

Measuring Environmental and Social Sustainability in the Apparel Supply Chain

by

Sophie Elise Agbonkhese

BBA

Acadia University, 2006

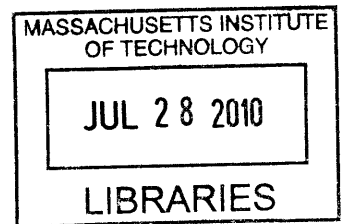
Submitted to the Engineering Systems Division in Partial Fulfillment of the Requirements for the Degree of

Master of Engineering in Logistics

at the

Massachusetts Institute of Technology

June 2010



ARCHIVES

© 2010

Sophie Agbonkhese

All rights reserved.

The author hereby grants to MIT permission to reproduce and to distribute publicly paper and electronic copies of this document in whole or in part.

Signature of Author.....
Master of Engineering in Logistics Program, Engineering Systems Division
May 7, 2010

Certified by.....
Executive Director, MIT SCALE Network in Latin America
Thesis Supervisor

Accepted by.....
Professor, Engineering Systems Division
Professor, Civil and Environmental Engineering Department
Director, Center for Transportation and Logistics
Director, Engineering Systems Division

Measuring Environmental and Social Sustainability in the Apparel Supply Chain

by

Sophie Agbonkhese

Submitted to the Engineering Systems Division
on May 7, 2010 in Partial Fulfillment
of the Requirements for the
Degree of Master of Engineering in Logistics

ABSTRACT

Historically, the apparel industry has operated in an unsustainable way. Materials, energy, and other resources are used inefficiently throughout the apparel supply chain, leading to unsustainable levels of waste generation. Post-purchase use and disposal are rarely considered during the design and production of apparel products. Apparel companies are becoming more cognizant of their environmental impact and are implementing sustainability programs to counteract these issues. The field of sustainable supply chain management is a relatively new concept and companies face the challenges of choosing sustainability initiatives, measuring the success of those initiatives, and assessing their overall progress toward sustainability. This thesis addresses these three challenges. First, it compiles a comprehensive set of nearly 300 sustainability initiatives used by eight apparel companies. Second, it documents the initiatives' associated metrics, which were found to exist for only 30 percent of the initiatives. Third, it provides a system for measuring overall corporate sustainability through an initiative classification scheme. It was determined that three of the eight companies studied embody the highest level of corporate sustainability. The industry has made progress toward becoming more sustainable, but cannot be truly sustainable until systemic changes are made to the design, production, use, and disposal stages of the apparel product life cycle.

Thesis Supervisor: Dr. Edgar Blanco

Title: Research Director at the MIT Center for Transportation & Logistics and

Executive Director of the MIT SCALE Network in Latin America

ACKNOWLEDGEMENTS

I would like to express my profound gratitude to the following people:

1. Dr. Edgar Blanco, my thesis advisor, whose passion for and knowledge of supply chain sustainability issues contributed substantially to the evolution of my thesis and my interest in the topic. Thank you for supporting my idea for this thesis and for allowing me to explore many possible approaches before settling on this one. It has been a privilege working with you.
2. Dr. Bill Haas, writing coach extraordinaire, for sitting with me for countless hours to revise my work. Your feedback will influence my writing for many years, and for this I cannot thank you enough.
3. Cara Chacon, Director of Social & Environmental Responsibility at Patagonia, for taking time out of her hectic schedule to answer my sustainability questions. Her willingness to share information is representative of Patagonia's collaborative approach to sustainability.
4. Ben, Eva, and Amani, my patient and loving family. Words cannot express how grateful I am to you for your support during the writing of my thesis and the completion of the MLOG program.
5. The MLOG Class of 2010, whose friendship and encouragement kept me grounded all year. I am so fortunate to have had the opportunity to meet you all and learn with you.
6. Karla Decker, for her detailed feedback on my final drafts.

TABLE OF CONTENTS

| | |
|--|----|
| ABSTRACT | 2 |
| ACKNOWLEDGEMENTS | 3 |
| LIST OF FIGURES | 6 |
| LIST OF TABLES | 6 |
| 1 INTRODUCTION | 7 |
| 1.1 OVERVIEW OF THESIS | 8 |
| 1.2 SUMMARY OF FINDINGS | 9 |
| 2 THE APPAREL INDUSTRY | 13 |
| 2.1 APPAREL INDUSTRY PLAYERS | 14 |
| 2.2 APPAREL PRODUCT LIFE CYCLE | 15 |
| 2.3 SUMMARY | 17 |
| 3 LITERATURE ON SUSTAINABLE SUPPLY CHAINS AND METRICS | 18 |
| 3.1 SUSTAINABLE SUPPLY CHAIN MANAGEMENT | 19 |
| 3.1.1 DEFINING THE SUSTAINABLE SUPPLY CHAIN..... | 20 |
| 3.1.2 THE DIMENSIONS OF SUSTAINABILITY | 22 |
| 3.1.3 ADVANTAGES OF SSCM..... | 24 |
| 3.2 SUSTAINABILITY IN THE APPAREL SUPPLY CHAIN | 24 |
| 3.3 METRICS FOR MEASURING INDIVIDUAL SUSTAINABILITY INITIATIVES | 27 |
| 3.3.1 TYPES OF SUSTAINABILITY METRICS | 27 |
| 3.3.2 FORMAT OF METRICS..... | 28 |
| 3.4.1 SAMPLE METRICS | 29 |
| 3.4 MEASURING CORPORATE SUSTAINABILITY LEVELS | 31 |
| 3.5 SUMMARY | 36 |
| 4 DATA COLLECTION AND ORGANIZATION | 37 |
| 4.1 DATA COLLECTION | 37 |
| 4.2 DATABASE CREATION | 39 |
| 4.2.1 SUSTAINABILITY DIMENSIONS..... | 39 |
| 4.2.2 COMPANIES..... | 40 |
| 4.2.3 INITIATIVES..... | 40 |
| 4.2.4 SUPPLY CHAIN STAGE | 40 |
| 4.2.5 METRICS | 41 |
| 4.2.6 TARGETS..... | 42 |
| 4.2.7 PAGE REFERENCE | 42 |
| 4.2.8 CLASSIFICATIONS..... | 42 |
| 4.3 SUMMARY | 48 |

5 SUMMARY OF FINDINGS 49

5.1 ANALYSIS OF INITIATIVES AND IDENTIFICATION OF OPPORTUNITIES 51

5.2 METRICS AND THE FOUR TYPES OF SUSTAINABILITY INITIATIVES..... 56

 5.2.1 INDIVIDUAL METRICS 56

 5.2.2 MEASURING CORPORATE SUSTAINABILITY 57

5.3 ONLINE DATABASE 64

5.4 SUMMARY 64

6 KEY INSIGHTS AND RECOMMENDATIONS FOR FUTURE WORK..... 66

LIST OF REFERENCES 68

APPENDIX 1: DATABASE STRUCTURE 74

APPENDIX 2: DETAILS ON THE EIGHT APPAREL COMPANIES..... 75

APPENDIX 3: SEVENTY-THREE SUSTAINABILITY INITIATIVES AND THEIR METRICS 76

APPENDIX 4: TIMBERLAND'S NUTRITIONAL LABEL..... 86

LIST OF FIGURES

| | |
|---|----|
| Figure 1: The Seven-Phase Life Cycle of an Apparel Product..... | 16 |
| Figure 2: The Dimensions of Sustainability | 22 |
| Figure 3: The Product Life Cycle | 41 |
| Figure 4: Allocating the Initiatives to Classifications..... | 48 |

LIST OF TABLES

| | |
|--|----|
| Table 1: A Model of Sustainable Supply Chain Management Practices | 21 |
| Table 2: Sample Sustainability Metrics | 30 |
| Table 3: Typology of CSR Standpoints..... | 32 |
| Table 4: Strategic Approaches to Corporate Involvement in Society..... | 34 |
| Table 5: Comparing Porter's Standpoints to Veleva and Ellenbecker's Stages | 34 |
| Table 6: Comparing Porter & Kramer's Strategies to Veleva and Ellenbecker's Stages | 34 |
| Table 7: Four Sustainability Positions | 35 |
| Table 8: Summary of the Six Categories of Initiatives..... | 46 |
| Table 9: Distribution of Initiatives by Sustainability Dimension and Supply Chain Stage..... | 52 |
| Table 10: Distribution of Initiatives as a Percentage of all Initiatives and as a Percentage of all Initiatives with Metrics | 56 |
| Table 11: Distribution of each Company's Initiatives by Type | 59 |
| Table 12: Distribution of each Company's Initiatives Excluding Social Responsibility | 59 |
| Table 13: Weighting System for the Types of Initiatives | 60 |
| Table 14: Range of Scores for each Sustainability Position..... | 60 |
| Table 15: Sustainability Scores for the Eight Apparel Companies..... | 61 |

Sustainability: the capacity to continue with minimal long-term effect on the environment.

American Heritage Dictionary (2000)

There is no finish line for environmental efforts—we can always go further.

Nike (2009)

1 INTRODUCTION

Companies with sustainable supply chains adapt their design, production, distribution, and promotion strategies to provide socially and environmentally responsible products and services in a profitable way. Sustainable businesses are innovative—they reconceptualize the supply chain and draw on the knowledge of non-traditional allies such as competitors and non-governmental organizations (Pagell & Wu, 2009). They incorporate sustainability into their daily operations and decisions at every level.

Historically, the apparel industry has operated in an unsustainable way. Materials, energy and other resources are used inefficiently throughout the apparel supply chain, leading to unsustainable levels of waste generation. Fashion products have short life cycles and are frequently replaced before the end of their useful lives. Because products often contain synthetic fibers or harmful chemicals that do not decompose readily, this cyclical consumption can generate massive amounts of waste. In addition, the production of natural fibers is water- and energy-intensive, as is the post-purchase maintenance of garments. Further, the global nature of the apparel supply chain leads to a heavy CO₂ footprint and questionable working conditions in developing nation contract factories. Forward-thinking apparel companies are racing to address these issues and create a more sustainable industry.

This thesis examines the supply chain strategies of eight apparel companies that are incorporating sustainability into their businesses. Adidas, Gap Inc., H&M, Mountain Equipment Co-op, Nike, Patagonia, Puma, and Timberland are experimenting with environmentally friendly materials, eliminating wasteful processes, and actively restructuring their suppliers' operations. Cumulatively, these eight companies have implemented close to 300 sustainability initiatives in their supply chains. They are on the leading edge of moving toward sustainability, but still a long way from becoming sustainable.

1.1 OVERVIEW OF THESIS

This thesis explains the sustainability efforts of apparel companies, documents the metrics used to measure their progress, and evaluates the industry's current level of sustainability. It analyzes the sustainability initiatives reported on each company's website and in other publicly available data and categorizes them by supply chain stage and sustainability dimension. Then, it classifies and ranks the initiatives and uses the number and types of initiatives implemented to estimate the companies' commitment to sustainability.

The thesis is divided into five chapters. Chapter 2 surveys the apparel industry and the seven phases of an apparel product's life cycle. The first five phases occur in the pre-consumer apparel supply chain and the last two phases are consumption and post-consumer use. Apparel companies are starting to expand their supply chain focus to include these last two phases of the product life cycle. Chapter 3 reviews the literature pertaining to sustainable supply chains, sustainability in the apparel supply chain, metrics, and sustainability positions. This chapter defines the sustainable supply chain and introduces the four dimensions of sustainability—economic, environmental, external social, and internal social. It also reviews various types of metrics and explains the value of using absolute metrics rather than relative metrics. Finally,

three different models of sustainability strategies are compared and synthesized to define four stances toward sustainability. Chapter 4 summarizes the process of collecting and organizing data. The sustainability initiatives were captured in a Structured Query Language (SQL) database, categorized by supply chain stage and sustainability dimension, and classified. This chapter details the process of developing the classification system based on the initiatives' scalability, cost, rewards, potential for impact, and certainty of outcome. Chapter 5 provides an analysis of the data. The initiatives are aggregated, that is, disassociated with the company names, to identify gaps at the industry level and elicit opportunities for further efforts. A list of metrics used by the eight apparel companies is introduced. The section concludes by describing an online tool I created for interested parties to search the database of apparel industry sustainability initiatives.

1.2 SUMMARY OF FINDINGS

Firms adopt one of four positions toward sustainability: compliant, instrumental (opportunistic), good citizen, or intrinsic (Porter, T., 2008). Compliant firms comply with legal and industry regulations, but have minimal implementation of corporate social or environmental responsibility (CSER). Opportunistic firms, or what Porter defines as instrumental firms, engage in “win-win” CSER by improving facility performance and efficiency to mitigate harm caused by supply chain activities. Good citizen firms transform their supply chains and products to benefit society, while supporting corporate strategy. Firms with an intrinsic position toward CSER focus on long-term issues like resource depletion, and they integrate sustainability into their values, missions, strategies, and operations. Because the apparel supply chain is fragmented and global, it is particularly important that companies aiming to be good citizens or intrinsically sustainable

include suppliers and customers in their sustainability decisions—internal changes alone do not suffice.

The eight companies studied have reported almost 300 supply chain sustainability initiatives, 213 of which are unique. These initiatives are not spread evenly through the supply chain. Over 90 percent of the initiatives involve raw materials, production, or distribution—the first three segments of the supply chain. The remaining 8 percent of initiatives are split between the fourth and sixth segments—transportation and disposal. Of all the initiatives published by the companies, only one of them is focused on the use stage of the product life cycle. Likewise, they are not evenly spread across a variety of sustainability issues. Forty-one percent are focused solely on social responsibility. Thirty-five percent of the initiatives focus specifically on social responsibility in the production segment of the supply chain. This indicates that there is still much opportunity for new sustainability initiatives in the transportation, use, and disposal segments of the supply chain.

Another imbalance exists in the area of metrics. Of 213 unique initiatives, only 73 had stated metrics. While energy and emissions initiatives accounted for only 21 percent of initiatives, they accounted for 41 percent of the metrics. Conversely, social responsibility accounted for 41 percent of the initiatives, but only 8 percent of the metrics. Possible explanations for this are that energy and emissions metrics are more valuable to companies, or that social responsibility initiatives are more often symbolic and thus, more difficult to measure.

To understand the nature of the sustainability initiatives, I classified them into four types:

1. *Symbolic Actions* are initiatives that are not measured. They are low scale and low cost, have low to moderate impact and high certainty of outcome, and offer low to moderate

rewards. If the rewards are not clearly defined, the payback period is difficult to calculate.

2. *Quick Wins* are easily implementable and have a short payback period, usually less than three years. They may be one-time or ongoing projects. The cost is low relative to the rewards, scale, or impact. The outcome is highly certain.
3. *Strategic Projects* require a long-term commitment. They are moderate to high in scale, impact, and cost; moderate to high certainty of outcome; and low to high in rewards. It may be difficult to measure the rewards, but companies pursue these projects in spite of this, because of the long-term potential impact and benefits.
4. *Game Changers* change the rules of the industry. A game changer must have a significant impact on the apparel supply chain or the life cycle of an apparel product. They are high in cost, uncertainty of outcome, scale, impact, and potential rewards. The implementation of game changing initiatives is a hallmark of intrinsically sustainable firms.

The most common type of initiative reported was strategic projects, which accounted for 37 percent, followed by quick wins and symbolic actions at 30 percent each, and finally, game changers, constituting 3 percent of all initiatives. It was anticipated that there would be a high number of symbolic actions and few game changers, but it was surprising to see more strategic projects than quick wins. Strategic projects require significantly higher levels of commitment than quick wins, so it seems logical that quick wins would be more prolific. However, removing the social responsibility initiatives, which are rarely quick wins, from the database caused a 60 percent decrease in the number of symbolic actions and strategic projects but only a 22 percent decrease in the number of quick wins. This corrected the unexpected distribution of the data.

Finally, analysis of the number and types of initiatives showed that all eight companies are at least good citizens, with three classifying as intrinsically sustainable, but opportunities still exist for further reductions in the environmental impact of the apparel industry.

2 THE APPAREL INDUSTRY

The apparel supply chain, and the life cycle of an apparel product, is global and segmented. Apparel brands such as Nike, Gap Inc., and Adidas have fractional ownership of their products' life cycles, and consequently, their products' environmental impacts. Raw materials, works-in-progress, and finished goods traverse the globe and change ownership several times before products reach consumers. Understanding the structure of the apparel supply chain is instrumental in exploring opportunities for sustainability initiatives. Companies' incomplete authority over parts of their supply chains limits their ability to implement sustainability initiatives in those areas.

This section summarizes the players and processes that comprise the apparel supply chain. It also lists some of the countries or regions where these processes predominantly take place. Finally, it discusses the seven phases in the life cycle of an apparel product—fiber production, textile manufacturing, garment manufacturing, distribution, consumption, disposal, and aftermarket—and the types of businesses or consumers involved with each stage.

