider and more complete comparative analysis, each standard/initiative represents a different type of organization from an independent and public organization, to an international brand, and an industrial coalition. Below is a short description of each program.

2.4.1. STeP by OEKO-TEX®

OEKO-TEX® International Association developed the Sustainable Textile Production (STeP) by OEKO-TEX® in 2013 as a replacement of OEKO-TEX® Standard 1000 certification for environmentally-friendly and socially-compatible production. STeP by OEKO-TEX® is a certification system for production facilities of all processing stages from fiber production, spinning mills, weaving mills, knitting mills to finishing facilities and manufacturers of ready-made textile items that want to communicate their achievements regarding sustainable manufacturing processes to the public (OEKO-TEX, 2016).

OEKO-TEX® International Association is a non-profit organization and independent research and network of testing institutes focused on enhancing both product safety and sustainable production in the textile industry. It was founded in 1992 and is now comprised of 18 institutes from European Union Countries and Japan with representative offices in more than 60 countries (OEKO-TEX, 2016).

The first certification developed by the Association and the most widely-accepted certification for textile products in the world is OEKO-TEX® Standards 100 for textile products safety (from raw materials, semi-finished or finished products) which are tested for harmful substances to human health and environment. Since its development in 1992, more than 160,000 certificates have been issued to manufacturers in about 98 countries world-wide (OEKO-TEX, 2016).

STeP by OEKO-TEX® requires a holistic assessment, analysis, and audit of sustainable production of the textile supply chain in six modules which are management of chemicals assessment and management, environmental performance, environmental management, health and safety performance management, social responsibility, and quality management. Depending on a company's achievement of all six criteria, the certificate has three different levels of certification with one being basic achievement and three being the best achievement. The verification is carried out in the form of a production facility's site visit audit. Since its launch in mid-2013, STeP by OEKO-TEX® has issued approximately 150 certificates worldwide (STeP, 2016).

2.4.2.EU Ecolabel

The EU Ecolabel, which was launched in 1992 by the European Commission in light of developing a Europe-wide voluntary environmental labelling scheme that consumers could trust, has (as of the September 2016 reporting period) issued 1,998 licenses (EU Ecolabel, 2016).

This textile product criteria is aimed at identifying products that have a lower environmental impact along their life cycle. The criteria seeks specific improvements so that they are sourced from more sustainable forms of agriculture and forestry, so that they may be manufactured using resources and energy more efficiently, while using cleaner, less polluting processes, and less hazardous substances, and, designed and specified to be of high quality and durability (EU, 2014).

The standard as described by the European Commission no. 2014/350/EU is comprised of 6 different categories namely, (1) textile fiber compositions; (2) components and

accessories; (3) chemicals and processes which include those on the Restricted Substance List (RSL), energy efficiency and water and air emission treatment, (4) corporate responsibility, and (5) documentation of data requirements.

2.4.3. Adidas Sustainability Standard

Adidas AG is the largest sportswear manufacturer in Europe and the second largest in the world. In 2015, the company employed approximately 55,555 people worldwide². The Adidas Group's global net sales amounted to about 16.92 billion euros in 2015. Footwear and apparel are two of the Adidas Group's biggest segments. In 2015, the company produced 301 million pairs of shoes worldwide and 364 million units of sports apparel (statista.com, 2017). Adidas works with more than 1,000 independent factories from around the world that manufacture products in 61 countries. In 2015, the top five countries per region by number of supplier sites were (Adidas, 2016):

- The Americas (25%): United States, Brazil, Canada, Argentina and Mexico
- Asia (65%): China, Korea, Vietnam, Indonesia and Japan
- EMEA (10%): Germany, Turkey, Italy, Spain and South Africa

To work with large, multi-tiered and varied supply chains, Adidas has a detailed and systematic approach to managing the relationships with their suppliers. Adidas established "Workplace Standards", the supply chain code of conduct which also covers workers' health and safety and provisions to ensure environmentally sound factory operations. To enforce compliance of the standards, Adidas has multi-level monitoring and enforcement processes in place, including the use of an innovative rating system for the assessment of the suppliers. The rating results are shared with the sourcing teams which then decide whether and to what extent Adidas continues the business relationship with a specific supplier (Adidas, 2017). The standards require suppliers to self-assess their environmental sustainability criteria such as energy, water, GHG, chemical managements, waste as well as safety, and social responsibility and labor compliance.

² <https://www.statista.com/statistics/268427/number-of-employees-of-the-adidas-group-worldwide-since-2000>

The environment is being increasingly degraded due to man-made issues including human/labor rights violations, pollution, growing energy consumption and waste. In order to address these issues and challenges that endanger the planet and people, Adidas developed a holistic strategy for their sustainability goal 2020 which includes six strategic priorities in two categories namely, water, materials, energy in product category and empowerment, health and inspiring action in people category. (Adidas, 2016).

2.4.4.HIGG Index

The Higg Index is a self-assessment tool designed to assess and measure the performance and impacts of environmental and social/labor of apparel and footwear products across the value chain at the brand, product and facility levels (SAC, 2016). The tools were developed by Sustainable Apparel Coalition (SAC), a global alliance of retailers, brands, suppliers, advocacy groups, labor unions and academics, aimed at creating “apparel, footwear and home textiles industry that produces no unnecessary environmental harm and has a positive impact on people and communities (The Guardian, 2016). As of January 2017, the coalition has 183 members from 31 different countries with approximately 40% of the members being from the United States (SAC, 2017).

The Higg index has five core modules to evaluate environmental sustainability performance at three levels – company (brand or retailer) and facility (factory). These include three environment and social modules for brand/retailer and two facility modules for environment and social/labor assessment tools. Each Higg Index module is comprised of questions developed by the SAC which are regularly reevaluated and updated to address all corporate policies and practices, from foundation-level measures (e.g. basic compliance) to medium-level to aspirational-level (e.g. advanced and far-reaching sustainability policies) (SAC, 2016).

The Environmental Modules are based on life-cycle thinking and span of the apparel and footwear life cycle (materials, manufacturing, packaging, transportation, use, and end-of-user) (SAC, 2016). It covers several principles including: (1) environment management system or program, (2) energy use and Greenhouse Gases (GHG) emissions, (3) water use,

(4) wastewater/effluent, (5) emissions to air, (6) waste management, and (7) chemical management. To assess its performance, the facility may answer all the questions from level one to three depending on how advanced their programs are on each aspect (SAC, 2016).

The Social/Labor Modules are based on the worker lifecycle and were developed using the best available tools and frameworks. In this module, the Higg Index covers three different sections, which includes labor and workplace performance management for the facility and its value chains, and external engagement, community impact, transparency and public (SAC, 2016). In labor and workplace performance section, it evaluates the facility's recruitment and termination process, compensation, working hours, health and safety, and workers involvement, communication, treatment and development (SAC, 2016).

The scoring system of the Higg Index was designed to drive behavior change, in which each module is given a specific weight to calculate the total score. It has no performance thresholds for evaluating facility scores and no validation is needed unless the company chooses to have third party audit verification of their own. Based on the total score, the facility is then awarded either bronze, silver or gold level (SAC, 2016).

3. RESEARCH METHODS

This study employs comparative analysis and a mixture of quantitative and qualitative survey methods. The comparative analysis aims to assess the alignment of GIS criteria compared to four other globally-established sustainability standards. The combination of both quantitative and qualitative surveys aims to gather industry and other stakeholders' opinions about GIS. The quantitative survey gathers information from a large number of manufacturers and all types of textile supply chain operating on Java Island where most of the textile and apparel industry is located. The qualitative interview method's objective is to gather expert opinions from selected stakeholders in order to understand the deeper issues and solutions from different perspectives.

3.1. Comparative Analysis

In the comparative analysis, GIS is compared with four globally-established textile sustainability standards as benchmarks which offer a wider and more complete comparative analysis as each standard represents a different type of organization. The standards and documents analyzed for this purpose are as follows:

(1) STeP by OEKO-TEX® Standard (2016) representing an independent non-profit organization

(2) EU Eco-Label representing an alliance of developed countries. The standard reviewed is the EU commission Decision of 5 June 2014 for establishing the ecological criteria for the award of the EU Ecolabel for textile products (notified under document C (2014) 3677) (2014/350/EU)

(3) Adidas Environment and Social Sustainability Standard representing the private sector. The documents reviewed were (1) Global Policy Manual GWP01 – Integrated Management System Policy, September 1, 2016 (2) Policy for the Control and Monitoring of Hazardous Substances A-01, September 1, 2016 (3) Labor Rights Charta May 01, 2011 and, (4) Environmental Guidelines, January 2010

(4) Higg Index developed by SAC representing an alliance of fashion, retailing, and manufacturing organizations. Assessment tools used version 2.0 facility module, environment and social/labor dated July 28, 2015.

(5) GIS document reviewed was the Indonesian Ministry of Industry decree No. 515/M-Ind/Kep/12/2015 (2015). The Green Industrial Standard for Dyeing, Printing, and Finishing of Textile Industry (SIH). December 14, 2015.

The analysis results of STeP by OEKO-TEX®, and the EU Eco Label from *Standardsmap.org* was first reviewed and adopted as a basic format for the comparative analysis research. Then the other two standards, Adidas Standards and Higg Index, were added and finally GIS. *Standardsmap.org* was chosen as it is a global online platform developed by the International Trade Center, a joint agency between World Trade Organization and the United

Nations, which enables users to explore and compare hundreds of sustainable standards from many different countries (ITC, 2016).

3.2. Mixed Method of Quantitative and Qualitative Research

3.2.1. Quantitative Method

The quantitative survey was distributed in two batches first in hardcopy form at a seminar and the second by email. The quantitative survey includes 36 questions which are split into 3 different categories, company profile, GIS, and company sustainability. Out of a total of 114 quantitative surveys returned, 85 surveys from 85 different companies were used and analyzed for this research as 29 surveys from the 114 represented duplicate companies and were excluded. The positions the respondents held in their respective companies are as follows: 43% in managerial positions, 32% supervisors or staff, 13% in top level management positions such as general managers and directors, with 12% respondents who did not mention their positions. The majority of the manufacturers are located in greater Jakarta (45%) and West Java (41%) while the rest are located in Central Java (11%) and East Java (4%). Some respondents filled the *Duke Qualtrics* online survey but most filled in the excel format survey. All the surveys were entered and combined in the *Duke Qualtrics* survey for analysis.

