

ABSTRACT

BURMAN, RITIKA. Sustainability in Textile and Apparel Industry: Framework Development and Industry Analysis. (Under the direction of Dr. Yingjiao Xu).

The textile and apparel (T/A) industry plays an important role in human lives by providing the basic needs of clothing and also numerous economic benefits to the society through trade and employment. However, from production to consumption, the T/A supply chain is associated with a number of environmental, social and/or economic issues, collectively referred to as the sustainability issues. Presently, companies are trying to better understand the sustainability challenges and transform them into opportunities by monitoring their activities and reporting their sustainability initiatives. It is important for companies in the textile and apparel industry to have inclusive sustainability frameworks which can help in internal measurement as well as provide a reference for external reporting.

Therefore, the goal of this research is to propose a sustainability reference framework for textile and apparel industry (SRF-T/A) that can be used as guidance for external reporting as well as for internal assessment specifically for the textile and apparel industry. The proposed SRF-T/A was developed through a comparative analysis of two well-known frameworks (GRI G4 and the Higg index) and an extensive review of literature including journal articles, trade articles, conference proceedings, industry associations' websites and reports from consulting firms. The proposed SRF-T/A was then reviewed by industry experts for refinement. All the reviewers were unanimous in commending that the developed framework is very comprehensive and industry specific. Few changes suggested by the industry reviewers were incorporated into the SRF-T/A. The refined SRF-T/A was then used to gain an insight of the sustainable development efforts in the textile and apparel industry through a

content analysis of the company published sustainability information from a sample of T/A companies. The results of the analysis revealed that there is no standardization in organization and contents of sustainability reports by different companies engaged in similar businesses. It was also found that not all companies provide information related to all the three dimensions of sustainability. While there is plentiful communication with regards to the efforts within the social dimension followed by the environment dimension, the economic dimension was however meagerly discussed as a part of the sustainability report by many companies. This study brings contribution to existing literature as well as the textile and apparel industry by suggesting a comprehensive and industry specific sustainable reference framework. This study also provides some insights regarding the overall trend of the textile and apparel companies in terms of their sustainability efforts as well as their sustainability reporting practices.

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Sustainability in Textile and Apparel Industry: Framework Development and Industry
Analysis

by
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To my wonderful husband Mr. Amber Kapoor. Thanks!

BIOGRAPHY

Ritika Burman was born and raised in New Delhi, India and received her Bachelor of Science degree in Home Science from Lady Irwin College, University of Delhi. She was interested in the field of textiles and subsequently obtained her Master of Science degree in Textile and Clothing from Institute of Home Economics, University of Delhi. She continued her association with academia and textiles by teaching under graduate and graduate students at University of Delhi before relocating to United States to pursue her doctoral degree. Her research interests are in sustainability and consumer behavior.

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CHAPTER 1

INTRODUCTION

The textile and apparel industry plays an important role in human lives by providing the basic need of clothing. The industry comprises various businesses which involve production and construction of fibers, yarns, textiles and apparel. The textile sector is also a significant contributor of raw materials for industries such as home furnishings, automobiles, footwear and accessories, healthcare and industrial. As being one of the most globalized industries in the world (Gereffi, 2002; Keane & Velde, 2008), it supports many related businesses; providing jobs to millions of people (Adhikari & Yamamoto, 2008). The industry is globally fragmented such that raw materials, intermediate products and final products are transported among different parts of the world in order to capitalize on the labor force, expertise and market presence (Ha-Brookshire, 2012).

Though the textile and apparel industry plays a significant role in the society, the production and retail of textile and apparel goods exert significant impact to the environment as well as on the community in which it operates. Production of textile and apparel products requires raw materials, equipment, capital and labor. Further, dyeing and finishing, washing and drying along with care and disposal of the textile and apparel products post-consumer purchase have been found to impact the quality of air, water, and land (Chen & Burns, 2006; Fletcher, 2013; Hawley, 2006; Orzada & Moore, 2008). Hence, from production to

consumption, textile and apparel supply chain is associated with a number of environment, social, and economic issues (Fletcher, 2013), collectively sustainable development issues.

The concept of sustainable development was first introduced and defined by the Brundtland Commission report, *Our Common Future* (1987) as: “*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*”. According to Johnston, Everard, Santillo and Robert (2007), the concept of sustainable development advocates that the true form of progress (of a company) is the one which simultaneously addresses the interlinked aspects of economic, environment and social well-being. Sustainable development is hence an integrative concept with three broad dimensions: economic, environmental and social sustainability (Elkington, 1998; Hansmann, Mieg & Frischknecht, 2012; World Bank, 2012). Attention towards sustainable development increased as the impact of human activities on growing environmental issues and emergence of socio-economic problems (Box, 2002; Hart & Milstein, 2003; Hopwood, Mellor, & O'Brien, 2005). Hart and Milstein (2003) list four different drivers of sustainable development: 1) increasing industrialization and its associated material consumption, pollution, and waste generation; 2) proliferation and interconnection of civil society stakeholders and emergence of non-governmental organizations (NGOs) as monitors and enforcer of social and environmental standards; 3) emergence of technological solutions like renewable energy to render energy and material intensive industries obsolete; and 4) increases in population, poverty, and inequity associated with globalization.

The definition of sustainable development is a highly contested concept and is interpreted differently by industry, academe and governments (Drexhage & Murphy, 2010; Johnston et al., 2007; Woods, 2002). For example, Drexhage and Murphy (2010) explain that for governments and businesses, sustainable development is sustained economic growth made more environmentally sensitive such that the living standards can be improved globally and the link between poverty and environmental degradation can be broken by making economic growth a part of the solution. Others view sustainable development as a balancing act between the economy and the environment where the economy is an entity separate from the environment (Drexhage & Murphy, 2010).

Therefore, sustainable development has been attached to a variety of definitions based on diverse goals, indicators, values and practices of the stakeholder (White, 2013). The emergence of vast number of definitions has resulted in great ambiguity of the concept of sustainable development (Gatto, 1995; Glavic & Lukman, 2007; Johnston et al., 2007; Marrewijk, 2003; McKenzie, 2004; White, 2013). This ambiguity has resulted in varied and diverse implementation of sustainable development guidelines (Glavic & Lukman, 2007; Drexhage & Murphy, 2010). Despite the debate on the definition of sustainable development, there is a consensus in the literature regarding its three broad dimensions: economic sustainability, environmental sustainability and social sustainability (Drexhage and Murphy, 2010; Elkington, 1998; Figge, Hahn, Schaltegger & Wagner, 2002; Glavic & Lukman, 2007; GRI, 2002; Hansmann et al., 2012; Labuschagne, Brent & Van Erck, 2005; Pope, Annandale & Morrison-Saunders, 2004; White, 2013).

Key stakeholders like government, consumers and NGOs exert pressure on companies requiring them to address sustainability related challenges by monitoring their activities and report their efforts towards sustainable development (Seuring & Müller, 2008; Willard, 2002). Businesses that realize the importance of embracing sustainable development can put the concept into operation by identifying indicators of sustainability to measure the progress being made by the company (Schwarz, Beloff & Beaver, 2002). In order to monitor their activities, companies use sustainability measurement frameworks to quantify the efficiency and effectiveness of a company's activities (Tangen, 2005). Searcy (2012) defines a sustainability performance measurement framework as a “system of indicators that provides a corporation with information needed to help in the short and long-term management, controlling, planning, and performance of the economic, environmental, and social activities undertaken by the corporation” (p. 240).

There are several well-known and widely adopted sustainability measurement frameworks, including the ones provided by the United Nations Commission on Sustainable Development (United Nations, 2001, 2007), the Triple Bottom Line Index (Elkington, 1998), The Sustainability Consortium (TSC) and the Organization for Economic Co-operation and Development (OECD, 2005). These frameworks are developed to address sustainability measurement for all industries and for helping policy makers at national level. There have been efforts to develop frameworks to address industry specific issues by adopting these general frameworks (Azapagic, 2004; IChemE, 2002; Nordheim & Barrasso, 2007; Singh; Murty, Gupta & Dikshit, 2007; Veleva & Ellenbecker, 2001). For example, Azapagic (2004)

developed sustainability indicators for the mining and minerals industry while Singh et al. (2007) and Nordheim and Barrasso (2007) focused on the steel and aluminum industries respectively. Within the textile and apparel industry, the popular ones are the Higg Index developed by the Sustainable Apparel Coalition (SAC) (SAC, n.d.) and the now defunct Eco Index developed by the Outdoor Industry Association (OIA, n.d.). The content of Eco Index has been used to create the Higg Index which is considered the next iteration of the Eco Index (OIA, n.d.).

Disclosing and sharing of the sustainable development related information with stakeholders is usually done through sustainability reports. Ioannou and Serafeim (2014) define a sustainability report as “a firm-issued general purpose non-financial report, providing information to investors, stakeholders (e.g., employees, customers and NGOs), and the general public about the firm’s activities around social, environmental and governance issues, either as a stand-alone report or as part of an integrated (e.g. financial and sustainability) report” (p.2). A sustainability report can help increase transparency of a company by bringing about a change in corporate behavior resulting in a competitive advantage (Ioannou and Serafeim, 2014).

However, such practices of reporting sustainability related information is currently being debated as these reports not always facilitate stakeholders understanding about a company resulting in reduced usefulness of the information (Cheng et al., 2014; KPMG and FERF 2011). To address this issue, the importance of Integrated Reporting (IR) has been emphasized (Busco, Frigo, Riccaboni and Quattrone, 2013; EY, 2014; Eccles and Krzus,

2010; IIRC, 2015). Eccles and Krzus, (2010) describe IR as a single document that presents and explains a company's financial and non-financial (environmental, social, and governance) performance.

There are various frameworks available for external reporting purposes as well. Some of these include reporting guidelines by the Global Reporting Initiative (GRI, 2002), the International Integrated Reporting Council (IIRC) and the Carbon Disclosure Project (CDP). These frameworks provide general guidance and guidelines to different industries for reporting information regarding environmental, social performance and/or economic impacts.

From the business perspective, companies realize that efforts towards measuring and reporting sustainable development initiatives can bring multiple benefits to the businesses. Some of the identified benefits include cutting of costs by efficient use of resources, improved employee motivation, improved relationship with stakeholders, better evaluation by financial investors and improved ability to mitigate risk (Azapagic, 2003; Elkington, 2004; Hubbard, 2009; Lazlo & Zhexembayeva, 2011; PricewaterHouse Cooper, 2012; Kieffel, 2012).

Statement of Problem

Many sustainability measurement frameworks developed for monitoring activities are not complete and only a few of them have a comprehensive approach (Delai & Takahashi, 2011; Labuschagne, Brent & Van Erck, 2005; Singh, Murty, Gupta & Dikshit, 2012; Veleva & Ellenbecker, 2001). An analysis on several general sustainability frameworks suggested that the frameworks primarily focus on the environmental dimension of sustainable development (Singh et al., 2009). There is no standardization in classification of the issues based on different criteria's especially between social and economic dimensions (Delai & Takahashi, 2011). Also, there is no consistency in the scope of the measurement of each issue as different frameworks measure the same issue at different levels (Delai & Takahashi, 2011). Additionally, these frameworks can be used by all industry sectors, hence lacking the ability to address and reflect the sustainable issues associated with a particular industry.

Recognizing these limitations, there are efforts to develop industry specific sustainability frameworks. The Higg Index is developed specifically for the textile and apparel industry and has been the one frequently adopted by the SAC member companies for internal assessment. However, this tool focuses on two dimensions of sustainability only: environmental and social. Additionally, the tool is still in development stage and there are several areas which are being considered for further development (SAC, n.d b). Some of these areas include: development in product assessment, expanding the indicator-based Index to include quantitative data and metrics; refining governance process and increase of community engagement for material sustainability index (SAC, n.d b). Likewise, the scope of the Eco

Index is limited to helping companies incorporate environmental consideration into design and production (OIA, n.d a).

Similar to measurement frameworks, the external reporting frameworks also lack standardization as not all of the frameworks provide guidelines that help in developing a cohesive report including environmental, social and economic activities of a company (except GRI). For example, guidelines provided by CDP are restricted to gather information related to climate change (CDP, 2015). Additionally, the reporting guidelines by different organizations including GRI and IIRC provide very generic guidelines that can be used across different industries and do not reflect specific nature of a particular industry. For example, the GRI guidelines (G4 guidelines) do not provide any sector guidelines specific for the textile and apparel industry.

In absence of inclusive standardized frameworks (both measurement and for reporting) for textile and apparel industry, there is diverse implementation of sustainable development activities throughout the industry. Additionally, companies also tend to communicate their efforts towards sustainable development in a variety of ways (Fletcher, 2009). This can make it difficult for stakeholders and investors to compare performances between companies across the industry (Adams & Frost, 2008). Also, lack of a comprehensive and industry relevant framework may result in a narrow view of the sustainability concept and reduces a company's contribution towards sustainable development (Drexhage & Murphy, 2010). Therefore, it is important for the companies in the textile and apparel industry to have inclusive sustainability frameworks which can help in internal measurement as well as

provide a reference for external reporting. The textile and apparel industry already has the Higg Index which is by far the most comprehensive sector specific internal assessment tool available. However, there is a no sector specific framework or guidelines for external reporting available for textile and apparel industry that can provide guidance to disclose information about economic sustainability, environmental sustainability and social sustainability.

Therefore, the goal of this research is twofold. First, based on an extensive review of literature regarding the currently available sustainability measurement and reporting frameworks and a thorough understanding and analysis of the nature of sustainable development issues related to the textile and apparel industry, this study will propose a sustainability reference framework. The proposed framework can be used as guidance for external reporting as well as for internal assessment specifically for the textile and apparel industry. Second, using the developed sustainability reference framework, this study aims to gain insight of the sustainable development efforts of a sample of textile and apparel companies. Below is a summary of the two objectives for this study:

Research Objective I: To develop a sustainability reference framework for the textile and apparel industry (SRF-T/A).

Research Objective II: To gain an insight of sustainable development in the textile and apparel industry by applying the developed framework to a sample of textile and apparel companies.

Significance of the Study

The first objective of this study is to propose a reference framework of sustainability specifically relevant for the textile and apparel industry that can provide guidance for external reporting purposes. The framework is based on a comparative analysis of two well-known sustainability models, namely: the Global Reporting Initiative guidelines and the Higg Index along with an extensive review of sustainability literature including journal articles, trade articles, conference proceedings, industry associations' websites and reports from consulting firms. Since the framework provides a comprehensive set of guidelines developed through a comparative analysis of two established models, it can contribute in furthering the standardization of sustainability reporting and sharing information with stakeholders. Comprehensive reporting can help to improve communication between companies and stakeholders by making the company more transparent (Ioannou and Serafeim, 2014). Reporting can also help establish a favorable reputation with stakeholders resulting in a competitive advantage (Ioannou and Serafeim, 2014; Porter and Kramer, 2011). Additionally, standardized reports and sustainability information can help companies to self-benchmark both externally and internally.

Secondly, the result of the empirical examination of sustainability efforts of different companies in the textile and apparel industry using the developed sustainability reference framework can provide perspective regarding the efforts of the textile and apparel industry towards sustainable development. Additionally, the findings of this study can help the

industry gain insight on the collective contribution made towards sustainable development across the supply chain and how to diversify the efforts further.

Research Limitations

There are limitations in this study. Published research uses the words sustainable development and sustainability interchangeably. However, some scholars point out the difference between the usages of the two terms: sustainable development and sustainability. The present study does not attempt to differentiate between these two terms and refers to economic, environmental and social sustainability as objectives or goals of sustainable development, as mentioned in the World Bank (2012).

The concepts of sustainable development and sustainability are usually discussed in terms of three dimensions: economic, environmental and social. However, the sustainable development concept has been found to be dynamic and there is a lack of standardized description of the concept as well as the three dimensions in the literature. While the present study involved exhaustive review of literature and has attempted to describe the dimensions as objectively as possible with regards to the textile and apparel industry; it is possible that the scope of the dimensions can be further broadened. Since the topic of sustainable development is still being explored, there can be additional factors that are excluded from this study, or have not been addressed in the literature.

List of Abbreviations

AAFA - American Apparel and Footwear Association

CERES - Coalition for Environmentally Responsible Economies

CSR - Corporate Social Responsibility

Dfe - Design for Environment

EASHW - The European Agency for Safety and Health at Work

EOU - End of use

ESAT - Energy and Sustainability Assessment Tool

GDP - Gross Domestic Product

GHG – Green House Gas

GRI - Global Reporting Initiative

IChemE - Institution of Chemical Engineers

IISD - International Institute for Sustainable Development

ILO - International Labor Organization

LCA- Life Cycle Assessment

MFA – Multi Fiber Arrangement

MSD - Musculoskeletal System

NGO - Non-Governmental Organization

OECD - The Organization for Economic Co-operation and Development

OIA - Outdoor Industry Association

RSL - Restricted Substance List

SAIC - Scientific Applications International Corporation

SOMO - Centre for Research on Multinational Corporations

SAC - Sustainable Apparel Coalition

TBL - Triple Bottom Line

UN - United Nations

UNESCO - United Nations Educational, Scientific and Cultural Organization

UNEP - United Nation Environment Programme

UNCED – United Nations Conference on Environment and Development

USDA - United States Department of Agriculture

VOCs - Volatile Organic Compounds

WCED - World Commission on Environment and Development

WBCSD - World Business Council for Sustainable Development

Definitions of Terms

Gross Domestic Product: Gross domestic product is an aggregate measure of production equal to the sum of the gross values added of all resident institutional units engaged in production (plus any taxes, and minus any subsidies, on products not included in the value of their outputs). The sum of the final uses of goods and services (all uses except intermediate consumption) measured in purchasers' prices, less the value of imports of goods and services, or the sum of primary incomes distributed by resident producer units (OECD, 2002).

Restricted Substance List: The AAFA provides a restricted substance list to the apparel and footwear companies with information related to regulations and laws that restrict or ban certain chemicals and substances in finished home textile, apparel, and footwear products around the world (AAFA, 2013).

Stakeholders: Any group of people or individuals who can affect or are affected by the achievement of the organization's objectives (Freeman, 1984).

Sustainable Development: Development meeting the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987).

Sustainability Performance Measurement Framework : “system of indicators that provides a corporation with information needed to help in the short and long-term management, controlling, planning, and performance of the economic, environmental, and social activities undertaken by the corporation” (Searcy, 2012, p.240).

Textile and Apparel Industry: The industry is defined as a diverse and heterogeneous industry that covers a large range of activities beginning from the transformation of fibers to

yarns and fabrics and from these to different types of textile and apparel products (Gardetti & Torres, 2013).

Triple Bottom Line (TBL): Sustainable development involves the simultaneous pursuit of economic prosperity, environmental quality and social equity. It is an approach measuring a company's success based on social and environmental factors in addition to the traditional economic value (Elkington, 1998).

Volatile Organic Compounds (VOCs): Any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate that participates in atmospheric photochemical reactions (EPA, 2012).

CHAPTER 2

LITERATURE REVIEW

An extensive base of knowledge is vital for understanding sustainable development in the context of textile and apparel industry. This chapter first describes the importance of the textile and apparel industry for the society and different activities of its supply chain. Next, concept of sustainable development and its dimensions are reviewed. Then, the sustainability issues related to the textile and apparel supply chain followed by a review of the published literature on sustainability of the industry is highlighted. Subsequently, the sustainability measurement and reporting frameworks available in the literature both for general management purposes and specific to different businesses are reported. Finally, the benefits of embedding sustainability in the core activities of businesses are described.

2.1 Textile and Apparel Industry

2.1.1 Overview of the Industry

The textile and apparel industry is one of the oldest and largest industries in the world (Keane & Velde, 2008; Gereffi, 2002). This industry plays an important role in terms of trade, gross domestic product (GDP) and employment for many countries thus impacting their economies (Brenton & Hoppe, 2007; Keane & Velde, 2008). Though all the countries are involved in import and export of textile and apparel products at different levels, Gereffi and Fredrick (2010) pointed out that the consumption of total world apparel imports which, reached US\$ 376 billion in 2008, was highly concentrated in three main regions: the United

States, the European Union, and Japan. On the other hand, some countries (generally developing) are seen as major producers and exporters of the textile and apparel products (Ha- Brookshire, 2014; Keane & Velde, 2008). In 2010, the total value of world apparel exports reached US\$ 314 billion, 51.3% of which were exported by five leading countries: China, Bangladesh, India, Turkey and Vietnam (WTO, 2011).

Exports of textile and apparel products contribute significantly to the GDP of many developing countries (Keane & Velde, 2008; WTO, 2006). For example, in 2008 the textile and apparel sector contributed 67% of the manufacturing sector of GDP of Cambodia followed by food and beverages at 14.35 % (Cambodia Investment, 2011). The industry is also an important source of foreign exchange earnings for many developing nations. For example, foreign exchange earnings for export of textiles and apparel for Cambodia are 80% of total manufacturing exports (Keane & Velde, 2008).

The industry fulfills society's need of apparel and textile products; and also provides economic benefits through employment (Brenton & Hoppe, 2007; Keane & Velde, 2008). The industry comprises businesses that include production of fiber, construction of yarns and fabric; and the production of apparel products. In the process, the industrial supply chain supports many interconnected businesses that help in the production, construction and distribution of textile products for industrial, wholesale and personal consumption (Nordås, 2004). Collectively, these businesses provide employment to millions of people worldwide (ILO, 2010). China is the largest employer in this industry and provides employment to nearly 30 million people (ILO, 2010). In India, the textile industry accounts for 21% of the

total employment generated in the economy, of which about 8% are directly employed in the textile manufacturing activities and indirect employment accounts for the remaining 13% (Dhanabhakym & Shanthi, 2010). In other countries like Bangladesh, the total employment generated in the economy by this industry is as high as 75% of total employment in manufacturing (Keane & Velde, 2008). Brenton and Hoppe (2007) points out that the industry absorbs large numbers of unskilled labor, usually coming from rural locations as one of the reasons why the apparel sector plays an important role in economic development.

2.1.2 Industry Supply Chain

As depicted in Figure 2.1, the textile and apparel supply chain is long, complex, and multifaceted, intertwined with several other related industries like chemical industry and transportation industry. The major segments of the supply chain include: production of fibers; manufacturing of yarns and fabrics; dyeing, printing and finishing of fabric; manufacturing of apparel and other products; distribution and retail; and consumption and disposal (Forman & Jrgensen, 2004; Frederick, 2010; Giri & Rai, 2013).

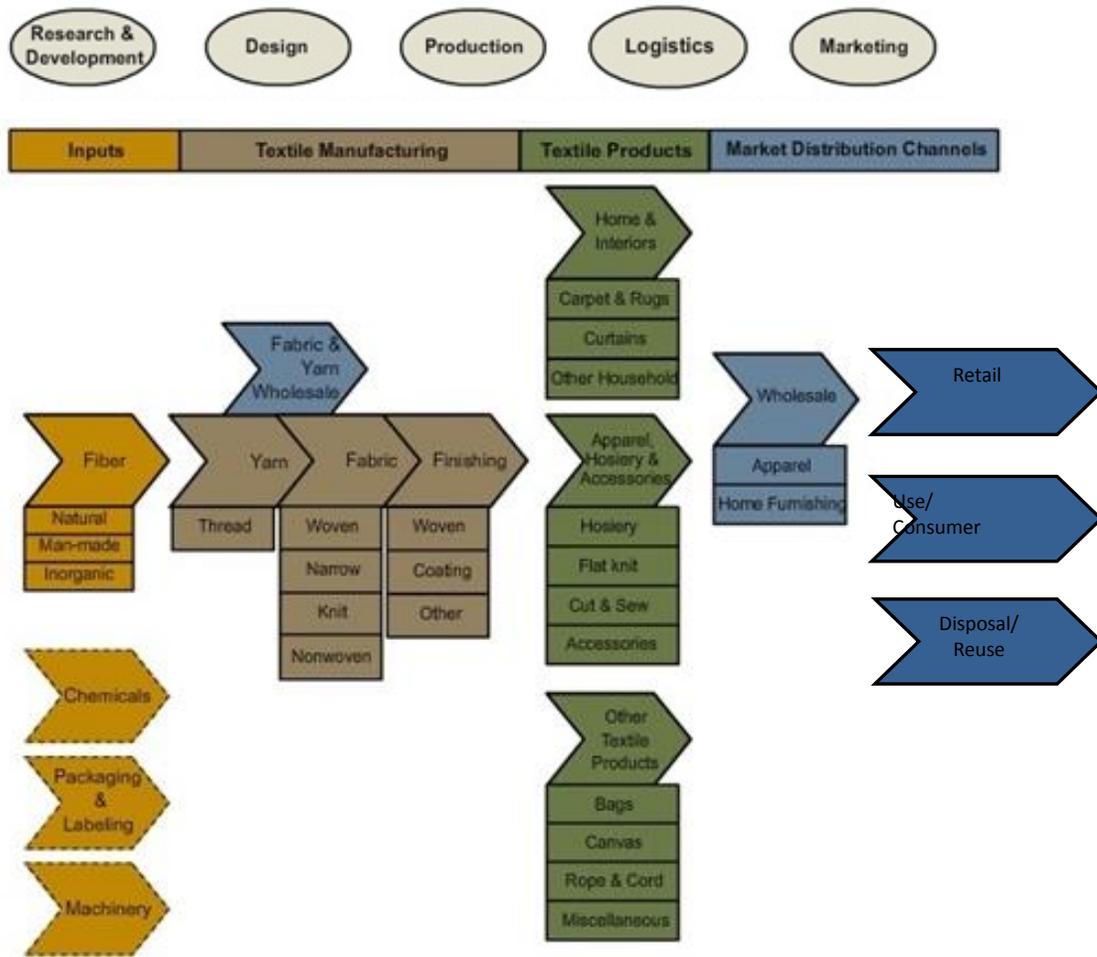


Figure 2.1 Textile value chain visual reference model (Adapted from: Frederick, 2010)

Production of fibers. Fibers form the basic raw materials for textiles and apparel products are generally categorized as natural or manmade. Natural fibers can be plant based produced in the farms such as cotton, linen, jute; or they can be animal based such as wool, fur and silk (Giri & Rai, 2013). Synthetic fibers are made from treating natural materials like cellulose

(e.g. viscose) or produced from raw materials such as petroleum and chemicals (Giri & Rai, 2013). Synthetic fibers include but not limited to polyester, nylon, and acrylic.

Manufacturing of yarns and fabric. Raw fibers from natural sources are spun into yarns through a combination of steps like rowing, combing and twisting and require various preparation steps including cleaning before spinning (Giri & Rai, 2013). The manmade fibers on the other hand, are cleaner and manufactured as long filament yarns. Yarns can be produced in regular and novelty varieties. These yarns are then used for manufacturing of fabrics by weaving and knitting (Giri & Rai, 2013). The fabric produced is used as the raw material from which most textile products are made.

Dyeing, printing and finishing of fabric. Finishing can occur in fabric or garment form depending upon the end use (AATCC, 2008). Finishing can be accomplished chemically or mechanically and may include processes like dyeing, printing or improving the appearance, texture or performance of the product (Giri & Rai, 2013). The stage usually ends with washing and drying of materials. These processes collectively add colors, patterns, special performance characteristics, durability and serviceability to the finished product (Giri & Rai, 2013).

Manufacturing of apparel and other products. The finished textile is converted into a variety of textile and apparel based products. As a common practice, fibers produced and spun in some part of the world are usually transported to other countries to be made into fabrics, which are then shipped to places with low labor costs to cut, sew and assemble into a final product (Ha-Brookshire, 2012). The apparel manufacturing involves multiple steps like

designing, cutting and sewing, attaching trims and pieces and dyeing before they are ready to be sold to consumers. The process usually starts with development of designs based on the market trends (Giri & Rai, 2013). Companies either employ their own designers or outsource designers (Giri & Rai, 2013). Pieces of the fabric are cut according to the selected designs which are then sewn together (Giri & Rai, 2013). Additional finishing may occur after the garment is constructed (Giri & Rai, 2013).

Distribution and retail of textile and apparel products. As a next step, products are prepared for the finishing process where they are cleaned, pressed, packed and labeled (Giri & Rai, 2013). The finished products are then distributed to their respective wholesale or retail stores employing appropriate logistics system and network (Giri & Rai, 2013). From retailers, the products reach the consumers.

Consumption and disposal. The textile and apparel products purchased by consumers are used and maintained via variety of processes like washing, drying, ironing and dry cleaning. Once the products have served their purpose, the products are then disposed by the consumers in different ways like throwing in landfill, donating, repurposing, trading or selling (Solomon & Rabolt, 2009).

From the production of fibers to final disposal of the products by the consumers, textile and apparel supply chain activities are associated with various sustainable development issues for the industry (MSA, 2012; Martin, 2013). Fragmented and heterogeneous nature, usage of wide variety of materials, machinery, consumption and disposal of products result in many economic, environmental and social challenges at each step of the industry's complex

supply chain (Hasanbeigi, 2010; Holmsten-Carrizo, 2013; Krueger, Mena & Srivastava, 2011; MSA, 2012).

2.2 Sustainable Development

2.2.1 Definition

In the wake of global ecological degradation, the United Nations sponsored the Brundtland Commission that published the report *Our Common Future* in March 1987. This report introduced the concept of sustainable development for the first time and defined it as: “*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*”. This is the most acceptable definition of the concept to date (Banerjee, 2008; Berke & Conroy, 2007; Giddings, Hopwood & O'brien, 2002; IISD, 1992).

This definition attempts to integrate economic development with social equity, and environmental protection (Hopwood, 2005; DiSano, 2002). The World Commission on Environment and Development (WCED, 1987) also suggests that sustainable development involves protection of the environment and natural resources as well as providing social and economic welfare to the present and to subsequent generations. Hence, sustainable development is an integrative concept with three dimensions: economic, environmental and social sustainability (Figure 2.2) (Elkington, 1998; Hansmann et al., 2012; World Bank, 2012).



Figure 2.2 Three dimensions of sustainable development (adapted from World Bank, 2012)

2.2.2 Confusion

The concept of sustainable development enjoys an extensive endorsement from various organizations like international institutions, governments, businesses, researchers and civil society (Johnston et al. 2007). However, different businesses attach their own interpretation on what sustainable development means and adapt the concept suitable to their own purposes (Hopwood et al., 2005; Johnston et al. 2007). A report by Drexhage and Murphy (2010) states that the wide ranged adoption of sustainable development as a guiding principle can be

due to its flexibility but has resulted in emergence of many different definitions over the past two decades.

The definitions of sustainable development found in the literature can be divided into various groups on the basis of diverse goals, indicators, values and practices of different stakeholders (White, 2013). These groups comprise different definitional components including ecological services (climate, clean air, land productivity, fresh water, etc.), societal characteristics (dignity, peace, health, equity, etc.) and human values (freedom, tolerance, respect for nature, etc.) (White, 2013). For example, World Business Council for Sustainable Development (WBCSD) defines sustainable development as forms of progress that meet the needs of the present without compromising the ability of future generations to meet their needs. International Institute for Sustainable Development (IISD, 1992) described sustainable development for business as sustainable development means adopting business strategies and activities that meet the needs of the enterprise and its stakeholders today while protecting, sustaining and enhancing the human and natural resources that will be needed in the future. Kates, Parris and Leiserowitz (2005) defines sustainable development as “a concept that, in the end, represents diverse local to global efforts to imagine and enact a positive vision of a world in which basic human needs are met without destroying or irrevocably degrading the natural systems on which we all depend” (p. 20). While McCann-Erickson’s (2007) as cited in Jones, Clarke-Hill, Comfort and Hillier (2008) defined sustainability as: “...a collective term for everything to do with responsibility for the world in which we live. It is an economic, social and environmental issue. It is about consuming differently and consuming

efficiently. It also means sharing between the rich and the poor and protecting the global environment while not jeopardizing the needs of future generations” (p. 125).

Different definitions of sustainable development depict wide range of meanings and interpretations leading to ambiguity of the concept (Dahlsrud 2006; Gatto, 1995; Glavic & Lukman, 2007; Johnston et al., 2007; Marrewijk, 2003; McKenzie, 2004; White, 2013). This ambiguity has resulted in varied and diverse implementation of sustainable development guidelines (Drexhage & Murphy, 2010).

2.2.3 Three Pillars of Sustainable Development

Sustainable development is multidimensional and is usually associated with the three pillars (dimensions) – *environment*, *economic* and *social*. Together the three pillars form the Triple Bottom Line (TBL), a term introduced by John Elkington in 1998. The term emphasizes the importance of integrating economic prosperity, environmental quality and social justice for a sustainable business (Elkington, 1998). According to Figge, Hahn, Schaltegger and Wagner (2002), integration of the three dimensions is important for businesses that want to be a sustainable enterprise. Hart and Milstein (2003) defines a sustainable enterprise as “one that contributes to sustainable development by delivering simultaneously economic, social, and environmental benefits—the so-called triple bottom line” (p. 56). The TBL dimensions are also commonly called the three Ps: people, planet and profits (Slaper & Hall, 2011).

Economic dimension. The economic dimension of sustainable development focuses on the impact of a business on its financial viability (bottom line) and also its impact on the economic systems at the local, national and global levels (Bansal 2005; Elkington, 1998; GRI, 2013 a; Krajnc & Glavic, 2005). It was found that different variables have been attached to the economic dimension of sustainability. Elkington (1998) suggests that the economic dimension of a business should impact the bottom line and the flow of money. Bansal (2005) also suggests that enhancement of financial performance of a business should be part of this dimension. Global Reporting Initiative (GRI) emphasizes that economic dimension should include the impact of a business on its internal and external stakeholders and also on the economic systems at the global, national and local levels (GRI, 2013 a). Krajnc and Glavic, (2005) support the GRI's view point, but also emphasize that the economic dimension should encompass aspects of economic interactions, including the traditional measures of financial accounting. The comparison of various frameworks by Labuschagne et al. (2005) in the study '*Assessing the sustainability performances of industries*', noted that the United Nations (2001) and Wuppertal frameworks (1998) put emphasis on considering the economic dimension in terms of contribution to gross national product or gross domestic product per capita. Overall, the economic dimension draws attention towards income, expenditures and taxes including specific variables such as: organizational profit, establishment sizes, percentage of firms in each sector and revenue by sector contributing to gross state product, value creation among others (Slaper & Hall, 2011).