The information in this section is based primarily on three sources. First, IBISWorld reports described sector activities, market characteristics, industry conditions, key success factors, major players, and industry performance for each subsector of the apparel industry. Second, Jones' *Apparel Industry* (2006) reviewed the UK apparel industry and its place within the global economy. Third, Rivoli's *Travels of a T-Shirt* (2005) provided information on the global nature of the apparel industry as the author followed a T-shirt through its life cycle from a family-owned cotton farm in Texas to its post-consumer life as an export to the used clothing industry of a Third World nation.

2.1 APPAREL INDUSTRY PLAYERS

The apparel industry consists of the companies and activities that convert natural and synthetic fibers into *clothing* and deliver the clothing to consumers (Jones, 2006). This thesis also includes the production and distribution of *footwear* in that definition. Companies who sell apparel products can be grouped into four categories: clothing retailers, shoe retailers, clothing wholesalers, and footwear wholesalers.

Apparel retailers sell their own proprietary brand of clothing, a selection of other brands, or both. The retail clothing market is fragmented with many small players, but four dominant companies—Gap Inc, TJX Companies, Ross Stores, and Abercrombie and Fitch—account for approximately 40 percent of the US market (IBISWorld, 2010a). Likewise, the retail footwear market is highly fragmented, with the top four companies—Collective Brands Inc (Payless), Foot Locker Inc, Brown Shoe Company Inc (Famous Footwear, Warehouse Shoes), and Schottenstein Stores Corporation (DSW Shoe Stores)—capturing 30 percent of the market (IBISWorld, 2010b).

Apparel wholesalers design branded products and sell them through retailers, through their own outlets, or both. In the wholesale market, the footwear segment is highly fragmented with Nike, Adidas, Jones Apparel Group, and Timberland earning approximately one quarter of the market (IBISWorld, 2010c). Finally, the wholesale clothing segment is the most fragmented of all. No firm in either the men's or women's subsector has greater than 5 percent market share. The bestselling brands are LVMH Moet Hennessy Louis Vuitton, VP Corporation (Lee, Wrangler, and Rustler brands), Polo Ralph Lauren Corporation, and Levi Strauss & Co (IBISWorld, 2009a; IBISWorld, 2010d).

One of the difficulties with such a fragmented industry is that, with the exception of a handful of companies, each player is relatively small. Therefore, most individual companies in the industry have difficulty exerting much influence over other members of the supply chain, particularly tier-2 and tier-3 suppliers (those suppliers that companies do not deal with directly). A closer look at the apparel life cycle will reveal why this can be a major issue.

2.2 APPAREL PRODUCT LIFE CYCLE

An apparel product typically goes through seven phases in its life cycle, as shown in Figure 1 below, which is adapted from Jones (2006) and Rivoli (2005). The dark boxes on the right-hand side of Figure 1 note the corresponding supply chain segment for each phase of the product life cycle.

Each of the seven life cycle phases takes place all over the world. The first phase is the production of either natural or synthetic fibers, or both. Cotton, one of the largest raw material inputs in the apparel industry, is grown in the United States, India, Brazil, Australia, most of Northwest Africa, and throughout the Middle East (Cotton Council International, 2010). Synthetic fibers, which were historically produced by American and European firms, are increasingly being produced in China and India (IBISWorld, 2009b).

Fibers are transported to textile mills, which produce fabrics that are then purchased by garment factories. Mills and factories, the second and third phases of the life cycle respectively, are located worldwide, but American companies most often import apparel products from China, Brazil, Indonesia, Italy, Mexico, Taiwan, Bangladesh, Vietnam, and Honduras (American Apparel and Footwear Association, 2008a, 2008b). Apparel produced by garment factories is sent to distribution centers (DCs) around the world. In the fourth stage, products are sorted at DCs and then distributed to regional warehouses or retail outlets. For example, a shirt

manufactured for Zara in Bangladesh would first go through Zara’s DC in Spain before ending up at a Zara store in Boston.

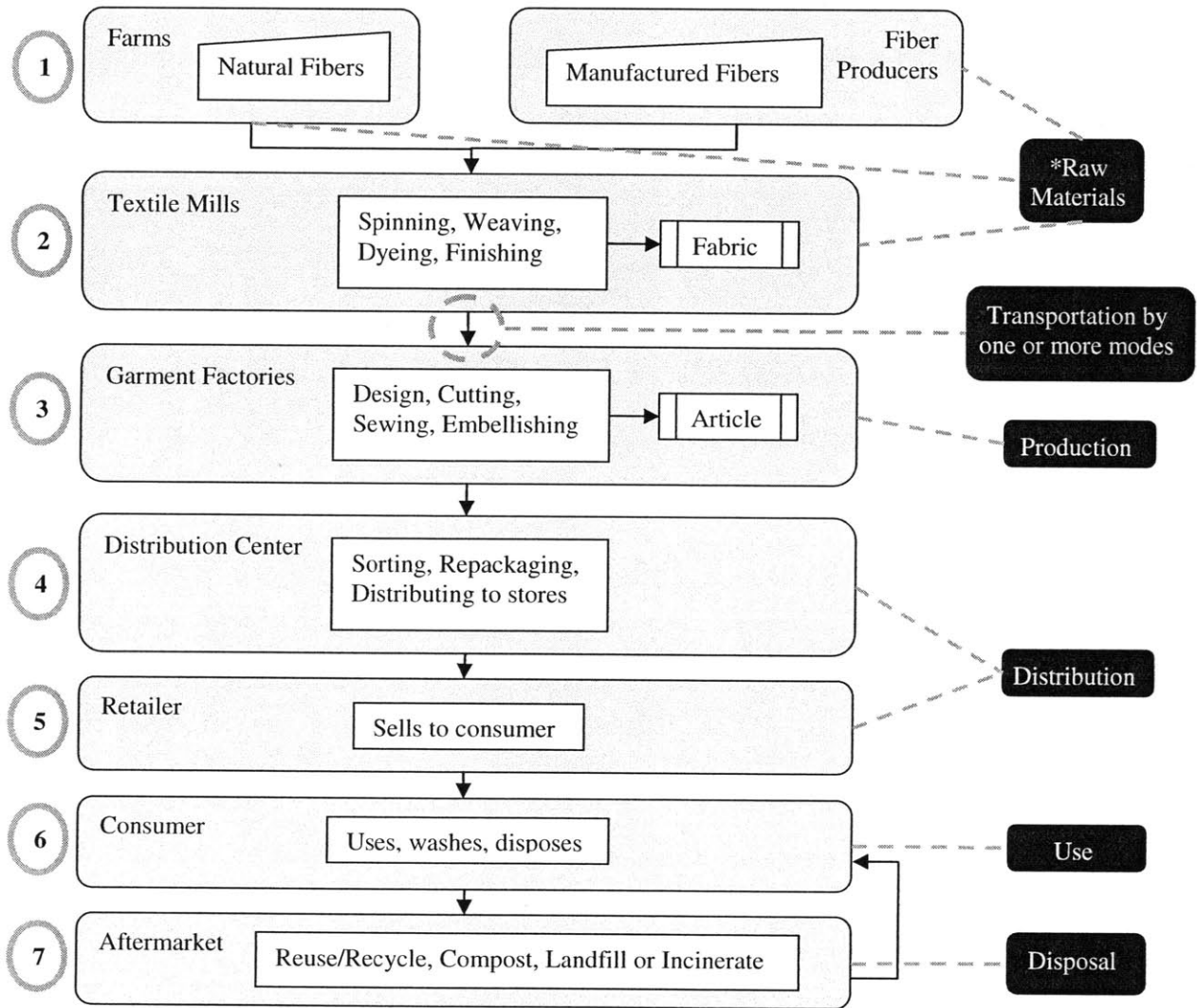


Figure 1: The Seven-Phase Life Cycle of an Apparel Product

*The dark boxes on the right indicate the corresponding supply chain segment for each phase of the product life cycle.

In the fifth and sixth phases, consumers purchase and use the apparel products. Consumers wear apparel products until they are tired of them or until the products are no longer wearable. Finally, in the seventh phase of the life cycle, they donate them, sell them, return them

to the apparel company, compost them, or throw them away. Products resold by their owners or through charities repeat the use phase of their life cycle in the domestic market or are sold to textile recycling firms who export them, mostly to Africa, as wearable clothing, wiping rags, or fiber (Rivoli, 2005). If the apparel company takes the products back, it breaks them down into fibers and uses them as inputs for new products. Products made of natural materials like hemp can be composted, while the remaining items culminate in landfills.

Clearly, the fraction of the apparel supply chain directly controlled by the apparel company is marginal. Apparel companies, such as Adidas and Timberland, generally have direct control over the design and distribution segments of their supply chains only. While companies have a moderate to high level of influence over their garment manufacturers, they have less influence over the farmers, fiber producers, and textile mills (Lim & Phillips, 2007). Similarly, once the product is sold to the consumer, the company has virtually no influence over what the consumer does with the product during the rest of its life cycle. This lack of authority is challenging to apparel companies attempting to implement sustainability initiatives in those parts of the supply chain.

2.3 SUMMARY

This chapter examined the apparel industry supply chain and identified the key firms operating in the industry. Emphasis was placed on the global and fragmented nature of the industry, which creates challenges for implementing and measuring sustainability programs. The next section provides a review of the literature on sustainability as it relates to supply chains and the apparel industry and will further illustrate the challenges faced by apparel companies as they try to become more sustainable.

3 LITERATURE ON SUSTAINABLE SUPPLY CHAINS AND METRICS

This research examines the sustainability efforts of apparel companies and the metrics used for evaluating them. The literature relating to this research addresses the role of sustainability in supply chain management, the apparel industry, and the use of metrics. The literature covering sustainability in the supply chain (Carter, 2008; Pagell & Wu, 2009) and sustainability metrics (Beloff & Beaver, 2000; DJSI, 2009; Veleva & Ellenbecker, 2001) has steadily increased in the last two decades, but less is written about sustainability in apparel supply chains. In *Fashioning Sustainability*, Forum for the Future (2007) does provide an overview of the sustainability challenges facing the fashion industry, and Locke et al (2003; 2007) extensively discuss the specific challenge of monitoring Nike's garment-manufacturing suppliers.

This chapter summarizes the relevant literature to build a foundation of knowledge for the subsequent discussion of the research findings. Specifically, these four areas are addressed:

1. Sustainable supply chain management (SSCM) and the dimensions of sustainability
2. Sustainability impediments and strategies in the apparel supply chain
3. Types and formulation of metrics for measuring individual sustainability initiatives and a selection of sample metrics
4. An approach to measuring overall corporate sustainability

First, the relatively new concept of SSCM is addressed. This topic generates questions from businesses and consumers alike. For example, what is a sustainable supply chain and what factors make a supply chain sustainable? Is it strategic or extraneous to pursue sustainability initiatives in the supply chain? This section details the dimensions of sustainability and explores

the benefits that businesses can receive from focusing not only on economic sustainability, but also on social and environmental sustainability.

Second, an account is given of sustainability within the apparel supply chain specifically. Nine sustainability challenges facing the industry are described, followed by a discussion of the strategies for overcoming these challenges, as recommended by Forum for the Future (2007).

One challenge faced by firms who pursue sustainability initiatives is that of measuring the results of their actions, and this challenge is addressed in the third section of this chapter. Veleva and Ellenbecker's five evolutionary stages of sustainability metrics (2001) are discussed, as well as the types of sustainability metrics and their preferred formats. Table 2 contains a selection of sustainability metrics for each stage of the supply chain, with particular emphasis on metrics for the apparel industry.

The fourth and final section of this chapter introduces a model for ranking companies' overall commitment to sustainability. To do so, it compares Terry Porter's (2008) sustainability standpoints to Porter and Kramer's (2006) strategic approaches to corporate social responsibility and Veleva and Ellenbecker's (2001) evolution of sustainability metrics. While Veleva and Ellenbecker's work, introduced in the preceding section, focuses specifically on metrics for individual initiatives, it is also reflective of the varying degrees of sustainability that a firm can exhibit. This comparison results in the definition of four sustainability stances, which are closely related to Terry Porter's four standpoints.

3.1 SUSTAINABLE SUPPLY CHAIN MANAGEMENT

The quantity of literature on sustainable supply chain management (SSCM) has increased in the past two decades as organizations and academics have become increasingly concerned about anthropogenic (human-caused) climate change, the depletion of natural resources, and the rate of

waste generation (Vachon & Klassen, 2007). Carter and Rogers (2008) performed an extensive review of sustainability literature and found that while the concept of sustainability is well-understood and accepted on a macro level, organizations struggle to define their roles within the larger picture and develop a sustainable business strategy at a micro level. The Dow Jones Sustainability Indexes (2009) measure publicly traded companies on three aspects of sustainability, thus providing some guidance to firms on where to place their focus. This section defines SSCM, examines the dimensions of sustainability, and notes the advantages of adopting SSCM practices.

3.1.1 DEFINING THE SUSTAINABLE SUPPLY CHAIN

Several explicit and implicit definitions of SSCM exist, and are worth examining. According to Carter and Rogers (2008), sustainable supply chains strategically and transparently integrate and achieve social, environmental, and economic goals through systemic coordination of key processes. Pagell and Wu (2009) describe practices that lead to sustainable supply chains, gleaned through case studies of ten exemplary firms. These practices, summarized in Table 1, are grouped into four areas: capacity for innovation, management orientation toward sustainability, reconceptualization of supply chain members, and a focus on supply base continuity. The important distinction of this framework is that environmental, social, and economic goals are not considered independently; rather, the three factors merge together to influence the company's strategic decisions.

Finally, Shrivastava (1995) explains that sustainable companies must accept and foster the concept of "ecologically responsible consumption" and adapt their design, production, distribution, and promotion strategies to literally shape the way consumers consume. This is the great challenge of long-run corporate sustainability: how can businesses develop and distribute

socially and environmentally responsible products and services, while discouraging a consumption-obsessed economy and remaining profitable?

Sustainable Supply Chain Management: The process by which companies adapt their design, production, distribution, and promotion strategies to continually provide socially and environmentally responsible products and services in a profitable way.

Firms engage in SSCM by examining their supply chains and product life cycles, and determining where in the chain sustainability initiatives will have the greatest impact (Fiksel, 2009). They must then align these supply chain functions with the three areas of sustainability—economic, environmental, and social—and create a plan of action for integrating sustainability into their business processes.

Table 1: A Model of Sustainable Supply Chain Management Practices
(Pagell & Wu, 2009)

| Capacity for innovation | Managerial orientation toward sustainability | Reconceptualization of supply chain | Focus on supply base continuity |
|--|---|--|--|
| <ul style="list-style-type: none"> - Firms must be innovative and think beyond lean techniques and total quality management - Focus must be on closed loop systems and reverse logistics | <ul style="list-style-type: none"> - Economic goals and employee incentives are aligned with environmental and social goals - Sustainability is part of day-to-day conversations and decision-making across the organization - Investment is made in human capital | <ul style="list-style-type: none"> - Skills and knowledge of nontraditional supply chain members such as NGOs, competitors, regulators, and community members are leveraged | <ul style="list-style-type: none"> - Supplier continuity is valued and encouraged through decommodification, transparency, and reducing supplier risks - Encouragement of supplier certification and inclusion of social and environmental criteria in supplier selection - Traceability of products throughout the supply chain is key |

3.1.2 THE DIMENSIONS OF SUSTAINABILITY

Figure 2, which is adapted from the Dow Jones Sustainability Indexes (2009) and Forum for the Future (2007), shows the dimensions of sustainability. As mentioned above, economic, environmental, and social factors are considered the three pillars of sustainability; but I have disaggregated social sustainability into external social sustainability and internal social sustainability, which is sometimes referred to as a fourth dimension—culture. The shaded boxes indicate areas directly related to supply chain management.