The first batch of quantitative surveys was conducted during a sustainability textile supply chain seminar on November 22nd, 2016 in Jakarta, Indonesia. Hard copies of the questionnaires were distributed to 110 participants and 99 questionnaires from 70 companies were returned. This study eliminated returned surveys from the same companies and this was based on the hierarchal position and job relevancy of the participants (e.g. questionnaires from a director or manager was chosen over staff while questionnaires from supervisor and sustainability staff were chosen over sales staff).

The second batch of quantitative surveys was distributed by email to 100 textile manufacturers of various types of production in Central Java and West Java. The company names and information were selected from the Indonesian Textile Directory and the Indonesian Textile Association member database. The survey was distributed shortly after

the first by email on December 21st, 2016 and was open for three weeks. Unfortunately, this second batch was not well participated as only 15 of the 100 companies returned the questionnaires. Two factors contributed to this: (1) Unreliable information - some email addresses were not updated and, as a result, many emails were undelivered, and (2) Timing – the surveys were distributed during the holiday season when many people were out of their offices.

3.2.2. Qualitative Method

For the qualitative method, 12 in-depth interviews were conducted from January to February 2017. A total of 17 questions were asked to each participant working in medium to high level management positions (e.g. head of sustainability, factory managers, general managers, directors, and managing directors or shareholders) from different stakeholders in textile related industries including fiber makers, yarn (raw white and yarn-dyed), dyeing, printing and finishing of fabrics, and garment, government officers, international brands, certification institute, and representative from the synthetic fibers/yarn association. These interviewees were key in their offering of different perspectives on the challenges, needs, and understanding of the role of sustainability and its implementation in the Indonesian textile industry.

3.3. Research Limitations

The limitation of this research is that all the participants in this study are either export-oriented companies or exposed to export markets through their customers. Therefore, the opinions of manufacturers who are not exposed to export markets are not well represented here as very few responses from manufacturers who only serve the domestic markets without any exposure to export markets, especially small-medium companies. Further research would be needed to analyze the sustainability adoption for such companies.

In order, to understand the entire textile industry's readiness to adopt sustainability practices, this research included all types of manufacturers in textile supply chains even though GIS is focused solely on fabric dyeing, printing and finishing. Therefore, the survey focused on the GIS criteria without measuring thresholds.

4. DATA ANALYSES AND RESULTS






4.1 GIS Criteria and Recognitions

The analysis of the four international sustainability standards - STeP by OEKO-TEX®, EU Eco Label, Adidas and Higg Index - used as benchmarks, resulted in eight general criteria across all standards namely:

- (1) Chemical management and RSL compliance,
- (2) Waste management,
- (3) Water,
- (4) Energy,
- (5) Greenhouse Gases (GHG),
- (6) Social responsibility (including labor and safety compliance)
- (7) Product management, and
- (8) Sustainability management aspects.

Apart from social/labor and safety compliance, GIS covers all eight criteria. However, the most notable difference is that the requirements for GIS certification are still very basic compared to the benchmarks which are more detailed and rigorous. For example, GIS covers only a few of the requirements for restricted harmful substances or restricted substance list (RSL) in dyestuffs and chemicals compared to other standards which include hundreds of harmful substances. This is understandable when considering that GIS is still a new standard. The comparative analysis results of these standards are detailed in Table 2 below.

Table 2. Comparative Analysis of GIS to Four Global International Standards

	General Criteria	Sub criteria	 GIS	 STEP by OEKO-TEX	 EU ECOLABEL	 ADIDAS	 HIGG INDEX
1	Chemical management and RSL compliance	Chemical management - General principle - MSDS, storage, and labelling	✗	✓	✓	✓	✓
		Restricted harmful substances compliance	✓ limited	✓	✓	✓	✓
2	Waste	Waste treatment, packaging, and disposal	✓	✓	✓	✓	✓
		Air pollution reduction and monitoring	✗	✓	✓	✓	✓
		Waste reuse/recycle program	✗	✓	✓	✓	✗
		Noise, odor and other pollution nuisance	✗	✓	✓	✓	✗
3	Water	Water consumption management	✓	✓	✓	✓	✓
		Water use and recycling	✓	✓	✓	✓	✓
		Wastewater management/treatment and discharge	✓	✓	✗	✓	✓
4	Energy	Energy management	✗	✓	✗	✓	✓
		Reduce use of energy	✓	✓	✓	✓	✓
		Energy alternative/renewable	✗	✓	✓	✓	✓
5	Greenhouse gases (GHG)	Carbon policy	✗	✓	✗	✓	✓
		GHG emission monitoring and reduction	✓	✗	✓	✓	✓
6	Social responsibility/labor and safety compliance	Work and labor law compliance	✗	✓	✗	✓	✓
		Health and safety working conditions	✗	✓	✓	✓	✓
		Child labor and minimum age	✗	✓	✓	✓	✓
		Collective bargaining and freedom of association	✗	✓	✓	✓	✓
		No discrimination	✗	✓	✓	✓	✓
		Compensation (minimum wage)	✗	✓	✗	✓	✓
		Working hours and overtime	✗	✓	✓	✓	✓
7	Product management	Product quality requirements	✓	✓	✓	✓	✗
		packaging	✓	✓	✗	✓	✓
		Product safety	✓	✓	✓	✓	✓
8	Sustainability management aspects	Management systems/ programs - General principles	✓	✓	✗	✓	✓
		Monitoring and measuring effectiveness of procedures	✓	✓	✗	✓	✓
		Compliance of law and regulation	✓	✓	✗	✓	✓
		Environmental Performance improvement	✗	✓	✗	✓	✓

Source: adopted from standardsmap.org

The second significant difference is the threshold settings. Unlike GIS that sets thresholds in almost all its criteria requirements, the benchmark standards only set the thresholds for criteria which are regulated by laws in certain countries such as chemical management and Restricted Substance List (RSL) usage, and wastewater. Moreover, there were no thresholds stated for energy, water usage or Greenhouse Gases (GHG); instead, performance improvement or efficiency was expected. This is reasonable as water and energy usage may vary considerably depending on factors such as machine type, dyes used, material composition and material design. Since different fibers, dyes, colors or shades may need different chemicals or types of dyestuff, the actual requirement of liquor ratio, water temperature and dyeing time are different (Fletcher, 2008). Further, some designs require that both the dyeing and printing processes are performed simultaneously and this uses more energy and water than doing one or the other.

The third difference is the manufacturer participation target. All four benchmark standards are applicable to all five stages of textile manufacturing i.e. (1) fiber production (2) spinning process (yarn) (3) weaving process (fabric) (4) dyeing, printing and finishing process, and, (5) assembling (sewing) process but GIS only targets the fourth stage of dyeing, printing and finishing. Nevertheless, manufacturers of other processes such as, fiber, spinning, and weaving manufacturing processes which also drive high energy use should be encouraged to adopt sustainability practices as well.

The quantitative survey and interviews gave mixed results about the recognition of GIS by both international and domestic customers. In the quantitative survey, 65.7% of the respondents thought that GIS would be accepted by both domestic and international customers, while 20% believed that only domestic customers would recognize this standard. On the other hand, of those interviewed, 4 out of 6 manufacturers were of the opinion that international customers would not recognize this standard. According to interviews with international brand and retail representatives, GIS criteria would only be accepted on the condition that its requirements are either the same or higher than their own sustainability standards. This suggests that there is an opportunity for the Indonesian government to gain wider recognition from international brands and organizations. A strategy for collaboration

and negotiation for reciprocal recognition with parties both in the private and public sectors needs to be implemented.

Moreover, 25% interviewees in this study regularly raised the common challenge that the need for repeating the same audit and testing for the same criteria and products by different organizations is a burden that manufacturers have to bear to get third party certification or get approval as an international brand and retailer nominated supplier. In addition to time and resources, manufacturers have to spend a lot of money to pay the cost of testing which may sometimes test identical parameters. In fact, even though most international standards use the same global RSL which include a large number of harmful substances, most of the time, different organizations or brands will not accept or recognize the testing results if they are not from their nominated testing laboratory. For example, Nike requires their suppliers to test their products at its nominated testing laboratories such as Intertek Taiwan and will not accept the test results from other organizations even though the same products supplied to Nike have been tested and certified by another international testing laboratory. This common practice within international standards and organizations is a result of a lack of collaboration and partnerships and creates greater financial and human resource burdens for manufacturers. Nevertheless, in order to get order placements from customers, manufacturers are required to fully comply.

Industrial coalitions, multilateral agreement with other countries, or public-private organizational partnerships such as SAC, or Zero Hazardous Discharge Chemicals (ZHDC) initiative in which different organizations share agreement on one or more common global standards to be uniformly adopted and followed would substantially reduce the duplication and unnecessary costs that exist today.

4.2 Development of Sustainable Manufacturing in the Indonesian Textile Industry

In order to develop sustainable manufacturing to increase the Indonesian textile industry's competitiveness in the global market, the readiness of manufacturers in Indonesia along with the challenges they face when adopting cleaner production and sustainable programs need to be examined in addition to how the government can support the industry. The survey

results from 85 manufacturers and 12 interviews with those working in textile and apparel related organizations were analyzed to address this subject.

All types of textile producers from small companies with 1-100 employees (17.6%), medium-large companies with 100 – 1000 employees (51.8%) and large companies with more than 1000 employees (30.6%) participated. The types of companies included Indonesian owned companies (54.2%) or foreign or mixed (with Indonesia) investment companies (45.8%). Most respondents sold their products to both domestically and abroad with the five biggest target markets being domestic (71.9%), Europe (48.8%), ASEAN countries (45.1%), USA (40.2%), and Japan (40.2%).