Environmental dimension. The environmental dimension represents the long range impact of businesses on natural resources (natural capital), ecosystem and biodiversity (GRI, 2013 a; Elkington, 1998; Krajnc & Glavic, 2005). The variables attached with this dimension are mostly unanimous. According to Krajnc and Glavic (2007), this dimension can include impacts of the company on living and nonliving natural systems, including ecosystems, land, air and water. GRI (2013) gives consideration to company's impact related to inputs (such as energy, chemicals and water) and outputs (such as emissions, effluents and waste). Elkington (1998) suggested a list of variables for this dimension, some of which are: energy, materials water usage at production sites; polluting emissions; waste generation; consumption of critical natural capital; life cycle impacts of products. Overall the environmental dimension draws attention towards consumption of materials, pollution of air, water and land; electricity and water consumption, fossil fuel consumption, hazardous chemical usage, solid and toxic waste generation, and land use/land cover (Slaper & Hall, 2011).

Social dimension. The social dimension focuses on the impact of a business on people both inside and outside; and social systems within which it operates (Elkington, 1998; GRI, 2013 a; Krajnc and Glavic, 2007). These include impacts on employees, suppliers, contractors, customers and the society at the global, regional and local level (Elkington, 1998; Krajnc & Glavic, 2007). According to Elkington (1998), the variables attached with this dimensions include equity and access to social resources, human rights, trade union relations, wages and working conditions of employees, animal testing, health and well-being, quality of life, and social capital (in form of public health, skills and education). Labuschagne et al. (2005) point

out the importance of communication and interaction with stakeholders within the social dimension. The study shows that stakeholder participation is a social sustainability criterion within most of the frameworks or guidelines developed with a business perspective, e.g. GRI, Institution of Chemical Engineers (IChemE), and the Dow Jones Sustainability Group Index (Labuschagne et al., 2005). Some of the other variables suggested by Global Reporting Initiative guidelines (GRI, 2013 *a*) for the social dimension include: gender equality in wages, disciplinary practices and human rights aspects in employee sourcing; training and development opportunities for employees.

2.3 Sustainability Issues in the Textile and Apparel Supply Chain

In order to understand the scope of sustainable development for textile and apparel industry, it is important to identify the existing sustainability issues prevalent in the industry. According to Azapagic (2004), identification of relevant issues that reflect the specific characteristics of each type of industry is critical to the development of sustainability guidelines. Sustainable development requires that the company should balance the impacts associated with environmental, economic, and social issues (Searcy, Karapetrovic & McCartney, 2005). The textiles and apparel industry is confronted with sustainability issues at each stage of supply chain (Putte et al., 2013; Müller-Christ & Gandenberger, 2006, MSA, 2012). These issues range from consumption of energy, emissions of greenhouse gas (GHG) from processing, significant water usage associated with the production stage and subsequent toxic effluent discharged to low wages and child labor (Putte et al., 2013; MSA, 2012). These

issues can be divided according to the three dimensions of sustainable development: economic, environmental and social.

2.3.1 Economic Issues

Economic success of the textile and apparel industry is an important concern for sustainable development as the industry is responsible for various economic benefits to the society (Brenton & Hoppe, 2007; USDA, 2012). Businesses contribute to gross domestic product of the country in form of tax, royalties and other payments bringing indirect benefits and amenities to local communities (USDA, 2012). However, an unprofitable scenario restricts the ability of the industry to give back to the society and as a result; the government and communities get deprived of valuable income (USDA, 2012). For example: the contribution of the textile industry to the GDP in the US has declined in recent years. Krueger et al. (2011) noted that the textile industry's contribution to the economy decreased from 0.23% in 2004 to 0.12% in 2008.

Another economic issue for the industry is consumer spending. Consumers represents the demand side of the supply chain and have the power to influence the success of a business as well as the general economic conditions of the consumer market (Czinkota & Skuba, 2009; Kotler & Armstrong, 2013). Recently some countries have seen a decline in consumer spending for textile and apparel products. For example: there has been a steady decline in the U.S. apparel consumption from years 2000 to 2008 (Gereffi & Fredrick, 2010). According to the AAFA's Apparel Stats report (2012), the share of personal consumption

expenditures allocated towards clothing and footwear purchases declined from 3.9 % in 2007 to 3.7% in 2008. It has further come down to 3.5 % in 2010 (Singhal, 2012). The lack of business and consequent profit restricts the ability of the industry to contribute towards GDP of a country and also restricts its ability to reinvest in the business and adopt new technologies (Keane & Velde, 2008).

Hasanbeigi (2010) noted that the textile industry uses large quantities of energy in the form of both electricity and fuels and have a direct impact on the cost of production for the industry. The textile industry is complex comprising different number of plants which collectively consume a significant amount of energy (Hasanbeigi, 2010). For energy, the industry utilizes both electricity and fuels (oil, gas and coal). For example, for yarn spinning, electricity is the dominant energy source while wet-processing requires fuels as its major energy source (Hasanbeigi, 2010). Energy is needed to run all the machinery used by the industry, like the spinning, weaving and knitting machines. However, majority of energy consumed is mostly for heating water to process fabric, and then to dry the wet fabric (MSA, 2012; Thiry, 2011). The energy consumption is one of the main cost factors of the textile industry and with the energy prices experiencing high price volatility this can have a direct impact on cost of production for the industry (Hasanbeigi, 2010).

Additionally, huge quantities of fresh water are also needed for various wet processes like washing, scouring, dyeing etc. Fresh water is an important resource for the textile and apparel industry which is declining steadily (UNEP, n.d). Decreasing availability of fresh water also poses a concern for the industry as it may increase the cost of production in future.

Therefore, the cost and availability of these resources are important economic issues facing the industry.

2.3.2 Environmental Issues

The activities in the textile and apparel supply chain significantly augments various environmental issues like depleting resources, energy consumption, pollution of air and water and waste disposal. This industry is dependent on using natural resources, both renewable and nonrenewable which are available in limited quantities (Sheth, Sethia & Srinivas, 2011). For example, cotton, a natural resource for fiber production requires land and water to grow (Müller-Christ & Gandenberger, 2006). Similarly oil/ petroleum, a non- renewable raw material for synthetic fibers, is limited in quantity (Müller-Christ & Gandenberger, 2006). The global textile and apparel consumption was estimated to be over 30 million tons a year (Chen & Burns, 2006) and with growing population the demand for these products the demand for raw materials would potentially escalate. It is expected that by 2050 the world population may increase to 9 billion people. In such scenario, it is expected that the land allocated for cotton crops at present may have to be used for food production in future to support the growing population (Müller-Christ & Gandenberger, 2006). While there are concerns about land for cotton there are also concerns about oil reserves.

Environmental concerns also include pollution of air and water. Pollution from the textile and apparel industry occurs at different stages of the supply chain including: (a) the

production, (b) the finishing and dyeing/printing, (c) the use and maintenance of the product, and (d) the disposal of the product (Chen & Burns, 2006).

Air pollution: The production of fibers, their conversion into yarns and fabrics, and subsequent steps of finishing, sewing, packaging etc. are done on big machines which consume large amounts of energy (MSA, 2012). During the process, machines (like dryers) emit greenhouse gases (GHG) like carbon dioxide and other Ozone depleting emissions in the atmosphere polluting the environment (Gallagher, 2002; MSA, 2012). In addition, due to the fragmented nature of the textile and apparel industry, materials are shipped across the globe at different stages of the supply chain (Ha-Brookshire, 2014). The process of transportation of goods to their respective customers via land, water and air consumes large quantities of fossil fuels directly or indirectly; and results in emission of harmful gases in air and water (Akimoto, 2003; Carter & Roger, 2008; MSA, 2012). It has also been noted that considerable environmental impacts also occur when the products are used by the consumers (CBI, 2011; Gardetti & Torres, 2013). This is mainly explained by the use of electricity to heat water for washing and drying processes (Gardetti & Torres, 2013). Since products are washed and ironed multiple times post purchase, it contributes significantly to environmental pollution (CBI, 2011).

Water pollution: The textile and apparel industry is known to consume large quantities of water (Thiry, 2011; NIKE, n.d). Fresh ground water, a natural resource, is used in different treatments of fabric like: washing, sizing and de-sizing, dyeing,

bleaching. The water used is usually of high quality and largely potable (MSA, 2012; Thiry, 2011). However, the availability of accessible fresh water is decreasing and there is scarcity of fresh water for people to drink (UNEP, n.d; Gleick, 2014; Rayne & Forest, 2013; Thiry, 2011; World Water Council, n.d). According to UNESCO (2013) and Oecotextiles (2010), more than 783 million people lack access to potable water. In this scenario, using large quantities of fresh water by the companies can present as a potential risk of reputation damage. Apart from consumption, the industry also contributes towards pollution of water. The water used by the industry for various wet processing leads to discharge of non-biodegradable dyes and chemicals in soil and water (Khan & Malik, 2014). Such processes can results in wastewater containing volatile organic compounds (VOCs) which are present in various chemicals, metals, alkalis, acids, lubricants, surfactants and non-biodegradable dyes (Krueger et al., 2011; Verma, Dash, Rajesh & Bhunia, 2012). Many of these dyes and additional chemical effluents are unable to decompose readily in nature and thereby pollute soil and water (Kadolph & Langford, 2002; Khan & Malik, 2014; Odjegba & Bamgbose 2013; Suteu, Zaharia, Muresan, Muresan & Popescu, 2009). Krueger et al., (2011) note that dyeing processes can result in wastewater containing up to 72 chemicals, 30 of which cannot be removed, (Krueger et al., 2011).

Disposal of waste is also a concern for the textile and apparel industry. The transportation and subsequent sale of textile and apparel products requires packaging

materials such as hangtags, corrugated cartons, shoeboxes, shipping pallets, tissue paper, labels, hangers, retail, gift and specialty boxes, bags and poly-bags. Packages once used, are usually disposed off in landfills as solid waste (Sonneveld, James, Fitzpatrick & Lewis, 2005). This issue is also augmented by the pre- consumer and post-consumer textile waste that goes to the landfill (Chen & Burns, 2006). Pre-consumer waste consists of by-product materials from fiber, yarn, or fabric production, while post-consumer waste accounts for products discarded by consumers after use (Chen & Burns, 2006). It was noted that only 48 percent of post-consumer textile waste was recycled and remainder ended in landfills (Chen & Burns, 2006). On an average, a US resident throws away up to 68 pounds (~30.84 kg) of clothing every year (Krueger et al., 2011). The cumulative effects of these processes result in environmental pollution (Hawley, 2006).

2.3.3 Social Issues

The textile and apparel industry products are labor intensive and therefore there are significant sustainability issues related to employees and the society at large throughout the supply chain. The industry employs millions of people across the globe which makes wages a large share of the cost of production (USDA, 2012). Ascloy, Dent and Haan, (2004) point out that low cost of textile and apparel products (like fast fashion goods) can be attributed to compensation given to workers in the form of lower wages and benefits. Though governments of many countries set the minimum wages in consultation with specialized bodies, research done by International Labor Organization (ILO) suggests that compliance

with wage legislation is often low in the textile and apparel industry (ILO, 2014). The issues involved were postponed wage payments, underpayment of wages, mostly for overtime, and no pay for social security contributions (ILO, 2014).

Similar to low wages, long working hours of employees are also becoming an issue for the industry. ILO limits the hours of work in industrial undertaking to 8 hours a day or 48 hours a week (www.ilo.org). In wake of keeping up with demands and production cycles of fast fashion products, most textile and apparel firms hire workers that work 10 to 12 hours per day (Korinek, 2005).

Another issue in the industry is that of gender bias with regards to wages. There has been an increase in number of women workers in the textile and apparel industry (Ascloy et al., 2004; ILO, 2014). However there is a disparity between the wages of men and women in this industry with men getting paid a higher amount (Luginbühl & Musiolek, 2014; ILO 2000; ILO, 2014; GRI, 2002; Korinek, 2005) and that the trend is visible in many countries like Bangladesh, Eastern Europe, Turkey (Luginbühl & Musiolek, 2014; Korinek, 2005).

Some other employee related issues that the industry faces is protection of human rights. Various prominent companies of the textile and apparel industry have been under radar for exploitation of human rights, including paying unfairly low wages, denying the right to employees to organize in trade unions and the employment of children as labors (Clean Clothes Campaign, n.d; Seuring 2001; Seuring & Müller, 2008).

In addition to wages, benefits and labor laws, another important employee related issue that the industry is challenged with is that of occupational health and safety. The textiles

industry can pose health hazards and risks to its workers (MSA, 2012). These include exposure to unsafe chemical substances, manual handling and working with dangerous machinery and exposure to loud noise and vibrations (Clean Clothes Campaign, n.d; EASHW, 2008). Various groups of chemical substances are used during different activities of textile and apparel supply chain. These chemicals include heavy metals and organic chemicals like formaldehyde which are hazardous in nature and can cause lasting damage to human health (Clean Clothes Campaign, n.d; Putte et al., 2013). The report by European Agency for Safety and Health at Work (2008), points out that workers exposed to high quantities of such chemicals for long hours become susceptible to respiratory and skin diseases. The report also discusses the health issues for workers exposed to heat, dust and pollutants for long hours which can lead to reduced lung function in workers. Additionally, the workers often have to operate heavy machinery and equipment that requires specialized training and monitoring. Lack of training to use such machinery can result in serious safety issues for the workers (Clean Clothes Campaign, n.d). Manual handling such as lifting, holding, pushing, pulling, carrying or movement of a load is the largest cause of injury and gradual deterioration of the musculoskeletal system (MSD) of workers in the textiles industry (EASHW, 2008). Finally, exposure to loud noise during weaving, spinning, sewing, twisting, and cutting processes may result in permanent hearing damage such as noise-induced hearing loss and tinnitus in industry workers (EASHW, 2008)

The industry also faces several issues regarding the local communities such as employment in the local area, sourcing material from outside among others (Ascloy et al.,

2004). The textile and apparel industry is known to source materials and human resource from different places around the world in order to capitalize on the low cost of material and the labor force (Ha-Brookshire, 2014). Such practices can cause the domestic market to lose a lot of business as well as employment opportunities (USDA, 2012). Additionally, as a general practice, the industry outsources laborers and contract workforce per need (Ruckelshaus & Goldstein, 2002). Such part time workers do not enjoy all the benefits of a full time employee and are unsure of long term earnings (Ruckelshaus & Goldstein, 2002).

The social issues also relate to the safety of products that the consumers buy to satisfy their needs (MSA, 2012). Dyes and chemicals used by the industry can be harmful and can have hazardous impact on the health of the consumer (OEKO-TEX, n.d *b*; Putte et al., 2013). OEKO-TEX (n.d *a,b*) reports that some of the dyes and finishes used in textile and apparel products contain harmful substances like allergenic disperse dyes or carcinogenic dyes, formaldehyde and lead. Such substances can cause allergic reactions to the person using it specially children and have long-term negative effects on the person's healthy development (OEKO-TEX, n.d *b*). The American Apparel & Footwear Association (AAFA) provides a restricted substance list to the apparel and footwear companies with information related to regulations and laws that restrict or ban such chemicals and substances in finished home textile, apparel, and footwear products around the world (AAFA, 2013).

In summary, the textile and apparel industry faces several sustainability issues beginning from production and consumption of fibers to disposal of textile and apparel products by the

end consumer. These issues have been highlighted by many conference proceedings, publications of industry associations and trade articles.

2.4 Sustainability Activities at Corporate Level

Along with emphasizing the importance of different sustainable development issues, the literature also emphasizes the importance of certain sustainability activities, initiatives and tools that are helpful in integrating sustainability into current systems of businesses and making the business more transparent (European Commission, 2012; Foerstl, Reuter, Hartmann & Blome, 2010; Glavič & Lukman, 2007; Labuschagne et al., 2005; Lazlo & Zhexembayeva, 2011). They are seen as a prerequisite for sustainable operations at corporate level (DiSano, 2002). Some of the initiatives include: making sustainability a board level concern, performing life cycle analysis (LCA) of different products, using Design for Environment (Dfe) tool, investing in process innovation, supplier screening and auditing, and reporting the progress to stakeholders. Also, initiatives like LCA and supplier screening can help in identifying sustainability issues across the supply chain (Glavič & Lukman, 2007) while tools like Dfe and process innovation can help in more efficient use of resources during production. By making sustainability a board level concern, reporting and practicing transparency of supply chain can help in improving credibility of the company (Wagner, Hespenheide & Pavlovsky, 2009; Tonello 2010).

A business can only truly contribute towards sustainable development if issues of sustainability are made a board level concern (Azapagic, 2003; Lazlo & Zhexembayeva,

2011; Tonello 2010; Wagner et al., 2009). Decisions for all the processes involved in business are made by the top management or at the board level of organizations (Wagner et al., 2009). Therefore, if made an important board level issue, the business would embed sustainability in every decision and can influence the various interconnected businesses of textile and apparel industry to control and measure their respective sustainability impacts. Such initiative and subsequent activities exhibit leadership in sustainability which in turn helps manage and build reputation of the business (Deloitte, 2012; IISD, 1992).

Life cycle analyses (LCA) and Design for Environment (Dfe) are the product related tools available for the industry. LCA can help in identifying issues along the supply chain (Glavič & Lukman, 2007), while Dfe can help improve efficiency of resources being used (European Commission, 2012). According to Glavic and Lukman (2007) the LCA of products assesses all stages and the life time of products taking into account the impacts of each stage on the environmental as well as services, manufacturing processes, and decision making. SAIC and Curran (2006) defines LCA as a “cradle-to-grave” approach for assessing industrial systems beginning with the gathering of raw materials from the earth to create the product and till the point when all materials are returned to the earth. Since the tool helps in achieving improved life cycle performance therefore it is a vital approach for the implementation of sustainable development into product design (Glavič & Lukman, 2007). More than eighty percent of the environmental impact of a product is determined at the design stage (European Commission, 2012). In order to address such situations, coherent and integrated methods like Dfe can be implemented. Dfe address all the environmental impacts

of a product from the earliest stages of design and hence help avoid uncoordinated product planning thereby reducing the resource wastage, eliminate use of toxic substance and controls energy consumption (European Commission, 2012; Glavič & Lukman, 2007; Lenox, Jordan & Ehrenfeld, 1996).

Innovation in process and product design can further help in embedding sustainability in the organizational activities (GRI, 2013 *b*). A survey regarding sustainable product innovation conducted by PricewaterHouse Cooper in 2011 reported that 80 percent of CEOs of different industries believed that innovation leads to efficiencies and assisting in competitive advantage (PwC, 2012). According to Adams et al., (*n.d*), process innovations changes the way an organization produces and delivers its products or services by the introduction of new elements into production; while product innovations can change what product the organization finally offers the customer. To address sustainability concerns, product innovation strategies attend to materials, carbon, water, energy and pollution considerations (Capozucca and Sarni, 2012; Dangelico and Pujari, 2010). For example, Levis began using innovative waterless techniques in 2011 to reduce the water consumption during garment finishing. The company reports that by removing water from stone washes and some other processes helped in reducing the water consumption by 96 percent during finishing processes. Taking initiative towards building innovative products and processes is advantageous for the businesses as well. Capozucca and Sarni (2012) point out that innovation can help in product differentiation that is significant in shaping a company's prospects in the market. In addition, Dangelico and Pujari (2010) mention that sustainable

product innovation strategies can help the companies to comply with regulations, enhance corporate environmental image, and exploit market opportunities while responding to sustainability concerns.

Supplier screening and auditing are another tools that can help companies embed sustainability in their operations (Lee, 2008). Supplier screening or assessment involves monitoring, auditing and evaluation of each link in the value chain (Turker & Altuntas, 2014). The aim of such assessments is twofold. First, it helps improve the overall performance of suppliers, and second, helps the company avoid risks in the supply chain (Turker & Altuntas, 2014). Improvements in supplier performance are measured by criteria's like dependency, flexibility, quality and speed while the possible risks are evaluated according to the dimensions of the triple bottom line (Turker & Altuntas, 2014). As discussed by Foerstl et al., (2010) such tools play a vital role in the mitigating sustainability related risks (corporate reputational damage) of the buying firm usually caused by supplier misconduct.

Communication of the sustainability efforts made by the firms to the employees, consumers, investors and other stakeholders is a valuable step towards improving the assessment of the firm (Eccles & Saltzman, 2011; Kolk, 2008). Reporting is generally understood as a practice of measuring and disclosing sustainability information that is the economic, environmental and social impacts caused by company's everyday activities (GRI, 2002; UNEP). Reporting increases the transparency and accountability of companies such that they can demonstrate their performance and long term economic value and contribution

to sustainable development (UNEP). Eccles & Saltzman (2011) identify three benefits of reporting: 1) *internal benefits*, reporting helps in efficient internal resource allocation decisions, better engagement with shareholders and stakeholders, and decreased reputational risk; 2) *external market benefits*, providing information appearing on sustainability indices helps mainstream investors to ensure that data vendors report accurate nonfinancial information on the company; and 3) reporting helps in managing regulatory risk, as the company is already prepared for a possible wave of global regulation and can respond to requests from financial regulators.

2.5 Sustainability Measurement

Sustainability measurement or monitoring of sustainability activities is a vital initiative that can help an organization in decision making process and also helps in embedding sustainability into the organizational management system (Delai & Takahashi, 2011; Searcy, 2012). According to Tangen (2005), a performance measurement system is a metric that can be used to quantify the efficiency and effectiveness of a company's activities. Searcy (2012) defines a sustainability performance measurement system as a "system of indicators that provides a corporation with information needed to help in the short and long-term management, controlling, planning, and performance of the economic, environmental, and social activities undertaken by the corporation".

The performance measurement system for sustainability must be simple yet robust in nature (Schwarz et al., 2002). Simple such that it should not be inadequately time consuming

or requires a large manpower to develop and robust such that it should indicate the progress toward sustainability when real improvement has been achieved (Schwarz et al., 2002). A measurement system should consider a variety of stakeholders such as employees, customers and suppliers (Neely, Adams & Kennerley, 2002). In addition, a performance measurement framework should comprise two vital components: categories (what should be measured) and measures/indicators (how to assess) (Delai & Takahashi, 2011; Tangen, 2005).

Sustainability measurement is usually done through indexes or set of indicators included in the measurement framework (Delai & Takahashi, 2011; United Nations, 2007).

Sustainability metric should aim to combine key indicators of economic, environmental and social measures considering the multidimensional nature of sustainability (McCool & Stankey, 2004; Schwarz et al., 2002). The integrated measurement is important to make effective operational and capital investment decisions that positively impact organizational objectives as well as satisfy the objectives of multiple stakeholders (Epstein, 2003). The information collected using the indicators can help in giving an early warning to companies regarding economic, social and environmental setbacks and to mitigate future risks (Moldan & Billharz, 1997; Gallopín, 1997; McCool & Stankey, 2004; United Nations, 2007). They are also useful tools for communicating ideas, thoughts and values of the organization to different stakeholders (United Nations, 2007). Therefore, these indicators are important as they help in measuring and calibrating the organizations' progress toward its sustainable development goals (United Nations, 2007).

In order to measure the progress of companies towards sustainable development, different frameworks with sustainability indicators have been developed (Delai & Takahashi, 2011; DiSano, 2002; Krajnc & Glavic, 2005; Labuschagne et al., 2005; OECD, 2005; Singh et al., 2012). The United Nations Commission on Sustainable Development (UNCSD) developed indicators of sustainable development that can be used by policy makers in governments of different countries (DiSano, 2002; United Nations, 2007). The Organization for Economic Co-operation and Development (OECD) provides guidelines for multinational enterprises in areas ranging from human rights, employment and industrial relations, to information disclosure, environment and taxation (OECD, 2005). These (UNCSD & OECD) frameworks have been accepted at the international level (European commission, 2009; Labuschagne et al., 2005).

In addition to the frameworks developed by governmental and non-governmental organizations, some measurement frameworks have also been developed by scholars (Figg et al., 2002; Krajnc & Glavic, 2005; Delai & Takahashi, 2011). Figg et al., (2002) proposes a sustainability balanced scorecard for corporate sustainability management by integrating the three pillars of sustainability into a single management tool. Krajnc and Glavic (2005) designed a composite sustainable development index which depicts performance of companies along all the three dimensions of sustainability. Delai and Takahashi (2011) developed a reference model for measuring corporate sustainability that can be used by organizations to integrate sustainability measures into their current performance measurement system.

Many sustainability measurement frameworks have been developed for general management purposes but only few of them have an integrative focus measuring economic, environmental and social dimensions (Delai & Takahashi, 2011; Labuschagne et al., 2005; Singh et al., 2012; Veleva & Ellenbecker, 2000). A review of several sustainability frameworks shows that the measurement frameworks primarily focus on the environmental dimension of sustainable development (Singh et al., 2012). There is no standardization in classification of the sustainability issues based on different criteria's especially between social and economic dimensions (Delai & Takahashi, 2011). Also, there is no consistency on the scope of the measurement of each issue as different frameworks measure the same issue at different levels (Delai & Takahashi, 2011). Veleve & Ellenbecker (2000) also discuss that although a large number of sustainability measurement frameworks for companies are being developed, there are some weaknesses attached with them like: lack of indicators to address all sector specific aspects of sustainability; lack of direction/vision; use of quantitative indicators only; and lack of clear and detailed guidance for indicator application. Additionally, these frameworks were developed without regarding to specific industry sectors, and therefore are restricted in their ability to address and reflect the sustainable issues associated with a particular industry.

Recognizing limitation of general sustainability measurement frameworks, industries sectors and researchers have developed frameworks that are industry specific; some of which were developed by adopting the widely accepted international measurement frameworks. For example, the Institution of Chemical Engineers (IChemE, 2002) published a set of

sustainability indicators consistent to GRI for measuring the sustainability within the process industry. Similarly, Azapagic (2004) also developed a sustainability measurement framework for the mining and minerals industry compatible with the general indicators of the GRI. Veleva and Ellenbecker, (2001) proposed an eight step model of core and supplemental indicators for raising companies' awareness and measuring their progress toward sustainable production systems. Labuschagne et al., (2005) proposed a comprehensive measurement framework to assess the sustainability of operations in the manufacturing sector using the GRI, UNCSD, IChemE and Wuppertal Sustainability Indicators and the related information available in literature. Singh et al., (2007) presented a method for development of composite sustainability performance index that addresses the sustainable performance of steel industries along all the three pillars of sustainability—economic, environmental and societal while Nordheim and Barrasso (2007) focused on providing guidelines to derive sustainability measurement indicators for the steel and aluminum industry.

Similarly, several measurement tools have been developed for the textile and apparel industry, including: the Higg Index (SAC, n.d c), the Eco Index (OIA, n.d a) and the Sustainability Measurement and Reporting System (SMRS) by The Sustainability Consortium (TSC, 2015). The Higg Index is a self-assessment tool developed by the Sustainable Apparel Coalition (SAC). Specific to the apparel and footwear industry, this index helps in the assessment of the environmental and social performance of apparel and footwear products across the supply chain at the brand, product, and facility levels (SAC, n.d c). The Eco Index is an environmental assessment tool that was developed by the Outdoor

Industry in 2010 (OIA, n.d a). The Sustainable Consortium (TSC) provides sustainability measurement for different consumer products across industries including textile and apparel products. TSC has a science-based approach to sustainability assessment and aims to improve the environmental, social, and economic performance of the clothing.

The following section discusses some of the initiatives by UNCSD, SAC, OIA and TSC in detail for the purpose of this study. UNCSD is one of the earliest frameworks that provided sustainable development indicators and closely follows Brundtland Commission. The Higg Index by SAC and the Eco Index by OIA are specific to the textile and apparel industry and hence important for the study. TSC also provides sustainability measurement for different textile and apparel products.

2.5.1 The Indicators of the Commission on Sustainable Development

The United Nations Commission on Sustainable Development (UNCSD) was established by the UN General Assembly in December 1992 to ensure effective follow-up of United Nations Conference on Environment and Development (UNCED) (UNCSD, n.d). The commission devised a framework of the different sustainability indicators that assess the performance of governments towards sustainable development goals (Labuschagne et al., 2005; Singh et al., 2012).

Recognizing the importance of indicators in making informed decisions concerning sustainable development, the UNCSD published its first set of indicators for sustainable development in 1995 (United Nations, 2007). This set of indicators have since been revised

twice, in 2001 and then in 2005 (United Nations, 2007). The UNCSD defines indicators, explains their methodologies and provides training to implement them (United Nations, 2007).

The previous versions of the UNCSD framework emphasized four dimensions of sustainable development: social, environmental, economic and institutional dimensions (Delai & Takahashi, 2011; Labuschagne et al., 2005). It is the only framework that proposed four dimensions in the framework. Institutional sustainability, the fourth dimension aimed for adoption of strategies of sustainable development and the integration of socio-economic and environmental aspects in decision making (DiSano, 2002; Spangenberg, 2002). The institutional sustainability is important on a strategic level within a business (or industry) and is seen as a prerequisite for sustainable operations, projects and corporate sustainability (Labuschagne et al., 2005). The newly updated UNCSD framework, however, does not support the division of indicators on the lines of four 'pillars' (social, economic, environmental and institutional) (United Nation, 2007).

Following a hierarchical format, the framework consists of a broader theme and sub-themes which are followed by a comprehensive set of core indicator and other indicators categories (United Nation, 2007). The core indicators cover issues relevant for sustainable development. The additional indicators enable a more comprehensive and differentiated assessment of sustainable development (United Nations, 2007). The framework assembles indicators within 14 main themes and contains 96 indicators, including a subset of 50 core indicators (United Nations, 2007).

2.5.2 The Eco Index by the Outdoor Industry Association

The Eco Index is an environmental assessment tool that was developed by the Outdoor Industry Association in July 2010 (OIA, n.d *a*). This index aims to help companies incorporate environmental considerations into product design and supply chain management (OIA, n.d *b*). By assessing product-level sustainability, the tool helps companies to measure environmental impacts and identify areas for improvement in terms of sourcing and product life cycle decisions (OIA, n.d *b*). The latest version (BETA Phase 2) was launched in early 2011 (Saicheua, Cooper & Knox, 2012).

The Eco Index provides a tool for a company to measure areas within the company's supply chain across the following six product life cycle stages: materials, packaging, product manufacturing and assembling, transportation and distribution, use and service, and end of life. At each stage it focuses on measuring the environmental impacts, such as land use intensity, water, waste, biodiversity, chemistry/toxic-people, chemistry/toxic-environment, and energy use/greenhouse gas emissions (Saicheua et al., 2012).

The tool can be used for both intermediate and finished products, thereby providing a means to collectively evaluate performance at different stages of a product's life cycle separately, as well as evaluating the complete life cycle of the finished product. Also, the tool can be used to evaluate the related processes involved in production and the facilities where the production takes place (OIA, n.d *b*).

The Eco Index comprises three different tools – Environmental Guidelines, Environmental Indicators and Environmental Footprint Metrics (OIA, n.d *b*). The three tools

are based on the same criteria and lifecycle stages but serve different purposes and holds different levels of complexity for implementation. The use of environmental guidelines does not require any previous knowledge of sustainability by the companies as it aims to help the company increase their awareness about environmental problems. However, the other two tools: environmental indicators and environmental metrics, require more knowledge and experience by the companies before they can be used by them to measure sustainability (Söderberg, 2012).

Environmental Guidelines. The environmental guidelines provide general qualitative principles and practices to promote environmental improvement thought process and research ideas by the companies. The guidelines are divided into the three categories: *product guidelines*, *design guidelines* and *facilities guidelines*. Each category includes a number of sections which help companies to make choices of materials which can make the product more sustainable. For example the packaging guidelines has sections on design to reduce material use, design for reuse, design for recyclability, selection of packaging material and chemical responsibility (Söderberg, 2012).

Environmental Indicators. Environmental indicators use qualitative and quantitative comparative scoring system that can be utilized for a specific life cycle area as well for a full assessment of a consumer product. The Eco Index includes three categories of environmental indicators: *product indicators (PI)*, *facility systems indicators (FS)*, and *footprinting indicators (FI)*. The PI evaluates the environmental impacts of the various life cycle stages, beginning with the impact of the material used until a product is at the end of its intended

functional life. The FS indicators are used to evaluate facilities within a product's supply chain and may be applied to only three lifecycle stages: materials, packaging, product manufacturing and assembly. The FI comprises four indicators based on the environmental footprinting metrics: greenhouse gas emissions, energy use, water withdrawal and waste.

Environmental Footprint Metrics. The environmental footprint metrics is a tool for measuring the environmental footprint of a finished product across its entire life cycle. These metrics comprise units of measure, and also a common methodology for calculating the metric and collecting the data across the industry related to energy use, greenhouse gas emissions, water withdrawal and waste during the lifecycle stages materials, packaging and product manufacturing & assembly.

Figure 2.3 depicts the three different tools of Eco Index- Environmental Guidelines, Environmental Indicators and Environmental Footprint Metrics across the six product life cycle stages.