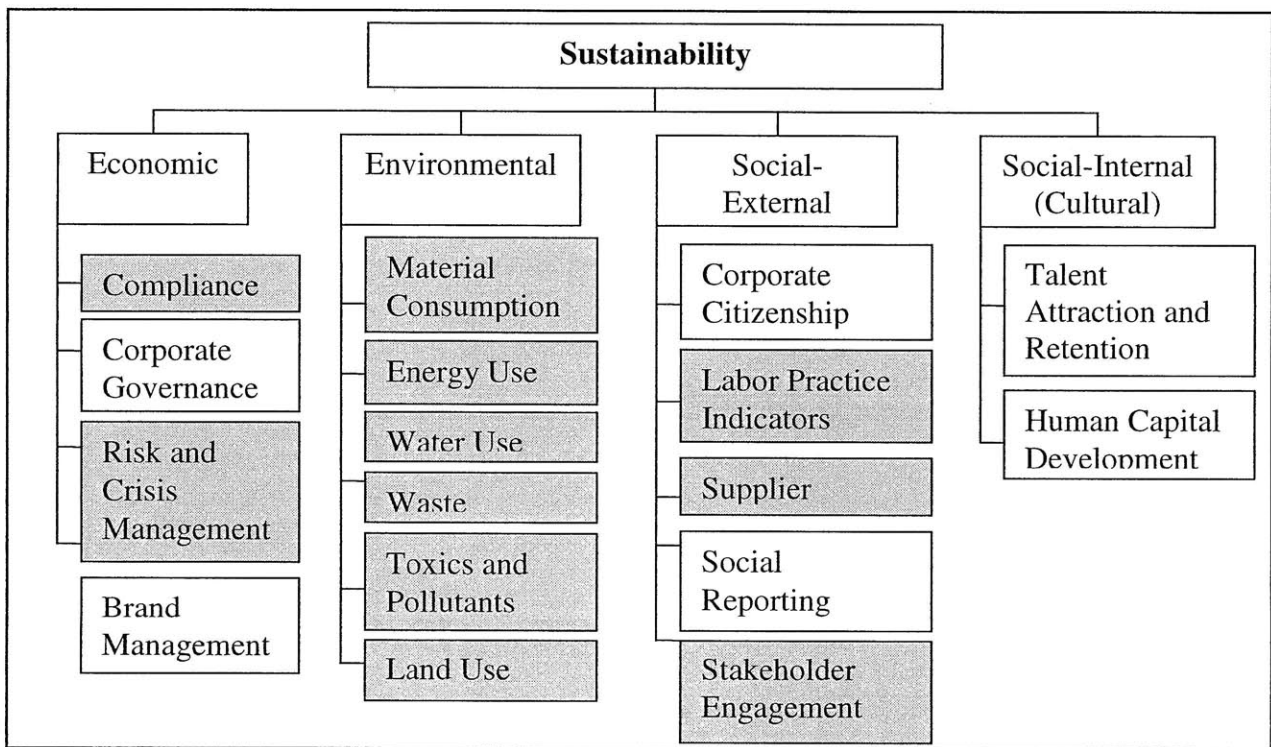


Figure 2: The Dimensions of Sustainability

*The shaded boxes indicate areas strongly linked to supply chain management.

Firms can find it challenging to simultaneously consider the various dimensions, because tradeoffs exist among them. As a simple example, a redesigned product could use recycled materials in its production, but require more water and energy to produce than the original product. Is it then a more sustainable product? The answer may depend on the source of the

energy used in production and whether the water used is treated and reused, or eliminated as wastewater runoff. Such tradeoffs exist in all sustainability decisions and are routinely more complex than this example.

Similarly, there is ongoing debate as to whether environmental sustainability should come at the expense of social and economic sustainability. Carter and Rogers (2008) argue that the three must be co-optimized. Their research indicates that environmental and social initiatives must be considered within the context of a firm's broader financial and strategic goals. However, economic sustainability and internal social sustainability, that is, how well the company attracts and retains talent, are more often at the forefront of business than environmental sustainability.

Consider, for example, the Dow Jones Sustainability Indexes (DJSI). The DJSI are considered leading indicators of sustainable businesses. The Indexes track the financial performance of "sustainable" companies and rank their sustainability levels. Companies are ranked in three areas: economic, social, and environmental. Some metrics are linear across industries, and some metrics and weightings are industry specific. All companies are assessed on factors such as risk and crisis management, corporate governance, environmental reporting, and labor practice indicators (DJSI, 2009). However, the three areas are not weighted equally. In the apparel industry, economic factors constitute 29 percent, social 56.6 percent, and environmental 14.4 percent (SAM Group, 2010). Brand management, an economic factor, comprises 11 percent of the total score, while stakeholder engagement and standards for suppliers, two social factors, constitute 35 percent of the total score (SAM Group, 2010). This makes sense considering that IBISWorld (2009a) ranks "access to, or contracts with, reliable manufacturers" as the first key success factor in the industry, but this imbalanced focus on social and economic factors renders the DJSI an inadequate measure of environmental sustainability.

3.1.3 ADVANTAGES OF SSCM

Environmentally and socially sustainable supply chains can yield cost savings from the reduction of waste and energy consumption, reduced health and safety costs, lower labor turnover, and the use of reusable components (Carter, 2008). Admittedly, not all socially and environmentally targeted programs are profit-compatible, but other competitive advantages can be realized from proactively shaping the supply chain to reduce inefficiencies and achieve shorter lead times, better product quality, and enhanced reputation (Pagell & Wu, 2009). Another important benefit is risk mitigation. Carter and Rogers (2008) give several examples of events and circumstances that threaten a firm's sustainability, including the manufacture of products that cause harm to consumers or workers, damage to a company's brand from dealing with a disreputable supplier, threats such as biodiversity loss and freshwater scarcity, or a disruption in supply. Creating an awareness of such risks and actively managing them with sustainable solutions is a key component of SSCM.

3.2 SUSTAINABILITY IN THE APPAREL SUPPLY CHAIN

While little literature focuses specifically on environmental sustainability in the apparel supply chain, Forum for the Future (2007) provides an overview in its *Fashioning Sustainability* report. Forum for the Future is a UK-based non-profit organization that works with corporations and governments to understand and manage risks relating to climate change, population growth, and resource scarcity, and to develop and implement innovative strategies for addressing these risks. The *Fashioning Sustainability* report details the sustainability challenges facing the apparel industry and offers seven high-level suggestions of how companies can overcome these challenges.

Forum for the Future (2007) cites eight sustainability issues in the apparel industry. It is clear from the authors' discourse that sustainability issues appear in all segments of the apparel supply chain. In the raw materials segment, conventional cotton production requires excessive quantities of water and uses dangerous pesticides. Synthetic materials, on the other hand, do not break down well in landfills. In the production of textiles and garments, firms face social issues such as unfavorable working conditions, as well as environmental problems, such as chemical use. Up to 80 percent of the energy consumption in a garment's life cycle takes place in the use phase when the consumer washes, dries, and irons the garment multiple times (Forum for the Future, 2007). Particularly interesting is the argument that the fashion industry is definitively unsustainable, as its objective is to promote increased consumption of "fashionable" items, with little emphasis on reduction, reuse, and recycling.

Sustainability issues in the apparel industry include (Forum for the Future, 2007):

1. Fashion reflects frequent changes in consumer tastes and represents an encouragement to people to consume more.
2. The production of cotton requires intense resource use (up to 10 tons of water can be required to produce enough cotton for one pair of jeans).
3. Working conditions across the supply chain are frequently unfavorable or inhumane.
4. Post-purchase laundering of clothing is energy-intensive.
5. Chemicals used in production of fabrics and apparel products pose a threat to workers and the environment.
6. Products made from synthetic fibers degrade very slowly in landfills.
7. Raw materials, fabrics, and finished products are shipped around the world multiple times, leaving a heavy carbon dioxide trail in their wake.

8. Animals used for their fur, wool, and leather are treated inhumanely.

Another issue, one that is not included in this report, is that of audit fatigue (Tucker, 2008). Because each contract manufacturer may supply several different apparel companies, each with their own code of conduct and monitoring routine, factories can receive audit visits as often as biweekly. Compounding this problem, factories enter into multiple compliance agreements that can directly conflict with each other. Factories therefore spend a lot of time preparing for audits and changing their operations from day to day to meet various requirements (Locke et al, 2007). This leads to apathy and audit fatigue for the suppliers. In addition, the overuse of audits ties up the apparel companies' staff from doing other work. For example, 80 percent of Levi Strauss' Environmental Health and Safety department's time is spent auditing factories (Tucker, 2008)—time that could be well used elsewhere.

Ironically, this monitoring that companies are investing so much of their time and money in may not be as effective as they hope. Locke et al (2007) found that, on its own, monitoring is not effective at improving labor standards in contract manufacturing factories. Combined with other initiatives such as employee engagement, however, monitoring can be very effective.

So what can be done about these issues that plague the industry? Forum for the Future (2007) also examines seven steps required to move the apparel industry toward sustainability. They suggest that apparel companies:

1. Raise awareness of sustainability issues among industry players
2. Increase transparency
3. Contribute to the development of, and comply with, international standards for apparel companies and their suppliers

4. Train and support all players along the supply chain
5. Provide suppliers with support, time, encouragement, and incentives to adopt sustainability programs
6. Empower and educate consumers about the impacts of their post-purchase behavior
7. Design desirable, functional, and stylish products while considering the environment

The extent to which various companies in the apparel industry are actually making efforts toward sustainability varies greatly. Some, such as Patagonia, Mountain Equipment Co-op, and Timberland embed sustainability in everything they do, and have done so since their respective inceptions. Others, like Nike, Adidas, and H&M, have made great strides toward sustainability through the introduction of corporate codes of conduct, increased transparency, and improved collaboration across the industry and the supply chain. Environmental sustainability, however, is a challenging objective for companies whose overall corporate strategy does not fully embrace it.

3.3 METRICS FOR MEASURING INDIVIDUAL SUSTAINABILITY INITIATIVES

This section of the literature review focuses on sustainability metrics. Specifically, it looks at the five evolutionary stages of these metrics (Veleva & Ellenbecker, 2001), their common formats and requirements, and a selection of sample metrics.

3.3.1 TYPES OF SUSTAINABILITY METRICS

Veleva and Ellenbecker (2001) list five evolutionary stages of sustainability metrics:

1. Facility compliance
2. Facility use and performance/efficiency
3. Facility environmental and human health and safety
4. Supply chain and product life cycle impacts

5. Long-term issues such as resource depletion and use of renewable resources.

The evolutionary stages, listed sequentially, also reflect one path that corporations can take toward achieving their sustainability objectives. A firm can start by ensuring compliance with regulations and standards. Then, it might adopt efficiency techniques in efforts to improve performance. When operations are running smoothly, the firm continues to work internally, improving conditions for workers and implementing environmental health and safety practices. Once it has its own house in order, the firm can start looking up and down its supply chain and measuring the impact of its products' life cycles. Finally, the firm can start addressing long-term issues like climate change, integrating such concerns into its corporate strategy. It is only at this level that a firm can be truly sustainable, and most firms have not yet reached this stage. Not all firms follow this linear path, and some firms never move past the first or second stages.

Emphasis is placed on level two to level five metrics based on the assumption that all companies in the apparel industry have extensive measurements in place to monitor their compliance with domestic and international regulations.

3.3.2 *FORMAT OF METRICS*

The World Business Council for Sustainable Development recommends metrics that are ratios of resource use or environmental impacts to value generation (Tanzil & Beloff, 2006). For example, MIT might measure the amount of energy consumed annually per unit of research volume produced, while Timberland might allocate a share of its water consumption to each pair of boots sold. This type of metric is a *Relative Metric*, as it is relative to the level of output. MIT could set a goal to reduce energy consumption per unit of research volume by 5 percent per year. If the research volume increases substantially year over year, MIT could potentially meet its goal while still increasing its overall energy consumption. Such measurements can be less valuable for

measuring sustainability because they allow firms to continue increasing their total emissions or energy consumption. *Absolute Metrics*, on the other hand, measure the total change in the measured unit, regardless of the level of output. While absolute targets are harder to meet for growing organizations, they are more representative of real progress toward sustainability.

Like any other metrics, sustainability metrics should be simple, understandable, reproducible, robust, non-perverse, cost-effective to calculate, useful for decision making, scalable, and protective of proprietary information (Beloff & Beaver, 2000).

3.4.1 SAMPLE METRICS

Table 2 contains a selection of metrics adapted from Tanzil and Beloff (2006) and Forum for the Future (2007). The metrics are organized by their supply chain stages and represent both standard sustainability metrics and apparel-specific metrics. Some of the metrics may seem difficult to quantify, and indeed, they are. As Forum for the Future (2007) points out, social and environmental factors are poorly considered in clothing design and manufacture, and thus the metrics are not very well developed. Further, as in any supply chain, it is difficult to gather the precise and detailed information required to perform such assessments.

Clearly, a high degree of sophistication is needed to accurately compute many of these metrics. While apparel companies may have the resources and motivation to do so, the onus is on them to persuade other supply chain members to implement sustainability initiatives and invest time and resources into measuring the results. Research findings show that industry collaboration and the setting of international standards may be required to facilitate this level of sustainability and the associated measurements.

Table 2: Sample Sustainability Metrics

Adapted from Tanzil and Beloff (2006) and Forum for the Future (2007)

| Supply Chain Stage | Metric | Calculation | Units |
|-------------------------------------|---|---|---|
| Raw Materials and Fabric Production | Use of renewable resources | Mass of renewable materials used/Total mass of raw materials | Percent |
| | Use of organic cotton | Mass of organically grown cotton used/Total mass of cotton used | Percent |
| | Use of other natural materials like hemp, bamboo, soy, algae, maize, and nettle | Mass of natural materials used/Total mass of materials | Percent |
| | Country of origin labeling | Yes/No | N/A |
| Garment Production | Material Utilization | Mass of raw materials purchased/output; mass of packaging materials used/output | Percent |
| | Presence of toxins in raw materials and finished products | Units produced containing toxins/Total units produced | Percent; Level of human toxicity and ecosystem toxicity |
| | Workplace conditions | Monitoring, Supplier audits, Codes of conduct guaranteeing human rights to employees | Lighting & cleanliness levels; existence and implementation of safety plans |
| Distribution | Waste generation from packaging | Quantity of one-use packaging/Total quantity of packaging | Percent |
| Transportation | Emissions | Emissions/unit sold or per \$/sold | Lbs of CO2 /unit or Lbs of CO2/\$ sold |
| Use | Energy used in washing, drying, and ironing | Average life span (in years) * Average number of washes (per year) * Average energy used in washing, drying, and ironing (in kilowatt hours per wash) | Kilowatt hours |
| Disposal | Design for composting, recycling, or upgrading | Yes/No | N/A |

3.4 MEASURING CORPORATE SUSTAINABILITY LEVELS

The preceding section introduced Veleva and Ellenbecker's five evolutionary stages of sustainability metrics (2001), and noted that these five stages represent one rather linear path that companies might take as they endeavor to become more sustainable. Other companies, such as Patagonia, enter the market with sustainability at the forefront of their business models, addressing level-five issues such as resource depletion and the use of renewable resources without necessarily having mastered the other levels, such as facility performance. So what determines the degree to which a company is sustainable and the scale of its sustainability strategy? This section addresses this question by comparing the five levels of metrics to Terry Porter's (2008) corporate social responsibility (CSR) standpoints and Porter and Kramer's (Porter & Kramer, 2006) CSR strategies. This comparison concludes by synthesizing the definitions given by Porter, Porter and Kramer, Veleva and Ellenbecker, and Pagell and Wu into four categories used throughout the remainder of the thesis to rank the sustainability levels of the studied companies.

Terry Porter, in his 2008 article, *Systems Based Applications for CSR Implementation*, develops a two-by-two matrix for classifying CSR standpoints. On the horizontal axis, he places "adoption of shareholder or stakeholder value criteria". A "shareholder" is defined as a person with an ownership stake in the company, while the broader term "stakeholder" includes employees, suppliers, community members, and anyone with an interest in the company or its operations. Therefore, firms with a shareholder perspective focus on financial profitability, while firms with a stakeholder perspective focus on all of the people and places that they impact through their business activities.

On the vertical axis, Porter places “a lower or higher priority on CSR” which is determined by a company’s primary value-adding strategy. With these two dimensions, Porter suggests that firms take one of four stances toward sustainability: compliant, good citizen, instrumental, or intrinsic. Table 3 illustrates Porter’s four CSR standpoints.

Table 3: Typology of CSR Standpoints

T. Porter (2008)

| | Shareholder Value | Stakeholder Value |
|--------------------------|--|---|
| CSR Low Priority | <p>Compliant</p> <ul style="list-style-type: none"> - Minimize intrusion of CSR initiatives into core strategy and business functions - Isolate CSR as a separate function or department with little clout - Comply with legal and industry regulations with minimal change | <p>Good Citizen</p> <ul style="list-style-type: none"> - Seek input from external stakeholders and include their concerns in decision making - Balance financial, social, and environmental performance - Market innovations as evidence of goodwill and good citizenship |
| CSR High Priority | <p>Instrumental</p> <ul style="list-style-type: none"> - “Win-win” CSR - Implement only in ways that enhance bottom-line performance - Avoid if it diminishes short-term results e.g., revenue or cash flow - Publicize all actions, perhaps leaning toward exaggeration, or “greenwashing” | <p>Intrinsic</p> <ul style="list-style-type: none"> - Deep commitment to CSR - Fully integrate CSR into values, mission, strategy, and operations - Focus on long-term benefits even if CSR initiatives negatively affect short-term performance - Marketing of CSR policy and main strategy are intertwined naturally |

The fascinating aspect of Porter’s theory is that “firms may adopt any of these standpoints at any time, and change standpoints gradually or abruptly in any direction.” For example, a firm that is compliant today might set a strategy to move to an intrinsic standpoint tomorrow. To do so, it would need to move through Veleva and Ellenbecker’s five stages,

though some may try to jump straight to stage five. While it is possible to set stage-five ambitions, it would be difficult to address long-term issues like resource depletion without first examining opportunities for creating efficiencies and improving the supply chain.