4.2.1 Company Readiness

The study suggests that sustainability practices are not a new topic to the Indonesian textile industry. For more than a decade some companies have started implementing sustainability criteria in their companies. A promising majority of 63.2% respondents already have sustainability programs and 26.3% are still developing such programs. Overall, the time frame of implementation shows that 29.4% have implemented sustainability programs between 5 years to more than 10 years, while 36.7% have implemented programs less than 5 years with a further 30.9% still have programs under development. Notably, two-thirds of the respondents have implemented one or more criteria of sustainability standards in the areas of quality management, water consumption efficiency, waste management, energy and production efficiency and chemical management/RSL compliance. The least implemented criteria is greenhouse gas emission monitoring and using non PVC packaging (see Table 3 and 4). These results are consistent with the survey results where 76.6% of the respondents are confident that the Indonesian textile industry is ready to go beyond traditional manufacturing processes to become sustainable manufacturers, while 16.9% are neutral, and only 6.5% disagree. Further, the results among different geographic locations or type of the manufacturing processes provide the same results, in which most of the respondents agree that the Indonesian textile and apparel industry is ready to incorporate more sustainable manufacturing as shown in Table 4.

Table 3. Sustainability Criteria Implementation in the Indonesian Textile Industry

#	Question	Already implemented	Will be implemented	Will not be implemented	Not applicable	Response
1	Energy efficiency	51	24	-	-	75
2	Waste management	57	9	-	7	73
3	Water consumption efficiency	58	16	-	1	75
4	Greenhouse Gas Emission	20	31	3	8	62
5	RSL/chemical management compliance	50	15	2	2	69
6	Quality Management	62	12	-	-	74
7	Production process effectiveness	57	14	1	2	74
8	Raw material consumption efficiency	49	18	1	2	70
9	No or Less PVC in packaging	33	27	3	4	67
10	Management strategy and aspects	51	17	-	-	68

Table 4. Geographic Results Variation

	Greater Jakarta (38 Respondents)	West Java (35 Respondents)	Central Java (9 Respondents)	East Java (3 respondents)
Industry Readiness				
Agree	26	21	7	2
Neutral	4	8	1	0
Not Agree	1	2	1	1
Sustainability program implementation				
Yes	23	19	4	0
Under development	6	8	3	3
No	3	4	1	0
Criteria Implementation				
Energy efficiency	21	21	5	3
Waste management	22	25	6	3
Water consumption efficiency	26	23	6	0
Greenhouse Gas Emission	6	9	3	1
RSL/chemical management	19	23	6	0
Quality Management	28	22	7	3
Production process effectiveness	28	19	6	2
Raw material consumption	24	15	5	3
No or Less PVC in packaging	11	13	6	0
Management strategy and aspects	24	18	5	2

Further to the criteria of GIS attainment, over three quarters of the survey respondents and all of the interviewees are confident that they would be able to attain all the criteria in GIS with only 6.5% of the respondents considering the attainment of all the criteria unlikely for their companies.

The responses to the sustainability criteria in Table 5 rank from the easiest (1) to the most challenging criteria (5) appear to vary greatly. For example, in qualitative interviews, RSL compliance and energy are the most talked about with either criteria being the easiest or the most challenging. However, according to the quantitative survey, the criteria rated the easiest as quality management, chemical/RSL compliance, and raw material consumption efficiency.

Table 5. Sustainability Criteria Ranking

No	Sustainability Criteria	1 (Very Easy)	2	3	4	5 (Very difficult)	Response	Average Value
1	Energy efficiency	17	24	25	5	3	74	2.36
2	Waste management	15	25	21	5	4	70	2.40
3	Water consumption efficiency	18	24	17	11	3	73	2.41
4	Greenhouse Gas Emission	7	12	24	13	10	66	3.11
5	RSL/Chemical management	14	29	19	4	1	67	2.24
6	Quality Management	21	32	16	2	1	72	2.03
7	Production process effectiveness	14	30	22	4	3	73	2.34
8	Raw material consumption efficiency	16	23	21	6	2	68	2.34
9	No or less PVC in packaging	17	15	22	9	3	66	2.48
10	Management strategy and aspects	16	23	27	4	1	71	2.31
11	Social responsibility/labor compliance	14	25	25	4	1	69	2.32

Manufacturers are well aware that customers' consistent focus is on quality as shown in Table 6, where quality is followed by long term partnerships, service and price. Since almost all of the respondents are export-oriented manufacturers, quality which goes hand in hand with production efficiency, and RSL are critical requirements for international customers due to the strict laws of developed countries regarding the use of harmful substances in products as illustrated in Table 5.









Table 6. Customer's Product Requirements Ranking

No	Requirement	1 (the least important)	2	3	4	5 (very important)	Response	Average Value
1	Price	1.33%	0.00%	8.00%	20.00%	70.67%	75	4.59
2	Environmentally friendly products/company	1.33%	1.33%	16.00%	38.67%	42.67%	75	4.20
3	Socially responsibility/ labor compliance	1.35%	4.05%	20.27%	32.43%	41.89%	74	4.09
4	RSL compliance/chemical management	2.67%	1.33%	12.00%	22.67%	61.33%	75	4.39
5	Best service	1.35%	1.35%	4.05%	20.27%	72.97%	74	4.62
6	Quality	1.33%	0.00%	5.33%	17.33%	76.00%	75	4.67
7	Lead time	1.35%	0.00%	8.11%	28.38%	62.16%	74	4.50
8	Product innovation	2.78%	1.39%	12.50%	34.72%	48.61%	72	4.25
9	Long term partnership	1.33%	0.00%	6.67%	17.33%	74.67%	75	4.64

On the other hand, the most challenging criteria are GHG, packaging, and waste (water, solid, and hazardous) management in which, according to qualitative interviews, many manufacturers are not familiar with GHG program. As different production types require different resources and input, different sustainability measures need to be implemented. For example, for fiber and spinning manufacturers, the challenge would be energy efficiency as they need almost 24/7 electricity to run production and accounts for 18-25% of production costs, but in garment manufacturing, energy is one of the easiest criteria to achieve as not

much is needed in this type of production. However, as energy was named as one of the biggest production cost factors, 60% of the respondents have already adopted energy efficiency programs and the other 30% are developing such programs. Based on these results, further research is necessary to identify and map the specific challenges faced by each type of manufacturing process in order to provide appropriate support and solutions to help the adoption of sustainability criteria.

Table 7. Drivers for Sustainable Manufacturing Implementation

#	Answer	Bar	Response	%
1	Buyer/customers requirement		61	81.33%
2	Increase company's competitiveness in domestic market		36	48.00%
3	Increase company's competitiveness in global market		53	70.67%
4	Company's self awareness		38	50.67%
5	Good marketing tools to promote products and company		40	53.33%
6	Increase sales revenue		29	38.67%
7	Government requirement		27	36.00%
8	Other reasons		1	1.33%
	Total		285	100.00%

Buyer and customer requirements are the major reasons for sustainability practice implementation in the Indonesian textile industry, followed by the opportunity to increase company competitiveness in the global market, and the provision of marketing tools to promote company image and products. Details of these results are shown in Table 7 and support the literary research that points to the increasing customer demand for ethically and environmentally friendly products. The respondents listed the five largest markets which require manufacturers to implement sustainability practices as Europe (66% respondents)

USA (52% respondents), Japan (38% respondents), ASEAN countries and domestic markets (21% respondents respectively). To gain a competitive edge globally, there is no other option for manufacturers in Indonesia but to fulfil their overseas clients' requirements. The international brand and retailers' model for creating markets to motivate manufacturers to implement sustainable manufacturing can be used as a benchmark for the government to move larger numbers manufacturers to adopt sustainable practices.

The finding is supported by another question when respondents were asked whether or not they would apply for GIS certification. Only 29.6% of the respondents said they would apply and 38% would consider it while 14.8% would apply only if it were mandatory, and 13.6% said no. The customer demand is the biggest driver because according to 60.8% respondents no customers currently require GIS.

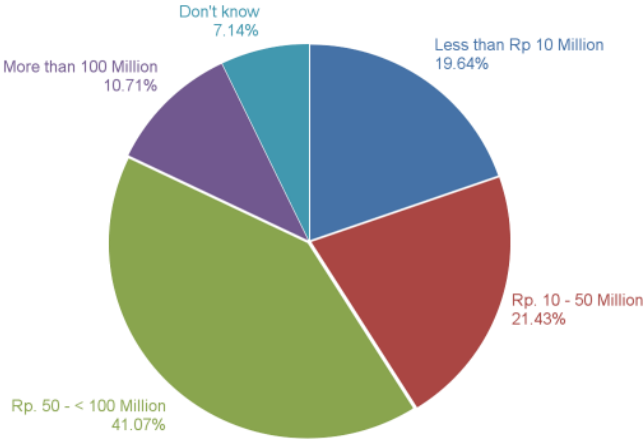
4.2.2. Challenges to Adopting Sustainability Practices

Besides management and stakeholder commitment, there are four other challenges faced by manufacturers to implement sustainable manufacturing from scratch. Adoption of such practices requires: (1) large financial investment which can be difficult for some companies, (2) improved human resources as there is a lack of technical experts especially in government bodies who can support sustainable manufacturing development, (3) local market demand for environmentally friendly products, and (4) government's equal treatment of manufacturers of different sizes operating in different areas of Indonesia. Interviewees mentioned that along with these challenges was the problem of trying to change stakeholders' mindsets and to get buy-in from shareholders to invest in various technologies and equipment to implement a sustainability program. The first step of which is to find information and guidance so as to prepare an accurate proposal on how such a program would provide economic benefits to the companies.

According to the interviewees, the initial investment for developing sustainability practices range from about Rp.100 million to more than ten times as much (from approximately US\$ 7,500 to millions of dollars) in the case of buying new energy efficient machinery. Even though 63.2% respondents of the survey are willing to invest, only 10.71% respondents are

willing to invest for more than Rp. 100 million as shown in Figure 4. This suggests that the respondents who are mostly in mid-level management might not fully understand how much investment would be needed for certain programs. With the current competitive market situation, the interviewees thought that it would be difficult for smaller manufacturers or domestic market oriented companies to make significant investments for sustainability criteria which have no positive direct relation to production cost such as developing a wastewater treatment plant or changing coal fired to gas fueled steam boilers as coal is a lot cheaper than gas. Further, the interviewees confirmed that it took time for the companies to reach a satisfactory return on investment and reap the benefits of the investment made for programs of this type. Therefore, to avoid the high initial investment costs of sustainable manufacturing transformation, companies can focus on the 'low hanging fruit' strategy by first being able to reap the rewards without paying a high price (Russell, 2014).