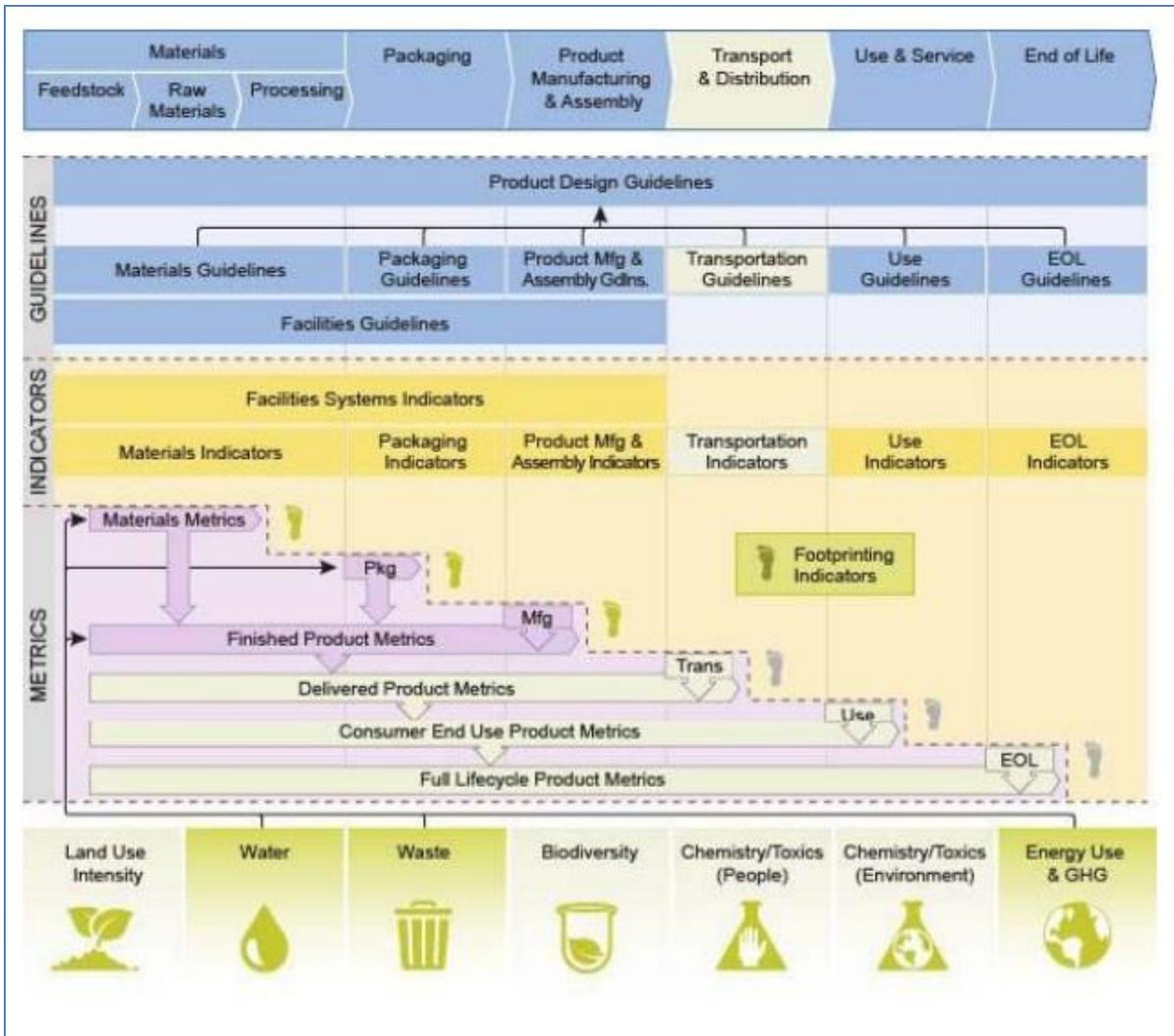


Figure 2.3 Eco Index Components (OIA, n.d a)

The Eco Index was developed to assess sustainability for active outdoor recreational products. However, the index is limited to environmental dimension of sustainability and does not provide measurement for the economic and social dimensions. Also, the Eco Index is currently an internal evaluation tool and does not have a consumer-facing component

(Gauthereau, 2011). Additionally, the Outdoor Industry Association Sustainability Working Group (OIASWG) has collaborated with the Sustainable Apparel Coalition (SAC) to develop sustainability indexes for apparel, footwear and equipment (OIA, n.d a). The contents of Eco Index have been used to create the Higg Index by SAC which is considered the next iteration of the Eco Index (OIA, n.d a).

2.5.3 The Higg Index by the Sustainable Apparel Coalition

The Higg Index is an indicator-based assessment tool for apparel and footwear products launched in 2012 by the Sustainable Apparel Coalition (SAC). The Higg Index is based on lifecycle analysis spanning the entire lifecycle of apparel and footwear products, encompassing raw materials, manufacturing, packaging, transportation, use and end of life. Additionally, this tool aims to standardize the methodology for measurement and evaluation of the environmental performance of the apparel and footwear products throughout the supply chain (SAC, n.d a).

Higg Index 1.0 was launched in June 2012. The aim of the first version of the tool was to collect the information on the environmental performance of products from different apparel brands and provide manufacturers with scores on the environmental performance of their products. The Index considered performance across the complete life-cycle including the impacts from input materials, manufacturing, packaging, transportation, use, and end-of-life. The tool also considered metrics that measure water use and quality, energy use and emissions, and raw waste and hazardous wastes (Reuben, 2012).

Higg Index 2.0 was introduced on December 11, 2013 (Radhakrishnan, 2015). Table 2.1 addresses the differences between the two versions. According to the SAC, the Higg Index 2.0 is practical for small and large companies and helps them to identify the different aspects of environmental sustainability and hence provides opportunities for improvement (SAC, n.d a). The tool uses a Microsoft Excel interface and consists of qualitative and quantitative indicators for evaluations (Radhakrishnan, 2015). An example of a quantitative indicator is: what was the percentage of volume shipped via air freight? While an example of qualitative indicator is: which statements best describe the Facility policy and procedure towards hours of work?

Table 2.1: Difference between Higg Index 1.0 and Higg Index 2.0 (SAC, n.d a)

Criteria	Higg Index 1.0	Higg Index 2.0
User Interface	Excel	Web Tool and Excel
Assessment Type	Qualitative Indicators	Qualitative Indicators + Facility Quantitative Data
Sustainability Topics		
Environment (Env.)	Yes	Yes
Social/Labor (S/L)	No	Yes
Product Categories		
Apparel	Yes	Yes
Footwear	No	Yes
Value Chain Area		
Higg Index Tools	Brand Module (Env.), Facility Module (Env.), Product Module	Brand Module (Env. + S/L), Facility Module (Env. + S/L), Rapid Design Module - Beta

The Higg Index 2.0 is based on several other tools including the Eco Index, Nike’s Apparel Environmental Design Tool, Global Social Compliance Program reference tools and social/labor practice tools, such as the SAI Social Fingerprint and FLA Sustainable Compliance Initiative (SAC, n.d a). This Index comprises a suite of tools that comprise three categories: facility tools, brand tools, and product tools (SAC, n.d a).

Facility Tools. These tools can be used by facilities, vendors, or manufacturers to assess specific facility sites where apparel and footwear products are made. There are two facility modules: environment module and social labor module.

1. *Environment*: This module helps to assess environmental performance of material, packaging, and manufacturing facilities. Specifically, the facility-site module aim to measure: energy use, GHG emissions, water use, wastewater effluent, emissions to air, waste management and chemical management (Higg Index, 2013).
2. *Social/Labor (Beta phase)*: This module aims to assess the social and labor performance of material, packaging, and manufacturing facilities. The social/labor module is further divided into three sub-sections: 1) the facility's labor and workplace performance management which includes indicators like recruitment and hiring, compensation, hours of work, worker involvement and communication, worker treatment and development, health and safety and termination and retrenchment; 2) the facility's labor and workplace performance management for the value chain; 3) the external engagement and collaborations, community impact, transparency and public disclosure.

Brand Tools. The tool can be used by companies categorized as brands to assess the impacts attached with their products. The brand tool contains three modules:

1. *Environment for apparel*: This module assesses the apparel product-specific environmental practices at the brand level. The module is further divided into seven categories each consisting of various indicators, including general category, materials, packaging, manufacturing category, transportation, product care and repair services and end of use of products.

2. *Environment for footwear*: This particular module assesses footwear product-specific environmental practices at the brand level. This module is similar in functionality as the apparel environment module.
3. *Social/Labor (Beta phase)*: This module is used to assess the specific social and labor practices for both apparel and footwear products at the brand level. This module is also further divided into three sub-categories which constitute different indicators, including social/labor performance management for company's internal purposes, for company's partners in the value chain and for company's external engagements.

Product Tools. The product tools aim to help assess the impacts at the product level. This category consists of two modules: *Rapid Design Module (RDM)* and *Materials Sustainability Index (MSI)*. The RDM is a prototype to help educate designers on sustainable product design by providing vital information and a support framework that assist them in decision making. The MSI data explorer is an online interface that helps users to understand the data and methodology behind MSI Base Material Scores. It also serves as a platform for data submission to help improve the quality of material scores or addition of new materials (Radhakrishnan, 2015).

The Higg Index 2.0 provides a valuable set of tools for assessing environmental and social sustainability for the apparel and footwear industry throughout the supply chain. However, this index has several limitations. First, there are several areas which are still being considered for further development of this index with regards to product assessment, improvement of scoring procedures and enhancement of metrics (SAC, n.d b). Second, the

scope of Higg Index 2.0 is to focus on only two dimensions of sustainability: environment and social. Unlike UNCSA and GRI, the Higg Index does not incorporate the economic dimension of sustainability in its modules. Third, the tool covers important aspects at the brand, product and facility level. It however, does not include modules for the retailing part of the supply chain. Finally, the Higg Index is an internal assessment tool and is not used as an external reporting tool by the companies.

2.5.4 The Sustainability Measurement and Reporting System (SMRS) by The Sustainability Consortium

The Sustainability Consortium (TSC) was launched in 2009 at the Bentonville, Arkansas. It is a global organization with a mission to improve the sustainability of consumer products during their production, sale and use, with a focus on manufacturers and the retail buyers (TSC, 2015). The consortium aims to create science-based decision tools to address sustainability issues throughout a product's lifecycle. TSC constitutes a diverse group of members including manufacturers, retailers, suppliers, service providers, NGOs, civil society organizations, governmental agencies and academics (www.sustainabilityconsortium.org). TSC is jointly administered by Arizona State University and the University of Arkansas, with additional operations at Wageningen University (Netherlands) and an office in China (www.sustainabilityconsortium.org).

TSC provides a portfolio of services to different industry sectors through a Sustainability Measurement and Reporting System (SMRS). The SMRS is used for different consumer

products from various sectors throughout the value chain and is based on life cycle analysis. This tool follows the ISO 14025 standard for environmental product declarations and the GHG Protocol product level accounting principles (Golden, Subramanian, and Zimmerman, 2011). The SMRS comprises: 1) product category baseline models which use worst-case market-typical products for comparative analysis; 2) product category rules; and 3) computational tools to conduct life cycle modeling (Golden et al., 2011). The SMRS performs life cycle analysis to identify environmental and social “hotspots” for each product category from different sectors. These sectors are a part one of the ten working groups: Clothing, Footwear & Textiles; Electronics; Food, Beverage & Agriculture; General Merchandise; Home & Personal Care; Measurement Science; Packaging; Paper, Pulp & Forestry; Retail and Toys (www.sustainabilityconsortium.org).

The Consortium’s Clothing, Footwear, and Textiles (CFT) Sector Working Group provides a science-based approach to sustainability assessment and information reporting in order to improve the environmental, social, and economic performance of the clothing, footwear, and textiles throughout the supply chain (www.sustainabilityconsortium.org). This sector group was launched in February of 2013 and currently provides sustainability insights and key performance indicators (KPI) for the following products: cotton, cotton textiles, cotton polyester blend textiles, nylon textiles, polyester textiles and rayon textiles (www.sustainabilityconsortium.org).

The consortium is one of the few organizations that provide sustainability insights specifically for the textile and apparel industry. The consortium started out with the aim of

conducting LCA for each and every consumer product to provide sustainability insights, measurement KPI's. However, the aim was not fulfilled and currently TSC provides information on product categories instead. The CFT sector working group is still in development stage and provides information on only five categories namely: cotton, cotton textiles, cotton polyester blend textiles, nylon textiles, polyester textiles and rayon textiles. Additionally, unlike the Higg Index, KPI's by TSC for different products in each working group is not assessable to general public and can be requested only by the member companies. Also, while the Higg Index provides a scoring system that can be used for internal assessment, the KPI by TSC follow a certain hierarchy but do not provide any scoring system that can be used by companies for self-assessment (Personal Conversation, 2015).

In summary, the UNCSD indicators were developed to measure the performance of governments towards sustainable development goals but it has been frequently referred for developing sustainability measurement frameworks for businesses. The Higg Index and Eco Index provide indicators to measure environmental and social sustainability for the textile and apparel industry. The TSC provides SMRS for textile and apparel sector but its still in development stage.

2.6 Sustainability Reporting

Sustainability report is the publication of company information that reflects the performance of a company with regards to the environmental, social and governance criteria

(ACCA, 2013). Ioannou and Serafeim (2014) defined a sustainability report as “a firm-issued general purpose non-financial report, providing information to investors, stakeholders (e.g., employees, customers and NGOs), and the general public about the firm’s activities around social, environmental and governance issues, either as a stand-alone report or as part of an integrated (e.g. financial and sustainability) report” (p.2). Due to increase in social (e.x. human rights, poverty) and environmental (e.x., emissions, water usage, and waste) related issues, companies are pressured to be transparent about their activities and disclose the consumption and utilization of natural resources and their impact on human capital (Abeysekera, 2013; Ioannou and Serafeim, 2014).

In the study “The Consequences of Mandatory Corporate Sustainability Reporting” Ioannou and Serafeim (2014) discussed the importance of sustainability reporting and suggested that it increases transparency for the company and can result in bringing a change in corporate behavior. The results of their study suggested that reporting can be helpful for building effective communication channels between the company and its stakeholders as it makes the company more transparent. Disclosing the sustainability related information requires the company to manage sustainability linked activities effectively so as to avoid disclosing inefficient performance to the stakeholder (Abeysekera, 2013; Ioannou and Serafeim, 2014).

There are various benefits of sustainability reporting. According to Ioannou and Serafeim (2014) disclosing sustainability information leads to a) an increase in the social responsibility of business leaders, b) a prioritization of sustainable development, c) a

prioritization of employee training, d) more efficient supervision of managers by boards of directors, e) an increase in the implementation of ethical practices by firms, e) a decrease in bribery and corruption, and f) an improvement of managerial credibility within society.

Along with reporting of sustainability information, the method of reporting and disclosure of the information is also gaining importance (Adams et al., 2011; Cheng et al., 2014; Cohen et al., 2012). Traditionally, reporting of information related to sustainability is done using a range of methods like stand-alone sustainability reports, corporate social responsibility (CSR) reports or within the annual report (Cohen et al., 2012; Cheng et al., 2014). However, such methods of reporting information not always facilitate stakeholders understanding about a company resulting in lowering the usefulness of the information (Cheng et al., 2014).

In order to address this problem, a number of coalitions (such as the International Integrated Reporting Council), councils, and NGOs are focused on improving and broadening the contents of corporate reporting (Bosco et al., 2013). An example of such an effort is Integrated Reporting (IR). Integrated reporting (IR) is a style of reporting that aims to provide a concise integrated picture of a company's financial, environmental, social, economic and governance performance and impacts (Abeysekera, 2013; Cheng et al., 2014; Bebbington, Unerman and O'Dwyer, 2014). The King Report on Governance for South Africa (King III) (IRCSA, 2011), defined IR as "a holistic and integrated representation of the company's performance in terms of both its finance and its sustainability" (p. 3). The objective of IR is to assist stakeholders in assessing whether a company is able to create and

sustain its value over the short, medium, and long term (IIRC, 2015; IRCSA, 2011). IR is an approach that also helps a company to demonstrate their responsible corporate behavior towards the global economy, shareholders, society, and the environment (IRCSA, 2011, p. 1).

In order to report the progress of companies towards sustainable development, different frameworks with sustainability reporting guidelines are available (GRI, 2012; CDP, 2015; IIRC, 2015). The Global Reporting Initiative (GRI) provides a framework for companies to report their respective organizations' economic, environmental and social performance (GRI, 2002). Carbon disclosure project requires companies to disclose information regarding climate change while the International Integrated Reporting Council (IIRC) provides guidelines for industries to follow integrated reporting covering six different capitals. The following section discusses some of these frameworks (GRI, CDP and IIRC) in detail for the purpose of this study.

2.6.1 The Global Reporting Initiative (GRI)

The GRI was established in 1997 by combined efforts of the Coalition for Environmentally Responsible Economies (CERES) and the United Nation Environment Programme (UNEP) (GRI, n.d a). The major focus of GRI is to provide a common framework for companies to report their progress towards sustainable development (Veleva & Ellenbecker, 2000). GRI also educates companies on improving the quality, structure and coverage of sustainability reporting (Labuschagne et al., 2005). Developed by a global multi-

stakeholder process involving representatives from business, labor, civil society, financial markets, auditors and experts in various fields, the GRI guidelines also include inputs from regulators and governmental agencies from different countries. The guidelines recommend adhering to a standardized format to facilitate easy cross comparisons between the companies (GRI, 2013 *a*). The GRI focuses on the triple bottom line concept – integrating economic, environmental and social performance of the company in one report (GRI, 2002).

The first set of GRI guidelines was introduced in the year 2000 (Willis, 2003). The guidelines have been updated several times to reflect the current and future trends in the sustainability reporting (GRI, n.d.*b*). The fourth and the most current update of the guidelines, GRI G4, was published in 2012 (GRI, n.d *a*). The main enhancements in the G4 guidelines have been in terms of requirements of updated and detailed disclosures on governance, ethics and integrity, supply chain, anti-corruption and greenhouse gas (GHG) emissions by the companies. There has also been some reshuffling of indicators from previous versions of guidelines.

The G4 guidelines are presented in two parts to facilitate the identification of reporting requirements and related guidance. Part one is called ‘Reporting principles and Standard Disclosures’. In addition to providing guidance on the reporting process, this section requires companies to provide a basic description of organizations’ profile, organization’s management and performance related to material aspects. Part two is named ‘Implementation Manual’ and contains guidance for reporting and interpretation of concepts that an

organization should consult while preparing its sustainability report. In addition, the manual also provides references to other sources, a glossary and general reporting notes.

As depicted in Figure 2.4, the GRI indicator framework is hierarchical in nature focusing on the three dimensions of sustainability: environmental, social and economic (Singh et al., 2012; Labuschagne et al., 2005; Veleva & Ellenbecker, 2000). The framework hierarchy consists of the following levels:

Category: It is the general class or a group of issues, representing the three pillars of sustainability: economic, environmental and social.

Aspect: These are the specific issues within each category about which information is to be reported (e.g. emissions, energy, water, product performance, health and safety)

Indicator: These are the most precise measure of the organizations performance for each aspect. The guideline contains more than 100 indicators across the three categories.

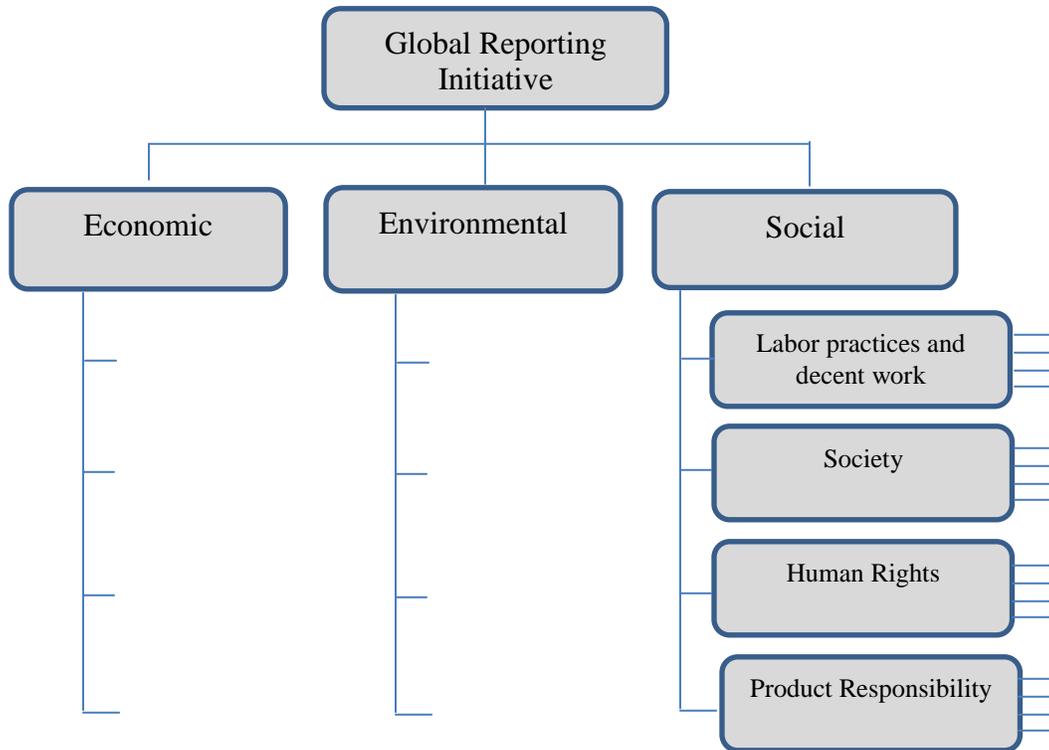


Figure 2.4 The structure of the Global Reporting Initiative (GRI) framework (Adapted from Singh et al., 2012)

The GRI framework provides specific guidelines on reporting of an organization's economic, environmental, and social performance (GRI, 2011). The economic category of the guidelines measures the economic impact of a business on its internal and external stakeholders and also on the economic systems at the global, national and local levels (GRI, 2013 *a*). This category includes aspects that are concerned with the flow of capital among different stakeholders, and the economic impacts of the organization throughout society (GRI, 2013 *a*). The various aspects of this category are: economic performance, market

presence, indirect economic impacts and procurement practices. A total of nine specific indicators are included for the economic category (GRI, 2013 *a*).

The purpose of the environmental category of the framework is to reflect the current state of the company's impact on the living and non-living natural systems. This category includes various aspects some of which are: materials, energy, water, biodiversity, emissions, effluents and waste, products and services, compliance, transport. The impact of an organization on the land, air, water and ecosystems and the impact related to inputs (such as energy, chemicals and water) and outputs (such as emissions, effluents and waste) are also measured in this section. A total of thirty-four specific indicators are included for the environmental category (GRI, 2013 *a*).

The social category takes into account the influence of a business on social systems within which it operates and includes impact on both employees and the society at the global, regional and local level (GRI, 2013 *a*). A total of forty-eight specific indicators are included for the social category (GRI, 2013 *a*). The GRI guidelines divide the social category into four sub-categories: labor practice and decent work, human rights, society, and product responsibility.

Labor practices and decent work- The indicators of this section measures the extent to which labor laws have been implemented or violated by the company based on internationally recognized universal standards. They also focus on the issues like non-discrimination, gender equality, freedom of association, occupational safety among others. This entire sub-category comprises sixteen indicators and includes aspects like: employment, labor/management

relations, occupational health and safety, training and education, diversity and equal opportunity, equal remuneration for women and men (GRI, 2013 a).

Human rights- This category aims to measure the steps taken towards the implementation of human rights such that each worker is treated fairly. There are twelve indicators in this sub-category measuring aspects like: non-discrimination, freedom of association and collective bargaining, child labor, forced or compulsory labor (GRI, 2013 a).

Society- This sub-category measures the impact that an organization has on local communities and contains aspects like: local communities, anti-corruption, public policy, compliance, supplier assessment for impacts on society and grievance mechanisms for impacts on society. The sub-category includes a total of eleven indicators (GRI, 2013 a).

Product responsibility- The indicators for this sub-category measure the direct impact of products and services on consumers and other stakeholders. The aspects included are: customer health and safety, product and service, labeling, marketing, communications, customer privacy and compliance. In all, nine indicators make up this sub-category (GRI, 2013 a).

While GRI provides most comprehensive set of sustainability guidelines (Delai & Takahashi, 2011; Labuschagne et al., 2005); there are few challenges in its application. GRI G4 provides guidelines for corporate sustainability reporting across different industries therefore the comprehensive and broad nature of the framework do not reflect the specific nature and issues of any particular industry sector. While the updated version of G4 guidelines emphasizes the importance of industry specific guideline, it provides sector

specific information only for the following industries: airport operations, construction and real estate, electric utilities, event organizers, financial services, food processing, media, mining and metal, NGO, oil and gas. GRI developed a pilot version of sector supplement for the apparel and footwear sector in 2008 based on the GRI G3 guidelines. The pilot supplement covers the following issues: 1) supply chain standards; 2) use of materials and energy; 3) wages and hours of employees; 4) labor and management relations; and 5) community investment strategy (GRI, n.d c). The supplement is focused on environmental and social dimensions of sustainability and do not take economic dimension into consideration. Additionally, the most recent G4 guidelines do not providing sector guidelines for the textile and apparel industry.

Secondly, GRI points out that the economic dimension of guidelines concerns the organization's impacts on the economic conditions of its stakeholders and on economic systems at local, national, and global levels but do not focus on the financial condition of the organization (GRI, 2013 a). This is a limitation for a comprehensive framework as it has been noted that the measures of financial performance for a company, like profits and shareholder returns also form an important part of the economic dimension (Elkington, 1998; Krajnc & Glavic, 2005).

Additionally, according to GRI (n.d) the guidelines can be used for preparing sustainability reports by different organizations, regardless of their size, sector or location. However, Velve and Ellekbecker (2000) and Azapagic (2004) noted that given the GRI's complex reporting framework, it may be challenging for small and medium-sized companies

as well as companies in developing countries to adopt it as they may not have the required resources and the experience. Hence, the guidelines are more suitable for multinational corporations (Azapagic, 2004).

2.6.2 International Integrated Reporting Council (IIRC)

An initiative of the Prince's Accounting for Sustainability Project (A4S) and the Global Reporting Initiative (GRI), the International Integrated Reporting Council (IIRC) was founded in August 2010 (Busco et. al, 2013; Cheng et al., 2014; Flower, 2014). IIRC is a global coalition comprising regulators, investors, companies, standard setters, accounting professional and NGOs (www.theiirc.org). The mission of this council is “to create a globally accepted integrated reporting framework which brings together financial, environmental, social and governance information in a clear, concise, consistent and comparable format” (Busco et. al, 2013). Such practice is intended to help companies to take sustainable decisions and also provide clear information to the investors and stakeholders regarding the performance of the company (Busco et. al, 2013).

The council mentions that it is the global authority on integrated reporting (IR) and defines it a “concise communication about how an organization’s strategy, governance, performance and prospects, in the context of its external environment, lead to the creation of value in the short, medium and long term” (www.theiirc.org). An integrated report combines the most material components of company published information (financial, management

commentary, governance and remuneration, and sustainability) in a comprehensive report (Abeysekera, 2013).

IIRC has proposed the International Integrated Reporting Framework in an effort to help organizations to report the information in a meaningful and transparent way (www.theiirc.org). It also aims to improve the quality of reports and information available to the stakeholders (Terri Eyden, 2013). The framework consists of fundamental concepts, guiding principles, and content elements (Busco et. al, 2013). The framework identifies with six capitals and requires companies to provide information related to them in the reports (Busco et. al, 2013). These six capitals are (Cheng et al., 2014):

- Financial (i.e., the pool of funds)
- Manufactured (i.e., manufactured physical objects, not necessarily owned by the organization)
- Intellectual (i.e., organizational, knowledge-based intangibles)
- Human (i.e., peoples competencies, capabilities and experience, and their motivations to innovate)
- Social and relationship (i.e., relationships within and between communities, groups of stakeholders and other networks, and the ability to share information to enhance individual and collective well-being), and
- Natural (i.e., renewable and non-renewable environmental resources and processes that provide goods or services that support past, current or future prosperity of the company)

The IIRC is one of the most recent initiatives that aim to promote integrated reporting which can help stakeholders cross compare companies of different industries. However, the framework proposed by the IIRC provides generic guidelines and do not reflect specific nature of any industry including the textile and apparel industry. The framework however does not provide benchmarks for the quality of an organization's strategy or the level of its performance (Busco et. al, 2013).

2.6.3 Carbon Disclosure Project

The Carbon Disclosure Project (CDP) is an independent not-for-profit UK-based organization that was established in December 4, 2002, with the mission to address global climate change (Peters and Romi, 2009). The CDP works to collect climate related data from different companies across the globe and makes the data available publicly (Andrew and Cortese, 2012; CDP 2015). The purpose of CDP is to assist in climate related investor decisions and management decisions within the reporting companies. The CDP closely works with the Climate Disclosure Standards Board (CDSB) which is a consortium of business and environmental organizations that help develop a global framework for climate related reporting (Andrew and Cortese, 2012). In order to collect the information the CDP requires participating companies to measure and disclose their emissions and climate strategies by completing an annual questionnaire covering topics like greenhouse gas emissions, emission reduction targets, climate change risk and management strategies, and opportunities for improvements (Knox-Hayes and Levy, 2011). In order to ensure the quality of the responses

and standardize reporting to enable comparison across firms, CDP requires companies to disclose the methodologies that have been used to produce data within their responses (Andrew and Cortese, 2012; Knox-Hayes and Levy, 2011). Presently, along with Climate Change program, the CDP also provides Water program, Supply Chain program and the Forests program (CDP, 2015).

As a core strategy, the CDP recruits institutional investors who in turn pressure companies in which they invest for carbon disclosure. By 2009, CDP had 475 investors with a total asset of US\$55 trillion under management (Knox-Hayes and Levy, 2011). With respect to disclosures, CDP started with 500 companies in 2003 and currently has over 3000 companies from 66 countries (Andrew and Cortese, 2012). This implies that CDP contains the largest repository of greenhouse gas data which makes it internationally significant and influential (Andrew and Cortese, 2012). CDP annually list all the companies that were requested to disclose information regarding corporate carbon emissions and climate change through their questionnaire (Peters and Romi, 2009). The responses from the companies are then made available for public via one of the following eight ways (Peters and Romi, 2009): (1) Answered questionnaire, permission to disclose granted, (2) Answered questionnaire, permission to disclose denied, (3) Online response to questionnaire, permission to disclose granted, (4) Online response to questionnaire, permission to disclose denied, (5) Provided information, permission to disclose granted, (6) Provided information, permission to disclose denied, (7) Declined to participate, or (8) No response.

The data collected by CDP offers comparable and cross-country information that can be used to adequately examine climate change disclosure incentives. However the organization collects data that is specific to the environmental aspect of sustainability which limits its scope for the purpose of this study.

In summary, the GRI and IIRC provide comprehensive guidelines for sustainability reporting. These guidelines however can be used by companies of different industries and are not specific for any particular industry. The CDP provide information that is specifically related to climate change and not comprehensive in scope with regards to sustainable development.

2.7 Academic Studies on Sustainable Development in Textile and Apparel Industry

The articles published in the journals for this industry focus only on specific parts of the supply chain with respect to sustainable development (Blackburn, 2009; Chen & Burns, 2006; Doorey, 2011; Hasanbeigi, 2010; Moore & Ausley, <http://www.sciencedirect.com/science/article/pii/S0959652603000581> - AFF22004; Müller-Christ & Gandenberger, 2006; Swami, Saini & Gupta, 2012; Wang, 2010; Zhou, 2009.). The studies collectively provide understanding of various approaches to sustainable development, but do not provide a consolidated picture of all the issues in each dimension of sustainability (Fletcher, 2009).

Very few studies focus on the economic dimension of sustainability for this industry (Hasanbeigi, 2010; Keane & Velde, 2008). Hasanbeigi (2010) focussed on energy as the

main cost factor in the textile industry and provided information on energy-efficiency technologies and measures that are applicable to the textile industry. Keane and Velde (2008) examined the role of textile and clothing industries in growth and development strategies for developing countries and suggested that textiles and clothing industries are important in economic and social terms. They explained that in the short-run this industry provides incomes, jobs, and foreign exchange earnings; while in the long-run it provides developing nations with appropriate policies and institutions for sustained economic development (Keane & Velde, 2008).

The majority of the literature is dedicated to the environmental dimension of sustainability (Bevilacqua, Ciarapica, Giacchetta & Marchetti, 2011; Blackburn, 2009; Chen & Burns, 2006; Curwen, Park & Sarkar, 2013; Fletcher, 2013; Müller-Christ & Gandenberger, 2006; Niinimäki & Hassi, 2011; Swami et al. 2012; Vandevivere, Bianchi & Verstraete, 1998; Wang, 2010; Werf & Turunen, 2008; Zhou, 2009). Müller-Christ and Gandenberger (2006) focused on industry resource consumption practices and pointed out that the textile companies are not sufficiently investing in long-term resource supply. Werf and Turunen (2008) quantified major environmental impacts associated with the production of hemp yarn using life cycle analysis methodology. Similarly, Chen and Burns (2006) focused on the environmental impacts of the textile and apparel industry by evaluating processes used to produce cotton, wool, nylon, polyester, rayon, lyocell (Tencel), and leather, using pre-selected criteria. Swami et al. (2012) discussed the environmental pollution caused during wet processing and suggests using enzymatic scouring & bleaching procedures for

sustainable development. Bevilacqua et al. (2011) and Vandevivere et al. (1998) focused on different ways of treatment of wastewater to lower the impact of various wet processes on the environment.

Wang (2010) pointed out that increasing world population has resulted in global fiber consumption which in turn has led to a higher amount of post-industrial and post-consumer fiber waste. The author provided an overview of fiber and textile recycling of carpets and offered a summary on selected recycling technologies and products from the recycling processes. Curwen et al. (2013) discussed the current challenges faced by the industry in order to develop sustainable apparel and emphasize the importance of interaction between designers and the upstream supply chain. The book 'Sustainable Textiles- lifecycle and environmental impacts' by Blackburn (2009) examines integration of environmental sustainability in textile design, production and processes like ensuring sustainable production of both natural and synthetic fibers, improving processes such as dyeing. The book also reviews recycling of textiles, importance of eco-labelling, use of organic textiles and recycled materials in textile products as efforts towards sustainable development.

Zhou (2009) discussed the initiatives that Chinese textile and apparel enterprises have implemented to green the supply chain. Niinimäki and Hassi (2011) presented a set of design and manufacturing strategies for the textile and apparel industry for reducing the environmental impact during production and consumption of products. In the book 'Sustainable Fashion and Textiles: Design Journeys', Fletcher (2013) discusses the environment and social sustainability impacts of textile and apparel products through

different stages of lifecycle: material cultivation/extraction, production, use and disposal. The book also discusses design concepts for altering the scale and nature of consumption.