Finally, Porter (Michael) and Kramer suggest four similar CSR strategies in their 2006 article, *Strategy and Society: The Link Between Competitive Advantage and Corporate Social Responsibility*. To develop their strategies, they first divide social issues (in which they include environmental issues) into three categories—generic social issues, value chain social impacts, and social dimensions of competitive context—into which all social issues must be sorted. Generic issues are “not significantly affected by the company’s operations,” but are nonetheless important to the society in which the company operates. Value chain social impacts “are those [social issues] significantly affected by the company’s activities.” Social dimensions of competitive context are external factors that affect the drivers of a company’s competitiveness.

They then identify two types of strategies: Responsive CSR and Strategic CSR. Responsive CSR consists of addressing stakeholders’ social concerns and mitigating adverse effects of business activities. Strategic CSR consists of “transforming value chain activities to benefit society while reinforcing strategy” and engaging in “strategic philanthropy” that provides opportunities to become more competitive.

Finally, they combine these two ideas into a model depicting the four strategies. Table 4 reproduces this model.

Table 4: Strategic Approaches to Corporate Involvement in Society
M. Porter and Kramer (2006)

| Generic Social Impacts | Value Chain Social Impacts | Social Dimensions of Competitive Context |
|------------------------|--|--|
| Good Citizenship | Mitigate harm from value chain activities | Strategic philanthropy that leverages capabilities to improve salient areas of competitive context |
| Responsive CSR | Transform value chain activities to benefit society while reinforcing strategy | |
| | | Strategic CSR |

Clearly there are similarities between this model and Terry Porter’s CSR standpoints.

This is demonstrated through a comparison of each model to Veleva and Ellenbecker’s stages.

Table 5 and Table 6 depict these comparisons.

Table 5: Comparing Porter's Standpoints to Veleva and Ellenbecker's Stages

| Porter’s CSR Standpoints | Veleva and Ellenbecker’s Stages |
|--------------------------|---------------------------------|
| Compliant | 1, 2 |
| Instrumental | 1-3 |
| Good Citizen | 1-3 (maybe 4) |
| Intrinsic | 1-5 |

Table 6: Comparing Porter & Kramer's Strategies to Veleva and Ellenbecker's Stages

| Porter & Kramer’s Strategies | Veleva and Ellenbecker’s Stages |
|-----------------------------------|---------------------------------|
| Responsive – Mitigate harm | 1, 3 (maybe 2) |
| Responsive – Good Citizenship | 1-3 |
| Strategic – Transform value chain | 1-4 |
| Strategic – Competitive Context | 1-5 |

These three models are complementary, so Table 7 presents a consolidated structure that is used throughout the remainder of the thesis with reference to the eight profiled companies. Pagell and Wu’s (2009)(2009) definition of a sustainable supply chain also influenced the definition of an intrinsic position toward sustainability.

Table 7: Four Sustainability Positions

| Sustainability Position | Definition |
|-------------------------|---|
| Compliant | <ul style="list-style-type: none"> - Comply with legal and industry regulations; may lobby against proposed environmental and social regulations that threaten business as usual - Isolate CSR as a separate function; minimal implementation of CSR |
| Opportunistic | <ul style="list-style-type: none"> - Engages only in “win-win” CSR; initiatives must enhance short-term financial performance to be approved - Mitigates harm caused by supply chain activities by improving facility performance and efficiency - Publicizes all actions, perhaps leaning toward exaggeration |
| Good Citizenship | <ul style="list-style-type: none"> - Ensures facility environmental human health and safety - Transforms supply chain and product life cycle to benefit society, while supporting corporate strategy - Balances financial, social, and environmental performance - Seeks input from external stakeholders such as NGOs and communities |
| Intrinsic | <ul style="list-style-type: none"> - Deep commitment to CSR from top management and throughout the organization - Fully integrate CSR into values, mission, strategy, and operations - Focus on supply base continuity and the integration of non-traditional supply chain members - Strategic philanthropy to improve competitiveness - Focus on long-term sustainability issues like resource depletion and renewable energy |

3.5 SUMMARY

In this section, sustainable supply chains were introduced as the co-optimization of economic, social, and environmental objectives. The components of each dimension of sustainability were indicated as either being related to supply chain management or not. The data analysis section addresses the numerous initiatives currently employed by apparel companies in the context of the dimensions of sustainability and the apparel supply chain discussed in this section.

This section also discussed the issues that make the apparel industry unsustainable and seven strategies that companies can use to overcome these challenges. It is clear that these issues occur throughout the apparel supply chain. The data analysis section will present information showing where in the supply chain these apparel companies are focusing their efforts and identify gaps in their strategies.

The final two sections of this chapter discussed methods for measuring individual initiatives as well as the overall level of corporate sustainability. Table 2 provides a selection of sustainability metrics that will be built upon in the analysis section, which examines the initiatives and metrics of real companies.

The next section explains the methodology I followed to collect and organize the information used in my analysis.

4 DATA COLLECTION AND ORGANIZATION

My research examines the sustainability strategies of eight apparel companies. Using both publicly available information and findings from an interview with one of the companies, I created a Structured Query Language (SQL) database of sustainability initiatives used in the apparel supply chain. The database is searchable by company, sustainability dimension, and supply chain function. It also includes the metrics these companies use to track the progress of their initiatives and the targets they set. Finally, the initiatives are divided into four categories—symbolic actions, quick wins, strategic projects, and game changers—based on the initiatives’ scalability, cost, rewards, potential for impact, and certainty of outcome. I hypothesize that a company’s sustainability position can be determined by the selection of initiatives it implements.

This section elaborates on the process of collecting and organizing the data used in my research. It details how the eight companies were selected and how the information on their sustainability initiatives was retrieved. Finally, it illustrates the process of building the database, explaining the rationale behind each field and its entries.

4.1 DATA COLLECTION

In choosing the eight companies to include in the study, I aimed for apparel companies that have adopted sustainability into their corporate strategies. I researched the members of non-profit organizations concerned with both sustainability and the apparel industry, such as the Better Cotton Initiative, the Organic Exchange, the Multi-Fiber Arrangement Forum, the Fair Labor Association, and Business for Innovative Climate and Energy Policy. I also consulted the Dow Jones Sustainability Indexes’ Clothing, Accessories and Textiles category, because a major requirement of inclusion in the Indexes is transparency, indicating that companies ranking high in the category would be abundant sources of information. From this preliminary research, I

arbitrarily chose twelve companies, which I later reduced to eight after realizing that each subsequent company I reviewed offered fewer unique initiatives than its predecessor.

I chose three athletic companies—Nike, Puma, and Adidas—all of which are ranked highly on the Dow Jones Sustainability Index. Analysis of these companies provided insight into the challenges of making performance-oriented goods environmentally friendly. Three outdoor-apparel companies—Timberland, Patagonia, and Mountain Equipment Co-op—were chosen for their intrinsic dedication to the environment. Finally, two mass-market fashion companies—Gap Inc. and H&M—were chosen because they represent the difficulty of incorporating sustainability into a business model defined by selling high volumes of relatively low-cost items, which poses challenges in the areas of waste reduction, quality of materials, and durability of designs.

After selecting the companies, information on their initiatives was collected from their websites, annual reports, and sustainability reports. Seven of the companies publish stand-alone sustainability reports, a common trend among publicly traded companies. I conducted an interview with Cara Chacon, Director of Social and Environmental Sustainability at Patagonia. I requested information from the other companies and was directed to their websites and sustainability reports, which they claimed are thorough and representative of their sustainability programs. A few companies also answered questions via e-mail.

Finally, I created a classification system for the initiatives, which is explained in more detail below. Essentially, a classification system was necessary to discern between the different levels of corporate commitment inherent in the initiatives. For example, it is not possible to equate one initiative such as *not purchasing store furnishings containing PVC* to another such as *creating an environmental “nutrition label” for every pair of shoes designed*. Therefore, I developed four classifications: symbolic actions, quick wins, strategic projects, and game

changers. These classifications are key in measuring the overall level of corporate sustainability displayed by these companies.

4.2 DATABASE CREATION

The initiatives were gathered in an SQL database with the following fields: Sustainability dimension, company, initiative, supply chain stage, metric, target, page reference, and classification.

4.2.1 SUSTAINABILITY DIMENSIONS

Figure 2 from the previous section outlined four dimensions of sustainability—economic, environmental, external social, and internal social. Within each of these four dimensions I listed several subcategories and indicated those that relate strongly to the supply chain. The relevant subcategories were:

- Economic: Compliance, risk and crisis management
- Environmental: Material consumption, energy use, water use, waste, toxics and pollutants, and land use
- External Social: Labor practice indicators, supplier standards, and stakeholder engagement

This research focuses on environmental and external social sustainability, so I did not include economic sustainability initiatives in the database. I organized the remaining subcategories into a narrower selection of five sustainability dimensions. These are:

1. Materials use
2. Water use (including toxics and pollutants in water)
3. Waste generation (including toxic waste)
4. Energy use and emissions (including air pollutants)

5. Social responsibility (including all external social subcategories mentioned above)

Land use falls into the second, third, and fourth dimension depending on what benefit each specific land use initiative intends to achieve.

4.2.2 COMPANIES

The companies evaluated were: Adidas, Gap Inc, H&M, Mountain Equipment Co-op, Nike, Patagonia, Puma, and Timberland. Appendix 1 provides information on the eight companies, including countries of origin, founding years, and mission statements.

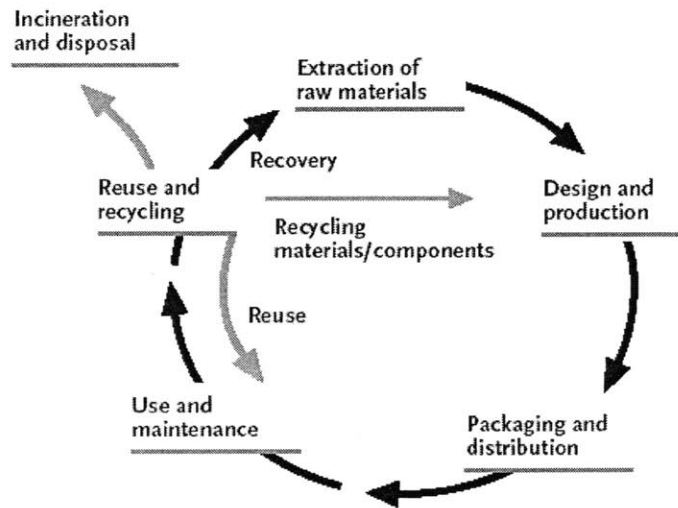
4.2.3 INITIATIVES

Within the sustainability dimensions, the wording of the initiatives implemented by different companies was standardized so that a search for unique values would not return the same initiative multiple times. For example, Gap Inc., Patagonia, Timberland, and Puma all use solar panels in some way. Timberland has a 400-kw solar array on the roof of its California distribution center. Patagonia has a 66-kw array in the parking lot of its Southern California headquarters. Both of these initiatives are in the database, and have been worded identically: *Install solar arrays at distribution centers or other facilities*. Appendix 1 shows a sample set of initiatives from the database.

4.2.4 SUPPLY CHAIN STAGE

While supply chains are generally defined as the set of people, facilities, and processes that move goods and services from the conception of an idea to the delivery of the final output to the customer, new trends in business are gradually increasing this definition to include post-consumer activities. For example, reverse logistics, the process of taking back and recycling or disposing of products at the end of their useful life, is now considered part of the supply chain. Figure 3 shows the product life cycle as defined by the Danish Environmental Protection Agency and adopted by the United Nations Environmental Program (UNEP). This model demonstrates that the life cycle of a product

can be either a closed loop or an open loop. Closed loop products move from raw materials to design and production to packaging and distribution to use and maintenance, and are then recycled with materials and components being captured and entering back into the system. In an open loop system, products are incinerated or disposed of at the end of their useful life.



(Miljøstyrelsen, 2010).

Figure 3: The Product Life Cycle

Based on these concepts, I have identified six supply chain stages to allocate initiatives to in my database: raw materials, production, distribution, use, disposal, and transportation. Reuse and recycling initiatives are included under the disposal category as they are the sustainable alternative to disposing of products. Distribution includes all activities involved in warehousing, retailing, and running corporate offices.

4.2.5 METRICS

The metrics field in the database shows how the various companies measure the results of their initiatives. This information was collected from corporate websites. Seventy-five percent of the initiatives are qualitative, and thus immeasurable, or are simply not measured quantitatively by the

companies. This inability to measure initiatives further illustrates the need for corporate sustainability metrics.

4.2.6 TARGETS

The targets field shows the goals that companies have set for themselves for each initiative. This information is less often publicized than the other information, and was even sparser than the metrics.

4.2.7 PAGE REFERENCE

The page reference field displays the page where the information relating to the initiative was found.

4.2.8 CLASSIFICATIONS

The companies studied in this research have cumulatively implemented close to 300 sustainability initiatives. These initiatives vary with regards to scalability, cost, rewards, potential for impact, and certainty of outcome. Therefore, it was necessary to develop a classification system for the initiatives that could be used in my measurement of how sustainable these companies are. Simply counting the number of initiatives implemented is not sufficient because ten low-cost, low-risk initiatives may have less of an impact than one large-scale, game-changing initiative.

To develop a classification system, I searched for existing models and found a useful one used by Wal-Mart and Blu Sky Consulting (Denend, 2007). This model groups initiatives into three categories:

1. *Quick Wins* have a payback period of less than one year. They make sense based on available technologies, products, and processes.
2. *Innovative Projects* have a payback period of one to three years. They make sense based on emerging technologies and innovations.

3. *Game Changers* are ongoing projects that change the “rules of the game” to support sustainable business practices.

This model is a useful starting point for a classification system, but the majority of the apparel companies’ initiatives could not be allocated into any of these three categories. A great many of the initiatives are long-term ones with no expected short-term payback, but they are not necessarily game changers. For example, five of the companies are accredited members of the Fair Labor Association (FLA). This designation requires substantial commitment from companies in terms of auditing suppliers and improving conditions within contracted factories. Committing to meet FLA requirements has no financial benefits (other than risk mitigation) and is not necessarily innovative or game changing. It does, however, show a strong commitment to fair labor standards and cannot be considered a quick win. Therefore, I needed to redefine, and expand, the classification system. I did this in two steps.

First, I devised six categories that cover all of the initiatives in the database. I analyzed each set of initiatives to determine how they ranged in terms of scalability, cost, rewards, potential for impact, and certainty of outcome. Then, using this assessment, I created four classes of initiatives covering every project in the database.

The six categories are suggestions to suppliers, requirements of suppliers, internal facility improvements, participation in industry associations, internal commitments, and leadership positions within working groups or associations. These categories are described below with explanations of the levels of commitment associated with each.

Suggestions to Suppliers: Apparel companies are extremely involved in their suppliers’ operations. They have enough purchasing power that they are able to influence their suppliers to

comply with certain criteria, such as the FLA standards discussed above. However, there are some areas in which apparel companies either cannot or do not require that suppliers follow more sustainable practices. In these instances, companies offer suppliers suggestions and resources for implementing the suggestions. For example, Puma encourages the formation of workers' committees in its contract factories. It cannot require that factory employees form these groups, but it will provide support if requested. Suggestions to suppliers are initiatives that are small scale and low cost; with a high certainty of outcome; and low to moderate opportunity for impact and internal rewards.

Requirements of Suppliers: More often, apparel companies have specific requirements that their suppliers must meet. These requirements can range in scale from low to high; have moderate to high cost for the apparel companies; have high certainty of outcome; and offer low to high opportunity for impact and internal rewards. Two contrasting examples are H&M's requirement that *transport carriers have a policy against idling for more than one minute* and Patagonia's policy of *requiring traceability of raw materials entering its supply chain*. The first is low scale, low impact, low cost, highly certain, and represents low internal rewards. The second is high scale, high impact, high cost; has low certainty of outcome; and has potential for high internal rewards.

Participation in Industry Associations: All eight of the apparel companies studied participate in numerous industry associations including The Organic Exchange, The Better Cotton Initiative, and Business for Social Responsibility. These association memberships vary widely in the benefits they offer members, as well as the commitments required. For some, the only criterion for membership is payment of annual dues. For others, such as the FLA, members must submit to regular unannounced factory audits by FLA auditors and commit to

implementing any required changes. For associations whose primary benefit is information sharing and marketing opportunities, the level of potential impact is low, but for others, such as the Fair Factories Clearinghouse or the Cotton Made in Africa Initiative, the opportunity for impact is high.

Internal Facility Improvements: One of the easiest ways for companies to start their sustainability journeys is by upgrading and updating their facilities to make them more energy efficient and sustainable. Initiatives in this category range from *using energy efficient light bulbs throughout all facilities* to *installing solar panels on the roof of a distribution center* to *building LEED certified headquarters*. Some of these projects have instant payback periods, and others may take years to generate return on investment. The scale, impact, cost, rewards and certainty of outcome will vary from low to high across this group of initiatives.

Internal Commitments: A majority of the sustainability initiatives are commitments that companies achieve through their own operations. Examples include *complying with the EU's Eco-label standards*, *conducting an environmental assessment to determine current emissions across the supply chain*, or *discontinuing the use of plastic bags*. These initiatives also range widely in terms of scale, impact, cost, certainty of outcome, and benefits.

Leadership Positions within Working Groups or Associations: Taking the membership initiatives one step further, many companies are instrumental in forming industry working groups or creating new associations. For example, eight members of Business for Social Responsibility, including Gap Inc., Nike, and Timberland, formed the Sustainable Water Group, which is committed to managing water use and wastewater discharge in global textile supply chains. Such initiatives are moderate to high in scale, impact, and rewards, and low to high in cost and certainty of outcome.

Table 8 summarizes these six groups of initiatives by their relative scale, impact, costs, rewards, and certainty of outcome.

Table 8: Summary of the Six Categories of Initiatives

| | Scale | Impact | Cost | Rewards | Certainty of Outcome |
|-------------------------------------|-------|--------|------|---------|----------------------|
| Suggestions to Suppliers | L | L | L-M | L-M | H |
| Memberships in Associations | L-M | L-H | L-M | L-H | H |
| Requirements of Suppliers | L-H | L-H | M-H | L-H | M-H |
| Facility Improvements | L-H | L-H | L-H | L-H | L-H |
| Internal Commitments | L-H | L-H | L-H | L-H | L-H |
| Leadership in Working Groups | M-H | M-H | L-H | M-H | L-H |

Once the initiatives were sorted into these six groups, I was able to define the classification system. The system has four classifications:

1. *Symbolic Actions* are initiatives that are not measured. They are low-scale, low-cost, low to moderate impact; have high certainty of outcome; and offer low to moderate rewards. If the rewards are not clearly defined, the payback period is difficult to calculate.
2. *Quick Wins* are easily implementable and have a short payback period, usually less than three years. They may be one-time or ongoing projects. The cost is low relative to the rewards, scale, or impact. The outcomes are highly certain.
3. *Strategic Projects* require a long-term commitment. They are moderate to high in scale, impact, and cost; have moderate to high certainty of outcomes; and offer low to high rewards. It may be difficult to measure the rewards, but companies pursue these projects in spite of this, for their long-term potential impact and benefits.

4. *Game Changers*, as defined above, change the rules of the game. A game changer must have a significant impact on the apparel supply chain or the life cycle of an apparel product. They are high in cost, uncertainty, scale, impact, and potential rewards.

Figure 4 depicts the allocation of the six categories of projects into the classification scheme. Suggestions to suppliers are always symbolic actions, as there is no way of measuring or enforcing them. Membership in associations can be either symbolic or strategic, depending on the requirements of membership, the impact that members have through the association, and the rewards of participation. To make this determination, I researched each association and determined how much of a commitment it represented.

Requirements of suppliers and facility improvements are either quick wins or strategic projects, depending on how long they take to achieve, the potential scale and impact, and the costs and rewards to the apparel company.

Internal commitments can fall into any of the four categories. The following four examples demonstrate this:

1. *Symbolic Action*: Offer personal development courses to workers and encourage them to avoid excess overtime (Timberland).
2. *Quick Win*: Help store managers focus on energy conservation by providing training materials and tips on reducing energy use along with targets for store-level energy reduction (Gap Inc).
3. *Strategic Project*: Increase the use of organic and alternative fibers (all eight companies).

4. *Game Changer*: Design products that are recyclable and offer recycling services at retail locations (Patagonia).

Finally, leadership positions in working groups and industry associations qualify as either strategic projects or game changers, depending on the impact and scale of the group’s contributions.

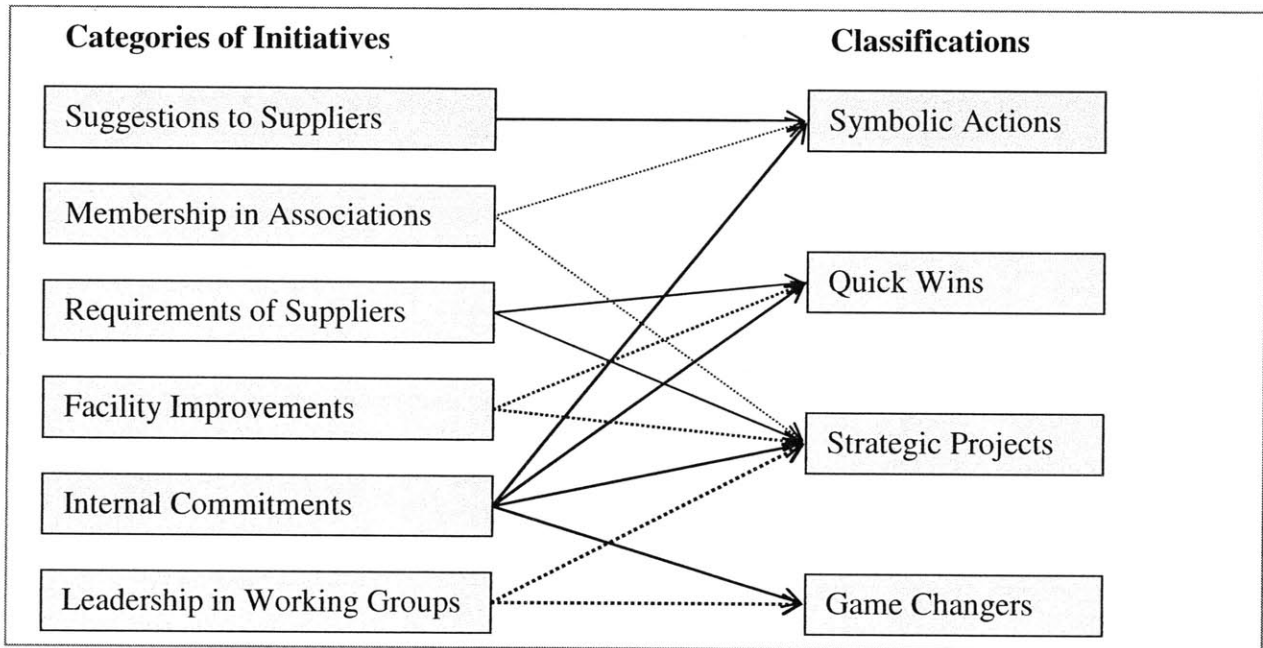


Figure 4: Allocating the Initiatives to Classifications

4.3 SUMMARY

This section detailed the collection and organization of the data used in my research. I selected eight apparel companies and collected information on their sustainability initiatives through publicly available materials such as websites and sustainability reports. I also conducted an interview with the Director of Social and Environmental Responsibility at Patagonia.

Using the information collected, I created an SQL database of approximately 300 initiatives currently implemented in the apparel industry. I then classified the initiatives into four

types: symbolic actions, quick wins, strategic projects, and game changers. This typology will be instrumental in the following section, which uses each company's set of initiatives to determine its sustainability position, and, in effect, measure its corporate commitment to sustainability.

5 SUMMARY OF FINDINGS

The information collected serves three purposes. First, it provides visibility into the number and types of initiatives that these apparel companies have implemented, revealing opportunities for improvement and shaping recommendations for future initiatives. Second, it elucidates the metrics that companies use to measure the progress of their initiatives, and allows for comparison of the overall corporate sustainability level of these apparel companies. Third, it is a rich collection of sustainability initiatives that can be searched by other apparel companies who strive to become more sustainable.

The three sections of this chapter discuss these contributions. The first section examines the initiatives of the apparel companies. It focuses specifically on the spread of the initiatives across supply chain functions and the dimensions of sustainability. A significant imbalance exists in the distribution of initiatives throughout the supply chain. Over 90 percent of the initiatives involve raw materials, production, or distribution. The remaining 8 percent of initiatives are split between transportation and disposal. Of all the initiatives published by companies, only one of them is focused on the use stage of the product life cycle. This contrasts sharply with Forum for the Future's eight reasons that the apparel industry is unsustainable, which attributes 50 percent of the issues to the transportation, use, and disposal stages of the product lifecycle. This imbalance represents major opportunities for new initiatives in the industry.

The second section focuses on the apparel companies' sustainability metrics. The vast majority of initiatives in the database do not have specific metrics tied to them. This is because their benefits are either qualitative or otherwise hard to measure. On a corporate level, the number and types of initiatives implemented by companies can help estimate a company's

sustainability position and, in effect, measure its progress toward environmental and social sustainability. This section also shows the breakdown of the types of initiatives that each company is using.

The final section of the data analysis chapter describes an online tool I created that allows apparel companies and other interested parties to search the database for inspiration on sustainability initiatives.

5.1 ANALYSIS OF INITIATIVES AND IDENTIFICATION OF OPPORTUNITIES

Cumulatively, these eight apparel companies reported 295 supply chain sustainability initiatives, 213 of which are unique. Table 9 displays the distribution of these initiatives by sustainability dimension and supply chain stage. Because some initiatives are implemented in more than one stage or have an impact on more than one dimension of sustainability, the total number of initiatives in the table is higher than the actual number of initiatives in the database.

From this table, it is evident that the focus is on social responsibility in the production stage of the supply chain. Initiatives of this type account for 35 percent of all the initiatives in the database. These initiatives, which revolve around factory working conditions and human rights advocacy in contract factories, have proliferated due to accusations of child labor and unfair working conditions in apparel factories. These accusations were not unfounded, and the apparel industry has made substantial strides toward correcting issues in contract factories. While factory audits constitute a significant part of their efforts, most of these companies take it to a higher level than that. For example, H&M offers a factory development program that aims to increase factory productivity and decrease overtime, and Puma trains factory workers to understand their basic rights and the benefits that they are entitled to, calculate their wages, sign labor contracts with an employer, wear personal protective equipment properly, and claim workplace injury

compensation. Timberland offers continuing education, food assistance, parenting courses, and microfinance to its contract factory workers. These initiatives are creating a more educated, safer, healthier, more empowered workforce which brings benefits to the apparel companies in terms of decreased turnover, higher productivity, and better supplier relations.

Table 9: Distribution of Initiatives by Sustainability Dimension and Supply Chain Stage

| Supply Chain Stage Sustainability Dimension | Raw Materials | Production | Distribution | Transportation | Use | Disposal | Total* |
|--|----------------------|-------------------|---------------------|-----------------------|------------|-----------------|---------------|
| Energy/ Emissions | 6 | 9 | 36 | 12 | 0 | 0 | 63 |
| Water | 14 | 16 | 9 | 0 | 0 | 0 | 39 |
| Waste | 3 | 4 | 11 | 1 | 1 | 9 | 29 |
| Materials | 47 | 11 | 12 | 0 | 0 | 0 | 70 |
| Social Responsibility | 16 | 124 | 0 | 0 | 0 | 1 | 141 |
| Total | 86 | 164 | 68 | 13 | 1 | 10 | 342 |

*The total shown here (342) is higher than the total number of initiatives in the database because some initiatives affect multiple supply chain stages and are thus counted twice.

*The database has a total of 295 initiatives, 213 of which are unique.

An issue noted earlier was that of audit fatigue. Each of these companies has a supplier base ranging in size from 50 to over 700 contract factories. Because each factory must be audited on a regular basis and the number of people within an apparel company dedicated to social responsibility is low, factory audits consume significant portions of the sustainability teams' time, inhibiting them from working on other projects. Apparel companies once believed that a competitive advantage existed in protecting the names of their factory suppliers. Now, they realize that they already use many of the same suppliers as their competitors and a greater advantage exists in harnessing the collective knowledge of factory performance and reducing the number of audits that each company must perform.

Two initiatives are advancing this industry-wide collaboration. The Apparel, Mills, and Sundries Working Group, of which Gap Inc and Timberland are members, brings together apparel brands and their suppliers to jointly develop one set of sustainability principles, diagnostic tools, and reporting mechanisms (BSR, 2010). This will alleviate the problem caused by multiple brands having opposing requirements for the same suppliers and will streamline the auditing process. The Fair Factories Clearinghouse, of which Adidas, Gap Inc., H&M, Nike, Patagonia, and Timberland are members, collects audit data from members and shares it for accessibility and transparency among all the participants, in accordance with antitrust, creating a global clearinghouse of factory information (Fair Factories Clearinghouse , 2008). This improves the availability, comprehensiveness, and standardization of information collected on factory conditions and performance, allowing companies to dedicate more time to correcting identified issues.

Indeed, much progress has occurred in the materials, production, and distribution segments of the apparel product life cycle. Significantly less emphasis has been placed on the transportation, use, and disposal stages. Initiatives impacting the transportation segment tend to be symbolic or quick wins. None of the reported initiatives claimed to address the impact of transportation systemically by redesigning the supply chain to be more streamlined or less geographically dispersed. Similarly, very few of the stated initiatives focused on creating extremely durable products that would reduce the need for frequent replacement or on motivating consumers not to wash garments in hot water. Anecdotally, Timberland and Patagonia respectively produce footwear and apparel that *are* quite durable, though the companies do not promote this as a sustainability initiative. Patagonia guarantees the quality of its products and offers repair services throughout the products' lifetimes.

In terms of disposal, Nike and Patagonia each have a game-changing initiative that reduces the number of their products accumulating in landfills. Nike Grind is a program that takes back old Nike shoes, disassembles them, grinds up the rubber portions and uses them to produce sports surfaces such as tennis and basketball courts, and running tracks. Through its Common Threads program, Patagonia designs garments that can be returned to Patagonia outlets and recycled into new products. Closed-loop initiatives like these appear to be rare among apparel companies.

Other apparel companies have created business models that are increasingly sustainable. For example, Keep & Share is a UK-based luxury apparel company that encourages customers to buy fewer items and keep them for longer (Keep & Share, 2010). The company designs handmade knit garments that do not follow short-lived trends, but are designed to transcend fads. Customers are encouraged to borrow garments from the company to try them out before purchasing them. Keep and Share suggests that customers clean their knitwear by hanging garments in the washroom to absorb steam while someone is showering, or by hand washing them and laying them flat. The company also offers free repair services for its garments and will provide spare buttons free of charge throughout the products' lives.

Levi Strauss has committed to transforming its supply chain to use 100 percent renewable energy and produce zero waste (Levi Strauss & Co, 2010). In the use segment, it runs campaigns to educate consumers about washing their jeans in cold water. It has also changed all garment labels to instruct consumers to wash in cold water. Through its website, it encourages visitors to its website to wash their jeans less frequently, hang them to dry, and donate them when they no longer wear them.

As apparel companies strive to become more sustainable, they must place more emphasis on the post-consumer segments of the product life cycle, for this is where substantial amounts of energy and water are consumed and waste generated. Strategies for further reducing the impact of the apparel supply chain include:

- Partnering with freight carriers who use hybrid technologies or clean fuels; sending products by ocean as far as possible before resorting to trucks
- Creating products that are durable in both quality and style, reducing the need for frequent replacement
- Creating products that are reversible, that can be worn in more than one way, or that can be upgraded to extend their useful life
- Offering repair or replace services throughout the product's lifetime to extend its useful life
- Enhancing traceability of raw materials and using high-grade recyclable or biodegradable materials so products can be taken back at the end of their useful lives
- Using materials that can be cleaned by energy- and water-efficient means; encouraging spot treatment of stains and infrequent washing of garments
- Offering incentives for customers to return their used shoes and clothing to stores as an alternative method of disposal
- Developing systems for breaking down products into their components and finding creative ways of reusing the raw materials

The following section describes the metrics that companies use to measure the initiatives that they are implementing.

5.2 METRICS AND THE FOUR TYPES OF SUSTAINABILITY INITIATIVES

Thirty percent of the initiatives in the database do not have specific metrics tied to them. This is because their benefits are either qualitative or otherwise hard to measure. This section examines the metrics that *are* used, and their relation to the dimensions of sustainability.

On a corporate level, the number and types of initiatives implemented can help estimate a company's sustainability position and, in effect, measure its progress toward SSCM. This section shows the number of symbolic actions, quick wins, strategic projects, and game changers implemented by each company and uses these numbers to elucidate each company's sustainability position.

5.2.1 INDIVIDUAL METRICS

Only 30 percent of the unique initiatives in the database have associated metrics. Appendix 3 lists 73 initiatives, 64 of which are unique, and the metrics that the apparel companies use to measure those initiatives.

Table 10 shows the 5 sustainability dimensions, the percentage of all unique initiatives that each dimension accounts for, and the percentage of all initiatives with metrics that each dimension accounts for. For example, materials initiatives account for 23 percent of all initiatives and 26 percent of all initiatives with metrics.

Table 10: Distribution of Initiatives as a Percentage of all Initiatives and as a Percentage of all Initiatives with Metrics

| Sustainability Dimension | Percent of all Initiatives | Percent of Initiatives with Metrics |
|--------------------------|----------------------------|-------------------------------------|
| Energy/Emissions | 21 | 41 |
| Materials | 23 | 26 |
| Water | 11 | 14 |
| Waste | 8 | 11 |
| Social Responsibility | 41 | 8 |

Interestingly, energy/emissions initiatives account for 21 percent of all initiatives, but 41 percent of all initiatives with metrics. Conversely, social responsibility initiatives account for 41 percent of all initiatives, but only 8 percent of those measured. One explanation is that while energy/emissions initiatives are less common, they are easier to measure than social responsibility initiatives. For example, it is simple to calculate the benefit of using renewable energy to power corporate headquarters, but it is difficult to measure the benefits of helping suppliers create their own sustainability reports. Another possible explanation is that there are more benefits to knowing the impact of energy/emissions initiatives. For example, if a cap-and-trade system is implemented, companies will need to account for their emissions and will benefit from knowing precisely how much they can reduce their emissions. Ultimately, companies will need to find ways to measure all of their sustainability initiatives if they want to track, report, and build on their progress.

5.2.2 *MEASURING CORPORATE SUSTAINABILITY*

The individual initiatives that each company implements constitute its sustainability program, which can be used to approximate the company's stance towards sustainability. This correlation may not be as evident from this set of data as it would be from another source, because these particular companies were chosen for their green efforts, biasing the sample. For example, it is unlikely that any of these firms would be considered compliant or opportunistic.

Table 11 shows the distribution of each company's initiatives by type. As one might expect, there is a high number of symbolic actions and quick wins, and very few game changers. Unexpectedly, the most common type of initiative is strategic projects. Since strategic projects require significantly higher levels of commitment than quick wins, it seems logical that quick wins should be more prolific, yet strategic projects account for 35 percent of initiatives while quick wins account for 30 percent. There are several possible explanations for this result.

First, as mentioned, these companies were chosen *because* they are known to be committed to sustainability. Therefore, it is possible that their commitment has led them to pursue projects with greater opportunity for impact. A second and not unrelated explanation is that these companies are doing enough strategic projects that they no longer need to report every quick-win initiative. For example, instead of detailing every energy-saving initiative into its modular components—replacing light bulbs, installing motion sensors, turning off inactive equipment—these companies may feel it sufficient to report that their distribution centers use 100 percent renewable energy. Thus, an initiative that could have been classified as multiple quick-win projects is classified as one strategic project.

Third, it is possible that the number of strategic projects relating to social responsibility skews the data. By nature, social responsibility initiatives are rarely quick wins; they are generally classified as either symbolic or strategic. To demonstrate this, Table 12 displays the distribution of each company's initiatives excluding those relating to social responsibility. The number of symbolic actions and strategic projects decreases by 60 percent and 54 percent respectively, while the number of quick wins decreases by only 22 percent. The aggregate values in Table 12 are closer to what I expected to see—a high number of quick wins relative to the number of strategic projects.

Table 11: Distribution of each Company's Initiatives by Type

| Company | Symbolic Actions | Quick Wins | Strategic Projects | Game Changers | Total |
|--------------|------------------|------------|--------------------|---------------|------------|
| Adidas | 13 | 8 | 13 | 0 | 34 |
| Gap Inc | 8 | 11 | 17 | 0 | 36 |
| H&M | 18 | 6 | 15 | 1 | 40 |
| MEC | 7 | 12 | 10 | 3 | 32 |
| Nike | 15 | 5 | 27 | 2 | 49 |
| Patagonia | 5 | 22 | 7 | 2 | 36 |
| Puma | 14 | 13 | 6 | 0 | 33 |
| Timberland | 7 | 5 | 13 | 1 | 26 |
| *Other | 0 | 9 | 0 | 0 | 9 |
| Total | 87 | 91 | 108 | 9 | 295 |
| Low | 5 | 5 | 6 | 0 | |
| High | 19 | 22 | 27 | 3 | |
| Average | 11 | 11 | 14 | 2 | |

*Nine initiatives in the database, all relating to water conservation, were identified by companies, but not necessarily implemented yet.

Table 12: Distribution of each Company's Initiatives Excluding Social Responsibility

| Company | Symbolic Actions | Quick Wins | Strategic Projects | Game Changers | Total |
|--------------|------------------|------------|--------------------|---------------|------------|
| Adidas | 4 | 4 | 9 | 0 | 17 |
| Gap Inc | 1 | 7 | 8 | 0 | 17 |
| H&M | 10 | 3 | 6 | 1 | 20 |
| MEC | 4 | 11 | 5 | 3 | 23 |
| Nike | 4 | 3 | 13 | 2 | 22 |
| Patagonia | 5 | 20 | 2 | 2 | 29 |
| Puma | 4 | 9 | 1 | 0 | 14 |
| Timberland | 3 | 4 | 5 | 1 | 14 |
| Other | 0 | 9 | 0 | 0 | 9 |
| Total | 35 | 70 | 49 | 9 | 165 |
| Low | 1 | 3 | 1 | 0 | |
| High | 10 | 20 | 13 | 3 | |
| Average | 5 | 8 | 7 | 2 | |

It is evident from Table 11 and Table 12 that all eight companies qualify as at least good citizens, if not intrinsically sustainable. A determining factor is the number of each type of initiative implemented. Assigning a weight to each type of initiative gives a more balanced view of each company's sustainability efforts, and provides insight into their sustainability positions. Table 13 shows the number of points (weight) allocated to each type of initiative. Game changers accrue significantly more points because of their high scalability, impact, cost, and uncertainty of outcome.

Table 13: Weighting System for the Types of Initiatives

| Type of Initiative | Weight |
|--------------------|--------|
| Symbolic Actions | 1 |
| Quick Wins | 3 |
| Strategic Projects | 6 |
| Game Changer | 30 |

A range of scores was then assigned to each of the four sustainability positions introduced in Table 7. These scores are based on a minimum and maximum number of each type of initiative that a firm with a given sustainability position would implement. Table 14 shows these ranges.

Table 14: Range of Scores for each Sustainability Position

| | Low | High |
|---------------|-----|------|
| Compliant | 0 | 29 |
| Opportunistic | 30 | 59 |
| Good Citizen | 60 | 160 |
| Intrinsic* | 161 | 400+ |

* Firms must have at least one game-changing initiative to qualify as intrinsic, even if their score falls within the stated range.

For each company, the sustainability score is the sum of the product of each type of initiative and its weight. For example, Adidas' score is calculated as follows:

$$\text{Sustainability score} = (13 \text{ symbolic actions} * 1) + (8 \text{ quick wins} * 3) + (13 \text{ strategic projects} * 6) + (0 \text{ game changers} * 30) = 115$$

Table 15 displays the sustainability scores of each company. Based on the ranges defined above, Mountain Equipment Co-op, Nike, and Patagonia are intrinsically sustainable. The other five companies classify as good citizens.

Table 15: Sustainability Scores for the Eight Apparel Companies

| | Symbolic Actions | Quick Wins | Strategic Projects | Game Changers | Total |
|------------|-------------------------|-------------------|---------------------------|----------------------|--------------|
| Weights | 1 | 3 | 6 | 30 | 40 |
| Adidas | 13 | 24 | 78 | 0 | 115 |
| Gap Inc | 8 | 33 | 102 | 0 | 143 |
| H&M | 18 | 18 | 90 | 30 | 156 |
| MEC | 7 | 36 | 60 | 90 | 193 |
| Nike | 15 | 15 | 162 | 60 | 252 |
| Patagonia | 5 | 66 | 42 | 60 | 173 |
| Puma | 14 | 39 | 36 | 0 | 89 |
| Timberland | 7 | 15 | 78 | 30 | 130 |

A key criterion in evaluating overall corporate sustainability is the number of game changers implemented. It is easier to accumulate quick wins, and even strategic projects, than to change a fundamental aspect of the industry. Through “greenwashing”—the over-publicizing of green initiatives—opportunistic companies could appear to be good citizens if their claims are not adequately investigated. Therefore, it is the game changers that set intrinsically sustainable companies apart, which is why they receive a significantly higher weight.

Consider these game-changing initiatives that are reshaping the apparel industry:

- Mountain Equipment Co-op's Green Building Program is significantly reducing the ecological footprint of the company's stores (MEC, 2010). MEC operates free-standing stores, each designed with the environment in mind. The company chooses existing buildings that are accessible on bike and foot, and reuses as many materials as possible. Stores are well insulated, maximize the use of skylights to admit natural light, and have thermally efficient windows to minimize energy consumption. Energy sources used in MEC stores include bio diesel, wind, and solar. The Toronto store has a rooftop garden that offsets CO₂ emissions and helps insulate the building, decreasing heating needs. MEC's Winnipeg location is considered the most energy-efficient commercial outlet in Canada.
- While most of the companies have committed to increasing the use of more sustainable fibers such as organic cotton and recycled materials, MEC and Patagonia have used *only* organic cotton since 2005 and 1996 respectively. These companies have overcome the obstacles posed by slowly developing supply of and demand for organic cotton in order to do what is best for the environment.
- Timberland uses a Green Index to rank the environmental impact of each of its products (Timberland, 2010). Products are ranked in terms of their greenhouse gas emissions, the chemicals used in their production, and the resources they consume. Timberland takes the scores and labels each shoebox with a "nutritional label" describing its ecological footprint (see Appendix 4 for an example).
- H&M is increasing the number of its products that qualify for the European Eco-label. In 2008, it sold almost 1.5 million Eco-label garments (H&M, 2010). The Eco-label is a voluntary standard established by the European Commission. Eco-labeled products

undergo vigorous testing by independent third parties to ensure their performance and environmental quality (European Communities, 2006). Specific criteria for Eco-labeled clothing include: factories must limit their use of water and water pollution, detergents and fabric softeners used in production must be 95 percent biodegradable, dyes must be natural or environmentally friendly, and energy savings in production must be passed on to the customer (European Communities, 2006).

- Nike has partnered with PopTech Labs to “help foster the search for new deep green materials, which are benign and low-impact, and which can exist in new large-scale “closed loop” ecosystems wherein the materials in finished products can be used as inputs for new products” (PopTech, 2009). As mentioned earlier, Nike also runs the Nike Grind program which disassembles and reuses old Nike shoes (Nike, 2008).
- MEC has discontinued the use of plastic bags in its stores. It designed reusable, recyclable bags made from a 100 percent woven polypropylene fabric containing at least 85 percent post-consumer recycled content (MEC, 2010b).
- Patagonia’s Common Threads Recycling Program takes back several types of products, including Capilene Performance Baselayers, Patagonia fleece, Polartec fleece clothing (from any maker), Patagonia cotton T-shirts, and some additional polyester and nylon 6 products, for recycling (Patagonia, 2010). The recycled fibers are used as inputs into new garments, reducing waste sent to landfills and Patagonia’s use of virgin materials.

The quote in the introduction to this thesis reads “there is no finish line for environmental efforts—we can always go further,” and these companies exemplify this concept. While all eight have made significant strides toward environmental sustainability, it is clear that sustainability is

not a destination but a journey. The apparel industry still has considerable room for improvement in terms of environmental stewardship. When the game-changing initiatives in this section and the opportunities identified in the preceding one become commonplace among all apparel companies, the industry will be much closer to meeting the target of a long-term, sustainable supply chain.

5.3 ONLINE DATABASE

The sustainability research required for this thesis resulted in a rich collection of resources. A key component of promoting sustainability is the sharing of information and best practices. Therefore, I created an online resource based on the initiatives database. This tool is open to the public¹ and can be searched by sustainability dimension or supply chain stage. Search results return a table listing relevant sustainability initiatives and online links to external web pages that provide more information related to the initiatives. This tool is intended for use by other apparel companies who are interested in increasing the sustainability of their supply chains.

5.4 SUMMARY

This chapter analyzed the data collected on the sustainability initiative of eight apparel companies. Across the supply chain, over 90 percent of all initiatives occurred in the raw materials, production, and distribution stages. Additionally, a large percentage of the initiatives focus on social responsibility. While this imbalance of focus occurs throughout the industry, other apparel companies, such as Keep & Share and Levi Strauss, are implementing initiatives to increase the sustainability of the post-purchase segments of the apparel product life cycle.

¹ The tool is stored at www.agbonkhese.com/apparel_sustainability.html.

Analysis of the metrics used to measure sustainability initiatives showed that only 30 percent of the unique initiatives have associated metrics, and the majority of these tend to be energy/emissions-focused initiatives. There are few metrics for measuring social responsibility initiatives, which are generally harder to measure.

The number of each type of initiative that the companies implemented was examined. Unexpectedly, strategic projects were the most common type of initiative. Possible explanations include a focus on social responsibility initiatives, which require long-term commitment in addition to the deeper level of commitment inherent in the companies selected for this research. A weighting system was introduced to differentiate the firms with an intrinsic position toward sustainability from those still operating at the good- citizen level.

Finally, an online tool created to assist other apparel companies wanting to increase the sustainability of their supply chains was described. The next and final chapter summarizes the findings of this thesis.

6 KEY INSIGHTS AND RECOMMENDATIONS FOR FUTURE WORK

Most companies have started addressing sustainability issues, but actions to-date have focused primarily on regulatory compliance (Berns, et al., 2009), or what this thesis defined as the lowest level of sustainability. Significant impact cannot be realized through symbolic actions or internal adjustments to facilities and processes. Companies who truly understand sustainability are redefining their industries by developing innovative and environmentally friendly products and packaging; engaging with governments, industry associations, competitors, suppliers, and customers to discuss sustainability issues and collaborate on solutions; closing the loops of the product life cycle; and educating suppliers and customers to incorporate sustainability into their decision-making processes.

Apparel companies striving to pave the path to sustainability should consider several opportunities that are possible with existing technologies and service providers. First, enhancing traceability of raw materials and using high-grade recyclable or biodegradable materials will position companies to take back their products and cycle the materials back into the supply chain. It will also enable the development of detailed product labels, such as Timberland's Nutritional Label, which allow consumers to make more sustainable choices. Second, supply chain carbon emissions can be decreased by partnering with freight carriers who use hybrid technologies or clean fuels, retrofitting existing facilities to use less energy, and purchasing renewable energy credits. Third, developing products that are durable and upgradeable, and servicing products throughout their life cycles will decrease the amount of waste generated by apparel garments. Developing products that also meet industry standards such as Europe's Eco-Label decreases environmental impact while providing a stamp of approval to customers. These initiatives are pragmatic yet have impact and provide a diverse set of options for apparel

companies. More suggestions for sustainability initiatives can be found in the online tool mentioned in the previous chapter.

One shortcoming of this thesis' analysis is that it relies almost solely on publicly available data published by the individual companies. Errors may have arisen due to under- or over-promotion of sustainability initiatives by the companies. Further research could focus on evaluating the relationship between companies' reporting of their sustainability programs and their actual implementation of initiatives. It is not unlikely that the most sustainable companies actually report fewer initiatives because they do not feel compelled to *prove* their commitment to sustainability by reporting every initiative. For example, an interview with Patagonia's Director of Social and Environmental Sustainability revealed that Patagonia is implementing more supply chain sustainability initiatives than is reported on its website. This discrepancy likely skewed the data in an unfavorable way for the intrinsically sustainable companies.

Another opportunity for future research is to attempt to attach financial costs and benefits to each initiative for one company. While some of the initiatives, particularly those relating to energy efficiency, are simple to measure, it will be extremely challenging to quantify the net benefits of social responsibility initiatives. It would also be insightful to map the relationships between the various initiatives and attempt to understand the indirect repercussions of implementing sustainability programs.

LIST OF REFERENCES

- American Heritage Dictionary. (2000). Sustainability. *The American Heritage Dictionary of the English Language, Fourth Edition*. Boston, Massachusetts, USA: Houghton Mifflin Company.
- Beloff, B., & Beaver, E. (2000). Sustainability indicators and metrics of industrial performance. Paper SPE 60982. *Presented at the SPE International Conference on Health, Safety, and Environment in Oil and Gas Exploration and Production*. Stavanger, Norway. June 26-28.
- Berns, M., Townend, A., Khayat, Z., Balagopal, B., Reeves, M., Hopkins, M., et al. (2009). The Business of Sustainability. *Sloan Management Review* .
- BSR. (2010). *BSR: Apparel, Mills, & Sundries Working Group* . Retrieved 04 17, 2010, from Business for Social Responsibility: <http://www.bsr.org/consulting/working-groups/apparel-sundries.cfm>
- Carter, R. (2008). A Framework of Sustainable Supply Chain Management: Moving Toward New Theory. *International Journal of Physical Distribution & Logistics Management* , 28 (5), 360-387.
- Cotton Council International. (2010, 1 14). *World Agricultural Supply & Demand Estimates (WASDE)*. Retrieved 2 6, 2010, from Cotton Council International: <http://www.cottonusa.org/files/economicData/wasde-01-12-2010.pdf>
- Denend, L. (2007). *Wal-Mart's Sustainability Strategy*. Case OIT-71, Stanford Graduate School of Business, Stanford.
- DJSI. (2009). *Criteria and Weightings: Corporate Sustainability Assessment Criteria*. Retrieved 02 11, 2010, from Dow Jones Sustainability Indexes: http://www.sustainability-index.com/07_html/assessment/criteria.html
- European Communities. (2006). *Clothing*. Retrieved 04 20, 2010, from The European Eco-Label: <http://ec.europa.eu/environment/ecolabel/brochures/consumers/en/clothing.pdf>
- Fair Factories Clearinghouse. (2008). *What We Do*. Retrieved 04-17-2010, from Fair Factories Clearinghouse: <http://www.fairfactories.org/what-we-do/>
- Fiksel, J. (2009). *Design for environment: a guide to sustainable product development*. New York: McGraw-Hill.
- Forum for the Future. (2007). *Fashioning Sustainability: A Review of the Sustainability Impacts of the Clothing Industry*. London: Forum for the Future.
- H&M. (2010). *CSR: Our Products - Other Initiatives*. Retrieved 04 20, 2010, from H&M: http://www.hm.com/us/corporateresponsibility/sustainabilityreporting/csrreport__csr_report.nhtml

- IBISWorld. (2010a). *IBISWorld Industry Report: Family Clothing Stores in the US: 44814*. IBISWorld.
- IBISWorld. (2010c). *IBISWorld Industry Report: Footwear Wholesaling in the US: 42234*. IBISWorld.
- IBISWorld. (2010d). *IBISWorld Industry Report: Men's & Boys' Apparel Wholesaling in the US: 42232*. IBISWorld.
- IBISWorld. (2010b). *IBISWorld Industry Report: Shoe Stores in the US: 44821*. IBISWorld.
- IBISWorld. (2009b). *IBISWorld Industry Report: Synthetic Fiber Manufacturing in the US: 32522*. IBISWorld.
- IBISWorld. (2009a). *IBISWorld Industry Report: Women's, Children's & Infants' Apparel Wholesaling in the US: 42233*. IBISWorld.
- Jones, R. (2006). *The Apparel Industry*. Oxford: Blackwell Publishing Ltd.
- Keep & Share. (2010). *About Us*. Retrieved 04 19, 2010, from Keep & Share: Handmade Designer Knitwear for Men and Women: <http://www.keepandshare.co.uk/index.html>
- Levi Strauss & Co. (2010). *Citizenship - Environmental Sustainability*. Retrieved 04 19, 2010, from Levi Strauss & Co: <http://www.levistrauss.com/Citizenship/Environment.aspx>
- Lim, S.J., & Phillips, J. (2007). Embedding CSR Values: The Global Footwear Industry's Evolving Governance Structure. *Journal of Business Ethics* , 143-156.
- Locke, R., Qin, F., & Brause, A. (2007). Does Monitoring Improve Labour Standards? Lessons from Nike. *Industrial and Labor Relations Review* , 61 (1), 3-31.
- MEC. (2010). *Green Building Program*. Retrieved 04 20, 2010, from Mountain Equipment Co-op: http://www.mec.ca/Main/content_text.jsp?FOLDER%3C%3Efolder_id=2534374302883380&bmUID=1271773017376
- MEC. (2010b). *Waste Reduction - Reusable Shopping Bags*. Retrieved 04 20, 2010, from Mountain Equipment Co-op: http://www.mec.ca/Main/content_text.jsp?FOLDER%3C%3Efolder_id=2534374302886690&bmUID=1271777771092
- Nike. (2009). *Corporate Responsibility Report*. Retrieved 04 20, 2010, from Nike Biz: <http://www.nikebiz.com/crreport/content/environment/4-1-0-overview.php?cat=overview>
- Nike. (2008). *Nike's Shoe Recycling and Sustainability: Reuse-A-Shoe & Nike Grind*. Retrieved march 16, 2010, from Nike Reuse a Shoe and Nike Grind: <http://www.nikereuseashoe.com/>

Pagell, M., & Wu, Z. (2009). Building a More Complete Theory of Sustainable Supply Chain Management Using Case Studies of Ten Exemplars. *Journal of Supply Chain Management* , 45 (2), 37-56.

Patagonia. (2010). *Common Threads Recycling Program*. Retrieved 04 20, 2010, from Patagonia: http://www.patagonia.com/web/us/patagonia.go?slc=en_US&sct=US&assetid=1956

PopTech. (2009, 10 29). *PopTech Launches New Signature Offering: "PopTech Labs"*. Retrieved 04 20, 2010, from PopTech: http://www.poptech.org/labs_press_release

Porter, M., & Kramer, M. (2006). Strategy and Society: The Link Between Competitive Advantage and Corporate Social Responsibility. *Harvard Business Review* , 84 (12), 78-92.

Porter, T. (2008). Managerial Applications of Corporate Social Responsibility and Systems Thinking for Achieving Sustainability Outcomes. *Systems Research and Behavioral Science* , 25 (3), 397-411.

Rivoli, P. (2005). *The Travels of a T-Shirt in the Global Economy*. Hoboken: John Wiley & Sons, Inc. .

SAM Group. (2010). *The Sustainability Yearbook 2010*. Retrieved 02 11, 2010, from Sustainability Investing: <http://www.sam-group.com/html/yearbook/>

Shrivastava, P. (1995). The Role of Corporations in Achieving Ecological Sustainability. *Academy of Management Review* , 20 (4), 936-960.

Tanzil, D., & Beloff, B. (2006). Assessing Impacts: Overview on Sustainability Indicators and Metrics. *Environmental Quality Management* (Summer), 41-56.

Timberland. (2010). *Environmental Stewardship: Green Index*. Retrieved 04 20, 2010, from Timberland: http://www.timberland.com/corp/index.jsp?page=csr_green_index

Timberland. (2010b). *Nutritional Label*. Retrieved 04 20, 2010, from Timberland: <http://www.timberland.com/shop/ad4.jsp>

Tucker, R. (2008, June 3). AAFA Conference: Better To Be Green. *Women's Wear Daily* , 195 (117), p. 15.

Vachon, S., & Klassen, R. (2007). Supply chain management and environmental technologies: the role of integration. *International Journal of Production Research* , 45 (2), 401-423.

Veleva, V., & Ellenbecker, M. (2001). Indicators of sustainable production: framework and methodology. *Journal of Cleaner Production* , December, 519-549.

American Heritage Dictionary. (2000). Sustainability. *The American Heritage Dictionary of the English Language, Fourth Edition*. . Boston, Massachusetts, USA: Houghton Mifflin Company.

Beloff, B., & Beaver, E. (2000). Sustainability indicators and metrics of industrial performance. Paper SPE 60982. *Presented at the SPE International Conference on Health, Safety, and Environment in Oil and Gas Exploration and Production*. Stavanger, Norway. June 26-28.

Berns, M., Townend, A., Khayat, Z., Balagopal, B., Reeves, M., Hopkins, M., et al. (2009). The Business of Sustainability. *Sloan Management Review* .

BSR. (2010). *BSR: Apparel, Mills, & Sundries Working Group* . Retrieved 04 17, 2010, from Business for Social Responsibility: <http://www.bsr.org/consulting/working-groups/apparel-sundries.cfm>

Carter, R. (2008). A Framework of Sustainable Supply Chain Management: Moving Toward New Theory. *International Journal of Physical Distribution & Logistics Management* , 28 (5), 360-387.

Cotton Council International. (2010, 1 14). *World Agricultural Supply & Demand Estimates (WASDE)*. Retrieved 2 6, 2010, from Cotton Council International: <http://www.cottonusa.org/files/economicData/wasde-01-12-2010.pdf>

Denend, L. (2007). *Wal-Mart's Sustainability Strategy*. Case O1T-71, Stanford Graduate School of Business, Stanford.

DJSI. (2009). *Criteria and Weightings: Corporate Sustainability Assessment Criteria*. Retrieved 02 11, 2010, from Dow Jones Sustainability Indexes: http://www.sustainability-index.com/07_html/assessment/criteria.html

European Communities. (2006). *Clothing*. Retrieved 04 20, 2010, from The European Eco-Label: <http://ec.europa.eu/environment/ecolabel/brochures/consumers/en/clothing.pdf>

Fair Factories Clearinghouse . (2008). *What We Do*. Retrieved 04 17, 2010, from Fair Factories Clearinghouse: <http://www.fairfactories.org/what-we-do/>

Fiksel, J. (2009). *Design for environment : a guide to sustainable product development*. New York: McGraw-Hill.

Forum for the Future. (2007). *Fashioning Sustainability: A Review of the Sustainability Impacts of the Clothing Industry*. London: Forum for the Future.

H&M. (2010). *CSR: Our Products - Other Initiatives*. Retrieved 04 20, 2010, from H&M: http://www.hm.com/us/corporateresponsibility/sustainabilityreporting/csrreport__csr_report.nhtml

IBISWorld. (2010a). *IBISWorld Industry Report: Family Clothing Stores in the US: 44814*. IBISWorld.

IBISWorld. (2010c). *IBISWorld Industry Report: Footwear Wholesaling in the US: 42234*. IBISWorld.

IBISWorld. (2010d). *IBISWorld Industry Report: Men's & Boys' Apparel Wholesaling in the US: 42232*. IBISWorld.

IBISWorld. (2010b). *IBISWorld Industry Report: Shoe Stores in the US: 44821*. IBISWorld.

IBISWorld. (2009b). *IBISWorld Industry Report: Synthetic Fiber Manufacturing in the US: 32522*. IBISWorld.

IBISWorld. (2009a). *IBISWorld Industry Report: Women's, Children's & Infants' Apparel Wholesaling in the US: 42233*. IBISWorld.

Jones, R. (2006). *The Apparel Industry*. Oxford: Blackwell Publishing Ltd.

Keep & Share. (2010). *About Us*. Retrieved 04 19, 2010, from Keep & Share: Handmade Designer Knitwear for Men and Women: <http://www.keepandshare.co.uk/index.html>

Levi Strauss & Co. (2010). *Citizenship - Environmental Sustainability*. Retrieved 04 19, 2010, from Levi Strauss & Co: <http://www.levistrauss.com/Citizenship/Environment.aspx>

Lim, S.-J., & Phillips, J. (2007). Embedding CSR Values: The Global Footwear Industry's Evolving Governance Structure. *Journal of Business Ethics* , 143-156.

Locke, R., Qin, F., & Brause, A. (2007). Does Monitoring Improve Labour Standards? Lessons from Nike. *Industrial and Labor Relations Review* , 61 (1), 3-31.

MEC. (2010). *Green Building Program*. Retrieved 04 20, 2010, from Mountain Equipment Co-op: http://www.mec.ca/Main/content_text.jsp?FOLDER%3C%3Efolder_id=2534374302883380&bmUID=1271773017376

MEC. (2010b). *Waste Reduction - Reusable Shopping Bags*. Retrieved 04 20, 2010, from Mountain Equipment Co-op: http://www.mec.ca/Main/content_text.jsp?FOLDER%3C%3Efolder_id=2534374302886690&bmUID=127177771092

Nike. (2009). *Corporate Responsibility Report*. Retrieved 04 20, 2010, from Nike Biz: <http://www.nikebiz.com/crreport/content/environment/4-1-0-overview.php?cat=overview>

Nike. (2008). *Nike's Shoe Recycling and Sustainability: Reuse-A-Shoe & Nike Grind*. Retrieved march 16, 2010, from Nike Reuse a Shoe and Nike Grind: <http://www.nikereuseashoe.com/>

Pagell, M., & Wu, Z. (2009). Building a More Complete Theory of Sustainable Supply Chain Management Using Case Studies of Ten Exemplars. *Journal of Supply Chain Management* , 45 (2), 37-56.

Patagonia. (2010). *Common Threads Recycling Program*. Retrieved 04 20, 2010, from Patagonia: http://www.patagonia.com/web/us/patagonia.go?slc=en_US&sct=US&assetid=1956

- PopTech. (2009, 10 29). *PopTech Launches New Signature Offering: "PopTech Labs"*. Retrieved 04 20, 2010, from PopTech: http://www.poptech.org/labs_press_release
- Porter, M., & Kramer, M. (2006). Strategy and Society: The Link Between Competitive Advantage and Corporate Social Responsibility. *Harvard Business Review* , 84 (12), 78-92.
- Porter, T. (2008). Managerial Applications of Corporate Social Responsibility and Systems Thinking for Achieving Sustainability Outcomes. *Systems Research and Behavioral Science* , 25 (3), 397-411.
- Rivoli, P. (2005). *The Travels of a T-Shirt in the Global Economy*. Hoboken: John Wiley & Sons, Inc. .
- SAM Group. (2010). *The Sustainability Yearbook 2010*. Retrieved 02 11, 2010, from Sustainability Investing: <http://www.sam-group.com/html/yearbook/>
- Shrivastava, P. (1995). The Role of Corporations in Achieving Ecological Sustainability. *Academy of Management Review* , 20 (4), 936-960.
- Tanzil, D., & Beloff, B. (2006). Assessing Impacts: Overview on Sustainability Indicators and Metrics. *Environmental Quality Management* (Summer), 41-56.
- Timberland. (2010). *Environmental Stewardship: Green Index*. Retrieved 04 20, 2010, from Timberland: http://www.timberland.com/corp/index.jsp?page=csr_green_index
- Timberland. (2010b). *Nutritional Label*. Retrieved 04 20, 2010, from Timberland: <http://www.timberland.com/shop/ad4.jsp>
- Tucker, R. (2008, June 3). AAFA Conference: Better To Be Green. *Women's Wear Daily* , 195 (117), p. 15.
- Vachon, S., & Klassen, R. (2007). Supply chain management and environmental technologies: the role of integration. *International Journal of Production Research* , 45 (2), 401–423.
- Veleva, V., & Ellenbecker, M. (2001). Indicators of sustainable production: framework and methodology. *Journal of Cleaner Production* , December, 519-549.

APPENDIX 1: DATABASE STRUCTURE

The database has eight fields, as shown here. This is a sample of sustainability initiatives relating to waste generation.

| Company | Initiative | Supply Chain Stage | Metric | Target | Page Reference | Sust_Type | Classification |
|-----------|---|-------------------------------|---------------------------------|------------|------------------------|-----------|----------------|
| Patagonia | Offer repair services for the lifetime of a product for free or at a nomin... | Use | NULL | NULL | Repairs | Waste | strategic |
| Nike | Measure and aim to decrease the waste generated from material cut... | Raw Materials | NULL | NULL | Considered Index | Waste | Strategic |
| Gap Inc | Conduct an environmental assessment to determine curren waste cr... | Raw Materials, Producti... | NULL | NULL | NULL | Waste | Strategic |
| Gap Inc | Reduce the use of corrugated cardboard by using recyclable contai... | Distribution | Tons of cardboard waste di... | 57000 | Eco focus | Waste | Quick |
| Gap Inc | Eliminate the use of plastic strapping in shipping. | Distribution, Transportati... | Yards of strapping diverted | 63 million | Eco focus | Waste | Quick |
| Gap Inc | Work with neighbouring retailers in shopping malls to recycle store-g... | Distribution, Disposal | NULL | NULL | Eco focus | Waste | Quick |
| MEC | Recycle, compost or donate as much generated waste as possible | Distribution, Disposal | Percent of waste diverted f... | 100 | Waste reduction at MEC | Waste | Quick |
| MEC | Undertake annual waste audits to estimate the amount of waste and... | Distribution | NULL | NULL | Waste reduction at MEC | Waste | Strategic |
| MEC | Discontinue the use of plastic bags. Sell reusable, recyclable bags m... | Distribution | NULL | NULL | Reusable shopping bags | Waste | Game Changer |
| MEC | Take back store-sold batteries for recycling. | Disposal | kg of batteries recycled | NULL | Battery recycling | Waste | Quick |
| Nike | Collect worn out and unusable shoes of any make, break them dow... | Disposal, Recovery | Tonnes of waste diverted | NULL | Nike Grind | Waste | Game Changer |
| Patagonia | Make products that can be recycled and offer recycling services at r... | Disposal, Recovery | Tonnes of fabric diverted fr... | NULL | Common Thread | Waste | Game Changer |
| Patagonia | Print catalogs and marketing materials on FSC certified post-consum... | Raw Materials, Distribution | Tonnes of solid waste diver... | NULL | FSC certification | Waste | Quick |
| Patagonia | Recycle construction, demolition and land-clearing waste such as m... | Distribution, Recovery | percent of waste recycled | 75 | LEED certified | Waste | Quick |
| Patagonia | Recycle, compost or donate as much generated waste as possible | Distribution, Disposal | NULL | NULL | LEED certified | Waste | Quick |
| Puma | Try to avoid waste and waste related items; aim must be the preventi... | Production, Disposal | tonnes of waste diverted | NULL | Puma Safe 87 | Waste | Quick |
| Puma | Try to utilize generated waste by means of recycling, reuse or reclam... | Production, Disposal, R... | tonnes of waste recycled | NULL | Puma Safe 87 | Waste | Quick |

APPENDIX 2: DETAILS ON THE EIGHT APPAREL COMPANIES

| Company | HQ Location | Founded | Industry | Mission |
|------------|-------------|---------|-------------------------------|---|
| Adidas | Germany | 1949 | Footwear, Apparel | Lead the sporting goods industry with brands built on a passion for sports and a sporting lifestyle |
| Gap Inc | US | 1969 | Apparel | Create a store experience that is easy for the customer and offered a wide selection of fits and styles |
| H&M | Sweden | 1947 | Apparel | Bring fashion and quality at the best price |
| MEC | Canada | 1971 | Outdoor Equipment and Apparel | Help people enjoy the benefits of self-propelled wilderness-oriented recreation |
| Nike | US | 1964 | Footwear, Apparel | Bring inspiration and innovation to every athlete in the world |
| Patagonia | US | 1965 | Apparel | Build the best product, cause no unnecessary harm, use business to inspire and implement solutions to the environmental crisis. |
| Puma | Germany | 1948 | Footwear, Apparel | Become the most desirable Sport lifestyle company |
| Timberland | US | 1952 | Footwear | Equip people to make a difference in their world |

APPENDIX 3: SEVENTY THREE SUSTAINABILITY INITIATIVES AND THEIR METRICS

| Company | Initiative | Supply Chain Stage | Metric | Target | Sustainability Dimension | Classification |
|------------|--|--------------------|---|---|--------------------------|----------------|
| Patagonia | Install light colored concrete in parking lots and driveways to avoid the absorption and radiation of heat caused by asphalt. | Distribution | Percent of concrete used that is light colored | N/A | Energy/ Emissions | Quick |
| Timberland | Install solar arrays at distribution centers or other facilities. | Distribution | Percent of energy used that is renewable | 100 | Energy/ Emissions | Quick |
| Gap Inc | Install solar arrays at distribution centers or other facilities. | Distribution | Percent of total energy use provided by solar power | N/A | Energy/ Emissions | Quick |
| Patagonia | Install solar arrays at distribution centers or other facilities. | Distribution | Barrels of oil saved; acid rain, smog and GHG emissions avoided | 5669 barrels, 20945 lbs, 10053 lbs, 4 million lbs | Energy/ Emissions | Quick |
| Patagonia | Build facilities with single-ply white membrane roofs that reflect heat. | Distribution | Cost savings | N/A | Energy/ Emissions | Quick |
| Patagonia | Install R30 insulation on the roofs of company-owned facilities and R12 rigid insulation on warehouse walls to help retain heat in winter and keep the building cool in summer | Distribution | Cost savings | N/A | Energy/ Emissions | Quick |
| Patagonia | Employ a night-flush vent system that replaces the hot air of day with cool, nighttime air instead of using air conditioning in company-owned facilities. | Distribution | Cost savings | N/A | Energy/ Emissions | Quick |

| Company | Initiative | Supply Chain Stage | Metric | Target | Sustainability Dimension | Classification |
|------------|---|--|--|-------------------------|--------------------------|----------------|
| Patagonia | Install double-paned windows and skylights to minimize heating and cooling costs and maximize solar gain. | Distribution | Cost savings on energy expenditures | 50-80% | Energy/ Emissions | Quick |
| Gap Inc | Participate in the Environmental Protection Agency's Climate Leaders Program to reduce energy use and greenhouse gas emissions. Collect and report emissions data for store operations. | Distribution | Decrease in emissions (year to year) | N/A | Energy/ Emissions | Strategic |
| Nike | Measure the amount of CO2 produced in the extraction and development of materials. | Raw Materials | Kg CO2 per kg of material | N/A | Energy/ Emissions | Strategic |
| Timberland | Use software like Gabi to calculate the GHG emissions created from the production of a product. | Raw Materials, Production, Distribution, Transportation | Kg of CO2 equivalents | N/A | Energy/ Emissions | Strategic |
| Puma | Install solar arrays at distribution centers or other facilities. | Distribution | kWh per year produced, tons of CO2 avoided | 70000, 35 | Energy/ Emissions | Quick |
| Gap Inc | Help store managers focus on energy conservation by providing training materials and tips on reducing energy use along with targets for store-level energy reduction. | Distribution | kWh/Sq ft | N/A | Energy/ Emissions | Quick |
| Gap Inc | Replace lighting fixtures with energy-efficient fluorescent lights. | Distribution | KWh saved, \$ saved | 26 million, \$2 million | Energy/ Emissions | Quick |
| Patagonia | Print catalogs and marketing materials on FSC certified post-consumer recycled paper. | Raw Materials, Distribution | MJ of energy saved | N/A | Energy/ Emissions | Quick |

| Company | Initiative | Supply Chain Stage | Metric | Target | Sustainability Dimension | Classification |
|------------|--|--------------------|---|-------------|--------------------------|----------------|
| Nike | Measure the energy intensity of the production of materials. | Raw Materials | MJ/Kg of Material | N/A | Energy/ Emissions | Strategic |
| Adidas | Engage local consultants to provide energy efficiency workshops to suppliers. | Production | Number of suppliers trained annually | N/A | Energy/ Emissions | Symbolic |
| Timberland | Plant a tree for every pair of boots sold through a partnership with GreenNet. | Distribution | Number of trees planted, tons of carbon emissions saved | 500000 tons | Energy/ Emissions | Symbolic |
| MEC | Build green (or LEED certified) facilities for stores and other operations. | Distribution | Percent of buildings owned that are green or LEED certified | N/A | Energy/ Emissions | Game Changer |
| Adidas | Work with cargo carriers that are ISO 14001 certified. | Transportation | Percent of carriers certified | N/A | Energy/ Emissions | Quick |
| H&M | Drivers must receive theoretical and practical training on fuel-efficient driving, i.e. Eco-driving. | Transportation | Percent of drivers who've received the training | 75 | Energy/ Emissions | Symbolic |
| MEC | Encourage employees to walk, bike or bus to work by providing showers, secure bike storage, and bike maintenance instead of employee parking spaces. | Distribution | Percent of employees using alternative forms of transportation | N/A | Energy/ Emissions | Symbolic |
| Patagonia | Encourage employees to walk, bike or bus to work by providing showers, secure bike storage, and bike maintenance instead of employee parking spaces. | Distribution | Percent of employees who use alternative transportation | N/A | Energy/ Emissions | Symbolic |
| MEC | Purchase renewable energy certificates for power that emits fewer greenhouse gases than on-grid energy sources. | Distribution | Percent of energy consumption that comes from renewable sources | N/A | Energy/ Emissions | Quick |

| Company | Initiative | Supply Chain Stage | Metric | Target | Sustainability Dimension | Classification |
|------------|--|--|--|---|--------------------------|----------------|
| Patagonia | Use as much renewable energy as possible to power company-owned facilities. | Distribution | Percent of power used that comes from a renewable source | 100 | Energy/ Emissions | Strategic |
| Adidas | Work with footwear suppliers that are ISO 14001 certified. | Production | Percent of suppliers certified | 100 | Energy/ Emissions | Quick |
| Adidas | Work with footwear suppliers that are OHSAS 18001 certified. | Production | Percent of suppliers certified | 100 | Energy/ Emissions | Quick |
| Gap Inc | Conduct an environmental assessment to determine current emissions across the supply chain. | Production, Distribution, Transportation | Percent reduction in GHG emissions | 11% over five years | Energy/ Emissions | Strategic |
| MEC | Reduce GHG emissions by creating more energy efficient stores through the use of efficient technologies. | Distribution | Reduction in energy consumption year to year or by a particular date | 30 % within 5 years | Energy/ Emissions | Quick |
| H&M | Set a maximum sulphur content level for the diesel used to transport products. | Transportation | Sulphur content ppm | 500 in Canada and USA, 350 in other countries | Energy/ Emissions | Symbolic |
| Timberland | Increase the use of organic cotton. | Raw Materials, Recovery | Percent of cotton used that is organic | 10 | Materials | Strategic |
| Nike | Increase the use of recycled content such as polyester, wool, cotton, and leather. | Raw Materials, Recovery | Percent of materials used that are recycled | N/A | Materials | Strategic |

| Company | Initiative | Supply Chain Stage | Metric | Target | Sustainability Dimension | Classification |
|-----------|--|-----------------------------|--|----------------------|--------------------------|----------------|
| Nike | Increase the use of renewable materials such as Tencel, cashmere, polylactic acid, cork, wool, silk, bamboo, hemp, flax/linen, soy azlon, modal, leather, and cotton. | Raw Materials, Recovery | Percent of materials used that are renewable | N/A | Materials | Strategic |
| H&M | Check that suppliers label their chemicals properly and that they have material safety data sheets (MSDS). Verify that the MSDS have been implemented (workers are trained in safe chemical handling and they use protective equipment). | Production | Percent of suppliers in compliance with safe chemical handling regulations | 68 | Materials | Symbolic |
| Nike | Evaluate products on their chemical makeup including carcinogens, acute hazards, chronic hazards, endocrine disruptors. | Raw Materials | Chemical makeup of products | N/A | Materials | Quick |
| MEC | Use only organic cotton. | Raw Materials | Kilograms of organic cotton used | 130000 | Materials | Game Changer |
| Nike | Increase the use of organic cotton. | Raw Materials, Recovery | Minimum percent of organic cotton in every product | 5 | Materials | Strategic |
| H&M | Comply with the EU's Eco-label standards and apply for Eco-labeling of products. | Raw Materials, Production | Number of Eco-labeled items | 20 % annual increase | Materials | Game Changer |
| Patagonia | Print catalogs and marketing materials on FSC certified post-consumer recycled paper. | Raw Materials, Distribution | Number of trees saved | N/A | Materials | Quick |

| Company | Initiative | Supply Chain Stage | Metric | Target | Sustainability Dimension | Classification |
|------------|---|-------------------------|--|--------|--------------------------|----------------|
| MEC | Use recycled paper (certified by the FSC or AFF) for printing catalogues. | Distribution | Percent of catalogue paper that is recycled; trees, water, energy, solid waste and GHG saved | 100 | Materials | Quick |
| Patagonia | Design buildings using materials manufactured close to the job site | Distribution | Percent of materials manufactured within a 500 mile radius | 20 | Materials | Quick |
| Patagonia | Design buildings using recycled and refurbished materials. | Distribution, Recovery | Percent of materials used that are recycled | 10 | Materials | Quick |
| MEC | Increase the use of recycled polyester. | Raw Materials | Percent of polyester used that is recyclable | 100 | Materials | Strategic |
| Timberland | Eliminate the use of PVC. | Raw Materials | Percent of products that are PVC free | 100 | Materials | Strategic |
| MEC | Partner with an independent textile mill auditing organization such as Bluesign to audit textile suppliers. Partner with other companies in the industry to do this and create a larger impact. | Raw Materials | Percent of textile suppliers audited | 70 | Materials | Strategic |
| Patagonia | Use FSC certified wood when building company-owned facilities. | Distribution | Percent of wood used that is FSC certified | 50 | Materials | Quick |
| H&M | Increase the use of organic cotton. | Raw Materials, Recovery | Tons of organic cotton used per year | 3000 | Materials | Strategic |
| H&M | Support the transition of farmers from conventional to organic cotton by purchasing their "transitional" cotton. | Raw Materials | Tons of transitional cotton used per year | 50 | Materials | Strategic |

| Company | Initiative | Supply Chain Stage | Metric | Target | Sustainability Dimension | Classification |
|------------|--|--------------------|--|--------|--------------------------|----------------|
| Timberland | Measure and aim to decrease the intensity of use of solvent based cleaners, primers and solvents in footwear assembly as well as in decorative applications. | Raw Materials | Tons of solvent saved | 160 | Materials | Quick |
| H&M | Offer a Supplier Development Program that aims to increase factory productivity to reduce overtime hours without decreasing capacity. | Production | Percent of suppliers in compliance with overtime standards | 32 | Social Responsibility | Quick |
| Adidas | Extend monitoring and reporting of volatile organic compounds (vocs) at footwear factories. | Production | Grams per pair of shoes | 20 | Social Responsibility | Quick |
| Adidas | Join and contribute to the database of the Fair Factories Clearinghouse (FFC) which aims to improve social, environmental and security standards and create safe, humane working conditions for workers. | Production | Number of strategic compliance plans uploaded to FFC website | N/A | Social Responsibility | Strategic |
| Adidas | Provide training to suppliers on Workplace Standards & SEA introduction; FFC training; SEA policies & sops | Production | Number of training sessions/year | N/A | Social Responsibility | Quick |
| Adidas | Provide training to suppliers on Sustainable compliance guideline & KPI improvement; Factory Self-Audits (factory internal audits) | Production | Number of training sessions/year | N/A | Social Responsibility | Quick |
| Adidas | Provide training to suppliers on Specific labor, health, safety and environmental issues | Production | Number of training sessions/year | N/A | Social Responsibility | Symbolic |
| MEC | Take back store-sold batteries for recycling. | Disposal | Kg of batteries recycled | N/A | Waste | Quick |

| Company | Initiative | Supply Chain Stage | Metric | Target | Sustainability Dimension | Classification |
|-----------|---|--------------------------------|---|--------|--------------------------|----------------|
| MEC | Recycle, compost or donate as much generated waste as possible | Distribution, Disposal | Percent of waste diverted from landfills | 100 | Waste | Quick |
| Patagonia | Recycle construction, demolition and land-clearing waste such as metal, concrete, cardboard and wood generated from construction of company-owned facilities. | Distribution, Recovery | Percent of waste recycled | 75 | Waste | Quick |
| Patagonia | Make products that can be recycled and offer recycling services at retail locations. | Disposal, Recovery | Tons of fabric diverted from landfills/reused | N/A | Waste | Game Changer |
| Patagonia | Print catalogs and marketing materials on FSC certified post-consumer recycled paper. | Raw Materials, Distribution | Tons of solid waste diverted | N/A | Waste | Quick |
| Nike | Collect worn out and unusable shoes of any make, break them down, and create a new material that can be used in sporting surface materials such as basketball courts. | Disposal, Recovery | Tons of waste diverted | N/A | Waste | Game Changer |
| Puma | Try to avoid waste and waste related items; aim must be the prevention or reduction of waste production and its harmfulness | Production, Disposal | Tons of waste diverted | N/A | Waste | Quick |
| Puma | Try to utilize generated waste by means of recycling, reuse or reclamation to extract secondary raw materials or as a source of energy. | Production, Disposal, Recovery | Tons of waste recycled | N/A | Waste | Quick |
| Gap Inc | Reduce the use of corrugated cardboard by using recyclable containers. | Distribution | Tons of cardboard waste diverted | 57000 | Waste | Quick |

| Company | Initiative | Supply Chain Stage | Metric | Target | Sustainability Dimension | Classification |
|-----------|--|------------------------------|-------------------------------------|---|--------------------------|----------------|
| Gap Inc | Eliminate the use of plastic strapping in shipping. | Distribution, Transportation | Yards of strapping diverted | 63 million | Waste | Quick |
| Patagonia | Use low-flow toilets, faucets, and other plumbing fixtures. | Distribution | Amount of water saved | Use 30percent less water than the baseline calculated for the building | Water | Quick |
| Patagonia | When landscaping around company-owned facilities, use native plants that require less water, pesticides, and irrigation. | Distribution | Amount of water used for irrigation | No more than 50percent of the potable water a typical commercial property of similar size in the area would use | Water | Symbolic |
| Puma | Use spring-loaded nozzles on hoses in textile mills to avoid continuously running hoses. | Raw Materials | Cubic meters of water saved | N/A | Water | Quick |
| Patagonia | Print catalogs and marketing materials on FSC certified post-consumer recycled paper. | Raw Materials, Distribution | Liters of water saved | N/A | Water | Quick |
| Nike | Measure the water intensity of the material production process. | Raw Materials | Liters/kg of material | <100 | Water | Strategic |

| Company | Initiative | Supply Chain Stage | Metric | Target | Sustainability Dimension | Classification |
|-----------|--|--------------------|--|--|--------------------------|----------------|
| Gap Inc | Establish a clean water program and require denim laundries to treat wastewater so that it's safe and clean when it leaves the facility. | Raw Material | Number of denim laundries that pass inspection | N/A | Water | Strategic |
| Patagonia | Install pervious pavers in company-owned parking lots to restore rainwater back into the ground. | Distribution | Rate and quantity of storm-water runoff | Same or less than pre-development levels | Water | Quick |
| Patagonia | Install sand/oil separation units around receiving docks to filter out contaminants from storm-water runoff. | Distribution | Rate and quantity of storm-water runoff | Same or less than pre-development levels | Water | Quick |

APPENDIX 4: TIMBERLAND'S NUTRITIONAL LABEL

(Timberland, 2010b)