Figure 4. Amount of Companies Willing to Invest in Sustainability Programs

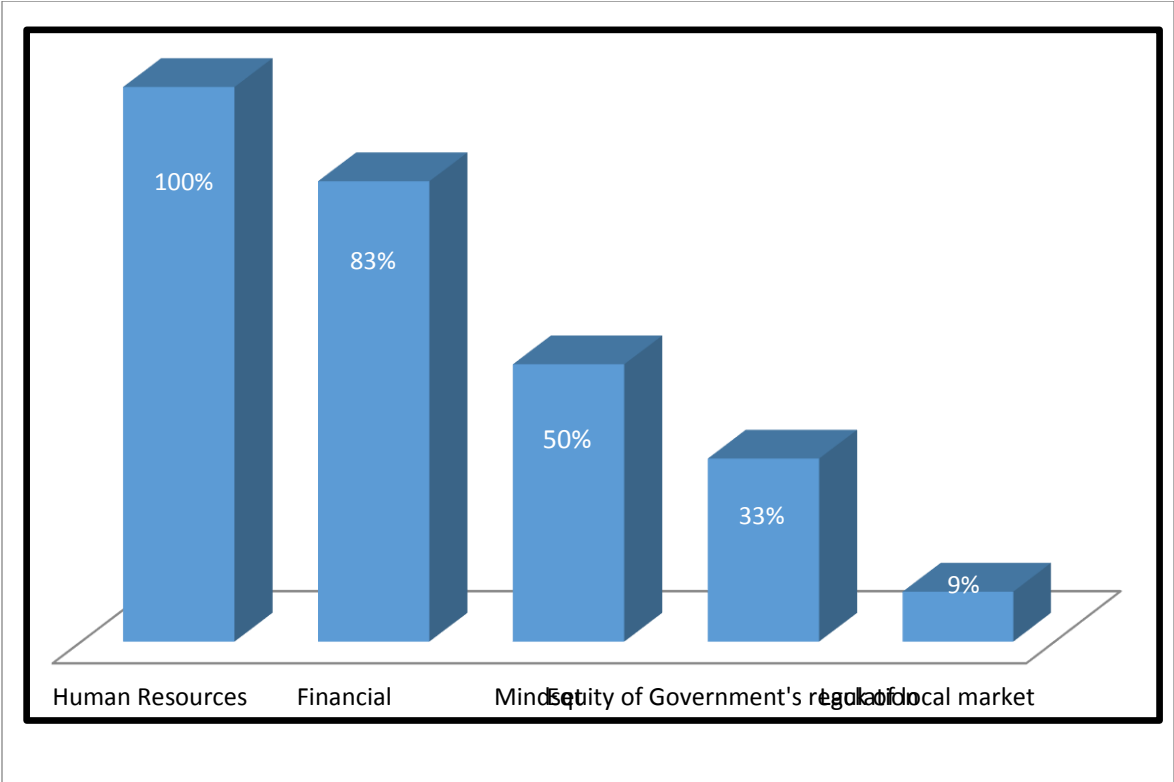


The lack number and quality of experts, especially in government bodies who can provide guidance and training focused on sustainability practices and processes is also a challenge for the industry. Hence, manufacturers have to find resources on their own either from consultant firms or technology related companies.

Domestic consumer awareness and demand for ethical and more environmentally sustainable products in Indonesia remain low compared to developed countries and is yet another major challenge. Another challenge is the equity of government's treatment of certain manufacturer sizes and areas. The government tends to loosen regulations and requirements for small-medium companies. Moreover, regulation requirements differ in some areas; for example, some areas have very strict local wastewater discharge regulations while in other areas regulation is very loose or there is no enforcement. It is unfair for sustainable manufacturers to have to compete with other manufacturers who discharge polluted-toxic wastewater directly from their production into a river while, in contrast, the former have invested billions of rupiah in the effort to minimize the environmental damage by treating the wastewater prior to discharging it into the same river.

The statistic results for the challenges face by manufacturers based on qualitative interviews with 12 different organizations can be seen in Figure 5.







Figure 5. Challenges Face by Manufacturers in Implementing Sustainable Manufacturing Practices



4.2.3. Government Support

Even though most of the respondents have already implemented one or more sustainability criteria, there are only a few manufacturers that have implemented the whole sustainability criteria in their manufacturing processes. Survey and interview results suggest that most manufacturers need education, consultation and guidance to attain the standard and better implement sustainable practices (73.3%). This was also requested by manufacturers that have fully implemented the sustainability practices for a decade. Further, the manufacturers also said they needed tax incentives (57%), simplification of corporate document processing, support in new efficient technology, and funding as outlined in Table 8.

Table 8. Government Support for Sustainability Adoption

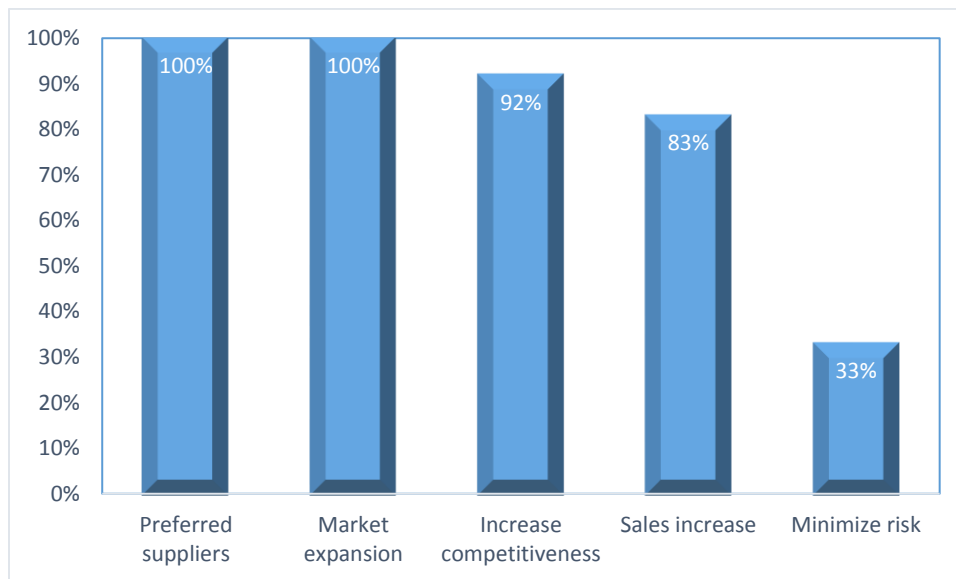
#	Government Support	Bar	Response	%
1	Tax incentive		43	57.33%
2	Consultation & guidance to implement the standard		55	73.33%
3	Funding		23	30.67%
4	Ease in corporate documents processing		42	56.00%
5	Support in new efficient technology (machinery)		32	42.67%
6	Other		6	8.00%
	Total		201	100.00%

4.3. Sustainability Benefits

To encourage and get buy-in from manufacturers to adopt sustainability practices, the Indonesian government needs to explore the potential benefits by identifying and analyzing, and communicating the sustainability benefits (GGBP, 2014) especially the economic benefits to the companies besides environmental protection, natural resource conservation and respecting community health in the neighboring areas from operating cleaner production. Fully implemented sustainable management throughout all processes allows for

production cost reduction, improved company image and increased customer trust and leads to higher sales and ultimately increased competitiveness and profitability (Solavis, nd). Based on the qualitative interview results, as shown in Figure 6, respondents agreed with five sustainability benefits as follows: (1) increased competitiveness, (2) increased sales, (3) minimized risk, (4) market expansion, and (5) becoming a preferred supplier for international brands and retailers.

Figure 6. Sustainability Benefits from Qualitative Interview Result



4.3.1. Production Cost Reduction and Sales Increase

More than 50% of the cost structure in the textile supply chain manufacturing processes is generated from raw material consumption followed by energy usage which accounts for approximately 14% to 25% (excluding garment assembly) depending on the production type. Hence, optimizing efficiency in raw material consumption and energy can significantly reduce production costs and lead to an increase in company profitability in the long term and according to the interviewees whose companies had implemented sustainability programs, these were the immediate benefits. This was also supported by survey results in which 85% and 75% respondents agreed that it increases the sales in global markets and domestic markets respectively. The sales increase resulted from sustainability

implementation (Table 9) could account up to 20% according to 52% respondents and about 27% respondents accounted for more than 20% sales increase.

Table 9. Sales Increase as a Result of Sustainability Implementation

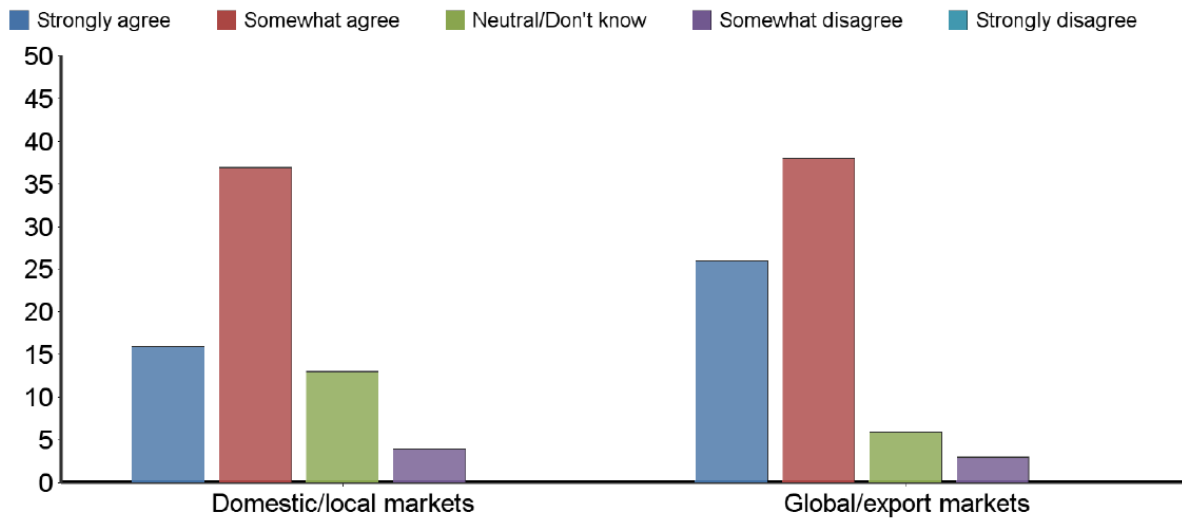
#	Question	0-10%	10-20%	More than 20%	No increase	Not applicable	Response	Average Value
1	Domestic/local market	13	9	10	8	7	47	2.72
2	Global/export markets	9	16	13	3	7	48	2.65

4.2.2. Competitive Advantage

Process industries in today's highly competitive global market must reconsider their production control policies and strategies if they are to achieve sustainable production and increase their competitiveness which is vital to their survival and economic growth. Therefore it requires a transformation to sustainable production processes that are at the same time highly competitive (Rottorp, 2006). Competitive advantage from sustainability practices have been proven by studies that identified that greening the different phases of the supply chain leads to an integrated green supply chain, which ultimately leads to competitiveness and economic performance (Rao, 2005).