Some of the published research also focused on the social dimension of sustainable development (Baskaran, Nachiappan & Rahman, 2012; Dickson, Eckman & Loker, 2009; Doorey, 2011; Fletcher, 2013; Moore & Ausley, <http://www.sciencedirect.com/science/article/pii/S0959652603000581> - AFF22004). Doorey (2011) discussed the importance of factory disclosure and transparency of supply chain in reducing the probability of being associated with “sweatshop” labor practices. This research discussed case studies of Nike and Levis and evaluated the contribution of factory disclosure. Moore and Ausley <http://www.sciencedirect.com/science/article/pii/S0959652603000581> - AFF2 (2004) focused on testing aquatic toxicity of wastewater discharges from wet processes of the industry. The research discussed development and use of new toxicity assessment tools such that industrial growth and prosperity can be maximized without a negative impact on local water quality for the society.

Dickson et al., (2009) in their book ‘Social Sustainability in Global Apparel Industry’ pointed out the importance of corporate strategies to implement social responsibility thorough the supply chain and discusses complex problems including child labor, harassment and abuse, discrimination, excessive hours of work, low wages, poor factory health and safety, and negative impacts on the environment. Similarly, Baskaran et al., (2012) examined suppliers within the Indian textile and clothing industry for social sustainability criteria: discrimination, abuse of human right, child labor, long working hours, unfair competition,

and pollution. They found that the criterion of long working hours, unfair competition and child labor were the most critical issues in the industry.

In summary, the published journal articles discussed different dimensions of sustainable development for textile and apparel industry but do not provide a consolidated picture of all the issues and possible measures that can be taken by the industry. In order to address the challenging task of sustainable development, it is important for the textile and apparel industry to view it in a holistic manner (Fletcher, 2009).

2.8 Businesses Advantages of Sustainable Development

The changing governmental policies, constant scrutiny by non-government organizations (NGO), customers and other stakeholders puts pressure on businesses to follow sustainability practices in all aspects of businesses (Doh & Guay, 2004; Maxwell & Vorst, 2003; Waddock, Bodwell & Graves, 2002). This demand is further aggravated due to media and news coverage (DeSimone & Popoff, 1997). Broadcasting information about the companies (both positive and negative) increases visibility of business functions and exacerbates the pressures on companies to integrate sustainable initiatives in their day-to-day businesses (DeSimone & Popoff, 1997).

Beyond the pressure from stakeholders, companies have begun to recognize that implementing sustainability related initiatives creates many potential opportunities with respect to market share, profits and value (DeSimone & Popoff, 1997; Lazlo &

Zhexembayeva, 2011). A number of benefits to the business while addressing sustainable development concerns have been discussed below:

- *Cost cutting.* Implementing sustainable manufacturing processes has the potential to substantially cut cost for companies. Design for Environment (Dfe) tools and innovative processes can improve material, energy and product efficiencies; (Azapagic, 2003; Capozucca & Sarni, 2012; Dangelico & Pujari, 2010; European Commission, 2012).
- *Improved image and reputation of the company.* The stakeholders constantly analyze the steps taken by the company towards sustainability and hence, any initiative taken towards sustainable development can greatly affect the company's brand image and reputation (DeSimone & Popoff, 1997; Hart & Milstein, 2000). This can have a direct impact on sales and profit for a company.
- *Employee retention.* Improved image and reputation can have a positive effect on recruitment, retention, and increased employee morale (DeSimone & Popoff, 1997). Increased employee morale can translate into higher productivity (McCowan, Bowen, Huselid & Becker, 1999; Lazlo & Zhexembayeva, 2011; Strandberg Consulting, 2005). Additionally, employee retention also means cost cutting for the company because frequent recruiting is seen as wastefulness of resources (Griffeth & Hom, 2001; WBCSD, 2005).
- *Relationship with stakeholders.* Commitment towards sustainable development also results in better relationship with stakeholders. Sharing information with stakeholders

demonstrates respecting the needs, desires, and rights of customers by the company; also highlights company's commitment towards providing quality products (Chambers & Lewis, 2001; Deloitte, 2012; Epstein, 2003; Lazlo & Zhexembayeva, 2011). Better relationships can mean less resistance by stakeholders when new initiatives are proposed.

- *Favorable evaluation by financial investors.* Companies working towards environmental and social issues of sustainability are evaluated favorably by financial investors (Azapagic, 2003). The evaluators analyse the health of the company on the basis of various indicators. Nowadays, they also put emphasis on analyzing the corporate, social and environmental risks attached with the companies. Higher evaluation can also mean easy access to lenders, insurers, preferential loans and insurance rates (Lazlo & Zhexembayeva, 2011).
- *Influence on regulation.* Companies which adopt more sustainable business processes are considered to be leaders in the marketplace (Hart, 2005; Lazlo & Zhexembayeva, 2011; PwC, 2011). Such companies can influence how standards are set by the regulations and governments (Lazlo & Zhexembayeva, 2011).
- *Market advantage.* A sustainable company builds deeper relationship with the customers and consumers. Sustainable activities help increase credibility of a company with its stakeholders (including consumers) and it can capitalize on that for market advantage (Drumwright, 1996; Ellen Mohr & Webb, 2000; Hess, Rogovsky & Dunfee, 2002; Kaptein & Wempe, 2001; Porter & Kramer, 2002).

- *Mitigate risk.* Commitment towards sustainable development prepares companies to better manage potential risk (United Nations, 2007). The companies working towards sustainable development constantly measure their performance using various indicators that can be vital in providing early warning to prevent economic, social and environmental setbacks and risks in future (McCool & Stankey, 2004; United Nations, 2007).

2.9 Synopsis of the Literature Review

The review of literature highlights the importance of the textile and apparel industry for the society and also describes how its complex global supply chain contributes to different sustainable development issues: economic, environmental and social. Due to stakeholder pressure and identified business advantages of sustainable development, companies are making efforts to monitor, measure and report their efforts. Various sustainability measurement and reporting frameworks were reviewed and their challenges were identified. The importance of sustainability related activities that could be implemented at the corporate level were also highlighted. Published journal articles do not provide a comprehensive view of sustainability for the textile and apparel industry. The growing importance of sustainable development and the lack of comprehensive reporting guidelines for textile and apparel industry make it critical to develop a sustainability reference framework for this industry.

CHAPTER 3

METHODOLOGY

The goal of this chapter is to describe the methodology used to address the two objectives for this study. The study employed a mixed-methods approach for the research objectives which is summarized in Table 3.1.

Table 3.1 Summary of research design

Research Objectives	Research Methods
Research Objective I: To develop a sustainability reference framework for the textile and apparel industry (SRF-T/A).	Comparative analysis
Research Objective II: To gain an insight of sustainable development in the textile and apparel industry by applying the developed framework to a sample of textile and apparel companies.	Content analysis against the developed framework

This chapter first describes the development of the proposed sustainability reference framework for the textile and apparel industry (SRF-T/A) by conducting a comparative analysis of selected frameworks. Then, the chapter describes results of the content analysis performed to gain an insight of sustainable development practices of a sample of textile and

apparel companies. The details for these methods are discussed in the following sections organized per research objectives.

3.1 Comparative Analysis for Research Objective I

A comparative method was used to develop a sustainability reference framework for textile and apparel industry (SRF-T/A). Currently there are several sustainability reporting and measurement frameworks in existence but they provide guidelines across industries. This study selected several of the most relevant frameworks as the basis for the development of SRF-T/A. Four steps were involved in this method: 1) defining the structure of the framework; 2) selecting the relevant frameworks for the comparative analysis; 3) comparative analysis of the selected frameworks; and 4) review of the proposed framework by industry experts.

Defining the structure of the framework. The structure of a framework includes various abstraction levels or hierarchy which helps in organizing contents and understanding the association between and among the components (Delai & Takahashi, 2011). Delai and Takahashi (2011) observed that sustainability frameworks usually consist of several abstraction levels. The authors in their study “Sustainability measurement system: a reference model proposal” proposed a sustainability reference framework with four abstraction levels: the dimensions (basic dimensions of sustainability), themes (major issues of each dimension), aspects (important topics of each theme) and indicators (measures of each

indicator category). Other frameworks like Global reporting Initiative (GRI) also classify the sustainability guidelines into a multi-level structure (Fig 2.3).

Given the importance of having abstraction levels for a sustainability framework, this study also proposed the SRF-T/A with four abstraction levels adapted from Delai and Takahashi (2011): 1) Dimensions, 2) Aspects, 3) Indicator Category and 4) Indicators (Figure 3.1).

1. Dimension: This abstraction level reflects the three dimensions of sustainability: economic, environmental and social.
2. Aspect: This abstraction level signifies important themes related to each dimension. For example, environmental dimension has aspects like energy, water, emissions.
3. Indicator Category: This abstraction level indicates scope of measurement for each aspect (e.g. for energy, the indicator categories are consumption, reduction and efficiency).
4. Indicators: This abstraction level provides specific measures of each indicator category. For example, the indicator category energy efficiency is measured by indicators like energy conservation initiatives taken by the company.

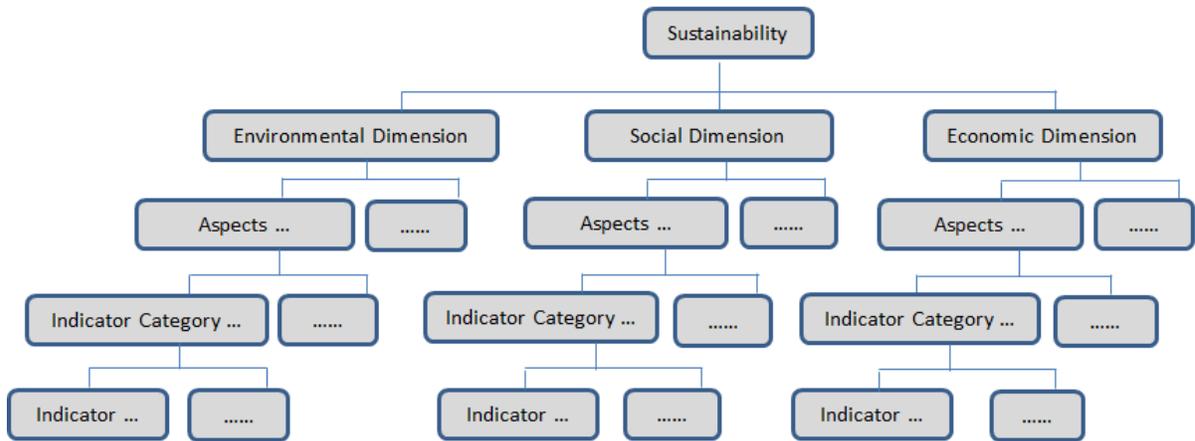


Figure 3.1 Structure of the proposed SRF- T/A (Adapted from: Delai & Takahashi, 2011)

Selection of relevant frameworks for the comparative analysis. There are quite a few sustainability reporting and measurement frameworks existing in the literature. Instead of comparing all the existing frameworks to develop the SRF-T/A, this study selected two of the most relevant frameworks for comparative analysis. The selection followed the selection criteria employed by Veleve and Ellenbecker (2000) in their study ‘A Proposal for Measuring Business Sustainability’. Based on a group of six selection criteria, their study selected four popular frameworks for assessment of business sustainability to evaluate their usefulness in promoting sustainable production. Using a similar approach, the current study also used the following criteria to select frameworks from the existing ones and use them for the comparative analysis:

1. The framework is based on a set of indicators rather than a single indicator.
2. Most of the work (framework development) has been completed and the indicators are constructed and supplemented by a clear guidance.
3. The indicator framework is published and readily available.
4. Developed indicators attempt to cover all three dimensions of sustainability: environmental, social and economic.
5. The proposed indicators are applicable across industrial sectors and firms.
6. The indicator framework is well known and has the potential to become widely used by companies.

Based on the above criteria, two frameworks were selected for the comparative analysis: the Global Reporting Initiative (GRI) G4 guidelines (2012) and the Higg Index (SAC, n.d a). GRI is an international not-for-profit organization that aims to provide a common framework for companies to report their progress towards sustainability (GRI, 2002). It is a widely adopted sustainability framework and provides the most comprehensive set of sustainability guidelines from the business perspective that can be used by all industry sectors (Delai & Takahashi, 2011; Labuschagne et al., 2005). The Higg Index is a self-assessment tool developed by the Sustainable Apparel Coalition (SAC). Specific to the apparel and footwear industry, this index helps in the assessment of the environmental and social performance of apparel and footwear products across the supply chain at the brand, product, and facility levels (SAC, n.d c). The Index is frequently adopted by the SAC member companies.

According to the selection criteria, both selected frameworks use a set of indicators rather than a single indicator. The frameworks provide clear guidance on the selection of the indicators. They are both published and publicly available. The goal of both frameworks is to promote standardization, such that GRI indicators are applicable across sectors and industries while Higg Index can be used by different businesses in the textile and apparel industry. GRI is most widely adopted and is the only framework that attempts to address all three dimensions of sustainability: economic, environmental and social (Veleva & Ellenbecker, 2000), while the Higg Index 2.0 is based on several other tools (SAC, n.d a) and provides comprehensive assessment of environmental and social issues specific to the textile and apparel industry. Therefore, GRI G4 and Higg Index 2.0 were selected for comparative analysis in this study.

Comparative analysis of the selected frameworks. Following the method used by Delai and Takahashi (2011) in the development of the sustainability reference framework, the proposed SRF-T/A was also developed through a comparative analysis using the complementarity of the two selected frameworks (GRI G4 and Higg Index 2.0) along with a review of academic literature on sustainability. The complementarity approach was selected as it helps to combine contents of selected frameworks and merge them into a more comprehensive framework. The analysis was done with the help of comparative tables and a critical review of contents of the selected models. The critical review was supported by the literature review that helped in identifying if the indicators in the selected frameworks address the issues specific to the textile and apparel industry. The proposed SRF-T/A takes into account the

industry relevant indicators from the selected frameworks and supplements them with additional indicators from the literature, merging them into one comprehensive framework specific for the textile and apparel industry.

For the proposed framework each dimension was developed separately. For environmental and social dimensions, a list of various aspects and corresponding indicators were developed from the GRI G4 guidelines. Then, additional indicators from the Higg Index were added to different aspects such that the indicators reflect the specific nature of the textile and apparel industry. Indicators from the GRI and the Higg Index that aimed to measure same sustainability initiatives were combined to avoid redundancy and rephrased to maintain consistency in the framework. Next, this list was further supplemented with additional indicators based on the findings from the literature review. The sources of indicators will be identified in the development of the framework. Therefore, included indicators can be from GRI, Higg Index or the literature.

It was found that the Higg Index provided certain additional aspects (like the Restricted Substance List). Such aspects were also added to the proposed framework in order to make the framework specific for the textile and apparel industry. In addition, an aspect category was also created with indicators from the GRI and the Higg Index that assess the information regarding activities at the corporate level like governance, process innovation among others. This indicator list was also supplemented with the indicators from the literature review.

For the Economic dimension, the aspects and indicators have been taken from the GRI G4 guidelines and the information from the reviewed literature. The Higg Index provides

measurement of only environmental and social dimensions and hence could not be used for the development of the economic dimension within the proposed framework. It must be noted that for all the dimensions, some of the GRI and the Higg Index aspects and indicators were reorganized within the framework since the two tools under consideration have different layouts.

Review of the proposed framework by industry representatives. Industry input was sought regarding the proposed framework to gain insight with respect to the strength and weakness of the developed framework and its applicability to the textile and apparel industry. Three industry professionals who are experts and experienced individuals in the field of sustainability and also the textile and apparel industry were contacted to review the proposed SRF-T/A. The participants were selected based on contacts made by the primary researcher with the help of the advisory committee. These reviewers were contacted requesting their participation in reviewing the proposed framework through an email. The email sent to the experts included background information about the research, the proposed framework and a list of review questions (Appendix A). Once the review was complete, the reviewers were contacted through a phone call to gather the feedback on the proposed SRF-T/A. Based on the feedback by the industry experts, required changes were made to the proposed SRF-T/A.

3.2 Content Analysis for Research Objective II

Using the developed SRF-T/A, this study aimed to gain an insight regarding the efforts of the textile and apparel industry towards sustainable development. Since the textile and

apparel industry comprises a large number of companies and also not every company reports its sustainability efforts, this study selected a convenience sample of companies that are of US origin and are directly associated with apparel products. After selecting the sample, a content analysis was conducted on the sustainability related information of the sample companies against the developed sustainability SRF-T/A. Hence two steps were involved in this method: 1) sample selection; and 2) content analysis against the developed SRF-T/A.

Sample Selection. To gain an insight vis-à-vis the efforts of the textile and apparel industry towards sustainable development, leading textile and apparel companies of the US were sought as they are indicative of the latest developments in the market. For the purpose of Research Objective II, a purposive sampling approach was used. First, a list of companies was taken from the Euromonitor International (2014) that provided the percentage share value of apparel and footwear companies in the US market. A total of forty five (45) companies were listed on the Euromonitor's "NBO Company Shares of Apparel and Footwear: % Value 2009-2013 list" (Appendix B) comprising companies like apparel brands and retailers. Secondly, the selection of companies from the list was conducted based on the following criteria:

1. Individual brands which are part of multiple brand companies were eliminated and only the parent companies were selected.
2. Only companies of the US origin or having headquarters in the US were selected.
3. Retailers were eliminated and only brands were taken into consideration.

After applying the criteria, the resultant sample list consisted of a total of 29 US based brands. Of these, few companies which are not exclusively apparel based like Nike, Under Armour were excluded as they are involved in trade of other non-textile products such as equipment as well. Therefore, this resulted in a final sample of twenty one (21) companies used for the analysis (Table 3.2).

Table 3.2 Source of sustainability related information of sample companies

No.	Company	Sustainability Related Reports	Sustainability Related Information on website
1	Gap Inc.	Yes	
2	Hanesbrands Inc.		Yes
3	VF Corp	Yes	
4	Phillips-Van Heusen Corp	Yes	
5	Ralph Lauren Corp	Yes	
6	Levi Strauss & Co		Yes
7	Jones Apparel Group Inc.		Yes
8	Limited Brands Inc.		Yes
9	Carter's Inc.	No	No
10	Forever 21 Inc.		Yes
11	American Eagle Outfitters Inc.	Yes	
12	Fruit of the Loom Inc.		Yes
13	Abercrombie & Fitch Co	Yes	
14	Ann Inc.		Yes
15	J Crew Group Inc.		Yes
16	Express Inc.		Yes
17	Aéropostale Inc.		Yes
18	The Children's Place Retail Store Inc.		Yes
19	Garan Inc.	No	No
20	Perry Ellis International Inc.		Yes
21	Liz Claiborne Inc.	No	No

In March 2015, company websites and various search engines (Google & Yahoo) were used to locate the latest company published sustainability related information to be used for analysis. Companies varied in their frequency of sustainability reporting, therefore the reports and information collected for content analysis ranged in publication dates from 2010 to 2014. Using the search engines various keywords like *sustainability report*, *sustainability efforts*, *corporate social responsibility* were used in combination with the company name. Information regarding sustainability was retrieved from one or more of the following sources:

- Company published reports such as Sustainability Reports, Corporate Social Responsibility Report (CSR), Citizenship Report etc.
- Information on company websites

Content analysis against the developed framework. In order to achieve the objective, content analysis of the sustainability practices published by the selected sample of companies was carried out against the proposed SRF- T/A from Research Objective I. A content analysis is an established research method technique used to make valid inferences from text (Weber, 1990). It is also frequently used in sustainability related research (Asif, Searcy & Santos, 2013; Delai & Takahashi, 2013; Guenther, Hoppe & Poser, 2007; Gray et al., 1995).

Delai and Takahashi (2013) in their study ‘Corporate sustainability in emerging markets: insights from the practices reported by the Brazilian retailers’ presented a content analysis methodology to identify the reported practices employed by Brazilian retailers towards sustainability. In their study, the content analysis comprised three main steps: pre-

analysis (establishment of the analysis' aim), analysis, and interpretation (draw the main conclusions). This study followed a similar methodology. Accordingly three steps of content analysis were executed for the purpose of this objective. First, the aim of the analysis was defined as identifying sustainability related practices reported by the sample companies. Next, for analyses purpose, the sustainability information collected was benchmarked against the SRF-T/A proposed in Research Objective I. The benchmarking process was done in a excel worksheet wherein the company published sustainability information was tallied against the indicator categories of the three dimensions of the proposed SRF-T/A. The column against the indicator category was marked as "x" for each company if the indicator category was mentioned in the company provided information. The percentage of companies reporting on each aspect and indicator category was calculated. Finally, for interpretation, results of the analysis were used to draw inferences on trend of sustainability efforts made by the textile and apparel companies.

CHAPTER 4

RESULTS

This chapter reports the result of the comparative analysis and content analysis conducted for this study. First, the chapter describes the development of the proposed sustainability reference framework for the textile and apparel industry (SRF-T/A) via a comparative analysis of the selected frameworks- GRI and Higg Index. Next, the chapter reports the findings of the content analysis performed on sustainability information as reported by a sample of textile and apparel companies. The details for these analyses are discussed in the following sections organized per research objectives.

4.1 Objective I: To develop a sustainability reference framework for the textile and apparel industry (SRF-T/A).

This section describes the development of the proposed SRF-T/A. The SRF-T/A was developed through a comparative analysis of two selected frameworks- GRI and the Higg Index. The developed framework was then reviewed by the industry experts and was further revised based on their suggestions.

4.1.1 Development of the proposed sustainability reference framework for textile and apparel industry (SRF-T/A)

Adapting the method used by Delai and Takahashi (2011) in development of their sustainability reference framework, a comparative analysis focusing on complementarity of the two selected frameworks (GRI G4 and Higg Index 2.0). The comparative analysis was conducted along with an extensive review of academic literature to assure that measurement indicators provide a relevant and complete view of sustainability specific to the textile and apparel industry.

Based on the analysis, the proposed SRF-T/A was developed by using the measurement indicators from the GRI guidelines, which were supplemented with additional indicators from the Higg Index and findings from the literature review. The framework developed consists of the hierarchical levels and the structure previously established with four abstraction levels: 1) Dimension, 2) Aspect, 3) Indicator Category and 4) Indicator (Figure 3.1). The contents of the proposed SRF-T/A is explained below that follows the order as shown in Figure 3.1.

The dimension level of the proposed SRF-TA was developed using the GRI guidelines and information gathered from the literature review. The GRI G4 guidelines are based on three dimensions: environmental, social and economic while the Higg Index provides with only two dimensions of sustainability: environmental and social. Though there is consensus around only environmental and social dimensions, it has been previously established that sustainable development and sustainability concepts are usually discussed in terms of three

dimensions: environmental, social and economic. Therefore, following the GRI G4 guidelines and findings from the literature, the proposed SRF-T/A includes three dimensions of sustainability: environmental, social and economic.

The other abstraction levels (aspect, indicator category and indicator) of the proposed SRF-T/A were developed from the GRI G4 guidelines and corresponding indicators from the Higg Index and the review of literature. These abstraction levels of the proposed SRF-T/A were developed separately for each dimension. The description of each dimension and corresponding abstraction levels are described in the following sections.

Environmental Dimension: The environmental dimension focuses on the impact of a company's activity on ecosystem, land, water and air (GRI, 2002). It also aims to provide information regarding the ability (of a company) to sustain the consumption rates of renewable resources and to sustain or decrease pollution creation, waste generation and non-renewable resource depletion (GRI, 2002). Efforts made by a company in order to reduce such environmental impacts translates into efficient usage of raw materials, energy, water and in turn has positive effect for the company in terms of fines prevention, reduced risk of compensations and maintenance of reputation (Delai and Takahashi, 2011; Ribeiro, 2005).

The results of the comparative analysis of the contents of GRI and Higg Index are shown in Appendix C. Some general observations were made through the comparative analysis:

1. There is not an absolute consensus on environmental aspects that should be measured. Some issues important to the textile and apparel industry such as packaging and chemical management are addressed only by the Higg Index. However, the Higg Index does not focus on the aspect of biodiversity which is an important part of the environment dimension (GRI, 2013). Nevertheless, most of the major aspects e.g. water, energy, air emissions are present in both the frameworks.
2. The proposed SRF-T/A followed the general structure of GRI G4 guidelines; however certain changes were made to the organization of the environmental dimension. For example, instead of the original 12 aspects, the proposed SRF-T/A comprises 14 aspects. This is because aspect “effluents and waste” in the GRI guidelines was divided into separate aspects “water effluents” and “waste” in the proposed SRF-T/A. This was done to clearly differentiate the difference between the measures of water effluent and waste management since both the aspects are of significance for the textile and apparel industry.
3. Some of the aspect and indicators of the GRI environmental dimension were regrouped into different aspect under different dimension. For example, the “overall” aspect of GRI environmental dimension that measured the total expenditure and investment made for environmental protection was placed under the aspect ‘economic performance’ of the economic dimension in SRF-T/A.
4. Several indicators in Higg Index are not provided in the GRI. Some examples are internal performance system, use of hazardous materials and hazardous waste

generation, life cycle assessment of products, industry collaborations, audits and training of suppliers. Such indicators help provide a complete picture of environmental sustainability impacts of a company's operations. Therefore they were also included into the proposed framework.

5. The literature review point towards the importance of some additional measure of environmental sustainability. Some examples of these are: material used from renewable or non-renewable resources, recycle and disposal of packaging, carbon trading, implementation of design for environment (Dfe) and initiatives on process innovation. Such measures are not covered in either of the two selected frameworks (GRI and the Higg Index) but were included into the developed framework.

Based on the analysis of the comparison of the two selected frameworks and the above findings, the environmental dimension of the proposed SRF-T/A was developed to include a comprehensive list of aspects, indicator categories and indicators. The environmental dimension of the proposed SRF-T/A consists of 14 aspects signifying the important themes related to environment dimension. These aspects are evaluated by 52 indicator categories reflecting the scope of measurement within each aspect. The indicator categories further comprise of a total of 80 indicators which provide specific measures of each indicator category. The various aspects of the environmental dimension are discussed briefly in the following sections.

1. *Materials.* Textile and apparel industry is product intensive and dependent on using materials procured from natural (renewable and nonrenewable) resources. Material

related sustainability information disclosed by the company can indicate the efforts and progress made by its management in reducing the company's dependence on natural resources.

This aspect is evaluated by three indicator categories as described below:

Consumption, Reduction and Efficiency.

- a. Consumption. This category aims to identify the total volume and type of material used by the company on yearly basis. This category is evaluated by five indicators.
 - b. Reduction. This category aims to identify if there has been a reduction in total material consumption by the company. This category is measured by one indicator.
 - c. Efficiency. This category aims to identify the efforts made by the company to reduce the material use by implementing efficiency practices like increased use of recycled input materials and renewable resources. This category is measured by one indicator.
2. *Energy*. Companies (manufacturing, brand, retail) require energy for various operations they perform. Total energy consumption by a company is directly related to the depletion of energy providing resources. Energy related sustainability information disclosed by the company can indicate the efforts and progress made by its management in reducing the company's dependence on energy.

This aspect is evaluated by three indicator categories as described below:

Consumption, Reduction and Efficient use of energy by a company.

- a. Consumption. This category aims to identify the total amount and type of energy consumed by the company operations on yearly basis. This category is evaluated by three indicators.
 - b. Reduction. This category aims to identify if there has been a reduction in total energy requirements by the company. This category is measured by two indicators.
 - c. Efficiency. This category aims to identify the efforts made by the company to reduce the energy use by implementing efficiency practices like heat exchange or heat recovery, thermal energy storage, computerized facility climate control. This category is measured by two indicators.
3. *Water*. The textile and apparel industry is a consumer of large quantity of freshwater which is necessary for many of its operations. This aspect focuses on the environmental impact caused by organizations on the amount and quality of freshwater resources. Water related sustainability information disclosed by the company can indicate the efforts and progress made by its management in reducing the company's dependence on freshwater resources.

This aspect is evaluated by three indicator categories as described below:

Consumption, Reduction and Efficient use of water by a company.

This aspect is evaluated by five indicator categories as described below:

Consumption, Reduction, Recycled/ disposal, Efficiency/ design improvement and Packaging restricted substances list (PRSL).

- a. Consumption. This category aims to identify the total volume of packages and packaging material used for product and transport packaging by the company on yearly basis. This category is measured by one indicator.
- b. Reduction. This category aims to identify if the company has made efforts to reduce consumption of product and transport packaging material as well as secondary materials such as adhesives, labels, foils, colorants, inks, seals, liners, laminates, waxes and coatings. This category is evaluated by two indicators.
- c. Recycle/ disposal. This category aims to identify the efforts made by the company to reduce packaging consumption by implementing various practices such as reusing packages and packaging material, using recycled content materials for making packages. This category is measured by three indicators.
- d. Efficiency/ design improvement. This category aims to identify the efforts made by the company towards design improvement and construction of the packaging material based on weight, size and volume, including using less materials and/or lighter materials, while still maintaining packaging functionality. This category is measured by one indicator.

- e. Packaging restricted substances list (PRSL). This category aims to identify efforts of the company towards adherence to the policy against use of packaging restricted substance (PRSL). This category is measured by one indicator.
5. *Biodiversity*. Biodiversity represents the long run impact of businesses on natural resources (natural capital) including the ecosystem and living species. Biodiversity is associated with sustainability of the ecosystem and living species as it provides essential products and services for human welfare (Delai and Takahashi, 2011). This aspect is evaluated by three indicator categories as described below: Ecosystem, Protected areas and Species.
- a. Ecosystem. This category aims to identify the significant impacts of company's activities, products, and services on the ecosystem. This category is measured by one indicator.
 - b. Protected areas. This category aims to identify efforts made by the company to restore and protect habitats and areas of high biodiversity value adjacent to company operational sites. This category is measured by two indicators.
 - c. Species. This category aims to identify if the company makes efforts to conserve species which are on national conservation list residing in areas affected by company operations. This category is measured by one indicator.
6. *Air Emission*. Air pollutants like greenhouse gases (GHG) are known to adversely impact the climate, ecosystems, air quality, habitats, agriculture, and human and animal health (GRI, 2013). This aspect deals with disclosing a company's activities

that can cause atmospheric pollution and also measures the efforts made by the company to monitor and reduce them.

The aspect is evaluated through four indicator categories as described below:

Greenhouse Gases (GHG), Global Warming, Reduction in air emissions and company policy on Carbon Trading/ Mitigation.

- a. Greenhouse Gases (GHG). This category aims to measure the total GHG emissions and emission intensity created by the organization itself, or by other value chain partners, like suppliers. GHG emissions intensity expresses the GHG emissions per unit of activity and are often called normalized environmental impact data (GRI, 2013). This category is measured by two indicators.
 - b. Global Warming. This category aims to calculate the total amount of gasses (e.g. Co₂, CH₄, particle emission from printing) and Ozone depleting substances (ODS) being produced during various company activities. This category is evaluated by one indicator.
 - c. Reduction. This category aims to identify efforts made by the company towards reducing significant air emissions. This category is measured by two indicators.
 - d. Carbon Trading/ Mitigation. This category aim to find the company policy on keeping a record of carbon trading done in past year. This category is measured by one indicator.
7. *Water Effluents*. Various activities of the textile and apparel industry like fabric washing, drying, dyeing, printing, finishing and others are known to contribute

towards pollution of water. The amount and quality of the wastewater discharged by a company is known to directly impact the ecological balance (GRI, 2013).

Additionally, spilling of water, chemicals, oils, and fuels can have significant negative impacts on the surrounding environment, potentially affecting soil, water, air, biodiversity, and human health.

This aspect is evaluated by four indicator categories as described below: Quality/ Quantity of wastewater discharge, Treatment of wastewater, Reuse/ Recovery and Disposal.

- a. Quality/ Quantity of wastewater. This category aims to measure the total quantity and quality of wastewater being discharged by the company during product manufacturing and other operations in one year. It also considers the number and volume of significant spills (including water, fuel, oil, waste). This category is measured by two indicators.
- b. Treatment of wastewater. This category aim to assess the company's systematic efforts to treat the wastewater containing high amounts of chemicals (nitrogen, phosphorous, or potassium) to reduce the impact on the receiving waters which in turn can affect the quality of the water supply available to the company and the nearby community. This category is measured by one indicator.
- c. Reuse/ Recovery. This category aims to identify efforts made by the company to reuse the treated water within the company for different operations. This category is measured by one indicator.

- d. Disposal. This category aims to identify company practices towards disposal of wastewater and its impact on local water bodies. This category is measured by two indicators.
8. *Waste*. As established earlier, one of the major issues of the textile and apparel industry is waste generation and its disposal. This aspect aims to measure the level of progress made by the company towards waste management.
This aspect is evaluated by four indicator categories as described below: Quantity of (hazardous and non-hazardous) waste generated; Reduction in waste generation, Efficiency Efforts (re-used/re-purposed, upcycled & down cycled and disposal) and Waste (including seconds/ rejects) Shipped internationally.
 - a. Quantity. This category aims to identify the quantity of waste generated during company operations like cardboard, paper, plastics, fiber, yarn, fabric, solvents, dyes, oil/lubricants, metals, glass, wood and others on yearly basis. It also includes the quality of waste generated like hazardous and non-hazardous waste. This category is measured by two indicators.
 - b. Reduction. This category assesses the efforts of a company towards reducing the quantity of waste generated (both hazardous and non-hazardous) on yearly basis. This category is measured by one indicator.
 - c. Efficiency. This category includes assessing the efforts of a company towards implementing waste minimization strategies like reuse, recycling, and recovery. This category is measured by one indicator.

- d. Shipped. This category aims to find the company policy towards transportation of waste (including seconds/ rejects, hazardous waste) to other countries which can impact both human health and the environment. This category is measured by one indicator.
9. *Transportation*. The textile and apparel industry is globalized and therefore heavily dependent on transportation of goods across different parts of the world. Transportation systems have a definite impact on the environment and contribute towards global warming, local smog and noise (GRI, 2013). This aspect is evaluated through three indicator categories as described below: Consumption and total impact, Reduction and Efficiency.
- a. Consumption and total impact. This category aims to assess the impact on the environment due to transportation systems of the company in terms of fossil fuel consumption and total distance of products transported. This category is measured by two indicators.
 - b. Reduction. This category aims to assess the efforts made by the company to reduce emissions and environmental impacts by improving/ optimizing transportation of products by organization and its value chain partners. This category is measured by one indicator.
 - c. Efficiency. This category aims to identify the logistics planning and efficiency efforts of the company to reduce environmental impacts by optimizing transportation facilities. This category is measured by two indicators.