Lower production costs from energy, water, and raw material efficiency, and increased productivity from cleaner production and better treatment in safety and labor rights, can produce better quality and safer (from using non-toxic chemicals) textile and apparel products at reasonable prices thus increasing a company's image and competitiveness in markets in the long term. This research found that 88.9% and 76.8% respondents agreed that sustainability in their companies can increase competitiveness in global and domestic markets respectively, as shown in Figure 7.

Figure 7. Increase in Competitiveness Related to Sustainability Adoption



4.2.3. Minimizing Risks

The dozens of chemicals in textiles and clothing that people wear every day may pose risks to human health and the environment. In textile production, chemicals are added at every stage, starting with synthetic fiber making or natural fiber growing to the garment assembling process. Developed countries, like Europe and the United States, have enacted laws to either ban, limit or disclose the use of harmful chemicals to protect consumers from the risks, since the 1970's. Examples of regulations include Proposition 65 in California, Washington's Children's Safe Products Act, and Children Product Safety Act of CPSIA, EU Restriction on Hazardous Substances chemicals regulation (REACH). Besides state and national regulations, the private sector, international brands, and retailers have also set high standards to ban the use of harmful substances in their products.

The management of chemicals in the manufacturing process through banning the use of harmful chemicals in products and productions can minimize risks related to customer complaints, worker safety, and the breaching of government regulations. Product recall from customer complaints especially by international brands due to products containing hazardous substances, can cause manufacturers significant financial losses as all non-compliance products from stores are returned to the manufacturers. For example, in 2014

dozens of Australian retailers recalled their products from the store which contained azo dyes (ACCC, 2014) and in 2015, Europe has reported that more than 2000 dangerous products triggered EU-wide alerts in which chemical risk topped the list (EU, 2016). This sustainability benefit was brought up by respondents during the qualitative interviews.

4.3.4. Market Expansion and Preferred Sourcing Company

In order to be a preferred sourcing company for international brands and retailers, manufacturers must comply with their standards which mostly include quality and safety of the product, environmental sustainability, and social responsibility/labor compliance. C&A, H&M, and Nike have developed points-based reward systems for companies to achieve their standard criteria in which higher points are rewarded to companies that can improve their performance and achieve targets beyond the standard requirements. H&M sets three different levels based on supplier performance in which each level is granted between 1-5 year contracts.

The interviews with manufacturers suggest that their sustainability practices have opened up bigger opportunities to expand markets globally and gain trust from customers to have long term partnerships. To source materials from new companies, international brands and retailers often check what other customers have approved. When quality and price are similar, customers prefer to source from manufacturers that have served well-known international brands rather than manufacturers that have not had business relations in the past with International brands. As a result, sustainable manufacturer can open up new market opportunities as it attracts customers and other stakeholders who are interested in environmentally sustainable products (Rusinko, 2007).

5. CONCLUSION

The criteria for GIS cover the general common criteria as in global standard benchmarks; however, the requirements are very basic and less extensive. In addition, GIS is still not in line with the three pillars of sustainability (i.e., people, planet and profit) as the criteria regarding social responsibility/labor compliance (people) are not covered.

With regards to industry readiness, this research suggests that a majority of every type of textile manufacturer that is export oriented or exposed to export markets has either implemented or is in the process of implementing at least some of the sustainability standard criteria in their manufacturing processes. As a result, it is safe to conclude that with appropriate support from the government, the Indonesian textile industry is ready to go beyond traditional manufacturing processes to become more sustainable, especially those that are exposed to export markets directly or indirectly.

Finally, it is clear that cost reduction as an outcome of the more efficient use of the natural resources and a decrease in production waste, and increased productivity directly correlates with the adoption of sustainability practices in textile manufacturing processes. Furthermore, manufacturers can produce better quality and safer products from using green chemicals thereby increasing company image by using its sustainability practices as a marketing tool to increase sales and initiate greater market expansion. All in all, these positive outcomes have fostered greater confidence among manufacturers to invest in incorporating sustainability practices in order to better compete in global markets.

6. RECOMMENDATIONS

6.1. Improvement of GIS

As a new regulation, GIS covers the common general criteria, but the sub-criteria requirements are not as broad nor as strict as the other international benchmarks. Hence, it is necessary for the Indonesian government to gradually widen its sub criteria coverage in their next evaluation to improve its current requirements, for example by adding air pollution control, renewable energy usage and a greater range of restricted harmful substances. Further, social criteria such as labor/safety compliance and social responsibility should be included since governments pursuing sustainability strategies should include social objectives in addition to achieving sustained economic growth and broader environmental improvements (GGBP, 2014).

Another consideration for future development of GIS is to widen participations manufacturing type targets. GIS should include other types of textile manufacturing

processes such as fiber making, spinning and weaving processes and garment manufacturing, not only limited to dyeing, printing, and finishing processes. To enable this standard to apply to all manufacturing types, the performance improvement assessments for certain criteria (e.g. instead of electricity usage of less than 1100 KWH/ton product thresholds, the assessment for efficiency can be made yearly for each production) can be introduced in the standard.

Having the government align GIS with other international organizations' requirements and objectives would increase its recognitions and promote Indonesia's textile and apparel industry as a global player in the world market.

6.2. Public-Private Partnership

Collaboration with other public or government organizations as well as with private organizations has multiple advantages and can be a major impact on the textile industry driving it toward more sustainable manufacturing processes. Public-private partnership (PPP) can be a powerful means for achieving green growth outcomes as it enables the knowledge, resources, and creativity of diverse stakeholders to be harnessed to create more effective outcomes. In particular, public sector entities can act as resource providers, information sources, or regulators by providing an environment where the private sector can develop and deploy solutions which generate green growth (GGBP, 2014).

Given the current lack of collaboration with international brands and other testing and certification bodies, collaboration and partnerships with other organizations is imperative for the government to gain wider recognition of GIS, get buy-in from the industry, and help the Indonesian textile industry to reduce the burden of having duplicate auditing and testing done repeatedly. This study reveals that private organizations, international brands and retailers, have greater bargaining power to drive the industry towards sustainable manufacturing practices. In addition, the private sector can provide knowledge, innovation, and most importantly for the Indonesian textile industry, the opportunity to create new markets for sustainable and ethical products, allowing governments to achieve broader social and economic objectives (GGBP, 2014).

Collaboration with other public organizations such as, bilateral or multilateral agreements with other countries for the mutual standard recognition, is also important as it will result in opening up market opportunities for the Indonesian sustainable textile industry abroad. Collaboration with public organizations within Indonesia can be in the form of creating a green purchasing policy for textile related procurement for example for the production of uniforms.

Another public-private collaboration to include would be to develop a greater range of alternative solutions for manufacturers seeking cleaner resources such as renewable energy supplies, clean technology, green chemicals and the like.

6.3. Incentives

Sustainable manufacturing transformation requires significant investment depending upon the subject or sustainability criteria the manufacturers wish to improve. In particular, small-medium and medium-sized companies often lack the finances and specialized human resource capacity to invest in sustainability. Hence, in the early stages of adopting sustainability practices, they need to choose carefully and focus on improving resource productivity and efficiency which would have the secondary effect of lowering manufacturing costs which would support cost competitiveness and lead to better business performance (Russell, 2014). The government can help by providing support in terms of financial or non-financial incentives to encourage the adoption of sustainable manufacturing practices in the Indonesian textile industry.

There is a wide variety of financial and fiscal incentives the Indonesian government can provide to encourage manufacturers to adopt sustainability practices. These can be in the form of tax incentives, low-interest loans, financial funding, or low import tariffs on green materials, chemicals, or technology (Russell, 2014). Such incentives can be given to manufacturers who have proven to have implemented sustainable manufacturing practices (supported by third party verification) or those who invest in measures that adopt sustainable manufacturing (e.g. tax or financial support for manufacturers installing wastewater treatment plants or the purchase of new energy-efficient machinery). These

financial and fiscal incentives will contribute to awareness and motivation among manufacturers to implement sustainable practices and processes.

According to this research, there are three preferred non-financial incentives expected by manufacturers. The first is education, training, and guidance to better implement sustainable manufacturing. The government can collaborate with regional textile associations to act as major advocates and partners and provide the requisite training and skills development in sustainability practices. They can also partner with regional academic institutions and NGOs to conduct workshops, training, and seminars on sustainable manufacturing (Russell, 2014). Further, an online government created portal dedicated to sustainable manufacturing practices would allow all manufacturers to get easy access to relevant information anytime and anywhere. The second expectation is the simplification of document processing such as for importing and exporting. This would be invaluable to manufacturers in expediting orders. Finally, the third expectation is to enable access to technology and innovation such as renewable energy alternatives and energy efficient machinery which the government can provide by collaborating with private organizations.

Finally, it is clear that the government can play a major role in promoting sustainable practices and processes and thereby build up Indonesia's textile and apparel industry to become a key player on the global market.

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APPENDICES:

Appendix 1. Technical and Management Requirements of GIS

No	Criteria	Sub-criteria	Thresholds
Technical aspect			
1	Raw Materials	Source of Raw materials	Certification from authorized body
		Specification	Acknowledge
		Handling	Based on procedure
		Product ratio	Min. 90%
2	Dyestuffs and auxiliaries	Substance:	
		Azo dyes	Not detected
		Formaldehyde	Not detected
		<u>Extracted heavy metals</u>	
		Cadmium (Cd)	< 0.1 ppm
		Nickel (Ni)	< 1 ppm
		Copper (Cu)	< 25 ppm
Lead (Pb)	< 0.2 ppm		
3	Energy	Energy consumption from electricity	< 1,100 kWh/ton product
		Energy consumption from thermal	< 3,500 kWh/ton product
4	Water	Water consumption	< 120 m ³ /ton product
		Recycled ratio process (dyeing, printing & finishing)	> 1%
5	Production process	Overall Equipment Effectiveness (OEE)	> 75%
		Annual reject rate	< 5%
6	Textile Products	Quality textile product standard	According to Oeko-Tex Standard 1000 or SNI 19-7617 amendment 2014 Eko Label criteria
		Perfluorooctanesulfonate (PFOS) content	PFOS content is acknowledge
7	Packaging	Polyvinyl chloride (PVC)/ polyvinyl dichloride (PVDC) content	< 50%
8	Waste	Production waste (solid, water and gas (emission) treatment	According to government's valid law/regulations
9	Greenhouse Gases (GHG)	CO2 Emission	< 2.03 ton CO2/ton product
Management aspect			
1	Organizational policies	Green Industrial policy	A written implementation of green industrial policy is mandatory
		Green Industrial committee	Organizational chart and committee of green industrial policy implementation
		Socialization of the policy	Activity programs for socialisation and organization of green industrial policy
2	Strategic Planning	Green Industrial objectives and goals	The company has a strategic planning and programs to achieve the goals and objectives of green industrial policy implementation
		Strategic planning and programs	
3	Implementation and monitoring	Program implementation	Programs are implemented according to schedule and reported regularly to management to get approval from top- management
		Program monitoring	Monitoring is conducted periodically and the results are reported to top management as reviews and feedback

Source: Indonesian Ministry of Industry decree No. 515/M-Ind/Kep/12/2015

Appendix 2. Qualitative Research Results (In-Person Interviews)

	PT. Argo Pantes Tbk	PT. Dasar Rukun	PT. Fotexco Busana International	Anonymous
Company Profile	Indonesian public listed company - established in 1977. Integrated company from spinning (yarn) to finished fabrics (dyed and printed fabrics). The company employs about 700 employees	Indonesian owned Spinning Mills located in Bogor West Java with more than 500 employees	Taiwanese company- Garment Manufacturer with more than 90% products are for export markets; about 2700 employees	Indonesian integrated company from spinning to finished fabrics (dyed, printed fabrics) with about 700 employees located in Jabotabek (Greater Jakarta)
Name and Position	Putrawan Aditya - Head of compliance and sustainability program	Putra Wijaya - General Manager	Yan May - Director	Factory manager - responsible for overall manufacturing activities inside the factory
Sustainability program	No sustainability strategy but adopting several sustainability programs: * Waste Heat Recovery Boiler * Recycled water * Management Energy System Implementation * NaOH Recovery : for chemicals efficiency	No sustainability strategy but adopting several sustainability programs: * Trees planting to absorb CO2 (40% of the factory land are greenery) * Waste recycled by third party company * Environmental management system * Energy efficiency	No sustainability strategy but implementing several sustainability programs: * Lean manufacturing system - energy efficiency - production efficiency - waste reduction Garment manufacturing does not need water or chemicals in its production * Adopted customers' standards	No sustainability strategy but adopting several sustainability programs: * Collaboration with government agency for energy efficiency program has not been working as expected * Waste management and waste water treatment * Controlled harmful substances program
Benefits				
Competitiveness increase	Yes	Yes	Yes	Yes
Sales increase	Yes	Not necessarily	Not necessarily	Yes- about 20 - 30% increase depending on the market situation
Market expansion	Yes- for export market	Yes	Yes- for export markets	Yes
Preferred suppliers	Yes - for International brands	Yes- mostly for European markets but also other international customers	Yes	Approach to becoming a preferred sourcing supplier
Other	Reliable company which respects the environment	Increase in productivity and energy consumption and decrease in production cost		Decrease in production cost which has led to increase in margins and help with internal control
Investment	The owners will invest if they are convinced that the benefits such as become more competitive, production cost reduction, bigger market expansion, sales increase Investment made : buying brand new efficient machine & energy efficiency	Yes, investment is necessary - the shareholders would invest as long as they can see the sustainability benefits. Investment: Equipment spare part for energy efficiency	Depends on the benefits of the programs and its necessity	Yes, the company invested in buying new and energy-efficiency machineries

	PT. Argo Pantes Tbk	PT. Dasar Rukun	PT. Fotexco Busana International	Anonymous
Awareness of GIS and opinion	Yes. The company is aware of the standard and will likely adopt it	No. Not aware of the program since it is only for dyeing, printing and finishing. Spinning is pretty clean production. But this standard is necessary if the company wants to survive and be able to compete globally	No. We have implemented international brand standards which are higher and encompass a greater breadth of requirements than this standard	Not aware of the standard. But it is necessary as the consumers awareness about sustainability products is increasing globally, especially European, US and Canada. However the Indonesian consumers still lack awareness
Indonesian textile industry readiness to incorporate sustainable manufacturing	The company is ready and big manufacturers are likely to be ready as the government has set many regulation about waste water, water consumption, labor etc.	We have to be ready because consumer demand is inclined to sustainable manufacturing.	Textile industry is not ready yet, especially small medium manufacturers	The company is ready but this may be hard for many other manufacturers in Indonesia
Criteria and threshold	The company will be able to attain all the criteria and thresholds	All the criteria should be easily attained by the company	80% criteria already implemented in the company	Most of the criteria are achievable perhaps one or two criteria need more effort
The criteria attainability	The easiest : compliance in RSL (Restricted Harmful Substances List) in auxiliaries & dyestuffs The most challenging : Energy since it needs big investment to change machinery and switch to renewable energy	The easiest: Energy, Green House Emission, production efficiency (98%), water (no water needed in production), harmful substances (not many chemicals used)	The Easiest: RSL, Production process, Management aspect, PVC packaging The most challenging: GHG	The easiest: RSL compliance in auxiliaries & dyestuffs The most challenging: production process - water consumption. The cost for doing recycle water is pretty high.
Standard recognition	International organizations and buyers will hardly recognize the standard	Other institutes will recognize it because it is issued by the Indonesian Government which is a legal institute	Not sure if international will accept this standard as the requirements are lower than international standards	International customers would prefer global international standards than GIS
Recommendations to Government	Transparency, accountability, and reliability in the implementation	Identification of the real textile industry issues and help them on how to sustain Reward and punishment from government	Equal treatment by the government for all types of manufacturers not only big manufacturers	Government needs to create a demand of this certification in the consumers or brands side (local or International) If government makes it mandatory then everybody will follow (locally)
Government challenges to get buy-in	Companies need large initial investment to implement sustainability and lack of awareness among employees Financial and human resources	Lack of technical experts from government that are needed to provide training and education at every processing stage Culture or mindset of stakeholders about environmental sustainability	With the existing condition, it would be challenging for small-medium companies to adopt this standard	If there is no demand, most companies will not apply for this certification
Support from Government	Financial and fiscal support (machinery revitalization) Technology supports (machinery revitalization) Ease in government document processes	Financial and fiscal support (electricity cost reduction, tax incentives etc.) Training and education from technical experts Ease in the government document processes	Ease in document processing Fiscal Incentives (tax credit) Technical experts supports	* Financial support (electricity cost reduction) Training, guidance, and education from experts about the technical know how Tax incentives
Social compliance	Many international brands ask about social compliance	We must comply with labor regulation	All international customers required for social responsibility and labor compliance	The government must include social and labor regulations

	PT. Sulindafin	PT. Idaman Eramandiri	H&M	C&A
Company Profile	<p>Sulindafin is under Shinta group, a Singapore company comprised of several companies from fiber manufacturer, spinning mills and dyeing and printing fabrics</p> <p>The company is located in Greater Jakarta and employs about 1700 employees</p>	<p>Indonesian own manufacturer producing dyed-yarn and sewing thread. The company is located in Bandung, West Java and employs about 240 employees</p>	<p>H&M group is a global fashion company, based in Sweden, with more than 4,300 stores in 64 markets. Brands in H&M includes – H&M, COS, Weekday, Cheap Monday, Monki and & Other Stories. In Indonesia H&M has about 70 garment suppliers and about 20 textile suppliers</p>	<p>C&A is a global private retail company with about 1575 stores throughout Europe, Mexico, China and Brazil. The head office is in Germany and production based mostly in Asian countries</p> <p>C&A global has about 30,000 employees</p>
Name and Position	Mr. paino Daslan - Advisor for Plant managers for Shinta Group	Hendra Indrawirawan, PhD - Managing Director and shareholder	Anya Safira - Senior Environmental Sustainability for productions	Much Afief - Chief Representative Officer and QA Manager of C&A Indonesia
Sustainability program	<p>No sustainability strategy but adopting several sustainability programs:</p> <ul style="list-style-type: none"> * Waste water treatment, waste management - audited * Efficiency energy 	<p>Sustainability program has been implemented since 2004</p> <ul style="list-style-type: none"> * Certifications according to STeP by OEKO-TEX, Indonesian Ekolabel, Nike standard * Energy efficiency, production efficiency, waste management, chemical management, 	<p>H&M Sustainability mission is to strenghten the social and environmental of H&M supply chains</p> <p>More than decades H&M more focus on the social responsibily and labor complience and in the last four years the env. sustainability is Criteria of H&M env sustainability: env. management, energy & GHG, emission, water & wastewater, chemicals and waste</p>	<p>C&A sustainability uses more sustainable materials for its clothing to reduce our environmental impacts and create an approach to a circular economy and to ensure safe and fair working conditions, to engage our employees and empower our customers (C&A, 2015).</p>
Benefits				
Competitiveness increase	Yes:	Yes- especially in the international market	Yes to increased Competitiveness and sales: H&M rewards manufacturers with long-term business contract base on its sustainability index	Will not increase companies competitiveness in the short term as it requires big investment Yes- C&A will usually increase their order if the companies improve their sustainable performance.
Sales increase	Yes	Yes- some brands have placed larger orders when sustainability program was implemented	Yes: International brands prefer to source suppliers with a good sustainability index	Yes- as International brands and retailers value sustainable practices, hence it's a chance for the companies to expand their markets
Market expansion	Yes: Europe, USA, India and local markets which have their owned brands	Yes- mostly in the international market and some domestic markets for baby products		Yes.
Preferred suppliers	Yes: with our increased credibility many customers have made us as preferred suppliers	Yes- the company has become preferred supplier for some International brands		Minimize risk
Other	Minimize risk from customers claim	Innovation, improved production efficiency and risk mitigation	Minimize risk	
Investment	Yes, Company has invested for waste management and will invest more if it is necessary	Company has been invested in many different sustainability program. The latest investment is building wastewater treatment in with the treated water can be reused for production	Company invested a lot of human resources to provide technical training and education to H&M's supply chain about sustainability and social	C&A invest in support, training and coaching to their suppliers. C&A's suppliers usually are willing to invest to adopt C&A's sustainability requirements upon contract agreements