10. *Chemical Management.* Various processes of the textile and apparel industry like fabric treatment, dyeing, printing, washing involve use of different chemicals. These groups of chemical substances contain heavy metals, volatile organic compounds like formaldehyde which are hazardous in nature and can cause lasting damage to human health (workers and consumers). Also many of such chemical present in wastewater effluents are unable to decompose in nature and thereby pollute soil and water. In order to safeguard the environment and human health, local and international organizations have developed regulations and laws to restrict or ban use of such chemicals in finished home textile, apparel, and footwear products around the world. This aspect is evaluated by three indicator categories as described below: Restricted Substance List (RSL), Reduction in chemicals use and Recovery.

- a. *Restricted Substance List (RSL).* This category aims to measure the efforts made by the company to comply with chemical use regulations and RSL. This category is measured by two indicators.
- b. *Reduction.* This category aims to assess the company's efforts to minimize use of harmful chemicals and dyes used during various company operations. This category is measured by one indicator.
- c. *Recovery.* This category aims to identify the ability of the company to recover and reuse chemicals (for example, with caustic soda) and measure their progress towards zero discharge. This category is measured by one indicator.

11. *Recyclable Products*. This aspect deals with estimating the amount of products sold by the company that are completely recyclable and which contain information on material types for end of life (EOU) recycling.

This aspect is evaluated by two indicator categories as described below: Product Recyclability and Design for environment (Dfe).

- a. Product recyclability. This category aims to identify the percentage of completely recyclable products sold by the company. It also aims to assess if the company provides material related information on the product to help in separating materials for EOU recycling. This category is measured by two indicators.
- b. Design for environment (Dfe). This category aims to find efforts made by the company towards integrating environmental considerations into product design and implementing programs like Dfe. This category is measured by two indicators.

12. *Compliance*. The growing concern for the impact of industries on the environment has led to emergence of various environmental regulations regarding quality of air emissions, quantity and quality of water effluents and other. Level of compliance or non-compliance of companies with the performance parameters provides insight regarding the efforts made by it to conform to the environmental laws.

This aspect is evaluated by three indicator categories as described below: Audits, Standards and legal permits and Fines.

- a. Audits. This indicator category assesses the frequency of the environmental audits done to identify company's potential environmental impacts e.g. quality of air emissions and water effluents such that required action could be taken. This category is measured by one indicator.
- b. Standards and legal permits. This category aims to identify if there are any cases of expired or non-compliant legal requirements/permits for environmental regulations. This category is measured by one indicator.
- c. Fines. This category measures the significant amount of fines and total number of non-monetary sanctions made by the company for non-compliance with environmental laws and regulations. This category is measured by one indicator.

13. *Supplier Assessment*. A lot of brands and manufacturers of the textile and apparel industry are directly dependent on external suppliers for their materials and products. Though it is cost efficient for companies to outsource operations but it also increases chances of potential reputational risks due to non-compliance of environmental standards by various members of the supply chain.

This aspect is evaluated by three indicator categories as described below: Screening of suppliers, Training of suppliers and Risk assessment.

- a. Screening of suppliers. This category aims to provide insights regarding the efforts made by the company to screen its suppliers on the basis of environmental compliance criteria like adherence to RSL, before signing any contract. This category is measured by two indicators.

- b. Training. This category takes into account the actions taken by the company in order to train its suppliers and other value chain partners to improve their environmental performance across any relevant impact areas. This category is measured by one indicator.
 - c. Risk assessment. This category aims to provide information regarding efforts made by the company to assess the risk factors that impact environmental performance of suppliers and required actions taken. This category is measured by one indicator.
14. *General.* The general aspect of the proposed SRF-T/A recognizes the importance of sustainability initiatives taken by a company at corporate level. As established in the literature review, companies can integrate sustainability into current systems of businesses and make the business more transparent through various activities. These activities can be for environmental performance or social performance or both. For example: making sustainability a board level concern, performing life cycle analysis (LCA) of different products, investing in process innovation, and reporting the progress to stakeholders.
- This aspect is evaluated by seven indicator categories as described below: Internal performance system, Governance, Reporting, LCA, Process innovation, Collaborations and Grievance mechanisms.
- a. Internal performance system. This category aims to identify presence of a formal environmental management system or internal metrics established by the

company that helps to improve organizational environmental performance. This category is measured by one indicator.

- b. Governance. This category aims to identify if the company maintains a separate department/ management personnel in the organization to manage environmental related performance activities. This category is measured by one indicator.
- c. Reporting. This category aims to find if the company shares environmental related information with the stakeholders via a formal report such as a sustainability report, corporate social responsibility (CSR) report or integrated report. This category is measured by two indicators.
- d. LCA. This category aims to assess the number of products for which the company performs a full LCA. This category is measured by one indicator.
- e. Process innovation. This category aims to assess the efforts made by the company towards development of any new technology or processes that can aid in lowering environmental impacts e.g. Low water or water-free textile dyeing, printing and finishing techniques. This category is measured by one indicator.
- f. Collaborations. This category aims to assess the efforts made by the company to jointly develop training efforts, tools and programs with other companies to improve environmental performance of the industry. This category is measured by one indicator.

- g. Grievance mechanisms. This category aims to identify the number of grievances that were filed, addressed, and resolved through formal grievance mechanisms by the company. This category is measured by one indicator.

A representation of the environmental dimension, its aspects and indicator categories are shown in Table 4.1. The detailed environmental dimension of the proposed SRF-T/A with aspect level and indicator category level information as well as indicator level information is presented in Table 4.2. (Note: Table 4.2 is reflective of the revisions suggested by the industry experts).

Table 4.1 Environmental dimension of the proposed SRF- T/A

E N V I R O N M E N T	Materials	Consumption Reduction Efficiency
	Energy	Consumption Reduction Efficiency
	Water	Consumption Reduction Efficiency
	Packaging	Consumption Reduction Recycled/ Disposal Efficiency/ Design improvement PRSL
	Biodiversity	Ecosystem Protected areas Species
	Emissions	GHG Global warming Reduction Carbon trading/ Mitigation
	Water Effluents	Quality/ quantity Treatment Reuse/ recovery Disposal
	Waste	Quantity Reduction Efficiency Shipped
	Transport	Consumption/ Total impact Reduction Efficiency
	Chemical Management	RSL Reduction Zero discharge
	Products Services	Product recyclability DFE
	Compliance	Audits Standards/ legal permits Fines
	Supplier Assessment	Screening Training Risk assessment
General	Performance system Governance Reporting LCA Process innovation Collaborations Grievance mechanism	

Table 4.2 Environmental dimension of the proposed SRF-T/A

Aspects	Indicator Categories	Indicator
Materials	Consumption	Total materials consumption by weight or volume for product manufacturing including sampling
		Percentage of materials used that are recycled input materials for product manufacturing
		Percentage of materials used that are from renewable and from natural resources for product manufacturing
		Percentage of materials used that are from non-renewable resources or are man-made or synthetic for product manufacturing
		Percentage of materials used that are organically produced for product manufacturing
	Reduction	Reduction in total amount of materials used by weight or volume for product manufacturing including sampling
Efficiency	Manufacturing efficiency by change in amount of seconds/rejects and by data tracking (e.g. cut-to-ship ratio, cut-to-package ratio)	
Energy	Consumption	Total energy consumption (within and outside) the organization e.g. purchased electricity, steam, natural gas, methane, ethanol, biomass
		Total energy requirements for product manufacturing
		Percentage of energy used that are from renewable resources (e.g., wind, solar, hydro-electric, geothermal, biomass)
	Reduction	Reduction in total energy consumption (within and outside) the organization
		Reductions in energy requirements of product manufacturing
	Efficiency	Energy conservation/ efficiency measures taken e.g. heat exchange or heat recovery, thermal energy storage, computerized facility climate control
		Energy intensity

Table 4.2 Continued

Aspects	Indicator Categories	Indicator
Water	Consumption	Total water consumption (e.g. municipal water, surface water (river, stream lake, ocean), well water, reclaimed water) by organization and for product manufacturing
		Water sources significantly affected by withdrawal of water
	Reduction	Reduction in water consumption by the organization and for product manufacturing
	Efficiency	Water conservation/ efficiency measures taken e.g. wastewater recycling, rainwater storage
Percentage of water recycled and reused by the organization and product manufacturing		
Packaging	Consumption	Total volume of packages and packaging material used for product and transport packaging
	Reduction	Reduction in product and transport packaging material
		Reduction in secondary materials - adhesives, labels, foils, colorants, inks, seals, liners, laminates, waxes, coatings, etc.
	Recycle/ disposal	Percentage of materials used in making packaging that is recycled content
		Percentage of packages and packaging material that is reused by the organization
		Percentage of packages and packaging material going into landfill by the organization
	Efficiency/ design improvement	Improvement in design and construction techniques based on weight, size and volume, including using less materials and/or lighter materials, while still maintaining packaging functionality
PRSL	Organization policy on adherence to PRSL compliance for packaging material	

Table 4.2 Continued

Aspects	Indicator Categories	Indicator
Biodiversity	Ecosystem	Description of significant impacts of activities, products, and services of the organization on the ecosystem
	Protected areas	Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas
		Total number habitats protected or restored
	Species	Total number of iucn red list species and national conservation list species with habitats in areas affected by operations, by level of extinction risk
Air Emission	Greenhouse Gases	Total emissions of greenhouse gas (ghg)
		Intensity of ghg emissions
	Global Warming	Total emissions of gasses (e.g. Co2, CH4, particle emission from printing) and ozone-depleting substances (ODS), NOx, SOx,) that affect global warming
	Reduction	Reduction in greenhouse gas (ghg) emissions
		Reduction in emissions of ODS, NOx, SOx, and other significant air emissions
Carbon trading/ Mitigation	Total amount of carbon trading done in past year by the organization	
Water Effluents	Quality/ quantity	Total quantity and quality water discharge (wastewater production) by the organization and during product manufacturing
		Total number and volume of significant spills (including water, fuel, oil, waste)
	Treatment	Percentage of wastewater being treated with primary and secondary treatment
	Reuse/ recovery	Total amount of waste water treated and reused
	Disposal	Total amount of waste water treated and disposed
Number of water bodies and related habitats significantly affected by the organization's discharges of water and runoff		

Table 4.2 Continued

Aspects	Indicator Categories	Indicator
Waste	Quantity	Total quantity of waste generated (e.g. cardboard, paper, plastics, fabric, solvents, dyes, oil/lubricants, metals, glass, wood and others) during product manufacturing
		Percentage of hazardous and non-hazardous waste generated during product manufacturing
	Reduction	Reduction in the quantity of waste generated (hazardous and non-hazardous) during product manufacturing
	Efficiency	Percentage of waste generated that is re-used/re-purposed, upcycled & down cycled and disposed in landfills
	Shipped	Percentage of waste (including seconds/ rejects) shipped internationally
Transportation	Consumption and Total impact	Total amount of fossil fuels (e.g. coal, diesel, gasoline) consumption (within and outside) the organization and other significant environmental impacts for transporting goods and materials for the organization's operations, and transporting members of the workforce
		Total distance and weight/ volume of products transported via air, land and sea and resulting normalized emissions
	Reduction	Reduction in emissions and environmental impacts by improving/ optimizing transportation of products by organization and its value chain partners
	Efficiency	Reduction in amount of fossil fuels consumption (within and outside) the organization for transporting products and other goods and materials for the organization's operations, and transporting members of the workforce by efficient planning
		Percentage increase in high efficiency motors by the organization and its value chain partners

Table 4.2 Continued

Aspects	Indicator Categories	Indicator
Chemical Management	RSL	Organization policy on adherence to chemical use regulation and RSL compliance in manufacturing, marketing, or sales location by the organization and value chain partners
		Improvement achieved in chemicals management performance by organization and value chain partners by prioritizing and selecting alternatives for substances of concern and/or RSLs
	Reduction	Reduction in quantity of chemicals and dyes used during product manufacture
	Recovery/ Zero discharge	Percentage of chemicals used by recovering and reusing them (for example, with caustic soda) during product manufacture
Recyclable Products	Product recyclability	Percentage of products sold by the organization that are completely recyclable
		Percentage of products designed such that material types can be identified and separated for EOU recycling
	Design for Environment	Percentage of products made by implementing Dfe (design for efficiency) tool
		Percentage of products made by recycled materials as input materials
Compliance	Audits	Frequency of audits by an independent third party auditor or an accredited internal auditor for organization's environmental management systems and for identifying potential environmental impacts e.g. quality of air emissions and water effluents
	Standards/ legal permits	Number of cases of expired or non-compliant legal requirements/permits for environmental regulations (e.g., air emissions, wastewater, hazardous waste, a general facility-wide environmental permit)
	Fines	Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations

Table 4.2 Continued

Aspects	Indicator Categories	Indicator
Supplier Assessment	Screening	Percentage of suppliers and other value chain partners screened using environmental criteria
		Organization policy on requiring suppliers and other value chain partners to provide self-assessment and also obtain third-party certifications regarding improved environmental/chemical management performance through Total Quality Management (TQM), ISO 14001 and adherence to RSL
	Training	Organization policy on providing written guidance, support and training to suppliers and other value chain partners to improve their environmental performance across any relevant impact areas (e.g., energy/greenhouse gas emissions, water use, waste, etc.)
	Risk assessment	Assessment of the risk factors that impact environmental performance of suppliers and actions taken
General	Internal performance system	Organization policy on establishing a formal environmental management system/ internal metrics aimed at understanding and continually improving organizational environmental performance and product manufacturing
	Governance	Organization policy on maintaining a separate department/ management personnel in the organization to manage environmental management performance activities
	Reporting	Reporting of environmental management performance to stakeholders via a formal report such as a Sustainability Report, CSR Report, Integrated Report following international standards by the organization and its suppliers
		Organization policy on validating public disclosures on environmental management performance is validated by a third party
	LCA	Number of products for which a full Life Cycle Assessment has been conducted

Table 4.2 Continued

Aspects	Indicator Categories	Indicator
General (Continued)	Process innovation	Description of development of any new technology or processes that aid in lowering environmental impacts e.g. Low water or water-free textile dyeing, printing and finishing techniques
	Collaborations	Description of joint/shared training efforts, tools and programs with other companies (for example sharing data from value chain partners)
	Grievance mechanisms	Number of grievances about environmental impacts filed, addressed, and resolved through formal grievance mechanisms

Social Dimension: The social dimension of the proposed SRF-T/A focuses on the impact of a company on the social system within which it operates. This dimension also aims to provide information regarding the ability (of a company) to have a positive effect on people both inside and outside the company like employees, suppliers, contractors, customers and the society at the global, regional and local level (GRI, 2013 a; Krajnc and Glavic, 2007). The efforts made by the company towards improving social performance can translate into efficient human resource, prevention of fines, reduction of the risk of compensations and maintenance of reputation (Delai and Takahashi, 2011).

The results of the comparative analysis of the contents of GRI and Higg Index are shown in Appendix D. Some general observations were made on the basis of comparative analysis:

1. There is no absolute consensus on social aspects that should be measured between GRI and Higg Index. Some issues important to the textile and apparel industry such

as hours of work, payment of minimum wage are addressed only by the Higg Index. However, Higg Index does not focus on the aspects related to employee type, anti-corruption and anti-competitive behavior which form an important part of the social dimension (GRI, 2013). Nevertheless, most of the major aspects like human rights, stakeholder engagement and product responsibility are present in both the frameworks.

2. The proposed SRF-T/A followed the general structure of GRI G4 guidelines; however certain changes were made to the organization of the social dimension. For example, instead of the original four aspects, the proposed SRF-T/A comprises ten social aspects. This is because various aspects like “compliance”, “supplier assessment” and “occupational health and safety” are separately measured in the proposed SRF-T/A. This was done because the issues related to these aspects are of significant importance for the textile and apparel industry.
3. Several indicators in Higg Index like impact of internal performance system, social life cycle analysis (SLCA) of the supply chain, industry collaborations, training of suppliers, safety from the building structure and workplace violence are not provided in the GRI. However, some indicators on employee engagement in development of safety programs, indigenous rights, fines given by the company due to noncompliance with social regulations are not described in the Higg Index. Such indicators help provide a complete picture of social sustainability impacts of a company’s operations.

4. The literature review points towards the importance of some additional measure of social sustainability. Some example of these are: equal pay for equal work to all employees, appropriate instruments provided to workers in high noise pollution sections of company, company policy on fair trade practices, consumer education on use and disposal of products and development of system innovation to lower social impacts. Such measures are not covered in either of the two selected frameworks (GRI and the Higg Index).

Based on the analysis of the comparison of the two selected frameworks and the above findings, the social dimension of the proposed SRF-T/A was developed to include a comprehensive list of aspects, indicator categories and indicators. The social dimension of the proposed SRF-T/A consists of ten aspects signifying the important themes related to social dimension. These aspects are evaluated by 48 indicator categories reflecting the scope of measurement within each aspect. The indicator categories further comprise of a total of 112 indicators which provide specific measures of each indicator category. The various aspects of the social dimension are discussed briefly in the following sections.

1. *Employment and labor laws.* The textile and apparel industry employs large work force and hence there are significant sustainability issues related to employees throughout the supply chain. This aspect focuses on the relationship between the company and its employees. It is a broad aspect that aims to identify the efforts made by the company to safeguard rights of its employees, such as providing equal opportunity to workers.

The employment and labor laws aspect is evaluated by six indicator categories as described below: Employee type, Legal contracts, Compensation and benefits, Broker screening, Diversity and equal opportunity and Hours of work.

- a. Employee type. This category aims to find if a company has a formal policy on new hires based on age, gender, and region. This information is reflective of the company's efforts to implement inclusive recruitment practices and efficiently use the available labor and talent. This category is measured by two indicators.
- b. Compensation and benefits. This category aims to find the efforts made by the company to provide fair compensation and benefits to workers irrespective of their age, gender and ethnicity. For example benefits such as social insurance, child care services, medical insurance, return to work after parental leave, minimum living wage, wage premiums for overtime and work performed on weekends and holidays as required by local law. This category is measured by ten indicators.
- c. Legal contracts. This category aims to find if the company provides clear legally recognized contracts to all employees in the language that employees understand. This category is measured by three indicators.
- d. Broker screening. This category aims to assess if the company screens labor brokers for legally issued license. This category is measured by one indicator.

- e. Diversity and equal opportunity. This category aims to find if the company has a formal policy on providing equal employment opportunity to workers irrespective of their age, gender and ethnicity. This category is measured by six indicators.
 - f. Hours of work. This category aims to find if the company has a formal policy and procedures for documenting employee hours of work and related details (e.g. overtime, work on weekend, holidays). This category is measured by six indicators.
2. *Employee Training and Education.* Maintaining and improving human capital through training in order to expand the knowledge base of employees is reflective of a company's efforts towards development of social sustainability.
- This aspect is evaluated through five indicator categories as described below: Skills management, Career development, Higher education, Health awareness and training of employees on Business code of conduct.
- a. Skills management. This category aims to find if the company makes effort towards implementing employee training and development programs such as management training and job-specific skill development. This category is measured by three indicators.
 - b. Career development. This category aims to find if the company makes effort towards succession planning and development of senior / executive management and providing regular performance and career development reviews to employees. This category is measured by two indicators.

- c. Higher education. This category aims to find if the company has formal policy and procedures to sponsor employees for further education. This category is measured by one indicator.
 - d. Health awareness. This category aims to find if the company undertakes efforts to provide training to employees on health awareness such as family planning and reproductive health, disease and illness education (including HIV/AIDS). This category is measured by one indicator.
 - e. Business code of conduct. This category aims to find if the company provides training to employees and security personnel regarding company policies and business code of conduct. This category is measured by one indicator.
3. *Labor/ Management Relation*. This aspect focuses on the measures taken by the company to ensure a timely communication and discussion of significant operational changes between the management and the employees. It also includes anti-competitive behavior, anti-trust, or monopoly practices and risk assessments of the potential incidents of corruption within a company.

This aspect is evaluated by three indicator categories as described below:

Communication, Anti-corruption and Anti-competitive Behavior.

- a. Communication. This category aim to highlight the level of transparency in communication and engagement of employees in significant operation changes within a company. This category is measured by two indicators.

- b. Anti-corruption. This category aims to find efforts made by a company to manage risks of incidents of corruption by designing and implementing policies to combat it. This category is measured by three indicators.
 - c. Anti-competitive behavior. This category aims to find out the legal actions initiated by the company under national or international laws designed for the purpose of regulating anti-competitive behavior, anti-trust, or monopoly practices. This category is measured by one indicator.
4. *Occupational Health and Safety*. Health and safety performance provides a key measure of a company's duty of care (GRI, 2013). This aspect deals with the way a company manages employee health and safety at the place of operation. This aspect is evaluated through five indicator categories as described below: Safety programs, Physical hazard, Noise level, Building structure, Anti-harassment/ abuse.
- a. Safety programs. This category aims to find efforts made by a company to create and implement employee health and safety programs at the place of operation. This category is measured by five indicators.
 - b. Physical hazard. This category aims to find efforts made by a company to minimize possibility of physical harm to the employee at the workplace. This category is measured by seven indicators.
 - c. Noise level. This category aims to assess efforts made by the company to safeguard employees from areas of high noise level sections by providing proper equipment. This category is measured by one indicator.

- d. Building structure. This category aims to find efforts made by a company to implement regular checks and maintenance of the building structures in order to safeguard employees from any hazard. This category is measured by one indicator.
 - e. Anti-harassment/ abuse. This category aims to find if the company has formal anti-harassment and anti-abuse policies for the workplace such as cultural sensitivities and workplace violence. This category is measured by one indicator.
5. *Human Rights and Animal Welfare*. This aspect focuses on policies and procedures that a company practices in order to combat human rights and animal welfare issues in its supply chain. According to GRI (2013) the human rights include freedom of association, collective bargaining, child labor, forced or compulsory labor, and indigenous rights.

This aspect is evaluated through five indicator categories as described below:

Freedom of association, Child and juvenile labor, Forced labor, Indigenous rights and Animal welfare.

- a. Freedom of association. This category aims to assess policies and procedures of a company to provide freedom of association and collective bargaining to employees. It also aims to find if the company makes efforts to address issues of concerns, needs, views, and request of workers. This category is measured by two indicators.

- b. Forced labor. This category aims to assess efforts made by the company to eliminate risk of forced or compulsory labor. This category is measured by three indicators.
 - c. Child and juvenile labor. This category aims to assess efforts made by the company to abolish child and juvenile labor. This category is measured by two indicators.
 - d. Indigenous rights. This category aims to find efforts made by a company to comply with rights of indigenous peoples. This category is measured by one indicator.
 - e. Animal welfare. This category aims to assess if the company is making efforts to abolish animal testing. This category is measured by one indicator.
6. *Society/ Community*. This aspect focuses on impacts that a company has on society and local communities in which it operates. According to Wang (2005), it is important for a company to be able to fulfill society's needs while achieving its own objectives.

This aspect is evaluated by four indicator categories in the proposed SRF-T/A as described below: Local community, Non-government organization (NGO), Employee engagement and Stakeholders engagement.

- a. Local community. This category aims to measure the efforts made by the company towards local community and to assess the impact of company's operation on the community. This category is measured by four indicators.

- b. NGO. This category aims to measure the efforts made by the company to partner with NGO's in order to develop community related projects for areas around company's office, retail outlets and manufacturing units. This category is measured by one indicator.
 - c. Employee engagement. This category aims to measure the efforts made by the company to involve employees in execution of community development programs. This category is measured by one indicator.
 - d. Stakeholder engagement. This category aims to measure the efforts made by the company to engage stakeholders to understand and identifying key concerns of the community (e.g. risks and challenges to local business, improvement in working conditions within the value chain). This category is measured by three indicators.
7. *Product Responsibility and customer relation.* Product responsibility and customer relation aspect concentrates on the relationship between the company and its consumers.

This aspect is evaluated by six indicator categories in the proposed SRF-T/A as described below: Product and service labeling, Marketing communications, Consumer education, Customer health and safety, Customer privacy, and Fair trade.

- a. Product and service labeling. This category aims to identify the degree to which information is provided by the company to the customer through labels.
Information like type of raw materials used (like organic, natural, biodegradable)

can help customers to make informed purchasing choices. This category is measured by three indicators.

- b. Marketing communications. This category aims to assess the efforts made by the company to communicate the sustainability impacts of the product or any additional sustainability initiatives taken by the company to customers. This category is measured by three indicators.
 - c. Customer health and safety. This category aims to measure the efforts made by the company to test and address health and safety impacts of the products sold to the consumer. This category is measured by two indicators.
 - d. Consumer education. This category aims to assess the efforts made by the company to educate consumer regarding maintenance and disposal of the products post purchase. This category is measured by two indicators.
 - e. Customer privacy. This category aims to measure the efforts made by the company to protect of customer information. This category is measured by two indicators.
 - f. Fair trade. This category aims to find if the company has any formal policy towards fair trade practices. This category is measured by one indicator.
8. *Compliance*. The growing concern for the impact of industries on the human capital and the society has led to emergence of various social rules and regulations by organizations like International Labor Organization (ILO). Such organizations provide regulations on maximum number of hours of employee work or regulation on

This aspect is evaluated by three indicator categories as described below: Screening of suppliers, Training of suppliers and Risk assessment.

- a. Screening. This category aims to provide insights regarding the efforts made by the company to screen its suppliers on the basis of social compliance criteria like adherence to labor standards and human rights before signing any contract. This category is measured by three indicators.
- b. Training. This category takes into account the actions taken by the company in order to train its suppliers and other value chain partners to improve their social performance across any relevant impact areas. This category is measured by one indicator.
- c. Risk assessment. This category aims to provide information regarding efforts made the company to perform risk assessment of social performance throughout its value chain to mitigate any potential negative social impacts. This category is measured by three indicators.

10. *General.* The general aspect of the social dimension in the proposed SRF-T/A is similar to the general aspect of the environmental dimension and emphasizes the importance of sustainability activities of a company at corporate level. As mentioned in the literature review, several sustainability activities and initiatives can help a company integrate sustainability into current business processes and make the business more transparent.

This aspect is evaluated by seven indicator categories as described below: Internal performance system, Governance, Reporting, Social life cycle analysis (SLCA), System innovation, Collaborations and Grievance mechanisms.

- a. Internal performance system. This category aims to identify presence of a formal social management system or internal metrics established by the company that helps to improve organizational social performance. This category is measured by two indicators.
- b. Governance. This category aims to identify if the company maintains a separate department/ management personnel in the organization to manage social sustainability related performance activities. This category is measured by one indicator.
- c. Reporting. This category aims to find if the company shares social sustainability related information with the stakeholders via a formal report such as a sustainability report, corporate social responsibility (CSR) report or integrated report. This category is measured by two indicators.
- d. SLCA. This category aims to assess the number of products for which the company performs a full SLCA to identify social performance impacts, strategy and priorities. This category is measured by one indicator.
- e. System innovation. This category aims to assess the efforts made by the company towards development of any new strategy or programs that can aid in lowering social impacts. This category is measured by one indicator.

- f. Collaborations. This category aims to assess the efforts made by the company to jointly develop training efforts, tools and programs with other companies to improve social performance of the industry. This category is measured by one indicator.
- g. Grievance mechanisms. This category aims to identify the number of social grievances that were filed, addressed, and resolved through formal grievance mechanisms by the company. This category is measured by two indicators.

A representation of the social dimension, aspects and indicator categories are shown in Table 4.3. The detailed social dimension of the proposed SRF-T/A with aspect level and indicator category level information as well as indicator level information is presented in Table 4.4. (Note: Table 4.4 is reflective of the revisions suggested by the industry experts).

Table 4.3 Social dimension of the proposed SRF- T/A

S O C I A L	Employment & Labor laws	Employee type Legal contracts Compensation & benefits Broker screening Diversity & equal opportunity Hours of work
	Training & Education	Skill management Career development Higher education Health awareness Code of conduct
	Labor/ Management Relation	Communication Anti-corruption Anti-competitive behavior
	Occupational Health & Safety	Safety program Physical hazards Noise levels Building structure Anti-harassment/ abuse
	Human Rights/ Animal Welfare	Freedom of association Child & juvenile labor Forced labor Indigenous rights Animal welfare
	Society/ Community	Local community NGO Employee engagement Stakeholder engagement
	Product Responsibility/ Customer Relations	Product & service labeling Marketing communication Consumer education Customer health and safety Customer privacy Fair trade
	Compliance	Audits Standards/ legal permits Fines
	Supplier Assessment	Screening Training Risk assessment
	General	Internal performance system Governance Reporting SLCA System innovation Collaboration Grievance mechanism

Table 4.4 Social dimension of the proposed SRF-T/A

Aspects	Indicator Category	Indicator
Employment and labor laws	Employee type	Total number and rates of new employee hires by age group, gender and region
		Percentage of full time, contractual/ part-time/ temporary workers and foreign migrant workers, broken down by region
	Compensation and benefits	Benefits provided to full-time employees by significant locations of operation e.g. social insurance, transportation subsidies, child care services, medical insurance
		Benefits provided to full-time employees that are not provided to temporary or part-time employees, by significant locations of operation
		Return to work and retention rates after parental leave, by gender
		Organization policy on full legal wages and severance to laid off employees
		Organization policy on wage premiums for overtime and work performed on weekends and holidays, as required by local law for all employees (foreign and homeworkers)
		Organization policy on adherence to local law for wage deductions for taxes, social insurance, or other legally required purposes for all employees (foreign and homeworkers)
		Percentage of workers receiving minimum living wage (compensation meets the basic needs of the worker and provides some discretionary income) as required by the local law
		Percentage of workers receiving at least the minimum wage for all regular hours worked as required by the local law
		Steps taken by the organization to pay minimum or above minimum wage levels (e.g. product cost model)
		Ratio of basic salary and remuneration of women to men by employee category, by significant locations of operation

Table 4.4 Continued

Aspects	Indicator Category	Indicator
Employment and labor laws (continued)	Legal contracts	Organization policy on providing all workers (home and foreign workers) with a legally recognized, written contract or agreement containing terms of employment, base wage, and wage calculation, skill grade, overtime incentives, benefits and bonus system
		Organization policy on providing illiterate workers with full explanation of the content of their contract in the language they understand
		Organization policy on employee termination (e.g. a collective decision taken by HR/recruitment department and the individual department manager)
	Broker screening	Percentage of labor brokers screened by the organization that operate with legally issued license
	Diversity and equal opportunity	Organization policy on equal employment opportunity (e.g. age, nationality, religion, gender, disability)
		Organization policy on equal opportunities for advancement based on their skills
		Organization policy on providing flexibility and the means to workers who suffer with chronic illnesses (e.g. HIV/AIDS) or disabilities
		Organization policy on providing equal pay for equal work to all employees at every level
		Total number of incidents of discrimination and corrective actions taken
		Organization policy on composition of governance bodies and breakdown of employees per employee category according to gender, age group, minority group membership, and other indicators of diversity

Table 4.4 Continued

Aspects	Indicator Category	Indicator
Employment and labor laws (continued)	Hours of Work	Organization policy on documenting hours of work and related details (e.g. overtime, work on weekend, holidays) by the employee
		Organization policy on providing all workers mandatory time off (e.g. one day off in every seven (7) day period)
		Organization policy on providing workers with breaks during work periods
		Organization policy to adherence to legal limits of regular hours and overtime hours of work per week (60 hrs. total)
		Organization policy ensuring that overtime hours of work are voluntary for all employees
		Organization monitors production capacity and factors in regular and overtime working hours prior to accepting orders
Employee Training and Education	Skills management	Average hours of total training per year per employee by gender, and by employee category
		Organization has programs to train employees related to job-specific impacts on labor performance in the value chain and on the organization’s social compliance program
		Total number of employee development programs for skills management and lifelong learning that support the continued employability of employees e.g. management training, career development, company’s social/labor compliance program/system
	Career development	Steps taken by the organization for succession planning and development of senior / executive management employees
		Percentage of employees receiving regular performance and career development reviews, by gender and by employee category
	Higher education	Percentage of employees that are financially sponsored by the company for further education

Table 4.4 Continued

Aspects	Indicator Category	Indicator
Employee Training and Education (continued)	Health awareness	Programs undertaken by the organization for employees on health awareness e.g. family planning and reproductive health, disease and illness education (including HIV/AIDS)
	Business code of conduct	Programs undertaken by the organization for employees and security personnel to train them regarding company policies on business code of conduct
Labor/ Management Relation	Communication	Organization policy on orientation program of new employees (e.g. provide information on the employee handbook, the code of ethics and business conduct)
		Minimum notice periods regarding operational changes, including whether these are specified in collective agreements
	Anti-corruption	Frequency of communication and training on anti-corruption policies and procedures to employees and suppliers
		Total number of operations assessed for risks related to corruption and the significant risks identified within the organization
	Total number of confirmed incidents of corruption and the corrective actions taken by the organization	
Anti-competitive behavior	Total number of legal actions for anti-competitive behavior, anti-trust, and monopoly practices and their outcomes in the organization and its N-tier suppliers	

Table 4.4 Continued

Aspects	Indicator Category	Indicator
Occupational Health and Safety	Safety programs	Percentage of total workforce represented in formal joint management–worker health and safety committees to help monitor and advise on occupational health and safety programs
		Number of health and safety topics covered in formal agreements with trade unions
		Steps taken by the organization on emergency planning, fire safety practices and medical services like first aid and CPR
		Organization provides gender appropriate safety programs
		Steps taken by the organization to provide appropriate sanitation and hygiene like clean bathrooms, availability of toilet supplies and potable drinking water
	Physical hazard	Type of injury and rates of injury, occupational diseases, lost days, and absenteeism, and total number of work-related fatalities, by region and by gender
		Percentage of workers with high incidence or high risk of diseases related to their occupation
		Percentage of health issues due to working specially in close proximity of hazardous chemicals and appropriate instruments provided
		Frequency of conducting physical hazard safety programs (long duration of standing, machinery usage, protective coverings)
		Frequency of regular maintenance of all machinery and periodic change in machinery and parts after its useful life.
		Frequency of regular checks on proper functioning safety guards, safety controls and/ or emergency stops in place, loose electrical wiring of machines with a pinching, puncturing or cutting risk
		Frequency of safety checks to ensure proper handling and storage of hazardous chemicals in all operations

Table 4.4 Continued

Aspects	Indicator Category	Indicator
Occupational Health and Safety (continued)	Noise level	Organization policy on compliance with international/ national noise levels and providing appropriate instruments to workers in high noise level sections
	Building structure	Frequency of checks and regular maintenance of the building structures of the organization according to the legal requirements (e.g. avoid fire, load limits, capacity, cracks)
	Anti-harassment/ abuse	Organization policy on providing written anti-harassment and anti-abuse policies and procedures for the workplace e.g. cultural sensitivities, workplace violence; and workers access to external contacts (union representatives, non-government organizations, women’s groups)
Human Rights and Animal Welfare	Freedom of association	Frequency with which organization engages with trade unions to proactively address issues of concerns, needs, views, and request of workers
		Organization policy on screening operations and suppliers for risk of violation of right to exercise freedom of association and collective bargaining and actions taken
	Forced labor	Organization policy on freedom to foreign workers e.g. free access of original identity cards, work permits and travel documents at any time
		Organization policy on screening operations and suppliers for risk for incidents of forced or compulsory labor, and measures to contribute to the elimination of all forms of forced or compulsory labor
		Organization policy on hiring related to the ability of an individual to perform the functions of the position being hired for

Table 4.4 Continued

Aspects	Indicator Category	Indicator
Human Rights and Animal Welfare (continued)	Child and juvenile labor	Organization policy on screening operations and suppliers for hiring juvenile workers and ensuring compliance with legal requirements (e.g. working hours, overtime, night shift, dangerous substances, tools and/or equipment)
		Organization policy on screening operations and suppliers for risk for incidents of child labor, and measures taken to contribute to the effective abolition of child labor
	Indigenous rights	Total number of incidents of violations involving rights of indigenous peoples and actions taken
	Animal welfare	Organization policy against animal testing and contributing towards animal welfare
Society/ Community	Local community	Percentage of operations with implemented local community engagement, impact assessments, and development programs in areas around organization's office, retail outlets and manufacturing
		Percentage of material sourced from small and medium enterprises and manufacturers owned by local community/ underrepresented minorities
		Organization policy on engaging with local community to identify concerns and development opportunities
		Percentage of operations with significant actual and potential negative impacts on local communities
	NGO	Number of local community development program/projects with NGO partnership in areas around organization's office, retail outlets and manufacturing
	Employee engagement	Percentage of employees engaging in voluntary activities for society development programs

Table 4.4 Continued

Aspects	Indicator Category	Indicator
<p align="center">Society/ Community (continued)</p>	<p align="center">Stakeholder engagement</p>	<p>Organization maintains list of stakeholder groups and the basis for stakeholder selection</p>
		<p>Frequency of stakeholder engagement by type (participating in multi-stakeholder initiatives, industry groups) and by group</p>
		<p>Organization policy on engaging with stakeholder groups to identify key topics and concerns (e.g. risks and challenges, improvement in working conditions within the value chain) with actions taken and outcome achieved</p>
<p align="center">Product Responsibility and Customer Relation</p>	<p align="center">Product and service labeling</p>	<p>Percentage of products provided with labels describing type of contents and other information like sustainability factor that help consumer in product selection</p>
		<p>Total number of incidents of non-compliance with regulations and voluntary codes concerning product and service information and labeling, by type of outcomes</p>
		<p>Organization policy to provide accessible customer service information (such as repair vs. replace guidance) through website, phone customer service, in-store printed materials, trained staff, and/or warranties or similar policies – excluding on-product permanent labeling</p>
	<p align="center">Marketing communications</p>	<p>Steps taken by the organization to provide information regarding its sustainability efforts at point of purchase (in store and online) such that consumer have direct access to it</p>
		<p>Steps taken by the organization for mapping product to source</p>
		<p>Percentage of banned or disputed products sold as per local/national/ international laws</p>

Table 4.4 Continued

Aspects	Indicator Category	Indicator
Product Responsibility and Customer Relation (continued)	Customer health and safety	Percentage of significant product and service categories for which health and safety impacts are assessed for improvement (e.g. dyes, chemicals, quality)
		Total number of incidents of non-compliance with regulations and voluntary codes concerning the health and safety impacts of products and services during their post purchase life cycle, by type of outcomes
	Consumer education	Percentage of products with label/ information card for consumer to reduce resource (energy, water) consumption and environmental impacts during product use and care
		Percentage of products with label/ information card for consumer to appropriately dispose product after use
	Customer privacy	Assessment of results of surveys measuring customer satisfaction and significant action taken
		Total number of substantiated complaints regarding breaches of customer privacy and losses of customer data
Fair trade	Organization policy on fair trade practices	
Compliance	Audits	Frequency of audits by an independent third party auditor or an accredited internal auditor for organization's social management systems
	Standards/ legal permits	Percentage of products that undergo quality assurance (e.g. material durability) using industry standards (e.g. ISO, ASTM)
	Fines	Number of cases of non-compliant legal requirements for social (e.g. human right, labor laws) regulations as required by the local, national or international laws
		Monetary value of significant fines for non-compliance with laws and regulations concerning the provision and use of products and services
		Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with social regulations

Table 4.4 Continued

Aspects	Indicator Category	Indicator
Supplier Assessment	Screening	Percentage of suppliers and other value chain partners screened using criteria for social impacts
		Organization policy on requiring suppliers and other value chain partners to provide self-assessment and also obtain third-party certifications regarding effective social compliance management systems
		Organization policy on compliance with any leading international labor standards (e.g. ILO) and requires same for value chain partners
	Training	Organization policy on providing written guidance, support and training to suppliers and other value chain partners to improve their social performance
	Risk Assessment	Assessment of significant actual and potential negative impacts for social performance in the supply chain and actions taken
		Assessment of risk factors that impact labor standards performance of value chain partners (e.g. production / manufacturing processes risk factors)
Organization policy on analyzing sourcing strategies for social/labor and human rights risks exist sting in different countries for value chain partners		
General	Internal performance system	Organization policy on establishing a formal social performance management system/ internal metrics aimed at monitoring and improving organizational social performance in the value chain (e.g. company code of ethics and business conduct, code of conduct for suppliers and employee, company values and culture)
		Organization policy on using metrics for purchasing practices aimed at lessening impact on social/labor performance at supplier/ manufacturer facilities.

Table 4.4 Continued

Aspects	Indicator Category	Indicator
General (continued)	Governance	Organization policy on maintaining a separate department/ management personnel in the organization to manage Social performance activities (e.g. internal human resources, and internal employee development and well-being)
	Reporting	Reporting of social management performance to stakeholders via a formal report such as a Sustainability Report, CSR Report, Integrated Report following international standards by the organization and its suppliers
		Organization policy on validating public disclosures on social performance by a third party
	SLCA	Number of products for which a full Social Life Cycle Assessment has been conducted to understand social performance impacts, strategy and priorities
	System innovation	Description of development of any new system that aim at monitoring and improving organizational social performance in value chain
	Collaborations	Description of joint/shared training efforts, tools and programs with other companies
	Grievance mechanisms	Number of grievances about impacts on society, labor practices and human rights filed, addressed, and resolved through formal grievance mechanisms
Organization policy on grievances raised by workers or external stakeholders (for e.g. keeping them confidential, addressing on time, no negative consequences for reporters)		

Economic Dimension: The economic dimension focuses on the impact of the company's activities on economic and financial condition of the company, its stakeholders, and on

economic systems at local, national, and global levels. It also aims to provide information regarding the ability of a company to last in time in terms of profitability, productivity and financial performance. Efforts made by the company to be transparent in dealings with stakeholders and investors and also contributing towards the society while achieving the short and long-term economic goals translates into positive effect for the company in terms of fines prevention and enhanced reputation.

As the Higg Index does not provides with an economic dimension and focusses only on environmental and social dimensions, the various aspects and indicators were taken from the economic dimension of the GRI G4 guidelines for the proposed SRF-T/A. However, the GRI guidelines on the economic disclosure focus only on the organization's impacts on the economic conditions of its stakeholders and on economic systems at social level, but does not focus on the financial condition of the organization (GRI, 2013 *a*). Literature suggests that a measure of financial performance of a company, such as profits and shareholder returns, is also a significant part of the economic dimension (Elkington, 1998; Krajnc & Glavic, 2005). Therefore, additional indicators, based on the findings from the literature review for different economic aspects were added to the proposed SRF-T/A.

The results of the comparative analysis of the contents of GRI and Higg Index are shown in Appendix E. Some general observations were made on the basis of comparative analysis: Most of the aspects and indicators of the economic dimension are from the GRI G4 guidelines which cover majority of themes like economic performance, ethical business practices and others.

1. Indicators in the economic dimension of the GRI guidelines emphasize on the organization's impacts on the economic conditions of its stakeholders and the society but not directed towards the financial condition of the organization. Therefore, indicators like profit generation, shareholders remuneration, accuracy and transparency of accounts are added from the literature review.

Based on the above findings, the economic dimension of the proposed SRF-T/A was developed including a comprehensive list of aspects, indicator categories and indicators. The economic dimension of the proposed SRF-T/A consists of three aspects signifying the important characteristics related to the economic dimension. These aspects are evaluated by nine indicator categories reflecting the broad themes of the indicators within each aspect. The indicator categories further comprise of a total of 16 indicators which provide measures of different aspect within the economic dimension. The various aspects of the economic dimension are discussed briefly in the following sections.

1. *Economic Performance*. Information related to company's wealth creation and investments provides crucial information for short and long term sustainability for any type of company (Delai and Takahashi, 2011). Economic performance can be measured via both direct and indirect impacts on the economy (GRI, 2013). The direct impacts include traditional financial measures like profits/ wealth creation, distribution and investments made by the company and tend to focus on the immediate consequences of monetary flows to stakeholders. Indirect impacts include

the influence generated as money circulates through the economy predominantly in developing economies.

The aspect is evaluated by the following indicator categories in the proposed SRF-T/A as described below: Profit, Investment, Shareholder remuneration, Community, Aids and Indirect economic impacts.

- a. Profit. This category aims to measure the total revenues and profit generated by the company in one fiscal year. This category is measured by one indicator.
- b. Investment. This category aims to measure investments made by a company that may be significant for its future growth such as investment in research and development of new products. This category is measured by three indicators.
- c. Shareholder remuneration. This category aims to measure the efforts made by a company to be transparent in its dealings with shareholders and capital providers. This category is measured by one indicator.
- d. Community. This category aims to identify the company's relation with the local communities/ regional economies and also measure any potential risks to reputation that may develop. This category is measured by three indicators.
- e. Aids. This category aims to measure the financial assistance received by the company from government and political parties. This category is measured by two indicators.
- f. Indirect economic impacts. This category aims to measure significant indirect economic impacts made by the company such as economic development in areas

of high poverty, economic impact of improving or deteriorating social or environmental conditions or availability of products and services for those on low incomes. This category is measured by two indicators.

2. *Ethical Business Practices*. Companies are expected to demonstrate their adherence to integrity and ethical business policies developed by the marketplace, international norms, and stakeholders (GRI, 2013). Activities related to corruption like misallocation of investments, and undermining the rule of law can result in negative impacts on the local economy (GRI, 2013).

The aspect is evaluated through two indicator categories as described below: Book keeping and Anti-corruption.

- a. *Book keeping*. This category aims to assess the extent to which a company makes effort to be transparent in the financial reporting and maintenance of accounts. This category is measured by one indicator.
 - b. *Anti-corruption*. This category aims to assess the extent to which a company makes effort to identify with anti-corruption practices within the organization. This category is measured by one indicator.
3. *Risk Management*. This aspect focusses on the ability of a company to manage possible financial risks related with the impact on the environment (climate change) and the society due to company's operation. A company and related investors and stakeholders may face financial risks and opportunities due to changes in the climate and weather patterns like: frequent and intense storms, changes in sea level, ambient

temperature, and water/ energy availability. Similarly, a company may also face risk of reputational damage due to its activities affecting society and workers and by non-compliance with the popular social standards like human rights and labor laws. The aspect is evaluated by one indicator category as described below: Risks/ Opportunities.

- a. Risks/ Opportunities. This category aims to assess the ability of the company to perform financial risk assessment and steps taken by the company to address them. This category is measured by two indicators.

A representation of the economic dimension, aspects and indicator categories are shown in Table 4.5. The detailed economic dimension of the proposed SRF-T/A with aspect level and indicator category level information as well as indicator level information is presented in Table 4.6. (Note: table 4.6 is reflective of the revisions suggested by the industry experts).

Table 4.5 Economic dimension of the proposed SRF- T/A

E C O N O M I C	Economic Performance	Profit
		Investments
		Shareholder remuneration
		Community
		Aids
		Indirect economic impacts
	Ethical Business Practices	Ethical book keeping
		Anti-corruption
	Risk Management	Risk/opportunities

Table 4.6 Economic dimension of the proposed SRF-T/A

Aspects	Indicator category	Indicator
Economic Performance	Profit	Total revenues and profit generated by the company in one fiscal year.
	Investment	Total operating costs in one fiscal year.
		Total investment in research and development in one fiscal year.
		Total coverage of the employee benefit plan obligations
	Shareholders remuneration	Total payments to providers of capital in one fiscal year (shareholders, bondholders, investors)
	Community	Total payments to government in form of taxes and related penalties at local, national and international level
		Total amount of donations and investment of funds to charitable (non-profit, NGO) organizations or projects
		Percentage of spending on local suppliers at significant locations of operation
	Aids	Financial assistance received from government
		Total value of political contributions by country and recipient/beneficiary
Indirect economic impacts	Development and impact of infrastructure investments and services supported	
	Significant indirect economic impacts, including the extent of impacts (e.g. economic development in areas of high poverty, economic impact of improving or deteriorating social or environmental conditions or availability of products and services for those on low incomes)	
Ethical Business Practices	Book keeping	Organization policy on book keeping ensuring accuracy and transparency in financial reporting
	Anti-corruption	Total number of legal actions for corruption, anti-competitive behavior, anti-trust, and monopoly practices
Risk Management	Risk/opportunities	Financial implications and other risks and opportunities for the organization's activities due to climate change
		Financial implications and other risks and opportunities for the organization's activities affecting society and workers

4.1.2 Review of the proposed SRF-T/A by industry experts

Industry input was sought regarding the completeness and relevance of the proposed sustainability reference framework for the textile and apparel industry (SRF-T/A). Three industry professionals who are experts and experienced in the field of sustainability were contacted via email and the discussion of the review was conducted over a phone call with each of them. A set of questions was provided to the reviewers (Appendix A) including the following three sections: general information, sustainability frameworks used by the industry and review of the proposed SRF-T/A. These sections are described below.

General information: The questions in this section were designed to gather information on how important sustainability reporting and measurement is for the textile and apparel industry and if companies use the sustainability related information to make corporate decisions. All the reviewers unanimously agreed that reporting and measurement of sustainability initiatives is of significant importance for this industry. It was mentioned that the information collected for reporting is helpful to companies only if the information is accurate. Since many companies in the textile and apparel industry have n-tier suppliers in different parts of the world, it is difficult to verify the information. The reviewers suggested that it was significant to get a third party verification to ensure that the information gathered by the company and its supply chain partners is genuine. It was also noted that the importance of disclosing of information and reporting by a company depends on company goals. Reviewers mentioned that some companies report just for reporting while others are more conscious. If companies are not able to use the information to make corporate

decisions, then the reporting exercise is futile. More conscious companies genuinely want to improve their triple bottom line and look for ideas to implement sustainability initiatives which ultimately help them reduce cost. Additionally it was mentioned that the importance of sustainability information for a company is also dependent on the trade aspect. This is because sustainability related information is becoming important for trade between business-to-business (b2b) due to changes in the regulations but not so much in case of business-to-consumer (b2c).

Sustainability frameworks used by the industry: The questions in this section were designed to gather information on the availability of sustainability frameworks specifically for the textile and apparel industry. Additionally, limitations of the two frameworks (GRI and Higg Index) used for developing the proposed SRF-T/A were also sought. There was a consensus among the reviewers that though many sustainability related frameworks are present or under construction like frameworks by UNCSD, Retail Industry Leaders Association (RILA), Carbon Disclosure Project, Fair Labor Association (FLA) and others; the only ones exclusive for the textile and apparel industry are the internal reporting systems: the Higg Index by the Sustainability Apparel Coalition and the Sustainability Measurement and Reporting System (SMRS) by The Sustainability Consortium. However, one of the reviewers pointed out that of these the Higg Index is more inclusive. All the reviewers agreed that GRI guidelines is the most popular and provides a comprehensive reporting system but it caters to a broad range of industries. It was noted that there are too many frameworks that are being developed and that there is no standardization among them. It was also mentioned that the

available frameworks focus on specific areas within different dimensions of sustainability. For example FLA is aimed towards improving the life of workers while the CDP focuses on the water mandate. According to the reviewers, providing sustainability information using various frameworks is very time consuming, suggesting the need of an inclusive one for the textile and apparel industry.

Review of the proposed SRF-T/A: The questions of this section aimed to get comments and suggestions from the industry experts on the proposed SRF-T/A regarding its applicability and comprehensiveness in regard to the textile and apparel industry.

While the reviewers communicated that the proposed SRF-T/A required quite details which could be a time consuming process for a company, the general response was that the proposed SRF-T/A is very comprehensive and covered almost every aspect of sustainability for the textile and apparel industry. The unanimous response to the proposed SRF-T/A was that it was very comprehensive and relevant for the textile and apparel industry. The suggestions and comments are described in the below section.

1. It was pointed that few of the indicators in two of the aspects were repetitive and should be combined. For example, the material aspect of the environmental dimension in the proposed SRF-T/A had separate indicators for consumption of materials from renewable resources and consumption of materials from natural resources which should be combined. It was also suggested that indicators on the global warming and ozone depleting substance can be combined together within one indicator category.

2. It was suggested to exclude indicators on conflict minerals as they are more important for the accessory industry and not so important for the textile and apparels.
3. Though it was agreed that the framework covers all the aspects of sustainability for the textile and apparel industry, it was communicated that the framework requires very detailed information, which might discourage the companies from using it. However, one of the reviewers pointed out that if a company is already reporting its sustainability related activities especially using GRI, then it will have most of the information making it easier to use this as a reference framework for industry related aspects. It was mentioned again, that the framework is useful only if accurate data is collected and disclosed by the company.
4. Majority of the reviewers suggested that a description of different indicator categories and their importance should be provided.
5. It was also suggested to develop another column of alternate sources of answer for different indicators. For example, to answer some indicators in the Human Rights aspect of social dimension, companies can refer to some standards as their answers. Though this step of making a comparable section could ease the process for the company but given the time constraint, it was out of scope for the present study.
6. Another comment was made regarding the economic section of the framework. Though there was consensus between all the reviewers that economic disclosure was an important part of sustainability information, it was mentioned that some companies may be hesitant to share their economic information.

All the suggestions and comments from the reviewers were incorporated in the final version of the framework. The environmental dimension of the revised framework consists of 14 aspects evaluated by 50 indicator categories which further comprised of a total of 76 indicators (Table 4.2). The social dimension of the revised framework consists of ten aspects evaluated by 47 indicator categories comprising 110 indicators (Table 4.4). The economic dimension of the revised framework consists of three aspects, nine indicator categories and 16 indicators (Table 4.6). This revised version of the proposed SRF-T/A was then used for Research Objective II.

4.2 Research Objective II: To gain an insight of sustainable development in the textile and apparel industry by applying the developed framework to a sample of textile and apparel companies.

For Research Objective II, sustainability initiatives taken and reported by a sample of textile and apparel industry were analyzed. This analysis was conducted to draw inferences on overall trend of the textile and apparel companies with respect to sustainability efforts as demonstrated by the collected data. Two steps were involved in this method: 1) sample selection; and 2) content analysis of company reported information against the developed SRF-T/A.

4.2.1 Sample Selection

For the purpose of Research Objective II, sustainability related information published by 21 US based companies (Table 3.2) was benchmarked against the SRF-T/A developed. Company reported sustainability data was retrieved either from company published reports (like sustainability reports, CSR report, citizenship report) or from information on companies' website (Table 3.2). It was found that of the sample selected, only six companies published formal reports with information related to sustainability initiatives while 12 companies had made sustainability related information available on their websites. However, three companies had no information on their sustainability initiatives that was available publicly as of March 2015. Therefore, content analysis of the sustainability related information was done conducted on the remaining 18 companies.

4.2.2 Content analysis against the developed framework

Following the method used by Delai and Takahashi (2013) in identifying the sustainability reported practices employed by Brazilian retailers, the present study performed content analysis of the sustainability practices related to the economic, social and environmental dimensions as reported by the sample companies. The information was then benchmarked against the developed SRF-T/A proposed in Research Objective I.

It was found that there was no consensus on the format and degree of details regarding the information on sustainability practices provided by the sample companies. Some of the companies provided information regarding their sustainability efforts in brief while some

provide extensive information. Since companies are found to be communicating their efforts towards sustainable development in a variety of ways, it can become difficult for stakeholders and investors to compare performances between companies across the industry. It was also found that only 14 of the sample companies disclose information related to all three dimensions of sustainability in their reports: environmental, social and economic. As established in the literature, it is of significant importance to report information regarding all the three dimensions of sustainability together so to get a comprehensive picture of efforts towards sustainable development. The following section provides the results of content analyses of company reported information according to the three different dimensions of sustainability: environmental, social and economic.

Environmental Dimension: The spreadsheet reflecting the content analysis against the developed SRF-T/A for environmental dimension is attached in Appendix F. The results of the analysis demonstrated that all of the companies are undertaking some efforts towards environmental sustainability. It was also found that all of the environmental aspects are addressed to some extent by all the 18 sample companies. Among the 14 aspects for the environmental dimension, the most widely addressed aspect was “energy” with 77.78 % companies addressing it, closely followed by aspects of “compliance” and “general”. The “recyclable products” is the least addressed aspect with only 16.67% companies taking initiatives towards it. Results of the analysis for each aspect of the environment dimension are discussed below.

1. *Materials*. This aspect is evaluated by three indicator categories: Consumption, Reduction and Efficiency in the proposed SRF-T/A. As indicated in Table 4.7, just under half (44.44%) of the companies reported their practices/initiatives in reduction of materials, while much less number of companies reported their total material consumption or efficiency in using materials. Mentioned efficiency measures included using recycled materials (synthetic yarns) or cotton yarns made directly from textile cutting wastes.

Table 4.7 Percentage of sample companies taking initiative towards material aspect of environmental dimension.

Aspects	Indicator Categories	% of Sample Companies Addressing the Aspect
Materials	Consumption	22.22%
	Reduction	44.44%
	Efficiency	22.22%

2. *Energy*. This aspect is evaluated by three indicator categories: Consumption, Reduction and Efficient use of energy by a company in the proposed SRF-T/A. As indicated in Table 4.8, thirteen of the companies (72.2 %) reported efficiency measures taken by them. Mentioned efficiency measures included using efficient ceramic metal halide (CMH) bulbs and compact fluorescent lamps (CFLs), LEDs,

natural lightning and automatic air conditioning systems. Companies also mentioned sourcing of renewable energy generated from biomass and hydroelectric sources. Over half (66.67%) of the companies reported their practices/initiatives to reduce energy input, while much less number of companies reported their total energy consumption.

Table 4.8 Percentage of sample companies taking initiative towards energy aspect of environmental dimension.

Aspects	Indicator Categories	% of Sample Companies Addressing the Aspect
Energy	Consumption	38.89%
	Reduction	66.67%
	Efficiency	72.22%

3. *Water*. This aspect is evaluated by three indicator categories: Consumption, Reduction and Efficient use of water by a company in the proposed SRF-T/A. As indicated in Table 4.9, half of the total companies discussed the initiatives taken by them to reduce water intake by identifying places where water was being wasted, including leaking pipes, valves, and fittings. Equipment and pipe system correction along with control changes also helped companies to reduce total water use intensity (water used/ manufactured unit). Companies also reported equipping their offices and

distribution centers with water-saving measures, including low flow, automatic flush toilets and urinals. Six companies reported initiatives to disclose their absolute water consumption as well as the efficiency measures taken by them. Some of the efficiency measures included reusing water from the cooling towers in toilets, capturing storm water in ponds and basins that could be used for different operations.

Table 4.9 Percentage of sample companies taking initiative towards water aspect of environmental dimension.

Aspects	Indicator Categories	% of Sample Companies Addressing the Aspect
Water	Consumption	33.33%
	Reduction	50.00%
	Efficiency	33.33%

4. *Packaging*. This aspect is evaluated by five indicator categories: Consumption, Reduction, Recycled/ disposal, Efficiency/ design improvement and Packaging restricted substances list (PRSL). As indicated in Table 4.10, eleven companies (61.1 %) revealed taking the recycle/ disposal measures like reusing and recycling transportation boxes and hangers, using recycled paper for packaging sometimes certified by the Forest Stewardship Council which is an independent organization that promotes responsible forest management. Ten of the total companies reported the initiatives taken by them to reduce packaging consumption. Some of the initiatives

such as reducing packaging size and hence the packaging material for high volume items, asking consumers if they need additional tissue wrappings were reported. Under half of the companies (44.4 %) reported steps taken towards design efficiency of packages. Some initiatives regarding efficiency practices included using cartons manufactured with fewer raw materials and with post-consumer recycled waste content. These cartons were designed to hold more merchandise and could stack more efficiently requiring less space during transportation. Companies also reported increasing the use of polyethylene terephthalate (PET) containers as they are readily recycled and its manufacturing is considered to be more environmentally friendly than PVC. Very few companies disclosed their absolute consumption of packaging material by type and only one of the companies disclosed efforts towards adherence to PSRL.

Table 4.10 Percentage of sample companies taking initiative towards packaging aspect of environmental dimension.

Aspects	Indicator Categories	% of Sample Companies Addressing the Aspect
Packaging	Consumption	22.22%
	Reduction	55.56%
	Recycle/ disposal	61.11%
	Efficiency/ design improvement	44.44%
	PSRL	5.56%

5. *Biodiversity*. This aspect is evaluated by three indicator categories: Ecosystem, Protected areas and Species. The analysis of the company reported sustainability information reveals that biodiversity is one of the less focused aspects within the environmental dimension. As indicated in Table 4.11 few companies (33.3 %) reported taking initiatives to eliminate or limit the negative impact on ecosystem. While one of the selected companies disclosed efforts towards preservation of species, none of the sample companies discussed the initiatives taken by them to protect areas of high biodiversity value near the company operations.

Table 4.11 Percentage of sample companies taking initiative towards biodiversity aspect of environmental dimension

Aspects	Indicator Categories	% of Sample Companies Addressing the Aspect
Biodiversity	Ecosystem	33.33%
	Protected areas	0.00%
	Species	5.56%

6. *Air Emission*. This aspect is evaluated through four indicator categories: Greenhouse gases (GHG), Global warming (ODS), Reduction in air emissions and company policy on Carbon trading/ Mitigation. As indicated in Table 4.12, over half of the companies disclosed initiatives taken towards reducing GHG's and also reported reductions in air emissions. Couple of companies reported selling and closing of

manufacturing units or decrease in number of supplier as a reason for reduction in air emissions. Over a quarter of the companies (27.8 %) reported efforts towards reducing global warming impacts while only one of the companies disclosed information on carbon trading/mitigation practices and informed the stakeholders regarding the practice of planting trees in national parks and forests in order to offset business travels.

Table 4.12 Percentage of sample companies taking initiative towards air emissions aspect of environmental dimension

Aspects	Indicator Categories	% of Sample Companies Addressing the Aspect
Air Emission	Greenhouse gases	55.56%
	Global warming	27.78%
	Reduction	50.00%
	Carbon trading/ mitigation	5.56%

7. *Water Effluents*. This aspect is evaluated by four indicator categories: Quality/ Quantity of wastewater discharge, Treatment of wastewater, Reuse/ Recovery and Disposal. As indicated in Table 4.13, seven companies disclosed information regarding the quality and quantity of waste water effluents from their facilities. A third of the total companies (33.3 %) reported efforts to treat the wastewater before disposal, for example by using activated sludge treatment (natural biological process)

in order to reduce impact on the environment. Equal number of companies also reported information on proper disposal of wastewater in order to reduce its impact on the ecosystem. Very few companies disclosed efforts made towards reuse of the recovered water. Some of the efforts included using treated effluent to irrigate nearby landscaping and soccer fields.

Table 4.13 Percentage of sample companies taking initiative towards water effluents aspect of environmental dimension

Aspects	Indicator Categories	% of Sample Companies Addressing the Aspect
Water Effluents	Quality/ quantity	38.89%
	Treatment	33.33%
	Reuse/ recovery	27.78%
	Disposal	33.33%

8. *Waste*. This aspect is evaluated by four indicator categories: Quantity of (hazardous and non-hazardous) waste generated; Reduction in waste generation, Efficiency efforts (re-used/re-purposed, upcycled & down cycled and disposal) and Waste (including seconds/ rejects) shipped internationally. As indicated in Table 4.14, over half of the companies (61.1 %) reported the initiatives taken by them to reduce waste generation. Mentioned initiatives included decreasing packaging components, discontinuing products and merchandise, visual marketing items, and furniture and

fixtures. Half of the sample companies revealed the efficiency measures to reduce the environmental impact. Reported measures included store recycling efforts, pallet recycling, product re-use (donations/sample sales). While few companies disclosed information regarding the absolute amount of waste material produced by type, none of the companies provided information on the efforts taken towards reducing the transportation of waste (including seconds/ rejects, hazardous waste) to other countries.

Table 4.14 Percentage of sample companies taking initiative towards waste aspect of environmental dimension

Aspects	Indicator Categories	% of Sample Companies Addressing the Aspect
Waste	Quantity	27.78%
	Reduction	61.11%
	Efficiency	50.00%
	Shipped	0.00%

9. *Transportation.* This aspect is evaluated through three indicator categories: Consumption and total impact, Reduction and Efficiency. As indicated in Table 4.15, half of the sample companies disclosed the efficiency measures taken to minimize environmental footprint. Some of these efforts included change in mode of transportation by maximizing use of ocean vessels (least carbon intensive) and

minimizing the use of air shipment and/ or increased usage of rail than truck that have more significant impact on the environment. Under a half of total companies (44.44%) discussed the initiatives taken by them to reduce the dependence on logistics. Some of these initiatives included using efficient trailer stacking techniques to optimize the use of trailer space. This helped in shipping larger volumes of products in fewer trips thereby reducing the number of trucks and amount of energy required for transportation. Improved utilization of freight containers and optimized routing of shipping were some of the other initiatives mentioned. Only seven (38.9%) of the companies reported their absolute consumption of fossil fuels and the total impact on the environment during transportation activities. Companies mentioned monitoring the total impact of transportation by participating in different programs that works with shippers, and logistics companies to reduce air pollution caused by transportation of goods. Example of such program is the U.S. Environmental Protection Agency's SmartWay Transport Partnership program.

Table 4.15 Percentage of sample companies taking initiative towards transportation aspect of environmental dimension

Aspects	Indicator Categories	% of Sample Companies Addressing the Aspect
Transportation	Consumption and total impact	38.89%
	Reduction	44.44%
	Efficiency	50.00%

10. *Chemical Management*. This aspect is evaluated by three indicator categories:

Restricted substance list (RSL), Reduction in chemicals use and Recovery/ Zero discharge. As indicated in Table 4.16, half of the sample companies disclosed having policies to avoid use of RSL. Five companies (27.8 %) disclosed collaboration with the Zero Discharge of Hazardous Chemicals (ZDHC). ZDHC is an apparel and footwear brand-led alliance focused towards zero discharge of hazardous chemicals for all products and all pathways in their supply chains by 2020 (<http://www.roadmaptozero.com>). Only one company reported efforts towards reducing the amount of harmful chemicals use by increasing the use of biodegradable chemicals.

Table 4.16 Percentage of sample companies taking initiative towards transportation aspect of environmental dimension

Aspects	Indicator Categories	% of Sample Companies Addressing the Aspect
Chemical Management	RSL	50.00%
	Reduction	5.56%
	Recovery /Zero Discharge	27.78%

11. *Recyclable products*. This aspect is evaluated by two indicator categories: Product Recyclability and Design for environment (Dfe). The content analysis of the company reported sustainability information reveals that this aspect is least discussed within

the environmental dimension. As indicated in Table 4.17, very few companies reported initiatives towards activities like recycling, reusing and making products which are recyclable. For example, a company reported reusing cotton products for producing rugs, floor mats, pillowcase and mop heads or spinning the disposed products back into yarns for making socks. None of the sample companies however mentioned integrating Dfe in the product design and manufacture.

Table 4.17 Percentage of sample companies taking initiative towards recyclable products aspect of environmental dimension

Aspects	Indicator Categories	% of Sample Companies Addressing the Aspect
Recyclable Products	Product recyclability	16.67%
	Dfe	0.00%

12. *Compliance*. This aspect is evaluated by three indicator categories: Audits, Standards and legal permits and Fines. As indicated in Table 4.18, twelve companies (66.7 %) conformed to different standards and possessed legal permits, licenses and certifications to operate. Half of the sample companies reported taking initiatives to perform regular audits to identify the potential environmental impacts in the supply chain such as quality of air emissions and water effluents in their supply chain. However, none of the companies disclosed if they had paid any fines because of non-compliance with the regulations.

Table 4.18 Percentage of sample companies taking initiative towards compliance aspect of environmental dimension

Aspects	Indicator Categories	% of Sample Companies Addressing the Aspect
Compliance	Audits	50.00%
	Standards/ legal permits	66.67%
	Fines	0.00%

13. *Supplier Assessment.* This aspect is evaluated by three indicator categories: Screening of suppliers, Training of suppliers and Risk assessment. As indicated in Table 4.19, about half of the companies reported taking initiatives to screen their suppliers before they included them in the supply chain. A third of the sample companies provided training to their suppliers in order to improve their ability to reduce environmental impacts. Some of the training projects included giving suppliers latest information on restricted or harmful chemicals. Few of the sample companies (27.8 %) disclosed information on risk assessment analysis performed on the supply chain to identify its potential environmental impacts such that corrective actions can be implemented.

Table 4.19 Percentage of sample companies taking initiative towards supplier assessment aspect of environmental dimension

Aspects	Indicator Categories	% of Sample Companies Addressing the Aspect
Supplier Assessment	Screening	55.56%
	Training	33.33%
	Risk assessment	27.78%

14. *General.* This aspect is evaluated by seven indicator categories: Internal performance system, Governance, Reporting, LCA, Process innovation, Collaborations and Grievance mechanisms. As indicated in Table 4.20, half of the sample companies reported making environment sustainability a board level concern and also provided information regarding getting involved in business collaborations with other companies and organizations like Business for Social Responsibility (BSR) or Natural Resources Defense Council (NRDC) in order to improve the environmental performance of various facilities. Some collaborated projects mentioned included training dyeing and finishing facilities to reduce water, energy, and chemical use. Under half of the total sample companies (44.44%) reported sharing environment impact related information with the stakeholders while 33.3 % of companies reported to have an internal performance system in place that helped them to track energy consumption, water usage, waste disposal, recycling efforts and other things for each facility in an online database. Some companies also had internal chemical review board or a sourcing committee that helped in reducing its environmental impacts by

sourcing of organic and sustainable materials. About a quarter of the companies reported implementation of some process innovations to reduce any negative impact on the environment. Some of the reported efforts included innovative garment dyeing processes to reduce both water and energy consumption by using cold-water pigment dyes or salt-free reactive dyes. Only three companies disclosed initiatives towards performing LCA for their products while only one company reported efforts towards maintaining records of grievances mechanisms.

Table 4.20 Percentage of sample companies taking initiative towards general aspect of environmental dimension

Aspects	Indicator Categories	% of Sample Companies Addressing the Aspect
General	Internal performance system	33.33%
	Governance	50.00%
	Reporting	44.44%
	LCA	16.67%
	Process innovation	27.78%
	Collaborations	50.00%
	Grievance mechanisms	5.56%

Social Dimension. The spreadsheet reflecting the content analysis against the developed SRF-T/A for social dimension is attached in Appendix G. The results of the analysis demonstrated that all of the sample companies are making some efforts towards social

sustainability and that all of the social aspects (100 %) are addressed to some extent by all the 18 sample companies. Among the ten aspects for the social dimension, the most widely addressed aspects were “employment and labor laws”, “occupational health and safety”, “human rights / animal welfare”, “society/ community”, “compliance” and “supplier assessment” with 100% of companies taking some initiative towards these aspects. This is closely followed by the aspect “training and education” with 88.89 % companies while information regarding “labor/ management relations”, “product responsibility and customer relation” aspects are the least addressed. From the analysis it can be deduced that companies are more communicative regarding the steps taken towards social sustainability. This is not in line with the analysis done by Singh et al. (2009) on several sustainability frameworks which suggested that the companies primarily focus on the environmental dimension of sustainable development. Results of analysis for each aspect of social dimension are discussed below.

1. *Employment and labor laws.* The employment and labor laws aspect is evaluated by six indicator categories: Employee type, Compensation and benefits, Legal contracts, Broker screening, Diversity and equal opportunity and Hours of work. Analysis of the reported practices revealed that this aspect is important for the sample companies. As indicated in Table 4.21, all companies disclosed providing compensation and benefits policy to their employees which are clear and easy to understand. Almost all (94.4 %) companies disclosed that employees were paid fairly for the number of hours they worked and that the work hours at facility were within legal limits as provided by the ILO. The analysis also shows that 88.9 % of companies were taking initiative to be

equal opportunity employer and employed a diverse workforce. Over half of the companies took initiatives to screen brokers such that only authorized brokers are used to provide employees and labor for the company. Less than half of the companies disclosed information regarding the legal contracts provided to the employees while only seven of sample companies disclosed information on the type and diversity of employees in the organization.

Table 4.21 Percentage of sample companies taking initiative towards employment and labor laws aspect of social dimension

Aspects	Indicator Category	% of Sample Companies Addressing the Aspect
Employment and labor laws	Employee type	38.89%
	Compensation and benefits	100.00%
	Legal contracts	44.44%
	Broker screening	55.56%
	Diversity and equal opportunity	88.89%
	Hours of Work	94.44%

2. *Employee Training and Education.* This aspect is evaluated through five indicator categories: Skills management, Career development, Higher education, Health awareness and training on Business code of conduct. Analysis of the reported practices reveals that companies make efforts to provide skills training and education in different ways. As indicated in Table 4.22, quite a few companies (77.8%) reported

educating new employees regarding the company’s code of conduct policy during orientation programs. Over half of the companies reported to have ongoing skills management programs like refresher course for employees on new technology, short training videos featuring product knowledge and selling tips. A third of the companies (38.9 %) reported providing career development advice to its employees through different programs like mentoring program that pairs senior executive and associates. Same number of companies disclosed implementing health awareness programs. Mentioned programs included female health education programs, information on HIV/AIDS. About 22.2 % of the companies reported to practice policies regarding financial support to employees who wanted to return to school and receive high-school diplomas and higher educational degrees.

Table 4.22 Percentage of sample companies taking initiative towards training and education aspect of social dimension

Aspects	Indicator Category	% of Sample Companies Addressing the Aspect
Training and Education	Skills management	66.67%
	Career development	38.89%
	Higher education	22.22%
	Health awareness	38.89%
	Business code of conduct	77.78%

3. *Labor/ Management Relation*. This aspect is evaluated by three indicator categories: Communication, Anti-corruption and Anti-competitive behavior. Analysis of the reported practices reveals that information regarding this aspect is not commonly provided. As indicated in Table 4.23, half of the sample companies disclosed having policy on anti-corruption. A little under half (44.4 %) of the companies mentioned making efforts towards maintaining a transparent communication between management and labors. Only 11.1 % of the sample companies reported to have policies against anti- competitive behavior.

Table 4.23 Percentage of sample companies taking initiative towards labor/ management relations aspect of social dimension

Aspects	Indicator Category	% of Sample Companies Addressing the Aspect
Labor/ Management Relation	Communication	44.44%
	Anti-corruption	50.00%
	Anti-competitive behavior	11.11%

4. *Occupational Health and Safety*. This aspect is evaluated through five indicator categories: Safety programs, Physical hazard, Noise level, Building structure, Anti-harassment/ abuse. Analysis of the reported practices reveals that this aspect is significantly important for the sample companies. As indicated in Table 4.24, almost

all of the companies reported to take proactive actions towards protecting the workers from any harassment or abuse on the facility. Fifteen companies disclose in their reports practicing policies to safeguard employees against physical hazards like faulty machinery. About 77.8 % companies communicated presence of safety programs for workers like provision of safe drinking water, availability of healthy food in cafeterias and hygienic sanitary conditions. Almost same number of companies reported making efforts towards maintenance of the facility buildings for worker safety to avoid incidents of fire and other issues. A third of the companies disclosed efforts towards providing special protective gear to employees working in close proximity of high noise pollution or chemical use. For example, performing sandblasting technique on denims involves high-pressure spraying of abrasive materials. These can be dangerous for workers until proper protective gear is used and required health and safety precautions are taken.

Table 4.24 Percentage of sample companies taking initiative towards occupational health and safety aspect of social dimension

Aspects	Indicator Category	% of Sample Companies Addressing the Aspect
Occupational Health and Safety	Safety programs	77.78%
	Physical hazard	83.33%
	Noise level	33.33%
	Building structure	72.22%
	Anti-harassment/ abuse	94.44%

5. *Human Rights and Animal Welfare.* This aspect is evaluated through five indicator categories: Freedom of association, Forced labor, Child and juvenile labor, Indigenous rights and Animal welfare. Analysis of the reported practices reveals that this aspect is also very significant for the sample companies. As indicated in Table 4.25, all the companies reported strict policy against forced labor. Almost all of the companies (94.4 %) disclosed that they provided freedom to employees to form association and also reported having policy against employment of child and juvenile labor. Nine companies revealed that they have policies against animal testing and animal cruelty while a third of total companies disclosed policies to provide employees with indigenous rights.

Table 4.25 Percentage of sample companies taking initiative towards human rights/ animal welfare aspect of social dimension

Aspects	Indicator Category	% of Sample Companies Addressing the Aspect
Human Rights / Animal Welfare	Freedom of association	94.44%
	Forced labor	100.00%
	Child and juvenile labor	94.44%
	Indigenous rights	38.89%
	Animal welfare	50.00%

6. *Society/ Community*. This aspect is evaluated by four indicator categories in the proposed SRF-T/A: Local community, NGO, Employee engagement and Stakeholders engagement. As indicated in Table 4.26, 88.9 % of companies made efforts to provide the local community with greater access to health, welfare and education services. Some of the other actions reported include facility renovations, equipment donation and providing help to disaster victims. About 13 companies disclosed information on employee engagement. It was reported that employees volunteer their time to help the community around company's office. Some of such activities included restoring schools and hospitals, helping victims of domestic violence and child abuse. In order to understand the local community and serve it better, companies initiated involvement of stakeholder in corporate decisions. Of the sample companies, about 66.7 % disclosed such efforts. Over half of the companies also partnered with NGO's in order to develop and fund projects like global fight

against human trafficking, projects related to education of local communities and human welfare.

Table 4.26 Percentage of sample companies taking initiative towards society/ community aspect of social dimension

Aspects	Indicator Category	% of Sample Companies Addressing the Aspect
Society/ Community	Local community	88.89%
	NGO	61.11%
	Employee engagement	72.22%
	Stakeholders engagement	66.67%

7. *Product Responsibility and customer relation.* This aspect is evaluated by six indicator categories in the proposed SRF-T/A: Product and service labeling, Marketing communications, Customer health and safety, Consumer education, Customer privacy, and Fair trade. As indicated in Table 4.27, about half of the companies took measures to ensure customers health and safety by testing of products before selling. Reported tests included safety issues like flammability, toxicity and physical/ mechanical abrasion of products. Some companies also mentioned collaboration with independent, accredited consumer product testing labs that helped them adhere to regulatory requirement related with consumer health and safety. Under a half of the companies reported efforts towards providing information on

product labels. Three companies (16.7 %) mentioned taking initiatives towards communicating the sustainability impacts of the product to the consumer. Same number of companies disclosed taking steps towards consumer education on product maintenance and disposal. Companies encouraged consumers to wash products in cold water and to donate and repurpose old clothing instead of throwing them in the landfills. Only one of the sample companies disclosed their policy towards customer privacy. This is also true for disclosure regarding company policy on Fair trade practices.

Table 4.27 Percentage of sample companies taking initiative towards product responsibility and customer relation aspect of social dimension

Aspects	Indicator Category	% of Sample Companies Addressing the Aspect
Product Responsibility and Customer Relation	Product and service labeling	44.44%
	Marketing communications	16.67%
	Customer health and safety	55.56%
	Consumer education	16.67%
	Customer privacy	5.56%
	Fair trade	5.56%

8. *Compliance.* This aspect is evaluated by three indicator categories in the proposed SRF-T/A: Audits, conformance to Standards and legal permits and Fines. As indicated in Table 4.28, all the companies reported performing regular audits to identify the potential social impacts such as non-adherence to human rights or labor laws in their supply chain. Majority of the companies (88.9 %) conformed to different standards and possessed legal permits, licenses and certifications by different organizations like Worldwide Responsible Accreditation Program (WRAP), Consumer Products Safety Improvement Act (CPSIA) and Oeko-Tex Standard 100. However, only one company disclosed information regarding any fines paid because of non-compliance with the regulations

Table 4.28 Percentage of sample companies taking initiative towards compliance aspect of social dimension

Aspects	Indicator Category	% of Sample Companies Addressing the Aspect
Compliance	Audits	100.00%
	Standards/ legal permits	88.89%
	Fines	5.56%

9. *Supplier Assessment.* This aspect is evaluated by three indicator categories: Screening of suppliers, Training of suppliers and Risk assessment. As indicated in Table 4.29, all of the companies disclosed initiatives to screen their suppliers before they included

them in the supply chain for adherence to social standards and regulations. About 88.9 % of total companies provided training to suppliers. Mentioned training programs included maintaining and supplying comprehensive time-keeping and worker payroll records, training to new vendors and regional trainings to improve social performance and reduce negative impacts across the supply chain. Half of the companies disclosed performing risk assessment of the supply chain to identify potential social risks such that corrective actions can be implemented.

Table 4.29 Percentage of sample companies taking initiative towards supplier assessment aspect of social dimension

Aspects	Indicator Category	% of Sample Companies Addressing the Aspect
Supplier Assessment	Screening	100.00%
	Training	88.89%
	Risk Assessment	50.00%

10. *General.* This aspect is evaluated by seven indicator categories: Internal performance system, Governance, Reporting, Social life cycle analysis (SLCA), System innovation, Collaborations and Grievance mechanisms. As indicated in Table 4.30, over a half of the companies (66.7 %) provided information regarding the collaborations and participation with organizations like the Business Council for Global Development (BCGD), Fair Labor Association (FLA) to improve efforts of

the industry towards social sustainability. Nine companies reported to have an internal performance system in place that helped them to check compliance with human rights and labor laws for each supply chain facility in an online database. Companies also reported to have internal teams comprised of social responsibility specialists that help in monitoring social performance. Half of total companies also reported efforts made towards sharing social impact related information with the stakeholders. Under half of the companies (44.4 %) reported making social sustainability a board level concern. Seven companies disclosed efforts towards maintaining records of grievances mechanisms. Only three companies reported involvement with some system innovations project to enhance social sustainability efforts like research on developing non-animal alternative methods. None of the companies however disclosed any policy towards performing SLCA of their supply chains for different products.

Table 4.30 Percentage of sample companies taking initiative towards general aspect of social dimension

Aspects	Indicator Category	% of Sample Companies Addressing the Aspect
General	Internal performance system	50.00%
	Governance	44.44%
	Reporting	50.00%
	SLCA	0.00%
	System innovation	16.67%
	Collaborations	66.67%
	Grievance mechanisms	38.89%

Economic Dimension. The spreadsheet reflecting the content analysis against the developed SRF-T/A for economic dimension is attached in Appendix H. The results of the analysis demonstrated that only 14 companies from the selected sample provide limited information regarding the economic dimension of sustainability. This may be because companies usually publish an annual report which contains information related to financial health of the company. However, as discussed before, a sustainability report should be a single document that presents and explains a company’s financial and non-financial (environmental, social, and governance) performance that helps in stakeholders understanding about a company (Busco et al., 2013; EY, 2014; Eccles and Krzus, 2010; IIRC, 2015). Of the information available, it was found that the most widely addressed aspect was “economic performance” closely followed by “ethical business practices” while “risk assessment” is the least

addressed aspect. Results of analysis for each aspect of economic dimension are discussed below.

1. *Economic Performance.* This aspect is evaluated by the following indicator categories in the proposed SRF-T/A: Profit, Investment, Shareholder remuneration, Community, Aids and Indirect economic impacts. Analysis of the reported practices reveals that this aspect is comparatively important for the sample companies. As indicated in Table 4.31, nine companies provided information on the philanthropic activities and economic benefits provided for community welfare. Under a quarter of the companies reported investing in sustainability activities like clean energy economy and improving manufacturing practices. Three companies disclosed information regarding the financial aids they had received from government or other organizations. Few companies disclosed the net profits and sales in their sustainability reports while only one company disclosed information on the indirect economic impacts and the shareholder remunerations given by the company.

Table 4.31 Percentage of sample companies taking initiative towards economic performance aspect of economic dimension

Aspects	Indicator category	% of Sample Companies Addressing the Aspect
Economic Performance	Profit	11.11%
	Investment	22.22%
	Shareholders remuneration	5.56%
	Community	66.67%
	Aids	16.67%
	Indirect economic impacts	5.56%

2. *Ethical Business Practices*. This aspect is evaluated through two indicator categories: Ethical book keeping and Anti-corruption. As indicated in Table 4.32, over a quarter of companies reported having stringent policies on maintaining the account books that reflected all financial transaction without any omissions. About one fifth of the companies (22.2 %) reportedly took proactive actions towards any anti-corruption practices involved with company finances like stock tipping, corrupt payments and others.

Table 4.32 Percentage of sample companies taking initiative towards ethical business practices aspect of economic dimension

Aspects	Indicator category	% of Sample Companies Addressing the Aspect
Ethical Business Practices	Book keeping	27.78%
	Anti-corruption	22.22%

3. *Risk Management.* This aspect is evaluated by one indicator category: Risks/ Opportunities. As indicated in Table 4.33, two companies disclosed their efforts towards financial risk management.

Table 4.33 Percentage of sample companies taking initiative towards risk management aspect of economic dimension

Aspects	Indicator category	% of Sample Companies Addressing the Aspect
Risk Management	Risk/opportunities	11.11%

CHAPTER 5

CONCLUSIONS

5.1 Overview

Textile and apparel industry is multifaceted. It involves operations like research, designing, manufacturing (fibers, yarns, and textiles), distribution, retail, and services thereby supporting many secondary businesses while providing employment to millions of people at every stage of its supply chain. Due to the multifarious nature of the supply chain and its vast spread, textile and apparel industry is associated with numerous sustainable development challenges like air emissions, non-compliance with labor laws and others.

The concept of sustainable development is gaining importance for all the industries including textile and apparel industry, which are pressured by stakeholders (e.g.: governments, customers, consumers) to measure and report their sustainability performance. In order to respond to the stakeholders demand to measure and report progress towards (or away from) sustainable development, a sustainability reference framework is needed. Though there are numerous sustainability frameworks available like UNCSD, GRI G4 guidelines, the Higg Index and the Eco Index; none of the frameworks available provide guidance on external reporting specifically for the textile and apparel industry. Therefore, reporting of sustainability related activities is a challenge for many textile and apparel companies.

In this context, the present study proposed development of a sustainability reference framework for the textile and apparel industry (SRF-T/A). The proposed framework was

developed based on the comparative analysis of two well-known sustainability frameworks, the GRI G4 guidelines and the Higg Index. In order to make the framework comprehensive, additional information from an extensive review of sustainability literature was included. Based on the analysis, the proposed SRF-T/A was developed which comprises a comprehensive list of aspects, indicator categories and indicators for the three dimensions of sustainability: environmental, social and economic. The developed SRF-T/A was reviewed by three industry professionals. All the reviewers were unanimous in commenting that the developed framework is very comprehensive and industry specific. The industry experts' review also provided insights to improve the proposed SRF-T/A. The suggested changes were accordingly made to refine the framework. This refined SRF-T/A aims to provide a comprehensive overview of sustainability landscape for the textile and apparel industry. Reporting of suggested sustainability initiatives will help a company become more transparent and improve communication with stakeholders. The proposed SRF-T/A can be used to collect sustainability related information throughout the supply chain thereby helping companies to self-benchmark both externally and internally.

Despite the growing importance of sustainable development for the textile and apparel industry, there is little information on what sustainability initiatives are being taken by various companies. Therefore, the present study also analyzed the trend in sustainability efforts made by industry. For this purpose, sustainability efforts of a sample of textile and apparel companies were benchmarked against the aspects and indicator categories of the developed SRF-T/A. This was accomplished through content analyses of the sustainability

practices reported by 18 apparel brands of US origin. The analysis provides great insights of the practices and reporting of sustainability initiatives. There is no standardization in organization and content of sustainability reports by different companies engaged in similar business. It was also found that not all companies provide information related to the three dimensions of sustainability in their sustainability reports. Majority of the companies did not report information related to the economic dimension. The results attempted to some shed some light on the range of sustainability related information being shared with the stakeholders by the brands of US origin.

5.2 Conclusion

5.2.1 Sustainability reference framework for the textile and apparel industry (SRF-T/A)

The proposed SRF-T/A aims to provide guidance for external reporting as well as for internal assessment specifically for the textile and apparel industry. The proposed SRF-T/A can be used as a starting point for companies to integrate sustainability into their current operations and can also help them expand their efforts towards sustainable development. The strengths of the proposed SRF-T/A are to overcome the shortcomings of the analyzed frameworks. It attempts to address the three main challenges that the existing sustainability frameworks have been facing.

First, there are numerous sustainability frameworks available for both measurement and reporting of sustainability initiatives (E.g.: Eco Index and OECD). However it was found that

most of these frameworks measure only one or two dimensions of sustainable development. Hence companies which follow these frameworks do not provide information regarding their efforts towards the three dimensions of sustainability: environment, social and economic. According to Figge et al. (2002) and Hart and Milstein (2003), a sustainable business is one that concurrently makes efforts towards the three dimensions of sustainable development. The proposed reference framework is more complete and comprehensive in that 1) it considers the three dimensions of sustainability and their major aspects, 2) it includes various initiatives that can help the company integrate sustainability in everyday operations, and 3) it evaluates the impacts of complete supply chain operations for a company in textile and apparel industry.

Secondly, there is no standardization regarding the classification of aspects between different dimensions of sustainability in the available frameworks. There is also no consensus around the scope of the measurement of each aspect since different frameworks measure the same aspect at different levels. Unavailability of a uniform framework can limit a company's contribution towards sustainable development. The proposed SRF-T/A comprises of aspects in each dimensions based on sustainability issues specific to the textile and apparel industry. It attempts to clarify boundaries between the environment, social and economic dimensions of sustainability making it easier to understand the concept. Since it is based on two well-known sustainability frameworks and an extensive review of literature, the aspects are measured comprehensively.

Finally, it was found that there are very few frameworks that reflect sustainability related aspects specifically for the textile and apparel industry. However these frameworks are not complete and still in development stage. Additionally, these tools focus on internal assessment of one or two dimensions of sustainability and were not designed to provide any guidance on external reporting. Reporting of sustainability initiatives to stakeholders is important as it helps to establish a positive reputation with stakeholders and can also result in a positive competitive advantage (Ioannou and Serafeim, 2014; Porter and Kramer, 2011). In absence of a systematic and structured approach to implement sustainable practices; the companies of this industry were found to be communicating sustainability initiatives in a variety of ways. This makes it difficult for the stakeholders to compare performances of different companies. The proposed SRF-T/A was developed specifically for the textile and apparel industry and was reviewed by industry experts to ensure its applicability for the industry. The SRF-T/A can help a company collect sustainability related information throughout the supply chain enhancing the possibility to perform internal and external benchmarking. Comparing companies within or across industries could initiate the implementation of newer sustainable practices and thus boost the movement towards sustainable development at a significantly faster rate.

In addition, some other conclusions can be made with reference to the present study. The SRF-T/A proposed in this study follows the organization of the GRI reporting guidelines. Hence the developed framework can be used in accordance with GRI guidelines as a sector

reference for textile and apparel industry thus enabling cross comparisons of different companies of the industry by stakeholders and investors.

Although the recent changes in business environment have prompted researchers to pay attention to the concept of sustainability, it was found that the articles published in the research journals for this industry focus only on sustainable practices for specific parts of the textile and apparel supply chain. Thus the literature available does not provide a consolidated picture of all the sustainability related issues for the multifarious textile and apparel industry. The proposed framework was developed based on two industry frameworks and an extensive literature review not restricted to research articles. Hence this study advances knowledge in the sustainability literature by providing a complete picture of all the sustainability issues and related aspects of environmental sustainability, social sustainability and economic sustainability.

The proposed SRF-T/A also offers managerial contribution. The developed framework can be used as a reference by the industry along with the GRI guidelines to produce standardized sustainability reports. It was found that various brands were selective in implementation of sustainability activities across their supply chains. The reference framework can help the companies to identify the opportunities and expand their sustainability efforts as the framework provides an exhaustive list of industry specific possible initiatives. Additionally, with the increasing stakeholder scrutiny and growing consumer demand for sustainable products, a company can integrate sustainability initiatives by using the reference framework and leverage these efforts to increase brand value and

create a distinctive sustainable proposition that will differentiate the brand within the industry.

5.2.2 Insights of sustainable development in the textile and apparel industry

Twenty-one US based apparel companies were selected as a sample to gain insights on sustainable development practices in the textile industry. Some general insights were gained regarding the efforts made by the sample companies towards sharing of sustainability information with the stakeholders. These insights are discussed in the following sections.

First, practice of sharing sustainability information by the companies with consumers and other stakeholders is gaining importance in the business environment. According to Ioannou and Serafeim (2014), this practice makes the company more transparent and is helpful in building effective communication channels between the company and its stakeholders. However, it was found that only 18 out of the 21 sample companies had publicly available sustainability information with different degrees of details and focuses. Three companies had no publically available information on their sustainability initiatives.

Second, the importance of sharing the sustainability related information via a formal reporting system has been emphasized in the literature (GRI, 2002; Ioannou and Serafeim, 2014). The purpose of a sustainability report is to provide information to investors, stakeholders and the general public about the company's activities around social, environmental and governance issues in one document (Ioannou and Serafeim, 2014). It was however found that, only six of the 21 sample companies' published formal reports with

information related to sustainability initiatives while 12 companies have sustainability related information on their websites. While lacking government requirement may be a contributing factor, a major reason might be related to the lack of a standard reporting guidelines specially for the textile and available industry.

Finally, it was also found that there is no normalization in the scope of sustainability information shared by the sample companies. Not all of the sample companies provided information related to the three dimensions of sustainability in their sustainability reports. The result of content analysis demonstrates plentiful communication with regards to the efforts within the social dimension followed by the environment dimension. The economic dimension was however meagerly discussed as a part of the sustainability report by many companies. One of the possible reasons could be that many companies' especially public companies provide economic related information in a separate annual report. However, importance of presenting and explaining a company's financial and non-financial (environmental, social, and governance) performance together in one integrative report has been emphasized (Busco et al., 2013; Eccles and Krzus, 2010; IIRC, 2015). Hence it can be of advantage for companies to practice integrative reporting thereby sharing information reflective of all the three dimensions of sustainability.

The content analysis of the sustainable practices employed by the sample companies towards sustainability demonstrated that there is no consensus around the scope of the measurement of aspects within different dimensions of sustainability. Some sample companies provided sustainability related information in detail while others provided

information in brief. This may be because of absence of industry specific guidance to report information.

The results of the analysis demonstrated that all of the companies are making some efforts towards environmental sustainability and all of the environmental aspects were addressed to some extent by all the 18 sample companies. It was found that information related to aspects like energy and compliance was disclosed by most of the companies. However information on aspects like recyclability of products and trade of recycled products was not shared by the sample companies. Similar results were demonstrated by information for social dimension. It was found that all of the sample companies are making some efforts towards social sustainability as information on all of the social aspects (100 %) were disclosed to some extent by the sample companies. It was found that information related to aspects like employment and labor laws, occupational health and safety, human rights, society/ community, compliance and supplier assessment was disclosed with all the sample companies taking some initiative towards these aspects. However, information on aspects like product responsibility and customer relation was least shared by the sample companies. As mentioned earlier, not all of the sample companies shared information with respect to the economic dimension of sustainability. It was found that the most widely disclosed aspect within this dimension was economic performance, closely followed by ethical business practices. Companies and the stakeholders can use the results to gain insight on the industry's collective contribution towards sustainable development. This information can be helpful to identify the main sustainability gaps and establish a (joint) action plan by the

companies to improve the performance of the whole industry by attempting to diversify the efforts further.

5.3 Research Limitations

While the findings of this study provide meaningful contributions to both the literature and practitioners of sustainable development in textile and apparel industry, this study has a several limitations. These are discussed in the below sections.

5.3.1 Sustainability reference framework for the textile and apparel industry (SRF-T/A)

The SRF-T/A proposed in this study is a result of comparative analysis of two established models. While these two strategically selected models are most comprehensive with GRI designed for all industries and the Higg Index for textile and apparel industry, it is still possible that the proposed framework does not represent an exhaustive list of sustainability measurement criteria.

The proposed SRF-T/A aims to capture the key issues for the textile and apparel industry, it should be emphasized that it would be impossible to translate all the industry issues into indicators of sustainable development. Nevertheless, as mentioned by the reviewers of the framework, the framework is very comprehensive given its scope.

The developed SRF-T/A aims to extract extensive information regarding the sustainability initiatives of a company and its supply chains and hence can be a time consuming activity. The framework however follows similar format as the GRI and hence

would not be difficult to implement for the companies that are already following the GRI guidelines for reporting.

5.3.2 Insights of sustainable development in the textile and apparel industry

The study examines the efforts of the textile and apparel industry towards sustainable development by applying the SRF-T/A developed in this study. Since the sustainability related information is self-reported by each company, there can be a possibility of bias in representation of the information in the reports.

The company published sustainability information examined is collected from a selective sample of companies in the textile and apparel industry. While the work of the examination can be repeated for a larger scope of companies in the industry, the results of this study can only provide perspectives and insights. Generalization of the results from this examination is suggested to be carried out with caution.

5.4 Future Research

For academic researchers interested in the field of sustainable development specifically for textile and apparel industry, the developed SRF-T/A provides opportunities for future research. The SRF-T/A provides an exhaustive list of possible sustainability initiatives that can be implemented, measured and reported by the companies of textile and apparel industry. Since the concept of sustainability is growing at a fast pace and its scope is changing frequently, there is opportunity to improve the framework with new possible sustainability

initiatives. Future research can also look into regulations and directions in the EU as they tend to lead the charge in sustainability.

The SRF-T/A attempts to provide a comprehensive and inclusive picture of sustainability issues specific to the textile and apparel industry. From the practical perspective it may be time consuming for a company to implement the SRF-T/A. Hence further work can be done to make modifications from practical perspective.

The developed SRF-T/A comprises the possible measurement indicators for various types of businesses of the textile and apparel industry such as brands, retailers and suppliers. This presents an opportunity to further divide the indicators of the framework into smaller models specific for different businesses in the textile and apparel industry. For example, there can be separate models for retailers, brands and manufacturers.

The study examines the efforts of the textile and apparel industry towards sustainable development by applying the SRF-T/A developed in this study. For the purpose, the study selected a sample of apparel companies based in the US. Further work can be done to assess the sustainability trend of other segments of the industry like manufacturers and suppliers. Additionally, further studies can also aim to compare companies at a global level benchmarking the company information against the developed SRF-T/A.

In summary, sustainable development is dynamic and multifaceted which makes it a complex concept. Therefore integrating sustainability into company's every day activities, its measurement and reporting is a difficult task. This task becomes more complicated with no consensus around what and how company's initiatives should be assessed and reported. The

scope of possible sustainable practices is broad for the textile and apparel industry given its diverse nature and global supply chains. This means that collective effort towards sustainable development by various companies can have enormous impact on the environment and society. Many companies have taken initial steps towards sustainability and are exploring opportunities to integrate the concept of sustainable development into their business operations. Companies realize that embracing sustainable activities can assist in taking advantage of the opportunities and managing the risks along with helping them achieve economic growth with the assurance of social and environmental protection.

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APPENDICES

APPENDIX A

List of review questions provided to the industry experts.

A. General Information

1. How important is the reporting of sustainability initiatives for T/A industry?
2. How useful is reporting for companies and is it to any extent used for making decisions within the company?

B. Frameworks used by the T/A industry

1. What are the popular sustainability frameworks that are currently being used by the industry?
2. What are some of the limitations of these frameworks: GRI and Higg Index or any other?

C. Review of the proposed framework

1. Considering the proposed framework, is there any part of the framework that you would suggest to change? If yes, please list and explain
2. Considering the proposed framework, is there anything that you would like to add to the framework?
3. Considering the proposed framework, is there anything that according to you are not applicable to the T/A industry?
4. How difficult will it be for a company to use the framework for reference purposes while reporting its sustainability initiatives?
5. Any other comments or suggestions with regards to the proposed framework?

APPENDIX B

Company shares of apparel and footwear: % Value 2009-2013. (Source: Euromonitor International, 2014).

Company	2009	2010	2011	2012	2013
Nike Inc.	3.8	3.5	3.8	4.3	4.6
Gap Inc.	3.4	3.2	3	3.1	3.3
Wal-Mart Stores Inc.	2.6	2.4	2.2	2.3	2.2
Hanesbrands Inc.	1.8	1.9	1.8	1.9	2
VF Corp	1.5	1.5	1.8	1.8	1.9
Phillips-Van Heusen Corp	0.7	1	1.1	1.3	1.6
Ralph Lauren Corp	1.1	1.1	1.3	1.3	1.4
Target Corp	1.4	1.3	1.3	1.3	1.3
Adidas America Inc.	1.2	1.3	1.4	1.3	1.3
Levi Strauss & Co	1.3	1.3	1.3	1.3	1.3
Jones Apparel Group Inc.	1.2	1.3	1.2	1.1	1.1
Limited Brands Inc.	1	1	1	1.1	1.1
Carter's Inc.	0.8	0.8	0.9	0.9	1
Forever 21 Inc.	0.7	0.7	0.8	0.9	0.9
American Eagle Outfitters Inc.	0.8	0.8	0.8	0.8	0.8
Fruit of the Loom Inc.	0.8	0.7	0.8	0.8	0.8
Chico's FAS Inc.	0.5	0.5	0.6	0.7	0.7
Abercrombie & Fitch Co.	0.8	0.8	0.8	0.8	0.7
Under Armour Inc.	0.3	0.4	0.4	0.5	0.7
Kohl's Corp.	0.6	0.6	0.6	0.7	0.7
JC Penney Co Inc.	0.5	0.5	1	0.7	0.6
Ann Inc.	-	-	0.6	0.6	0.6
J Crew Group Inc.	0.4	0.5	0.5	0.6	0.6
Express Inc.	-	0.5	0.6	0.6	0.6
Wolverine World Wide Inc.	0.4	0.4	0.5	0.5	0.5
Payless Holdings	-	-	-	0.5	0.5
H&M Hennes & Mauritz (USA)	0.3	0.3	0.4	0.4	0.5
Skechers USA Inc.	0.5	0.7	0.4	0.4	0.5

Table Continued

Company	2009	2010	2011	2012	2013
Deckers Outdoor Corp	0.4	0.4	0.5	0.5	0.5
Aéropostale Inc.	0.5	0.5	0.5	0.5	0.5
LVMH Moët Hennessy Louis Vuitton Inc.	0.4	0.5	0.5	0.4	0.4
Steve Madden Ltd	0.2	0.2	0.3	0.3	0.4
Children's Place Retail Stores Inc.	0.4	0.4	0.4	0.4	0.4
The Columbia Sportswear Co.	0.3	0.4	0.4	0.4	0.4
Garan Inc.	0.3	0.3	0.3	0.3	0.4
Perry Ellis International Inc.	0.3	0.3	0.3	0.3	0.3
Hugo Boss AG	0.2	0.3	0.3	0.3	0.3
Timberland Co, The	0.4	0.5	0.3	0.3	0.3
Gymboree Corp	0.3	0.3	0.3	0.3	0.3
New Balance Athletic Shoe Inc.	0.3	0.3	0.3	0.3	0.3
Payless ShoeSource Inc.	0.7	0.6	0.6	-	-
Liz Claiborne Inc.	0.7	0.6	-	-	-
AnnTaylor Stores Corp.	0.5	0.5	-	-	-
Express LLC	0.5	-	-	-	-
Others	65.3	65	64.2	62.9	61.8
Total	100	100	100	100	100

APPENDIX C

Result of the comparative analysis of the contents of GRI and Higg Index for environmental dimension.

Aspects	Indicator Categories	Indicator	In GRI	In Higg Index	In Literature
Materials	Consumption	Total materials consumption by weight or volume for product manufacturing including sampling	Yes	Yes	
		Percentage of materials used that are recycled input materials for product manufacturing	Yes		
		Percentage of materials used that are from renewable resources for product manufacturing			Yes
		Percentage of materials used that are from non-renewable resources for product manufacturing			Yes
		Percentage of materials used that are from natural resources for product manufacturing			Yes
		Percentage of materials used that are man-made or synthetic for product manufacturing			Yes
		Percentage of materials used that are organically produced for product manufacturing			Yes
	Reduction	Reduction in total amount of materials used by weight or volume for product manufacturing including sampling		Yes	
	Efficiency	Manufacturing efficiency by change in amount of seconds/rejects and by data tracking (e.g. cut-to-ship ratio, cut-to-package ratio)		Yes	

Table Continued

Aspects	Indicator Categories	Indicator	In GRI	In Higg Index	In Literature	
Energy	Consumption	Total energy consumption (within and outside) the organization e.g. purchased electricity, steam, natural gas, methane, ethanol, biomass	Yes	Yes		
		Total energy requirements for product manufacturing			Yes	
		Percentage of energy used that are from renewable resources (e.g., wind, solar, hydro-electric, geothermal, biomass)			Yes	
	Reduction	Reduction in total energy consumption (within and outside) the organization	Yes	Yes		
		Reductions in energy requirements of product manufacturing	Yes	Yes		
	Efficiency	Energy conservation/ efficiency measures taken e.g. heat exchange or heat recovery, thermal energy storage, computerized facility climate control			Yes	
		Energy intensity	Yes			
	Water	Consumption	Total water consumption (e.g. municipal water, surface water (river, stream lake, ocean), well water, reclaimed water) by organization and for product manufacturing	Yes	Yes	
Water sources significantly affected by withdrawal of water			Yes			
Reduction		Reduction in water consumption by the organization and for product manufacturing		Yes		
Efficiency		Water conservation/ efficiency measures taken e.g. wastewater recycling, rainwater storage			Yes	
		Percentage of water recycled and reused by the organization and product manufacturing	Yes	Yes		

Table Continued

Aspects	Indicator Categories	Indicator	In GRI	In Higg Index	In Literature
Packaging	Consumption	Total volume of packages and packaging material used for product and transport packaging			Yes
	Reduction	Reduction in product and transport packaging material		Yes	
		Reduction in secondary materials - adhesives, labels, foils, colorants, inks, seals, liners, laminates, waxes, coatings, etc.		Yes	
	Recycle/ disposal	Percentage of materials used in making packaging that is recycled content		Yes	
		Percentage of packages and packaging material that is reused by the organization			Yes
		Percentage of packages and packaging material going into landfill by the organization			Yes
	Efficiency/ design improvement	Improvement in design and construction techniques based on weight, size and volume, including using less materials and/or lighter materials, while still maintaining packaging functionality		Yes	
	PRSL	Organization policy on adherence to PRSL compliance for packaging material		Yes	
Biodiversity	Ecosystem	Description of significant impacts of activities, products, and services of the organization on the ecosystem			Yes
	Protected areas	Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	Yes		
		Total number habitats protected or restored	Yes		
	Species	Total number of iucn red list species and national conservation list species with habitats in areas affected by operations, by level of extinction risk	Yes		

Table Continued

Aspects	Indicator Categories	Indicator	In GRI	In Higg Index	In Literature
Air Emission	Greenhouse gases	Total emissions of greenhouse gas (ghg)	Yes	Yes	
		Intensity of ghg emissions	Yes		
	Global Warming	Total emissions of gasses (e.g. Co2, CH4, particle emission from printing) and ozone-depleting substances (ODS), NOx, SOx,) that affect global warming	Yes		Yes
	Ozone depleting	Total emissions of ozone-depleting substances (ODS), NOx, SOx,)	Yes		
	Reduction	Reduction in greenhouse gas (ghg) emissions	Yes		
		Reduction in emissions of ODS, NOx, SOx, and other significant air emissions	Yes	Yes	
	Carbon trading	Total amount of carbon trading done in past year by the organization			Yes
Water Effluents	Quality/ quantity	Total quantity and quality water discharge (wastewater production) by the organization and during product manufacturing	Yes	Yes	
		Total number and volume of significant spills (including water, fuel, oil, waste)	Yes		
	Treatment	Percentage of wastewater being treated with primary and secondary treatment		Yes	
	Reuse/ recovery	Total amount of waste water treated and reused			Yes
	Disposal	Total amount of waste water treated and disposed			Yes
		Number of water bodies and related habitats significantly affected by the organization's discharges of water and runoff	Yes		

Table Continued

Aspects	Indicator Categories	Indicator	In GRI	In Higg Index	In Literature
Waste	Quantity	Total quantity of waste generated (e.g. cardboard, paper, plastics, fabric, solvents, dyes, oil/lubricants, metals, glass, wood and others) during product manufacturing		Yes	
		Percentage of hazardous and non-hazardous waste generated during product manufacturing	Yes	Yes	
	Efficiency	Percentage of waste generated that is re-used/re-purposed, upcycled & down cycled and disposed in landfills		Yes	
	Reduction	Reduction in the quantity of waste generated (hazardous and non-hazardous) during product manufacturing		Yes	
	Shipped	Percentage of waste (including seconds/ rejects) shipped internationally	Yes		
Transportation	Consumption	Total amount of fossil fuels (e.g. coal, diesel, gasoline) consumption (within and outside) the organization for transporting products and other goods and materials for the organization's operations, and transporting members of the workforce			Yes
	Reduction	Reduction in emissions and environmental impacts by improving/ optimizing transportation of products by organization and its value chain partners		Yes	
		Reduction in amount of fossil fuels consumption (within and outside) the organization for transporting products and other goods and materials for the organization's operations, and transporting members of the workforce			Yes

Table Continued

Aspects	Indicator Categories	Indicator	In GRI	In Higg Index	In Literature
Transportation (continued)	Efficiency	Percentage increase in high efficiency motors by the organization and its value chain partners		Yes	
	Total impact	Total distance and weight/ volume of products transported via air, land and sea and resulting normalized emissions		Yes	
		Significant environmental impacts of transporting products and other goods and materials for the organization's operations, and transporting members of the workforce	Yes	Yes	
Chemical Management	RSL	Organization policy on adherence to chemical use regulation and RSL compliance in manufacturing, marketing, or sales location by the organization and value chain partners		Yes	
		Improvement achieved in chemicals management performance by organization and value chain partners by prioritizing and selecting alternatives for substances of concern and/or RSLs		Yes	
	Reduction	Reduction in quantity of chemicals and dyes used during product manufacture			Yes
	Recovery	Percentage of chemicals used by recovering and reusing them (for example, with caustic soda) during product manufacture		Yes	

Table Continued

Aspects	Indicator Categories	Indicator	In GRI	In Higg Index	In Literature
Recyclable Products	Product recyclability	Percentage of products sold by the organization that are completely recyclable			Yes
		Percentage of products designed such that material types can be identified and separated for EOU recycling	Yes	Yes	
	Dfe	Percentage of products made by implementing Dfe (design for efficiency) tool			Yes
		Percentage of products made by recycled materials as input materials			Yes
Compliance	Audits	Frequency of audits by an independent third party auditor or an accredited internal auditor for organization's environmental management systems and for identifying potential environmental impacts e.g. quality of air emissions and water effluents		Yes	
	Standards/ legal permits	Number of cases of expired or non-compliant legal requirements/permits for environmental regulations (e.g., air emissions, wastewater, hazardous waste, a general facility-wide environmental permit)		Yes	
	Fines	Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations	Yes		

Table Continued

Aspects	Indicator Categories	Indicator	In GRI	In Higg Index	In Literature
Supplier Assessment		Percentage of suppliers and other value chain partners screened using environmental criteria	Yes		
	Screening	Organization policy on requiring suppliers and other value chain partners to provide self-assessment and also obtain third-party certifications regarding improved environmental/chemical management performance through Lean, Six Sigma, Total Quality Management (TQM), ISO 14001 and adherence to RSL		Yes	
	Training	Organization policy on providing written guidance, support and training to suppliers and other value chain partners to improve their environmental performance across any relevant impact areas (e.g., energy/greenhouse gas emissions, water use, waste, etc.)		Yes	
	Risk assessment	Assessment of the risk factors that impact environmental performance of suppliers and actions taken	Yes	Yes	
General	Internal performance system	Organization policy on establishing a formal environmental management system/ internal metrics aimed at understanding and continually improving organizational environmental performance and product manufacturing		Yes	
	Governance	Organization policy on maintaining a separate department/ management personnel in the organization to manage environmental management performance activities		Yes	

Table Continued

Aspects	Indicator Categories	Indicator	In GRI	In Higg Index	In Literature
General (continued)	Reporting	Reporting of environmental management performance to stakeholders via a formal report such as a Sustainability Report, CSR Report, Integrated Report following international standards by the organization and its suppliers		Yes	
		Organization policy on validating public disclosures on environmental management performance is validated by a third party			Yes
	LCA	Number of products for which a full Life Cycle Assessment has been conducted		Yes	
	Process innovation	Description of development of any new technology or processes that aid in lowering environmental impacts e.g. Low water or water-free textile dyeing, printing and finishing techniques			Yes
	Collaborations	Description of joint/shared training efforts, tools and programs with other companies (for example sharing data from value chain partners)		Yes	
	Grievance mechanisms	Number of grievances about environmental impacts filed, addressed, and resolved through formal grievance mechanisms	Yes		

APPENDIX D

Result of the comparative analysis of the contents of GRI and Higg Index for social dimension.

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature	
Employment and labor laws	Employee type	Total number and rates of new employee hires by age group, gender and region	Yes			
		Percentage of full time, contractual/ part-time/ temporary workers and foreign migrant workers, broken down by region			Yes	
	Compensation and benefits	Benefits provided to full-time employees by significant locations of operation e.g. social insurance, transportation subsidies, child care services, medical insurance			Yes	
		Benefits provided to full-time employees that are not provided to temporary or part-time employees, by significant locations of operation	Yes			
		Return to work and retention rates after parental leave, by gender	Yes			
		Organization policy on full legal wages and severance to laid off employees			Yes	
		Organization policy on wage premiums for overtime and work performed on weekends and holidays, as required by local law for all employees (foreign and homeworkers)			Yes	

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
Employment and labor laws (continued)	Employee type (continued)	Organization policy on adherence to local law for wage deductions for taxes, social insurance, or other legally required purposes for all employees (foreign and homeworkers)		Yes	
		Percentage of workers receiving minimum living wage (compensation meets the basic needs of the worker and provides some discretionary income) as required by the local law		Yes	
		Percentage of workers receiving at least the minimum wage for all regular hours worked as required by the local law		Yes	
		Steps taken by the organization to pay minimum or above minimum wage levels (e.g. product cost model)		Yes	
		Ratio of basic salary and remuneration of women to men by employee category, by significant locations of operation	Yes	Yes	

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
Employment and labor laws (continued)	Legal contracts	Organization policy on providing all workers (home and foreign workers) with a legally recognized, written contract or agreement containing terms of employment, base wage, and wage calculation, skill grade, overtime incentives, benefits and bonus system		Yes	
		Organization policy on providing illiterate workers with full explanation of the content of their contract in the language they understand			
		Organization policy on employee termination (e.g. a collective decision taken by HR/recruitment department and the individual department manager)		Yes	
	Broker screening	Percentage of labor brokers screened by the organization that operate with legally issued license		Yes	
	Diversity and equal opportunity	Organization policy on equal employment opportunity (e.g. age, nationality, religion, gender, disability)		Yes	
		Organization policy on equal opportunities for advancement based on their skills		Yes	

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
Employment and labor laws (continued)	Diversity and equal opportunity (continued)	Organization policy on providing flexibility and the means to workers who suffer with chronic illnesses (e.g. HIV/AIDS) or disabilities		Yes	
		Organization policy on providing equal pay for equal work to all employees at every level			Yes
		Total number of incidents of discrimination and corrective actions taken	Yes		
		Organization policy on composition of governance bodies and breakdown of employees per employee category according to gender, age group, minority group membership, and other indicators of diversity	Yes		
	Hours of Work	Organization policy on documenting hours of work and related details (e.g. overtime, work on weekend, holidays) by the employee		Yes	
		Organization policy on providing all workers mandatory time off (e.g. one day off in every seven (7) day period)		Yes	
		Organization policy on providing workers with breaks during work periods		Yes	
		Organization policy to adherence to legal limits of regular hours and overtime hours of work per week (60 hrs. total)		Yes	

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
Employment and labor laws (continued)	Hours of Work (continued)	Organization policy ensuring that overtime hours of work are voluntary for all employees		Yes	
		Organization monitors production capacity and factors in regular and overtime working hours prior to accepting orders		Yes	
Training and Education	Skills management	Average hours of total training per year per employee by gender, and by employee category	Yes		
		Organization has programs to train employees related to job-specific impacts on labor performance in the value chain and on the organization's social compliance program		Yes	
		Total number of employee development programs for skills management and lifelong learning that support the continued employability of employees e.g. management training, career development, company's social/labor compliance program/system	Yes	Yes	
	Safety procedure	Average hours of training on safety procedures provided to job-specific employees on handling of (hazardous) chemicals per year		Yes	
		Average hours of training provided to employees on usage of machinery per year			Yes

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
Training and Education (continued)	Career development	Steps taken by the organization for succession planning and development of senior / executive management employees		Yes	
		Percentage of employees receiving regular performance and career development reviews, by gender and by employee category	Yes		
	Higher education	Percentage of employees that are financially sponsored by the company for further education			Yes
	Health awareness	Programs undertaken by the organization for employees on health awareness e.g. family planning and reproductive health, disease and illness education (including HIV/AIDS)		Yes	
	Business code of conduct	Programs undertaken by the organization for employees and security personnel to train them regarding company policies on business code of conduct	Yes		
Labor/ Management Relation	Communication	Organization policy on orientation program of new employees (e.g. provide information on the employee handbook, the code of ethics and business conduct)		Yes	
		Minimum notice periods regarding operational changes, including whether these are specified in collective agreements	Yes		

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
<p>Labor/ Management Relation (continued)</p>	<p>Anti-corruption</p>	<p>Frequency of communication and training on anti-corruption policies and procedures to employees and suppliers</p>	<p>Yes</p>		
		<p>Total number of operations assessed for risks related to corruption and the significant risks identified within the organization</p>	<p>Yes</p>		
		<p>Total number of confirmed incidents of corruption and the corrective actions taken by the organization</p>	<p>Yes</p>		
	<p>Anti-competitive behavior</p>	<p>Total number of legal actions for anti-competitive behavior, anti-trust, and monopoly practices and their outcomes in the organization and its N-tier suppliers</p>	<p>Yes</p>		
<p>Occupational Health and Safety</p>	<p>Safety programs</p>	<p>Percentage of total workforce represented in formal joint management-worker health and safety committees to help monitor and advise on occupational health and safety programs</p>	<p>Yes</p>		
		<p>Number of health and safety topics covered in formal agreements with trade unions</p>	<p>Yes</p>		
		<p>Steps taken by the organization on emergency planning, fire safety practices and medical services like first aid and CPR</p>		<p>Yes</p>	

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
Occupational Health and Safety (continued)	Safety programs (continued)	Organization provides gender appropriate safety programs			Yes
		Steps taken by the organization to provide appropriate sanitation and hygiene like clean bathrooms, availability of toilet supplies and potable drinking water		Yes	
	Physical hazard	Type of injury and rates of injury, occupational diseases, lost days, and absenteeism, and total number of work-related fatalities, by region and by gender	Yes		
		Percentage of workers with high incidence or high risk of diseases related to their occupation	Yes		
		Percentage of health issues due to working specially in close proximity of hazardous chemicals and appropriate instruments provided			Yes
		Frequency of conducting physical hazard safety programs (long duration of standing, machinery usage, protective coverings)		Yes	
		Frequency of regular maintenance of all machinery and periodic change in machinery and parts after its useful life.			Yes

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
Occupational Health and Safety (continued)	Physical hazard (continued)	Frequency of regular checks on proper functioning safety guards, safety controls and/ or emergency stops in place, loose electrical wiring of machines with a pinching, puncturing or cutting risk		Yes	
		Frequency of safety checks to ensure proper handling and storage of hazardous chemicals in all operations		Yes	
	Noise level	Organization policy on compliance with international/ national noise levels and providing appropriate instruments to workers in high noise level sections			Yes
	Building structure	Frequency of checks and regular maintenance of the building structures of the organization according to the legal requirements (e.g. avoid fire, load limits, capacity, cracks)			Yes
	Anti-harassment/ abuse	Organization policy on providing written anti-harassment and anti-abuse policies and procedures for the workplace e.g. cultural sensitivities, workplace violence; and workers access to external contacts (union representatives, non-government organizations, women's groups)			Yes

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
Human Rights and Animal Welfare	Freedom of association	Frequency with which organization engages with trade unions to proactively address issues of concerns, needs, views, and request of workers		Yes	
		Organization policy on screening operations and suppliers for risk of violation of right to exercise freedom of association and collective bargaining and actions taken	Yes		
	Forced labor	Organization policy on freedom to foreign workers e.g. free access of original identity cards, work permits and travel documents at any time		Yes	
		Organization policy on screening operations and suppliers for risk for incidents of forced or compulsory labor, and measures to contribute to the elimination of all forms of forced or compulsory labor	Yes		
		Organization policy on hiring related to the ability of an individual to perform the functions of the position being hired for		Yes	

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
Human Rights and Animal Welfare (continued)	Child and juvenile labor	Organization policy on screening operations and suppliers for hiring juvenile workers and ensuring compliance with legal requirements (e.g. working hours, overtime, night shift, dangerous substances, tools and/or equipment)		Yes	
		Organization policy on screening operations and suppliers for risk for incidents of child labor, and measures taken to contribute to the effective abolition of child labor	Yes		
	Indigenous rights	Total number of incidents of violations involving rights of indigenous peoples and actions taken	Yes		
	Animal welfare	Organization policy against animal testing and contributing towards animal welfare			Yes
Society/ Community	Local community	Percentage of operations with implemented local community engagement, impact assessments, and development programs in areas around organization's office, retail outlets and manufacturing	Yes		
		Percentage of material sourced from small and medium enterprises and manufacturers owned by local community/ underrepresented minorities		Yes	

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
Society/ Community (continued)	Local community (continued)	Organization policy on engaging with local community to identify concerns and development opportunities		Yes	
		Percentage of operations with significant actual and potential negative impacts on local communities	Yes		
	NGO	Number of local community development program/projects with NGO partnership in areas around organization's office, retail outlets and manufacturing		Yes	
	Employee engagement	Percentage of employees engaging in voluntary activities for society development programs		Yes	
	Stakeholders engagement	Organization maintains list of stakeholder groups and the basis for stakeholder selection	Yes		
		Frequency of stakeholder engagement by type (participating in multi-stakeholder initiatives, industry groups) and by group	Yes	Yes	
		Organization policy on engaging with stakeholder groups to identify key topics and concerns (e.g. risks and challenges, improvement in working conditions within the value chain) with actions taken and outcome achieved	Yes	Yes	

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
Product Responsibility and Customer Relation	Product and service labeling	Percentage of products provided with labels describing type of contents and other information like sustainability factor that help consumer in product selection			Yes
		Total number of incidents of non-compliance with regulations and voluntary codes concerning product and service information and labeling, by type of outcomes	Yes		
		Organization policy to provide accessible customer service information (such as repair vs. replace guidance) through website, phone customer service, in-store printed materials, trained staff, and/or warranties or similar policies – excluding on-product permanent labeling		Yes	
	Marketing communications	Steps taken by the organization to provide information regarding its sustainability efforts at point of purchase (in store and online) such that consumer have direct access to it			Yes
		Steps taken by the organization for mapping product to source		Yes	

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
Product Responsibility and Customer Relation (continued)	Marketing communications (continued)	Percentage of banned or disputed products sold as per local/national/international laws	Yes		
	Customer health and safety	Percentage of significant product and service categories for which health and safety impacts are assessed for improvement (e.g. dyes, chemicals, quality)	Yes		
		Total number of incidents of non-compliance with regulations and voluntary codes concerning the health and safety impacts of products and services during their post purchase life cycle, by type of outcomes	Yes		
	Consumer education	Percentage of products with label/ information card for consumer to reduce resource (energy, water) consumption and environmental impacts during product use and care			Yes
		Percentage of products with label/ information card for consumer to appropriately dispose product after use			Yes
	Customer privacy	Assessment of results of surveys measuring customer satisfaction and significant action taken	Yes		
		Total number of substantiated complaints regarding breaches of customer privacy and losses of customer data	Yes		

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
Product Responsibility and Customer Relation (continued)	Fair trade	Organization policy on fair trade practices			Yes
Compliance	Audits	Frequency of audits by an independent third party auditor or an accredited internal auditor for organization's social management systems			Yes
	Standards/ legal permits	Percentage of products that undergo quality assurance (e.g. material durability) using industry standards (e.g. ISO, ASTM)			Yes
		Number of cases of non-compliant legal requirements for social (e.g. human right, labor laws) regulations as required by the local, national or international laws			Yes
	Fines	Monetary value of significant fines for non-compliance with laws and regulations concerning the provision and use of products and services	Yes		
		Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with social regulations	Yes		

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
Supplier Assessment	Screening	Percentage of suppliers and other value chain partners screened using criteria for social impacts	Yes		
		Organization policy on requiring suppliers and other value chain partners to provide self-assessment and also obtain third-party certifications regarding effective social compliance management systems		Yes	
		Organization policy on compliance with any leading international labor standards (e.g. ILO) and requires same for value chain partners		Yes	
	Training	Organization policy on providing written guidance, support and training to suppliers and other value chain partners to improve their social performance		Yes	
	Risk assessment	Assessment of significant actual and potential negative impacts for social performance in the supply chain and actions taken	Yes		
		Assessment of risk factors that impact labor standards performance of value chain partners (e.g. production / manufacturing processes risk factors)		Yes	
		Organization policy on analyzing sourcing strategies for social/labor and human rights risks exist sting in different countries for value chain partners		Yes	

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
General	Internal performance system	Organization policy on establishing a formal social performance management system/ internal metrics aimed at monitoring and improving organizational social performance in the value chain (e.g. company code of ethics and business conduct, code of conduct for suppliers and employee, company values and culture)		Yes	
		Organization policy on using metrics for purchasing practices aimed at lessening impact on social/labor performance at supplier/ manufacturer facilities.		Yes	
	Governance	Organization policy on maintaining a separate department/ management personnel in the organization to manage Social performance activities (e.g. internal human resources, and internal employee development and well-being)		Yes	

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
General (continued)	Reporting	Reporting of social management performance to stakeholders via a formal report such as a Sustainability Report, CSR Report, Integrated Report following international standards by the organization and its suppliers		Yes	
		Organization policy on validating public disclosures on social performance by a third party		Yes	
	SLCA	Number of products for which a full Social Life Cycle Assessment has been conducted to understand social performance impacts, strategy and priorities		Yes	
	System innovation	Description of development of any new system that aim at monitoring and improving organizational social performance in value chain			Yes
	Collaborations	Description of joint/shared training efforts, tools and programs with other companies		Yes	

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
General (continued)	Grievance mechanisms	Number of grievances about impacts on society, labor practices and human rights filed, addressed, and resolved through formal grievance mechanisms	Yes		
		Organization policy on grievances raised by workers or external stakeholders (for e.g. keeping them confidential, addressing on time, no negative consequences for reporters)		Yes	

APPENDIX E

Result of the comparative analysis of the contents of GRI and Higg Index for economic dimension.

Aspects	Indicator category	Indicator	In GRI	In Higg Index	In Literature
Economic Performance	Profit	Total revenues and profit generated by the company in one fiscal year.			Yes
	Investment	Total operating costs in one fiscal year.			Yes
		Total investment in research and development in one fiscal year.			Yes
		Total coverage of the employee benefit plan obligations	Yes		
	Shareholders remuneration	Total payments to providers of capital in one fiscal year (shareholders, bondholders, investors)			Yes
	Community	Total payments to government in form of taxes and related penalties at local, national and international level	Yes		
		Total amount of donations and investment of funds to charitable (non-profit, NGO) organizations or projects	Yes	Yes	
		Percentage of spending on local suppliers at significant locations of operation	Yes		
	Aids	Financial assistance received from government	Yes		
		Total value of political contributions by country and recipient/beneficiary	Yes		

Table Continued

Aspects	Indicator Category	Indicator	In GRI	In Higg Index	In Literature
Economic Performance (continued)	Indirect economic impacts	Development and impact of infrastructure investments and services supported	Yes		
		Significant indirect economic impacts, including the extent of impacts (e.g. economic development in areas of high poverty, economic impact of improving or deteriorating social or environmental conditions or availability of products and services for those on low incomes)	Yes		
Ethical Business Practices	Book keeping	Organization policy on book keeping ensuring accuracy and transparency in financial reporting			Yes
	Anti-corruption	Total number of legal actions for anti-competitive behavior, anti-trust, and monopoly practices	Yes		
Risk Management	Risk/opportunities	Financial implications and other risks and opportunities for the organization's activities due to climate change	Yes		
		Financial implications and other risks and opportunities for the organization's activities affecting society and workers			Yes

APPENDIX F

Result of content analysis against the developed SRF-T/A for environmental dimension.

Aspects	Indicator Categories	Gap	Hanes brand	VF	PVH	RL	Levi's	JAG	L Brands	Forever 21	AEO	FoL	A&F	Ann Inc	J Crew	Express	Aero	Childrens Place	Perry Ellis
Materials	Consumption		x	x	x														x
	Reduction		x	x	x		x		x			x		x	x				
	Efficiency		x	x			x							x					
Energy	Consumption	x	x	x	x	x			x						x				
	Reduction	x	x	x	x	x	x		x		x	x	x	x	x				
	Efficiency		x	x	x	x	x		x	x	x	x	x	x	x				x
Water	Consumption	x	x	x	x		x						x						
	Reduction	x	x	x	x		x		x			x	x		x				
	Efficiency		x	x	x		x		x			x							
Packaging	Consumption			x	x	x								x					
	Reduction		x	x	x	x			x		x	x		x	x				x
	Recycled/ disposal		x	x	x	x			x	x	x	x		x	x				x
	Efficiency/ design		x	x		x			x		x	x		x	x				
	PRSL		x																
Biodiversity	Ecosystem	x	x	x	x		x		x										
	Protected areas																		
	Species				x														
Air Emissions	Greenhouse Gases	x	x	x	x	x	x		x			x	x	x					
	Global Warming		x				x					x	x	x					
	Reduction	x	x	x	x		x		x			x	x	x					
	Carbon trading/										x								
Water Effluents	Quality/ quantity	x	x	x	x		x		x		x								
	Treatment		x	x	x		x		x		x								
	Reuse/ recovered	x	x	x	x		x												
	Disposal		x	x	x		x		x		x								

Table Continued

Aspects	Indicator Categories	Gap	Hanes brand	VF	PVH	RL	Levi's	JAG	L Brands	Forever 21	AEO	FoL	A&F	Ann Inc	J Crew	Express	Aero	Childrens Place	Perry Ellis
Waste	Quantity		x	x	x						x	x							
	Reduction	x	x	x	x		x		x		x	x	x	x	x				
	Efficiency		x	x	x		x		x		x	x	x	x					
	Shipped																		
Transportation	Consumption/ Total		x	x	x	x			x		x	x							
	Reduction		x	x	x	x			x		x	x		x					
	Efficiency		x	x	x	x			x	x	x	x		x					
Chemical Management	RSL	x	x	x	x		x	x	x					x			x		
	Biodegradable											x							
	Recovery /Zero			x	x		x		x				x						
Recyclable Products	Product recyclability		x	x					x										
	DFE																		
Compliance	Audits	x	x	x	x				x			x		x	x	x			
	Standards/ legal	x	x	x	x			x	x			x	x	x	x	x		x	
	Fines																		
Supplier Assessment	Screening	x	x	x			x		x			x		x	x	x	x		
	Training			x	x		x		x						x	x			
	Risk Assessment	x			x		x		x					x					
General	Internal performance	x	x	x	x	x								x					
	Governance	x	x	x	x		x				x	x	x	x					
	Reporting	x	x	x	x				x		x		x	x					
	LCA		x	x			x												
	Process innovation	x	x	x	x		x												
	Collaborations	x	x	x	x		x		x		x			x	x				
Grievance mechanisms										x									

APPENDIX G

Result of content analysis against the developed SRF-T/A for social dimension.

Aspects	Indicator Category	Gap	Hanes brand	VF	PVH	RL	Levi's	JAG	L Brands	Forever 21	AEO	FoL	A&F	Ann Inc	J Crew	Express	Aero	Childrens Place	Perry Ellis
Employment and labor laws	Employee type	x		x	x	x	x				x		x						
	Legal contracts		x	x	x		x	x		x	x	x							
	Compensation and benefits	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Broker screening			x		x		x	x		x	x		x	x		x	x	
	Diversity and equal	x		x	x	x	x	x	x	x	x		x	x	x	x	x	x	x
	Hours of Work	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Training and Education	Skills management	x		x	x	x	x	x	x		x	x	x	x		x			
	Career development	x	x	x	x		x		x					x					
	Higher education		x	x	x		x												
	Health awareness			x	x	x	x						x	x	x				
	Code of Conduct	x	x	x	x	x	x	x	x	x	x		x	x		x		x	
Labor/ Management Relations	Communication	x		x	x	x					x	x		x				x	
	Anti-corruption	x		x		x	x	x	x		x			x		x			
	Anti-competitive behavior								x							x			
Occupational Health and Safety	Safety programs			x		x	x	x	x	x	x	x	x	x	x	x		x	x
	Physical hazard	x		x		x	x	x	x	x	x	x	x	x	x		x	x	x
	Noise level			x		x	x	v				x	v		x			x	
	Building structure	x		x	x	x	x	x	x		x	x	x	x	x		x		
	Anti-harassment/ abuse	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x
Human Rights / Animal Welfare	Freedom of association	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Child and juvenile labor	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Forced labor	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Indigenous rights	x		x		x	x				x		x						x
	Animal welfare		x	x		x	x	x	x		x			x	x				
Society/ Community	Local community	x	x	x	x	x	x		x	x	x		x	x	x	x	x	x	x
	NGO's	x	x	x	x		x	x	x		x		x	x	x				
	Employee engagement	x	x	x	x	x	x		x		x		x	x	x	x	x		
	Stakeholders engagement	x		x	x	x	x	x	x		x	x	x	x	x				

Table Continued

Aspects	Indicator Category	Gap	Hanes brand	VF	PVH	RL	Levi's	JAG	L Brands	Forever 21	AEO	FoL	A&F	Ann Inc	J Crew	Express	Aero	Childrens Place	Perry Ellis
Product Responsibility and customer relation	Product and service			x		x	x	x	x		x		x				x		
	Marketing communications			x									x			x			
	Consumer education		x	x			x												
	Customer health and	x	x	x	x			x	x		x		x			x	x		
	Customer privacy															x			
Fair trade			x																
Compliance	Audits	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Standards/ legal permits		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Fines			x															
Supplier Assessment	Screening	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Training		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	Risk Assessment			x	x		x	x	x					x	x		x	x	
General	Internal performance	x		x	x	x	x	x		x				x				x	
	Governance	x	x	x	x		x				x		x	x					
	Reporting	x	x	x	x	x			x		x		x	x					
	SLCA																		
	System innovation			x	x		x												
	Collaborations	x	x	x	x	x	x		x		x	x	x	x	x				
Grievance mechanisms		x	x	x	x			x		x	x								

APPENDIX H

Result of content analysis against the developed SRF-T/A for economic dimension.

Aspects	Indicator category	Gap	Hanes brand	VF	PVH	RL	Levi's	JAG	L Brands	Forever 21	AEO	FoL	A&F	Ann Inc	J Crew	Express	Aero	Childrens Place	Perry Ellis
Economic Performance	Profit			x									x						
	Investment			x					x		x					x			
	Shareholders remuneration			x															
	Community	x	x	x	x	x	x		x	x	x		x	x		x			
	Aids			x		x			x										
	Indirect economic impacts			x															
Ethical Business Practices	Book keeping					x	x		x			x				x			
	Anti-corruption							x	x					x		x			
Risk	Risk/opportunities			x		x													