	PT. Sulindafin	PT. Idaman Eramandiri	H&M	C&A
Awareness of the new standard and opinion	Aware of the standard. Textile manufacturers need to start going this direction. Because many international customers required some of this criteria	The company is not aware of the standard. The standard is necessary for the industry but it will be hard for textile manufacturers in general to adopt this standard. Because based on the company's experience it will need a lot of investment	Aware of the standard - because H&M needs to know all the local government standards and regulations. The standard is aligned with vision and mission of H&M	Only heard about the standard but never really seen the document before the interview. But the standard should not be too strict like in Europe as it is only at the beginning of implementation
Indonesian textile industry readiness to incorporate sustainable manufacturing	The company is ready. In general, textile manufacturers in Indonesia are not ready to be sustainable manufacturers but they have to start now.	The company is ready but in general Indonesian textile manufacturers are not ready to be sustainable manufacturing.	Export oriented manufacturers are ready but it will be challenging for domestic oriented manufacturers	All C&A nominated mills are already implementing sustainable practices.
Criteria and threshold	All the criteria is achievable	Company has adopted almost all of the criteria required, therefore the company is confident it can attain all the criteria	H&M sustainability standard has more requirements than this Indonesian Standard	All the criteria is covered in C&A requirements, so C&A suppliers should be able to attain most of the criteria
The criteria attainability	The easiest : RSL compliance & waste water - they are already implemented in the company The most challenging: energy - renewable energy in Indonesia is not easily accessible, while spinning mills need large amount of energy in production	Company has implemented almost all of criteria required, so the company is confident to attain all the criteria The most challenging: waste management	The easiest: Water The challenging : Chemicals and energy	The easiest: Energy, water & production process Challenge: Chemicals/RSL and Product quality consistency
Standard recognition	Yes, International and some local customers will accept the standard	International customers will not recognize this standard	H&M will acknowledge this standard as basis requirements but H&M will require additional requirements according to our Standards	C&A will recognize the standard criteria which are the same or higher with C&A requirements
Recommendations to Government	Promote and socialize the benefits of the program to motivate the industry Promote the Indonesian textile industry	Coordination and collaboration interdepartmental to create one National standard Develop manpower/experts to provide technical guidance to the industry	Provide training, education and development Engage International brands	Financial incentive as motivation to attract the adoption Ease in documentations processing Provide training, coaching, educations
Government challenges for buy-in	Lack of technical experts from government	Lack of government's technical experts to guide manufacturers Mindset	Enforcement and monitoring of the regulations Human resources in manufacturers	Equity to all type of textile productions Financial challenge by the industry
Support from Government	* Guidance from technical experts * Financial supports * Other incentives	* Financial & Fiscal supports (e.g. tax incentive, low bank interest) * Bring up the economic benefits of this standard for the company * Training and guidance	Provide training and education to manufacturers Provide alternatives for the controlled criteria (e.g. Renewable energy, green chemicals etc.)	Financial incentives Ease in document processing Training and guidance
Social compliance	Yes : labor compliance is a must	Social and labor criteria must be included just like other international standards	Social responsibility and labor compliance is critical requirements for doing business with international brands	Social/labor compliance needs to be included in the standard as it is already regulated by law in Indonesia and most other countries

	Ministry of Industry - Directorate of Textile and Multifarious Industries	Association (Apsyfi)	Ministry of Industry - R & D Center for Green Industry and Environment	International independent testing and certification company
Company Profile	<p>Planning, Development, implementation, and monitoring the strategy, programs, regulation to strengthen the textile industry to increase competitiveness.</p> <p>Providing technical guidance and promoting the industry; development of green industry</p>	The Association of Synthetics Fiber and Filament Yarn Indonesia (Apsyfi) has 16 members that are producers of synthetic fibers, and yarns	Government body under the Ministry of Industry with responsible for formulating Green industrial standards, implementing strategies, monitoring and evaluating	A global testing and certification company focused on product safety and sustainability certification for textiles
Name and Position	Elis Masitoh - Deputy Director	Redma Gita Wirawasta - General Secretary	Lintong Hutahaean - Head at Center for R & D of Green Industry	Lead auditor for sustainable textile production and product safety certification
Sustainability program		Members have their own sustainability programs mostly in energy efficiency related programs such as machinery restructuring and spare part replacement to make machinery more energy efficient because, in fiber and spinning manufacturing processes, the biggest costs are in raw material and energy use. Water is only for domestic use.		
Benefits				
Competitiveness increase	Yes: the efficiency as a result of sustainability adoption will reduce the production cost, it will increase the sales and competitiveness	Yes: with support from government	Yes: improvement in production will make them more productive and efficient. As a result, companies can produce higher quality products with an increase in sales and product acceptance in the market which all leads to increased competitiveness	Yes as international buyers ask for these kinds of requirements
Sales increase	Yes: it will open up market expansions	Yes; Logically it will increase sale and market expansion especially to Europe, USA and Japan		Yes: as companies can use this as a marketing tool to promote expand their markets and increase their sales
Market expansion	Yes: International customers will make them preferred suppliers			
Preferred suppliers		Yes as a result of increase in customer recognition		Yes: Good sustainability performance can lead to customer trust
Other		Gain trust in neighboring communities		as a survival tool for their businesses
Investment	Manufacturers will likely to invest for implementing criteria which is directly related in quality or production cost reduction.	Yes, members will likely to invest as it relates in production efficiency. But government supports in financial and fiscal incentives	Yes: manufacturers will likely to invest in implementation of criteria which will increase their profitability from efficiency and production reduction cost	Big manufacturers are likely willing to invest to survive and able to compete with other companies

	Ministry of Industry - Directorate of Textile and Multifarious Industry	Association (Apsyfi)	Ministry of Industry - Center for R & D of Green Industry center	International independent testing and certification company
Awareness of the new standard and opinion	Aware of the standard and participate as a technical committee in developing the standard. The standard is very good and covers all the necessary criteria to greening textile manufacturers in Indonesia	Not aware of this standard. If the standard is good to increase efficiency and productivity of the industry		Aware of the standard and it is good as the criteria is similar to other international standards even though the requirement still very basic
Indonesian textile industry readiness to incorporate sustainable manufacturing	The manufacturers are not ready if the government applies the standard as mandatory. A lot of effort and investment is needed to adopt all the criteria in their manufacturing process.	Members are ready to adopt this GIS and become sustainable manufacturers as fiber and spinning manufacturers are considered to have clean manufacturing processes.	Yes - manufacturers should be ready as the standards are created according to production conditions	Medium-big manufacturers are ready to become sustainable manufacturers. In fact, some big manufacturers have already implemented it
Criteria and threshold	Manufacturers should be able to attain about 50% of the criteria	Members should be able to attain most of these criteria.	A few manufacturers have already implemented the standard as pilot projects.	Only small number of companies are likely to be able to attain all the criteria
Criteria attainability	The easiest: Quality and Energy - it relates directly to production cost saving, so many manufacturers Challenge: Waste management and GHG	The easiest: Water and product quality -water is not used and not much production waste in manufacturing processes. The challenge : Energy and GHG	The challenge: wastewater as it increases production cost	The easiest: raw material Challenge: Wastewater, energy and GHG
Standard recognition	The international organizations most probably will not recognize the standard as they will only accept their own standards	The international organizations should accept and recognize the standard especially for the same criteria such as GHG	If the standard implemented consistently the international organizations will recognize the standard	International organizations will not likely accept this standard as they will ask manufacturers to comply with their own standards
Recommendations to Government	Negotiation or collaboration with other governments in different countries and other organizations	Collaboration with government with other countries and interdepartmental in Indonesia Promote the economic benefits of the program to industry	Government have collaborated with some NGOs (UN, Japan, etc.) in some sectors such as energy etc.	Adding recycle & reuse of solid production waste in GIS Socialization of GIS t industry Collaboration with testing and certification companies
Government challenges for buy-in	Mindset of Industry towards environmental awareness Financial and human resource challenges	Industry willingness to invest Mindset of the industry's stakeholders	Awareness and mindset of the companies (stakeholders) in environmental sustainability Enforcement to small-medium manufacturers	Financial Lacking alternative resources/technology to be more sustainable
Support from Government	Technology incentives Financial support and tax incentives Training and guidance	Fiscal (tax incentives) Financial supports for purchasing energy efficient machineries Reduce the gas price so members can replace coal power plant to gas	Capacity building - training, education, etc. Provide incentives to manufacturers who have already implemented the sustainability Or incentives to manufacturers who will implement sustainability programs	Training and education from technical experts Ease in obtaining information about sustainability programs
Social compliance	Social responsibility and labor compliance should be included	It will be complicated as there are differences in some labor requirement between international and Indonesian and even regional law	Yes- these criteria will be considered to be included in the standard	GIS must include this criteria especially the 8 ILO fundamental principles

Appendix 3. Quantitative Survey Questions

Developing Competitive Sustainable Manufacturing Survey					
Name:	_____				
Company Name :	_____				
Position in company:	_____				
I. Company Details:					
1	Where is the location of your company:				
	<input type="checkbox"/> West Java	<input type="checkbox"/> DIY & Central Java	<input type="checkbox"/> Jabodetabek	<input type="checkbox"/> East Java <input type="checkbox"/> Outside of Java	
2	How many people are working in your company				
	<input type="checkbox"/> 1-100 People	<input type="checkbox"/> 100- 500	<input type="checkbox"/> 500-1000	<input type="checkbox"/> 1000-5000 <input type="checkbox"/> Over 5000	
3	What is the nature of your company (you can choose more than one)?				
	<input type="checkbox"/> raw material Fiber/yarn	<input type="checkbox"/> Dyed Yarn/threads	<input type="checkbox"/> Finished Fabrics (dyeing, Printing & Finishing)	<input type="checkbox"/> Others	
	<input type="checkbox"/> Dyestuffs & chemicals	<input type="checkbox"/> Garment accessories	<input type="checkbox"/> Garments	<input type="checkbox"/> Retailers/brands	
4	Where are the market destinations of your products: (You can choose more than one market destination and please fill the percentage)				
		V	Percentage (%)		
	Europe	<input type="text"/>	<input type="text"/>		
	USA	<input type="text"/>	<input type="text"/>		
	Middle EAST	<input type="text"/>	<input type="text"/>		
	Japan	<input type="text"/>	<input type="text"/>		
	ASEAN	<input type="text"/>	<input type="text"/>		
	CHINA	<input type="text"/>	<input type="text"/>		
	DOMESTIC	<input type="text"/>	<input type="text"/>		
	Africa	<input type="text"/>	<input type="text"/>		
	Other countries	<input type="text"/>	<input type="text"/>		
5	Type of your company/organizations				
	<input type="checkbox"/> Indonesian owned company	<input type="checkbox"/> Foreign investment company (please specify which country/s			
	<input type="checkbox"/> Mixed Indonesian and foreign investment company, please specify _____				
II. Indonesian Green Industrial Standard					
1	Have you heard about Standar Industri Hijau untuk tekstil which was developed by Ministry of Industry				
	<input type="checkbox"/> Yes				
	<input type="checkbox"/> No	(Please see attached standard)			
2	Will your company likely apply for this new Indonesian Green Industrial standard ?				
	<input type="checkbox"/> Yes	<input type="checkbox"/> No (please answer no. 3)	<input type="checkbox"/> May be	<input type="checkbox"/> Only if it is mandatory <input type="checkbox"/> Not applicable	
3	If you answer No, what would be the reason your company will not apply for this Standard ? (you can answer more than one)				
	<input type="checkbox"/> No customers require this Indonesian Standard	<input type="checkbox"/> Too difficult to achieve			
	<input type="checkbox"/> No added value	<input type="checkbox"/> It will make the production cost higher			
	<input type="checkbox"/> No budget for this	<input type="checkbox"/> Other _____			
4	Below are the criteria of new Indonesian green standard. Please mark which criteria you will (or likely) implement in your company regardless you will apply or not apply for the standard.				
		Already implemented	Will be implemented	Will not be implemented	Not applicable
	Energy Efficiency	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	Waste (water & solid) management	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	Water consumptions efficiency	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	Greenhouse Gas Emission	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	RSL/Chemical management compliance	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	Quality Management	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	Production Process effectiveness	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	Raw material consumption efficiency	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	Not or less PVC in Packaging	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	Management Aspect	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

3 Do you think your company can attain all the criteria and threshold in the standard?
 Very unlikely Unlikely Don't know Likely Very likely

5 If you look at the nature of your company's production, Please rate from easiest (1) to the most difficult (5) criteria to achieve/adopt by your company:

	1 (easiest)	2	3	4	5 (most difficult)
Energy Efficiency					
Waste (water & solid) management					
Water consumptions efficiency					
Greenhouse Gas Emission					
RSL/Chemical management compliance					
Quality Management					
Production Process effectiveness					
Raw material consumption efficiency					
Not or less PVC in Packaging					
Management Aspect					
Social responsibility/ labor compliance					

6 Do you think your customers (domestic and exports) will recognize this Indonesian Standard?
 Yes to both markets
 No to both markets
 Only Domestic market
 Only Export markets

7 If you can choose, which sustainability standard would you apply/adopt in your company? (You can choose more than one)

	Very unlikely	unlikely	Neutral/don't know	likely	very likely
International Standard					
Indonesian Green Industrial Standard					
Customers/buyers Standard					
Company's own (internal) standard					
Others _____					

8 Reasons for your company to adopt below standards?

	Indonesian Standard	International Stand	Buyer/ Customers standard	Company's own Standard
Quality and reliability of the standard				
Well-known				
Cost				
Recognized by more customers in different countries				
Increase market's competitiveness				
Better overall standard				
Increase marketing and sales revenue				
Criteria are easier to adopt				
Required by customers				
Criteria are more strict				

9 What do you expect from government in order for your company to apply this Indonesian Green industrial standard in the company? (you can choose more than one)

Tax incentive
 Consultation and guidance to implement the standard
 Funding
 Ease in corporate documents processing
 Support in new-efficient technology (machinery)
 Others (please specify) _____

10 Do you think Indonesian textile industry/your company are ready to go beyond the traditional process to be more sustainable manufacturing?
 Strongly disagree Disagree Neutral/don't know Agree Very agree

11 What does government need to do for textile industry to implement this standard

Educate the textile industry about sustainability manufacturing
 Socialization of the new standard in the industry
 Encourage the industry by providing monetary (tax) incentives
 Others (please specify) _____

12 Do you support if the Indonesian Government makes this standard mandatory
 Strongly disagree Disagree Neutral Agree Very agree

Sustainability in Your company

1 Do you have a sustainability program/certification in your company ?
 Yes No (please go to question No. 4) Under development

2 How long has your company implemented sustainability initiatives
 Under development 0-5 years 5-10 years more than 10 years Not applicable

3 How many % is the sales increase after you implemented sustainability program in your company:

	0-10%	10-20%	More than 20%	No increase	Not applicable
Domestic/local market					
Global/export market					

4 Does your company or organization have/implement below programs:

	Yes	No	Under development	Externally certified (please state the name)
Quality Management system				
Environment Management System				
Social responsibility /labor Compliance				
RSL (chemical management)				
Buyer/Customer Standard				
Energy efficiency				
Higg Index				
Waste management				
Sustainability production/manufacturing				
Other programs (please state)				

- 5 What are the reason(s) your company will (or will likely) implement sustainability initiatives/certification: (you can choose more than one)
- Buyer/customers requirement
 - Increase company's competitiveness in domestic markets
 - Increase company's competitiveness in global markets
 - Company's Self awareness
 - Good marketing tools to promote the products and company
 - Increase sales revenue
 - Company's global policy
 - Government requirement
 - Not applicable
 - Other reasons _____

6 Do your local customers require your company to have below sustainability criteria

	All of them	Some of them	None
* Energy Efficiency			
* Waste management			
* Water consumption efficiency			
* Greenhouse Gas Emission			
* RSL/Chemical management compliance			
* Quality Management			
* Production Process effectiveness			
* Raw material consumptions efficiency			
* Not or less PVC in Packaging			
* Management Aspect			
* Social responsibility /labor compliance			

7 Do your global/exports customers require/ask whether your company have below sustainability criteria

	All of them	Some of them	None
* Energy Efficiency			
* Waste management			
* Water consumption efficiency			
* Greenhouse Gas Emission			
* RSL/Chemical management compliance			
* Quality Management			
* Production Process effectiveness			
* Raw material consumptions efficiency			
* Not or less PVC in Packaging			
* Management Aspect			
* Social responsibility /labor compliance			

8 How likely is your company willing to invest money and resources to adopt sustainability program

Very unlikely Unlikely Neutral/don't know Likely Very likely

9 How much money do you think is your company willing to invest

Less than Rp. 10 Million Rp. 10- <50 million Rp.50-< 100million > Rp. 100million None

10 Which market destinations require (or most likely will require) your company to adopt sustainability standard (you can choose more than one)

Europe
 USA
 Middle EAST
 ASEAN
 Japan
 CHINA
 Other Asia & Pacific countries
 DOMESTIC
 None
 Other Countries

11 Do you think being sustainable manufacturer can increase company's competitiveness in the markets?

	Strongly disagree	Disagree	Neutral/don't know	agree	Strongly agree
Domestic/Local market					
Global/exports markets					

12 Do you think being sustainable manufacturing can increase revenue and the sales of your products:

	Strongly disagree	Disagree	Neutral/don't know	agree	Strongly agree
Domestic/Local market					
Global/exports markets					

13 If the price and quality are the same, would you prefer to buy raw material/garments/accessories from sustainable company/manufacturer

Yes No May be

14 Will you ask your suppliers to have sustainability program in their company

Yes No May be

15 Will you still buy from a company which has a bad reputation in damaging environmental and social/labor

Very unlikely unlikely Neutral/don't know Likely Very likely

16 When you buy products from your suppliers, please rate from 1 for least to 5 for most importance of below criteria

	1-Not very important	2	3	4	5-Very important
Price					
Environmentally friendly company/prod					
Social responsibility/labor compliance					
RSL/harmless chemical compliance					
Best services					
Quality					
Lead time					
Product innovation					
Long term partnership					

17 Please rate the importance of below criteria for your customers when you sell your products

	1- Not very Important	2	3	4	5-Very important
Price					
Environmentally friendly company/prod					
Social responsibility/labor compliance					
RSL/harmless chemical compliance					
Best services					
Quality					
Lead time					
Product innovation					
Long term partnership					

18 What other aspects do you think can increase your company's competitiveness in domestic and global markets

19 What other aspects do you think your company needs to be sustainable manufacturer: