Sustainability in the Apparel Industry: Improving How Companies Assess and Address Environmental Impacts Through a Revised Higg Index Facility Module

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Sustainability in the Apparel Industry:
Improving How Companies Assess and Address Environmental Impacts through a
Revised Higg Index Facility Module

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A Thesis in the field of Sustainability and Environmental Management
for the Degree of Master of Liberal Arts in Extension Studies

Harvard University
November 2015
Abstract

This study was focused on analyzing the Facility Environmental Module (FEM) of the Sustainable Apparel Coalition’s (SAC) Higg Index. The research objectives were twofold: 1) to test whether the indicators featured in the FEM could accommodate the data requirements for calculating environmental impacts of apparel products, and 2) to identify if the FEM indicators could satisfy the data and information needs of other key stakeholder groups.

The long track record of irresponsible social and environmental practices in the apparel industry began gaining more attention in the press toward the end of the 20th century. Since then, many companies have been prompted to introduce sustainability practices in response to business-threatening criticisms. While these measures helped companies manage their supply chains better, for the most part the improvements remained at the scale of individual companies, limiting their effectiveness in implementing systemic change in the apparel industry.

The potential for improving sustainability across the industry rests in the ability for apparel companies to engage collaboratively toward the common goal. Helping to facilitate this objective is the Higg Index, the SAC’s self-assessment suite of tools. The Index is presently composed of three modules, which use a standardized scoring methodology to rate the performance of an apparel company’s brand, facilities, and products, respectively. One of the issues with the current state of the Index is the lack of connectivity between the product and facility modules. Because the processes conducted at the facility level have a direct impact on the embedded impacts of the product, it is
important to consider these factors when assessing the lifecycle implications of a given product.

The second issue considered in this study is that facilities are often confronted with external pressures to report, comply, and seek certifications related to environmental performance. In practice, this requires completing data and information requests similar to those of the Higg Index. However, these tasks can be burdensome for facility managers who may need to gather data from multiple sources. If the FEM and other Higg Index modules were structured in such a way that they could reduce the time and effort required to complete other requests for information they would likely be more easily adopted.

A gap analysis approach was used to test the FEM’s ability to yield valuable data for product LCAs and to understand its potential synergies with other data and information requests. First, the metrics that could be expected from a completed FEM were compared against the requirements of the product LCA methodology using a restructured excel file. This file featured all FEM key performance indicators (KPI) and included dedicated columns for mapping the criteria for data needed by each LCA impact category methodology. The second test involved using a similar excel-based tool to assess the equivalencies between the FEM KPIs and those featured in two example external frameworks: the Fair Trade Product Standard and the Cradle to Cradle Standard.

Based on the results of these gap analyses, it became clear that there is significant potential to improve the assessment of facilities’ performance through the introduction of more quantitative KPIs. This would be required to calculate relative impacts for product LCAs and it would also help facilities gain a better understanding of their performance. It is therefore recommended that the SAC reassess the KPIs featured in the FEM and
request more quantitative metrics. Additionally, continuing to evaluate the equivalencies of other sustainability frameworks may help the SAC to identify common KPIs that are asked by external organizations but not included in the FEM. These elements could then be incorporated into a future version of the FEM for a more comprehensive assessment of facility environmental performance.
Dedication

For Mom and Dad who are constant sources of inspiration and whose support has been unwavering through all aspects of life including my academic endeavors. For my siblings, especially Chris, whose regular whispers of encouragement kept me going. For my nieces and nephews whose future will be influenced by the actions we take today. And, of course, for Oli – who never let me lose sight of the finish line and kept me laughing along the way.
Acknowledgments

I am deeply grateful to my thesis director, Asheen Phanse, whose valuable insight and enthusiasm for this subject matter helped guide numerous conversations in the right direction. His dedication to the project and generosity with his time surpassed all expectations. I would also like to thank the teaching staff of the Harvard Extension School’s Sustainability and Environmental Management Program, especially Professor Mark Leighton who prepared me for this journey of writing a thesis. Finally, I am grateful for the support I received from the Sustainable Apparel Coalition (SAC). The numerous exchanges I had with SAC representatives, particularly, Cameron Childs, were instrumental in helping me arrive at a relevant focus for this piece of work.
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Chapter I
Introduction

The apparel industry has a deep, dark history of irresponsible environmental and social practices that have come to light relatively recently. With an educated public looking closely at the actions of these companies, these issues are impossible to ignore. In some cases, accusations related to socially and environmentally irresponsible practices have tainted the reputation of many apparel companies. In response, some of these companies began to address these issues and introduce sustainability practices in their organizations.

These early steps forward were important but overall impacts were limited given the size and complexities of the industry. The products produced through the apparel industry are ones that most individuals interact with on a daily basis and even depend on for survival. The large majority of the global population wear some type of clothing and footwear every day, and with over seven billion people participating in the apparel market, the sheer volume of apparel products produced to meet this demand is staggering. Moreover, many people have a tendency to continuously acquire apparel. This is not only driven by fundamental physiological factors, such as the need for warm layers in cool climates, but it is also woven into our social and cultural constructs. For centuries, the garments we choose to wear have been influenced by our desire to utilize our appearance as an outward display of our connectivity to certain socio-economic, ethnic, or cultural constructs and they can play a central role in helping us define our identity (Davis, 1994).
From an environmental perspective, the extreme demand for apparel products presents both sustainability challenges as well as opportunities with regard to production. On one hand, the materials and processes required to manufacture clothing and footwear can be environmentally intensive and the high volumes of consumption lead to significant accumulative impacts. However, given the influential nature of apparel companies, there is great potential to leverage apparel products as a medium for promoting sustainability more broadly. By educating consumers on the impacts associated with their purchasing decisions, the “demand” side of the economic equation is capable of balancing the sustainability improvements underway on the “supply” side.

Many apparel companies have since come to realize that improving sustainability practices means addressing related issues throughout the entire value chain, which necessitates collaboration among the industry stakeholders. Helping to facilitate this collaboration is the Sustainable Apparel Coalition (SAC).

Founded in 2010, the SAC is a member-based organization with a mission dedicated to transforming the industry’s typical management approaches through the introduction of a modular self-assessment tool, known as the “Higg Index”. While the Index has served as a valuable first step in standardizing the approach apparel companies take in migrating toward more responsible product designs and operating practices, it remains in its early stages of development and leaves much work to be done to optimize its practical applications. This thesis focuses on two main objectives for improving upon the latest version (2.0) of the Index.

The first objective is related to the structure of the Index. The three modules comprising the Index are dedicated to key aspects of the value chain: “Brand”,

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“Products”, and “Facilities”. Currently, each of these modules exists as a standalone assessment. Keeping these modules independent of one another may serve a valuable purpose in making the assessments at each level more digestible for companies. However, there is a missed opportunity in applying information collected in one module to the analyses resulting from another module. This becomes especially important when considering the complementary environmental key performance indicators (KPIs) addressed in the Facility Module (FEM) and Product Module.

The Product Module utilizes a standard life cycle assessment (LCA) methodology to determine the relative impact of a given product with consideration for the materials, production, distribution, use, and disposal associated with its lifetime. Currently, the data used in these calculations are sourced from a Materials Sustainability Index (MSI) database. This index of cradle-to-gate data for materials used in apparel production is the compilation of results from over eight years of material research sponsored by Nike (Sustainable Apparel Coalition, 2015). The index has served as an excellent starting point for the SAC’s Rapid Design Module (RDM) that allows designers to weigh the environmental pros and cons of certain materials during the conception of new products. However, the assessments conducted through the RDM tool do not account for the full lifecycle impacts of a product as data is not available for the “use” and “end-of-life” phases. Considering this calculation constraint along with the limited range of materials included in the MSI, the SAC is looking to expand the materials database to support the calculations of full LCAs with high quality data.

To that end, the data collected in the FEM could serve as valuable input to the SAC’s revised database as the processes occurring at the facility level are directly
relevant to the “production” phase of the product’s lifecycle. This primary data gathered through the FEM could directly benefit the quality of calculations conducted for assessing product impacts, yet the current state of the FEM was not designed to accommodate the data needs of the Product Module. Therefore, this research aims to evaluate the KPIs of the FEM and identify whether the data input from facilities could accommodate the calculations conducted as part of a product LCA. To accomplish this, the methodologies adopted by the SAC for assessing the impacts of a product’s lifecycle will be compared against the data that could be expected from FEM. Following this assessment, recommendations are made for modifying KPIs in the FEM so that they may yield high-quality, primary facility-level data that could be used directly in the Product Module of the Higg Index.

The second objective of this research is to test how the FEM may be adapted to better accommodate the data collection needs of apparel facilities. Managers are often confronted with the challenge of responding to an increasing number of external stakeholder requests for information, many of which require similar data. If the FEM could be revised to encompass the majority of KPIs requested of facility managers, the module could potentially be used as a central repository for sustainability data and information. This could help facilities reduce the time required for gathering and reporting data, and more time could be made available for identifying and implementing robust solutions to improve facility efficiencies. Therefore, this research has tested the potential for the KPIs in the FEM to accommodate the requirements of other frameworks. This was accomplished using two pilot equivalency gap analyses through which the extent of overlap between the eternal frameworks and the FEM KPIs were evaluated.
Background

Clothing has played an important role throughout most of human history. Interestingly, the more recent developments in the apparel industry occurring over the last few centuries have given rise to a dichotomy. While the growth of the industry has largely benefited society, it is also responsible for considerable social rights and environmental issues.

The mechanized approaches of today’s apparel production have made it possible to provide essential garments to an increasingly expanding global population. Efficiencies at the production level make it possible to turn out large volumes of apparel and to keep the price point reasonable for the end consumer. However, with more accessible apparel products for the masses, demand has risen, which in turn forces apparel companies to respond with increased supply. Maintaining the economic equilibrium of supply and demand has spurred continued growth across the industry, but this has contributed to further consumption of natural resources and outsourcing of labor leading to dire environmental and social impacts.

Recognizing the opportunities to improve corporate responsibility, a number of influential apparel companies have begun to identify ways in which they may reduce their impacts from operations. However, it is extremely difficult for apparel companies to leverage these individual efforts in ways that could transcend the company and influence their supply chain, much less the entire industry. Yet to adequately counter the many adverse effects the apparel industry imposes, changes are required at the industry level.
The SAC is dedicated to addressing this need for collaborative action throughout apparel value chains. While a fairly young organization, the SAC’s mission is one that is underpinned by the apparel industry’s deep history in both innovation and irresponsible practices. It is therefore helpful to consider the industry’s journey of triumphs and tribulations that have led it to today’s crossroads of continued growth and sustainable transformation.

Revolutionizing Industry

The introduction of the first mechanical device designed to improve the efficiency of spinning multiple threads for textile production, the Spinning Jenny, serves as an iconic symbol of the Industrial Revolution. The production of textiles became far more efficient with the automation of this invention in 18th century England; within 70 years of its introduction, workers in textile factories were capable of producing a thousand articles per day – a volume that previously would have taken at least a week by hand. The result of these improvements and the similar advancements seen across other industries made the production and distribution of goods, including apparel, far more streamlined and economically advantageous (Braungart & McDonough, 2002).

While the apparel industry continued to benefit from the progress fueled by the Industrial Revolution, there has been a continued focus on progress throughout society. Over the past couple centuries, society has achieved incredible scientific discoveries, technical achievements and civil advancements. Amidst these accomplishments, international trade, broad exchanges of ideas and innovative technology have spurred globalization (Khondker, 2015). In many ways, the interconnectedness and continuous
advancements of a globalized world have contributed to societal benefits including greater equality, improved labor practices, and refined cross-cultural understandings (Osland, 2003). But these developments have come at a cost. For instance, much of what has been accomplished through more efficient industries, including apparel, has been underpinned by economic objectives that overshadow any genuine regard for the environment (Braungart & McDonough, 2002). The result has been widely spread environmental degradation causing drastic effects on ecosystems and in some cases compromising human health.

Negative Impacts of Industrialization Coming to Light

In the 1960’s, the environmental movement began to take shape in the United States in response to the perilous inflictions caused by industrial practices. Many credit Rachel Carson with first shedding light on these issues through her publication of the book *Silent Spring* in 1964, which examined the serious strain placed on otherwise thriving ecosystems, and on public health, as a result of synthetic agricultural chemicals (Khondker, 2015; Sale, 1993). What was perceived as societal progress from technical and industrial advancements, was in reality detrimental to the environment and human health (Carson, Lear, & Wilson, 2002). Following this work, concern of the negative impacts resulting from industrialization only grew.

April 22, 1970 marked the United States’ first Earth Day, which was wildly successful and soon followed by the introduction of the federally appointed Environmental Protection Agency. Abroad, similar concerns with environmental protection amidst societal progress were brewing (Cramer & Karabell, 2010), which
prompted the United Nations to host the Conference on the Human Environment in Stockholm in 1972. As captured in the subsequent report from the United Nations, it is described that the conference was arranged “…having considered the need for a common outlook and for common principles to inspire and guide the peoples of the world in the preservation and enhancement of the human environment” (The United Nations, 1972). Among other important declarations from this conference, the proceedings stated that, “The protection and improvement of the human environment is a major issue which affects the well-being of peoples and economic development throughout the world; it is the urgent desire of the peoples of the whole world and the duty of all Governments” (The United Nations, 1972). Since then, the topics of environmental protection and sustainable development have continued to draw attention across various sectors including the general public, governments, and corporations. This increased environmental awareness has left the apparel industry directly exposed to reputational risks if environmental matters aren’t appropriately managed. Equally important, however, are the consumers of apparel products. The scientific community has clearly articulated that some of the most pressing environmental concerns, including climate change, are almost certainly linked to anthropogenic impacts. These impacts come in many forms including the burning of fossil fuels to drive cars and keep buildings at comfortable temperatures. However, these impacts also stem from consumerism like that seen in the growing apparel industry.

In November, 2014, the Intergovernmental Panel on Climate Change (IPCC) released an updated report highlighting the evidence of serious environmental concerns
facing the global community and ecosystems across the globe. The connectivity to human induced impacts is virtually undeniable:

Anthropogenic greenhouse gas emissions have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years. Their effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are extremely likely to have been the dominant cause of the observed warming since the mid-20th century. (IPCC, 2014)

As noted by the IPCC, the earth’s climate has transformed since the 20th century in such a way that the delicate balance required to sustain life on earth is threatened (IPCC, 2014). This message has been received by nations and corporations alike; however, it has taken time for momentum to build to action. In the case of the apparel industry, it took the exposure of the associated social and environmental injustices linked to its operations before many companies began addressing their impacts.

Acknowledging Irresponsible Supply Chain Management

It is somewhat surprising the irresponsible practices of some of the largest apparel companies in the world remained out of the public eye for as long as they did, considering the prominence of the industry and its vital contributions to the global economy. As of 2014 it is expected that up to 75 million people are employed by the global apparel industry, which is valued at $1.2 trillion (Stotz & Kane, 2015). Yet, for an industry that has a dominant presence in society, it is riddled with examples of
irresponsible corporate affairs. Perhaps one of the more familiar examples of a company that was forced to confront their business-as-usual practices due to brand-damaging public relations around misconduct in their supply chain is Nike (Googins, Mervis, & Rochlin, 2007). Understanding the processes that Nike went through to address these issues provides a useful insight into the challenges facing many apparel companies and the unquestionable need to reform management practices.

The unfair and dangerous working conditions of Nike’s supply chain became publicly known in the 1990s. A key component to the company’s business success was linked to the high profit margin made possible by outsourcing all manufacturing to low-wage regions (Spar, 2002). However, without any corporate-level oversight of working conditions, Nike’s supply chain was riddled with unchecked mistreatment of workers. This resulted in unjust labor conditions, such as less-than-minimum wage compensation and unsafe working conditions. When this issue was brought to the attention of the public, Nike was forced to respond. It did so by improving the monitoring of its supply chain. However, this was found not to be thoroughly effective as suppliers would regularly slip into non-compliance. Instead, Nike introduced a creative approach coined, “Rewire”, which includes integrating sustainability throughout Nike’s operations and rewarding high performing suppliers that also incorporate sustainability practices into their operations (Porteous & Rammohan, 2013).

Nike is not alone as a company which had to address irresponsible supply chain management, and this issue persisted for years, as seen in more recent events such as the collapse of the Rana Plaza building in Bangladesh in 2013. Killing more than 1,100
garment workers, this incident underscores how safety and labor rights remain insufficiently controlled in the apparel industry (Cline, 2013).

The social mistreatment of many who work in the apparel industry has been a serious issue, but the environmental toll for which the apparel industry is responsible is equally deplorable. Apparel production often uses toxic chemicals and non-biodegradable materials, consumes significant water and energy, and generates large volumes of waste and harmful gases that can have lasting environmental impacts (Choudhury, 2014). As an example, the methods used for textile dyeing can be a particularly intensive process. Some estimates project as much as 20% of all industrial water pollution is attributable to the use of synthetic chemicals used in textile production (Jackson, 2014).

The extent of environmental impacts from apparel facilities has even warranted an extended analysis from the international environmental advocacy group, the Natural Resources Defense Council (NRDC). In 2010, NRDC released a “Clean by Design” report (Natural Resources Defense Council (NRDC), 2010) in which they explored the various environmental and health threats posed by common practices in the apparel industry. Together with the Council of Fashion Designers of America, the report, “Revolutionizing the Global Textile Industry” was published in which the various sources of inefficiencies and polluting agents in the apparel industry were highlighted. For instance, significant waste is typically generated from fabric dyeing when original dye attempts do not match the buyer’s specifications. Additionally, hot water gets released into waste streams that could otherwise be reused in the facility, and pollutants get released into the environment.
Environmental concerns associated with the apparel industry extend beyond the production facility. One of the major contributions to the overall impact has to do with the use of products. In light of the fast nature of the fashion world and high demand from consumers, there is an inherent depletion of natural resources both for the raw materials needed for fabrics and apparel components as well as the fuels and water required for production. The more consumers buy apparel products, the more resources are required to supply the flow of goods. Meanwhile, unwanted garments are often disposed in waste streams, posing further pollution issues (Connell & Kozar, 2014).

Adapting for a Sustainable Future

Given the consensus among scientists that the recent changes observed in the global climate are attributed to anthropogenic drivers, it is important to acknowledge that a significant contribution of these human impacts can be linked to industry and consumerism. With regard to responding to the serious nature of climate change and needing to address its source, it is natural to look for opportunities in the industry with arguably the deepest ties to industrial innovation. The apparel industry would also benefit from reassessing its environmental impacts from the perspectives of restoring its reputation and securing its future business. However, this is not an easy endeavor given the size of the industry and the dynamic nature of the business, which is predominantly dictated by consumer behavior.

In modern day, most individuals choose their clothing at least partly based on societal influences. Fashion evolves and our perception of how we may utilize fabrics and other materials to express our identity and accommodate our lifestyles is forever in flux,
whether consciously or subconsciously. Apparel directly enables our ability to present ourselves in a desired image and to comfortably conduct our daily activities. In light of this explicit connection between people and apparel, companies are challenged with responding to rapidly evolving fashion trends that require speedy production turnaround and low price points to remain competitive. As a result, the apparel market experiences enormous consumer activity, which in turn drives companies to respond to the additional product demand (Jackson, 2014).

While “high-fashion” is reserved for wealthy consumers investing in luxurious clothing from famed designers, the general public tends to participate in a “fast-fashion” market that is largely driven by customer demands for emerging fashion trends made available in a timely manner and at an affordable price (Sull & Turconi, 2008). This has transformed the industry, forcing apparel companies to manage their business and organize their supply chain in such a way that allows them to be highly agile and capable of responding to the dynamic market (Christopher, Lowson, & Peck, 2004).

An example of the positive-feedback of the supply and demand system can be seen through a relatively new trend involving a broad adoption of athletic gear for applications beyond its utilitarian use. At the turn of the 21st century, some high-end athletic brands such as Lululemon began introducing “activewear” – clothing that combines fashion with the active functionality that a more athletic population desires (Sherman, 2014). Following suit were a slew of major apparel brands including the likes of Gap, Adidas, Nike, Forever 21 and H&M, that introduced dedicated product lines to address the consumer demand for clothing designs that straddle casual-chic and functional athletic wear. Because these companies are well-practiced in adapting to
changing trends, they were able to readily alter their production lines accordingly. It is expected that by 2019, the global sports apparel market including active lifestyle commodities will grow by 9% compared to 2012, reaching $11.5 billion (Trefis, 2013). This demonstrates the rapid responses to trends required by apparel companies to remain competitive in their high-stakes markets. What’s more, this dynamic nature of the apparel business is likely to become more difficult to manage as the number of consumers grows.

The United Nations predicts that the global population will increase from 7.3 billion in 2015 to 8.5 billion by 2030 and continued growth is essentially inevitable through 2050 (The United Nations, 2015). Considering most of these people will require at least some clothing, the apparel industry is expected to see continued growth as well. While a clear business opportunity, this reality also presents challenges for the industry. The natural fibers upon which humans have depended for centuries – cotton, flax, and wool – quite simply cannot be utilized as the predominant fabric to clothe a growing population into the future, due to impending agricultural land constraints (Boersem & Reijnder, 2010). The alternative is to use materials such as petroleum-based fibers like polyester and acryl, which actually have lesser environmental impacts than cotton (van der Velden, Patel, & Vogtländer, 2013). However, utilizing these alternative materials comes with its own environmental setbacks. Unlike natural fibers, synthetic or petroleum-based fibers are not easily biodegradable, and require greater energy input during production (Gam, Cao, Farr, & Heine, 2015).

Recognizing these current and forthcoming hurdles, apparel companies have begun to respond by assessing their practices and identifying opportunities to reduce their contributions to the industry’s environmental downfalls.
Patagonia, for instance, has a long-standing reputation as a leader in sustainable apparel. In 1990 they partnered with an external expert to conduct their first life cycle impact assessment, aiming to uncover the environmental impacts of cotton, nylon, polyester, and other fibers used in their products. The results of this study indicated that the most significant environmental impacts were attributed to cotton, which uses excessive pesticides and water through conventional growing practices. Additionally, the toxic chemicals used through the dyeing and finishing phases of cotton compound these impacts. Shocked by this discovery, Patagonia was inspired to take action and decided in 1994 to eliminate conventionally grown cotton from the company’s production lines (Chouinard & Brown, 1997).

From the demand side, there is a direct linkage between the potential for sustainability throughout the apparel industry and the reality of consumer behavior. Regardless of the efforts made at the level of the apparel company to limit the environmental impacts of its operations, if the sheer volume of products consumed is excessive, there is no hope for the industry to keep its overall impact in check (Connell & Kozar, 2014).

Research shows that a lack of sufficient understanding about current environmental issues has a strong influence on consumer behavior and leads to ecologically detrimental choices. More specifically, studies have shown that consumers’ awareness of environmental issues relative to clothing production, distribution, and consumption is low (Connell & Kozar, 2014). What makes matters worse is that consumers continue to make frequent purchases but are lacking the knowledge to make environmentally responsible choices. As part of the fast fashion mentality, consumers are
swept into a cycle of buying cheap, easily accessible clothing, but often paying the price in lack of quality, which prompts additional purchasing to replace the quick degrade of poor quality garments.

In the face of mass consumerism (Leichenko & O’Brien, 2008), Patagonia confronted the paradigm head-on. November 28, 2011 marked the day of Patagonia’s iconic campaign requesting that the public not buy their merchandise on Cyber Monday, a day otherwise earmarked to be “one of the biggest online shopping days ever” (Patagonia, 2011). Through this communication, which included a full-page spread in the New York Times, Patagonia candidly exposed the environmental impacts associated with the production and consumption of one of its best-selling items – the fleece “R2®” jacket. Although this jacket was carefully designed for longevity and eventual recyclability when it is no longer useful, the campaign explains how this and all other products require input of dwindling resources. Patagonia encouraged the public to consider this fact when making decisions to invest in a purchase rather than succumb to the lure of the unnecessary consumerism represented by Cyber Monday – “…as is true with of all the things we can make and you can buy, this jacket comes with an environmental cost higher than its price…Don’t buy what you don’t need” (Patagonia, 2011).

Following Patagonia’s lead, Levi Strauss and Co. also tried to identify how its products were impacting the environment. But, unlike Patagonia’s assessment aiming to uncover the relative impacts of different fibers, Levi conducted the first complete LCA in the industry in 2007. Similar to what Patagonia’s assessment uncovered, cotton cultivation proved to be a major contributor to Levi’s environmental impact. However, another interesting discovery was made – consumer care of Levi’s products was the other
major source of environmental burden (Levi Strauss & Co., 2015). To address this issue, Levi introduced a “Care Tag for the Planet” that is used to inform consumers how they can care for their clothing while using less water and energy.

These case studies highlight the undeniable movement toward improving sustainability in apparel and encouraging consumers to make informed decisions about their purchases. However, while individual companies have made notable headway in specific segments of their value chains, much more has to take place to make progress across the entire industry. This is especially important considering the complex supply chains involved with producing apparel. It is commonplace for numerous apparel brands to utilize a single supplier for a particular stage of production, which presents an opportunity for addressing sustainability throughout the supply chain. By focusing on collaboration, the apparel industry can make significant improvements at the supplier or facility level that have rippling benefits across a number of apparel companies.

Collaborating for a Transformed Industry

Recognizing the need for apparel companies to collaborate in order to influence change in the industry was a major driver for the establishment of the Sustainable Apparel Coalition (SAC). That fact the SAC was founded by the unlikely partnership of the largest retailer on the globe – Walmart, and one of the most sustainably-focused apparel retailers – Patagonia, indicates a marked transition in the industry’s acknowledgment of needing to adopt more environmentally and socially responsible practices (Ceres, 2014). Starting with over 30 top apparel companies as members in 2011, the SAC’s goal is to unite organizations involved in the apparel, footwear, and home
textile industry to establish a standardized measurement tool that will help evaluate environmental and social and labor impacts involved with their businesses. Ideally, this collaborative approach will benefit each participating organization, as well as the whole industry, in making the necessary changes to reduce environmental harm and have a positive impact on communities where they operate (Sustainable Apparel Coalition (SAC), 2015).

The tool under development for collecting relevant data and information, the Higg Index, is currently organized by three modules: 1) Brand, 2) Products, and 3) Facilities (with a fourth under development for Retail Spaces). The KPIs included in these modules are mainly inspired by the Outdoor Industry Association’s (OIA) Eco Index, Nike’s Environmental Design Tool (including a Materials Sustainability Index (MSI)), and the Global Social Compliance Program reference tools, in addition to a number of social and labor best-practice tools.

Each module has a dedicated web-based tool for members’ use as well as open-source documentation for general public access. The KPIs in these modules consist of a series of environmental and social questions related to the corresponding business unit. As users of these modules input responses and data, scores are calculated that are intended to help member organizations better understand the sustainability performance across their value chain, make more informed decisions about their product designs and operations, and benchmark against their peers. From a longer-term perspective, the scoring element of these modules is intended not only to guide SAC members in sustainability management decisions, but also to inform consumers of embedded environmental and social impacts on a garment-level basis. The SAC’s vision is that
consumers would be equipped with more information about the comparative sustainability aspects of products they are considering purchasing and will be able to make thoughtful decisions no longer exclusive to typical considerations, such as design, function, and cost. Introducing this additional piece of information into the decision-making process introduces an extended competitive playing field for apparel companies.

However, before moving forward with trying to influence the consumers’ purchasing decisions, the SAC found it imperative to build momentum in the industry by encouraging apparel companies to self-assess their sustainability performance and partake in the exchange of best practices. As described by Yvon Chouinard, the founder and chairman of Patagonia, the Higg Index only needs to be “good enough” in its early stages (Chouinard, Ellison, & Ridgeway, 2011). In light of this mentality, the Index exists as an evolving solution, regularly being reviewed and undergoing adaptations through iterative processes involving a diverse selection of stakeholder groups.

Evolution of the Higg Index

In December 2013, the SAC introduced an updated Higg Index – version 2.0. This version revamped what was predominantly an assessment tool based on qualitative information and introduced more quantitative metrics. Following this update, the SAC plans to release additional iterations and refine the approaches taken to collect the most essential data.

As part of the evolutionary process, the SAC’s goal is to expand the database that it currently uses for the design and development tool that is embedded in the Product Module. The database currently used for this tool is fed by legacy data from Nike’s
Materials Sustainability Index that sits in the backend of the Product Module. Users can test different design scenarios from an environmental perspective by comparing the inclusion of various materials in the product design.

The SAC recognized an opportunity to expand this database by requesting input from member organizations. Through a formal validation process led by a leading LCA expert, the data submitted for inclusion in the database will be fully vetted for integrity before it is adopted. Ultimately, this database will serve as an extensive, high-quality open data source that may help inform smarter product design.

This approach to evolving business and sustainability solutions is gaining popularity. In GreenBiz’s annual report, *State of Green Business-2015*, the concept of “open innovation”, or the free exchange of ideas moving across people and organizations, is becoming more commonplace for businesses seeking to offer solutions to today’s challenges (Makower, 2015). Often associated with technology, open innovation can take the form of accessible source code for programming software. It can also refer to the shared usage of new products like 3D printers. For the SAC, the living database fed and sourced by member organizations has great potential for advancing innovation in the apparel industry.

Optimizing Environmental Assessments

While parceling the impacts of an apparel company’s value chain, as it is done with the Higg Index modules, is sensible from the perspective of facilitating an assessment, it is important to consider how the results may be compiled to understand the holistic picture of sustainability at an apparel company. Through data compilation,
companies may make more informed decisions about where to focus efforts for improvement, and eventually to communicate progress to stakeholders in a meaningful manner.

This need for the integration of results is particularly important when it comes to the design and development of products. With an increased focus on conducting reliable LCAs based on improved data quality, the results of the environmental section of the Facility Module (FEM) are directly relevant to how materials are chosen and products manufactured and should therefore be closely aligned with the Product Module. Ideally, the impacts from manufacturing materials or products at the facility would feed directly into the LCA approach for calculating the overall environmental impacts through the Product Module.

An LCA allows users to consider the environmental impact of a product throughout its existence. This can include the earliest stages of production, including raw material extraction, all the way through to disposal methods when the product is no longer of use. Typical life cycle stages are: production or extraction of raw materials, manufacturing of product, use by the final consumer, and recycling or waste treatment at the end of life (ISO, 2006).

Conducting an LCA typically follows a four-phased approach, beginning with establishing the scope, including the boundaries, of the system under assessment. Second, an inventory analysis is conducted through which practitioners of the LCA log all the inputs and outputs of the system. For this, flow diagrams are often prepared to serve as a visual representation of the system and a helpful reference when conducting calculations to ensure all impacts within the defined scope are included in the assessment.
(Curran, 2006). With this inventory of inputs and outputs established, the environmental impacts associated with each phase of the life cycle are calculated and analyzed (ISO, 2006). As Figure 1 shows, the environmental impacts accrued through the processes occurring at the facility level have a direct impact on the overall material impacts, and should therefore be considered a data input to the database.

![Figure 1. Process map for apparel production. Processes listed correspond to those available as options in the Higg Index Facility Module.](image)

Given this direct connection between data available at the facility level and data that would be valuable input to the database for the design and development tool, it would be helpful to assess the current requests for data and information in the FEM to determine if the expected results would be sufficient for the needs of the database.
In addition to ensuring the FEM is designed to provide the most valuable data possible for product LCAs, it is also beneficial to understand the broader context of how the FEM KPIs may serve a greater purpose. It is not uncommon for facility managers to be asked to participate in a number of questionnaires, surveys, or other requests for information related to environmental management. With various external stakeholders interested in similar information but utilizing different platforms, facility managers are subjected to what is commonly referred to as “survey fatigue” when too many requests for information are distributed to a given facility (Herrera, 2011). The outcome can be counterproductive; it would benefit the SAC to consider how the FEM may be multipurposed so that the KPIs appearing in the FEM also satisfy the requests from other external entities. If the FEM could be more inclusive in capturing information from facilities that would be required for other frameworks, the module could provide significant added value to facilities by reducing the time required to gather data and craft responses for other stakeholders, thus reducing survey fatigue among member companies.

Recognizing this potential value-add, the SAC published a survey in early 2015 through which member organizations weighed in on the external stakeholder requests they are most commonly exposed to. What resulted from this exercise was a list of roughly 50 frameworks, certifications, or questionnaires that members suggested assessing for the equivalencies with the FEM.
Hypotheses and Specific Aims

In light of the early development of the FEM, this research tests two hypotheses focusing on elements that are likely to be most impactful for the next iteration of the module.

Hypothesis 1: Alignment of FEM and the SAC Database Methodology

The modules of the Higg Index are currently designed as stand-alone assessment tools for each of the three modules (Brand, Product, Facility) and do not complement each other to the fullest extent possible. In particular, version 2.0 of the Facility Module falls short in collecting the adequate level of environmental information that could benefit the assessment of products from an LCA perspective. However, if the FEM KPIs were revised to yield more quantitative data catered to the requirements for an LCA, it would enhance the value of this module. The data gathered through these revisions would not only provide a more informative picture of the state of facilities, but it would also directly benefit the LCA analyses conducted through the Product Module.

Hypothesis 2: Gap Analysis of Other Frameworks

Given that the Higg Index was not specifically designed to accommodate the requirements of other frameworks, certifications or surveys subject to the apparel industry, there is an opportunity to refine the KPIs presented in the Index so they include more of the most commonly requested information. If the FEM KPIs were revised to meet the needs of other industry frameworks, there could be potential for the Higg Index to serve as a single source of information for multiple stakeholders.
Specific Aims

The aims of this research are to identify whether the environmental KPIs included in the Facility Module may be revised to 1) yield primary data that may be used directly in the LCA methodology of the Product Module, and 2) introduce a solution for reducing survey fatigue by making the FEM more inclusive of information commonly included in other external stakeholder requests.
Chapter II
Methodology

The hypotheses of this research were tested by first examining the Microsoft Excel file of the Facility Module publically available on the SAC website. The latest version (2.0) is comprised of the following tabs:

1. Terms of Use
2. General Guidance
3. General Instructions
4. Facility Profile
5. Facility Environment Module (FEM)
6. Facility Social Module

The fifth tab (FEM) hosting the environmental metrics served as the primary basis of this study in the interests of better understanding a) how the environmental metrics could be applied to more comprehensive assessments of the environmental impacts associated with apparel product, and b) how the facility module may be able to function as a master data collection solution capable of accommodating the needs of other environmentally-relevant frameworks.

In the Excel file, the FEM is organized by sections of KPIs structured in tables. These tables represent seven overarching categories:

1. Environmental Management System or Program
2. Energy Use & Greenhouse Gas (GHG) Emissions
3. Water Use
4. Waste water/Effluents
5. Emissions to Air
6. Waste Management
7. Chemical Management
The series KPIs under these seven categories are grouped by several questions usually beginning with a generic high level question addressing the overall relevancy (answers requested as “yes” or “no”). As an example, the first question in the FEM is, “Do you know what this site’s environmental impacts are?” If these binary type questions are answered with “yes”, the responder is then asked to provide additional information for a number of related questions. The types of KPIs and questions found under each of the main seven categories tend to follow a similar pattern, beginning with questions related to management approaches, followed by goal setting, and concluding with questions focused on initiatives in place to reduce environmental impacts, including “leading practices” the facility may have underway.

As the FEM version 2.0 now stands, the complete list of questions spans nearly 800 rows in the excel file. It was therefore considered a helpful exercise with the intent of improving the efficiency of this research to distill the questions down to their basic elements when possible without compromising the objective of the questions. In addition, while maintaining the integrity and order of the questions, sub-categories were established to simplify the analysis of the questions (Appendix A). As a result, the revised FEM framework modified for the use of this research was reduced in length by more than half to help facilitate a more streamlined research approach.

Hypothesis 1: Alignment of FEM and the SAC Database Methodology

Utilizing the revised FEM framework, the first task of this research was to evaluate the KPIs included in the module. The answers that the FEM could reasonably yield were compared to the data requirements for SAC’s central database used to conduct
product LCAs. The impact categories SAC adopted per the recommendation of an external expert (Table 1) were mapped against the KPIs measured through the FEM. To do so, columns were added to the right of the seven main tables – one for each impact category (Figure 2). The exception was for the impact category Land Occupation; this category was omitted from the analysis as it is applies specifically to agricultural land use, which is outside the scope of operations at the facility level.

Table 1. LCA impact categories. Categories and methods provided by SAC and prepared by external LCA expert.

<table>
<thead>
<tr>
<th>Impact Category</th>
<th>LCIA Method</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate Change</td>
<td>IPCC 2013 GWP 100a v1.00</td>
<td>kg CO₂ eq</td>
</tr>
<tr>
<td>Resource depletion, fossils and minerals</td>
<td>CML 2 baseline 2000 v2.05</td>
<td>kg Sb eq</td>
</tr>
<tr>
<td>Eutrophication</td>
<td>CML-IA baseline 2013 v3.01</td>
<td>kg PO₄ eq</td>
</tr>
<tr>
<td>Water resources depletion/Scarcity</td>
<td>WSI Pfister et al. 2009 v1.01</td>
<td>m³</td>
</tr>
<tr>
<td>Human Toxicity</td>
<td>USE-Tox (Default) v1.03</td>
<td>CTUh</td>
</tr>
<tr>
<td>Ecotoxicity</td>
<td>USE-Tox (Default) v1.03</td>
<td>CTUe</td>
</tr>
<tr>
<td>Land Occupation (Agriculture only)</td>
<td>ReCiPe v1.10</td>
<td>m²a</td>
</tr>
</tbody>
</table>

For each Impact Category, the specific Life Cycle Impact Assessment (LCIA) methodology adopted by the SAC had to be considered carefully. The following describes each of the seven categories in further detail.

1) Climate change: The Climate Change Impact Category uses the common Intergovernmental Panel on Climate Change (IPPC) 2013 GWP 100a v1.00 standard. Through this impact assessment, greenhouse gas (GHG) emissions are calculated for each emitted substance using its equivalent global warming potential relative to CO₂ for a 100-year time horizon. This component of the LCA is commonly referred to as “carbon
footprinting” and accounts for all the gases identified as a greenhouse gas (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride) (Muthu, 2015).

2) Resource depletion: The CML-2 baseline 2000 method is used for calculating the risk of resource depletion including minerals and fossil fuels. For this category, the impacts at the facility level would be embedded in the materials and fuel used at the facilities and not an impact directly caused by production.

3) Eutrophication: To calculate how the processes at facilities may contribute to eutrophication, the CML-IA baseline 2013 method is used. Eutrophication, the state of nutrient overabundance in an ecosystem, can be detrimental. Common in waterbodies as a result of increased nitrogen or phosphorous levels, eutrophication can disrupt an entire aquatic ecosystem and lead to serious environmental issues.

4) Water resources depletion: Assessing the impact of water resources is incredibly important for the apparel industry due to the typically high volumes of water required at most stages of a product’s lifecycle. The impact method selected for this category was the WSI Pfister et al. 2009, which puts a strong emphasis on regional water scarcity by utilizing a water stress index on scale of 0.01 to 1.

5) Human toxicity: The USEtox method is applied to the Human Toxicity calculations. These impacts reflect the potential harm caused to human health.

6) Ecotoxicity: Similar to Human Toxicity, Ecotoxicity, or the potential threat to natural ecosystems due to contamination, is measured using the method USEtox.

With columns for these impact categories reserved to the right of the FEM KPIs (Figure 2), each KPI was assessed systematically by identifying which KPIs were
relevant to which impact categories and where there were potential gaps between the metrics collected through the FEM and methodology requirements for assessing the impact categories on the product level. In some cases, the FEM KPIs were related to data needed for impact calculations but the question was not worded in a fashion that would yield directly useful data. These occurrences were noted in the appropriate column for that impact category to serve as a basis for developing recommendations for potential revisions.

Figure 2. Portion of revised FEM layout including new section for gap analysis of SAC database methodology.

**Hypothesis 2: Gap Analysis of Other Frameworks**

To examine how functional the FEM may be in serving as a master tool that could accommodate the data and information needs from a wide range of other frameworks, certifications, and questionnaires, the equivalencies between two sample frameworks and the FEM was evaluated through gap analyses. The selection of the frameworks to use in the samples was influenced by the results of the 2015 SAC member survey and per the suggestion of the SAC’s Higg Index Product Manager. The chosen frameworks were the
Fair Trade’s Factory Standard for Apparel and Home Goods (version 1.1) and the Cradle to Cradle Product Standard (version 3.0).

Fair Trade Factory Standard for Apparel and Home Goods

The Fair Trade Factory Standard for Apparel and Home Goods uses high-level key performance indicators that allow organizations that might not have sophisticated sustainability programs in place to seek certification by meeting basic minimum criteria. Following certification, these organizations would be expected to demonstrate continuous development towards the fundamental principles of the standard, covering the following areas (Fair Trade USA, 2013):

- Workers’ Empowerment,
- Economic Development
- Social Responsibility
- Fair Trade Practices
- Environmental Management

For the purpose of this research, the gap analysis was conducted using the “Environmental Management” component of the Standard.

Cradle to Cradle Product Standard

The concept of Cradle to Cradle (C2C) was popularized by Michael Braungart and William McDonough, a chemist and architect, respectively (Lawson, 2011). In their 2002 publication, “Cradle to Cradle: Remaking the Way We Make Things”, Braungart and McDonough offered an innovative approach for rethinking how products are manufactured. The primary focus is on making pragmatic choices for materials used in manufacturing such that they may return to a use state (or, “cradle”) rather than requiring
disposal through a more traditional end-of-life circumstance. Consequently, careful consideration for the flow of “nutrients”, whether biological or technical, is required to achieve the cyclical state of a C2C design (Braungart & McDonough, 2002).

In 2010, the certification system for cradle-to-cradle design was established, which includes the Product Standard. This Standard provides guidance on the following categories:

- Material Health
- Material Reutilization
- Renewable Energy and Carbon Management
- Water Stewardship
- Social Fairness

Each of these topics have a number of associated KPIs on which organizations seeking certification are assessed (McDonough Braungart Design Chemistry, 2012).

Equivalency Evaluation Tool

To conduct the gap analyses of these frameworks against the FEM, the revised FEM framework with condensed questions and the inclusion of sub-categories was used as a basis for developing an equivalency tool. The tool was redesigned to make navigating the KPIs more straightforward. Ideally, the updated formatting will prove to be user-friendly, which would enable its distribution to representatives of external organizations with the request to complete the gap analyses between their framework and the FEM.

In addition to reducing the number of rows a responder would have to review, the reformatted FEM framework also consolidated basic information about the questions, including whether it is seeking a quantitative or qualitative response, the possible scores
that may be awarded, and the units requested for quantitative data. To the right of the FEM table, a separate section was developed to collect gap analysis input.

The analysis section was designed with the intent of making the gap analysis user-friendly in the event that it could be used by the SAC and its stakeholders for future equivalencies studies (Figure 3). This begins with a basic header to collect information related to the person completing the analysis and the framework examined. Beneath are four columns, each of which are dedicated to a parameter for assessment. These are then supplemented with a comment field for users to provide additional details or feedback in a dedicated fifth column. For the first two parameters, which request the degree to which an FEM element is in alignment with the framework being evaluated and what type of answer is desired, drop down menus with pre-populated possible answers were provided (Table 2). The other two parameters are dependent on the responses to the first two. If the response to the first parameter is “not at all”, meaning there is no alignment between the test framework and the FEM for that particular question, the remaining parameters are shaded to indicate no further analysis is required. If a question is in alignment with the test framework to some degree, the responder is then asked to provide the unit requested and a reference to the equivalent question. Additionally, conditional formatting applied to the excel file highlights answers of the same selection with a corresponding color. These finer design details and the attempt to simplify the structure were mainly intended to ease the process for external stakeholders to support the equivalencies study at a point in the future. As an added benefit, these features also improved the efficiency of assessing the two test frameworks for this research. The color coding of like responses, automatic
shading of questions that were not applicable and the truncated length assisted in readily identifying commonalities and gaps.

Table 2. Dimensions used for equivalencies gap analysis.

<table>
<thead>
<tr>
<th>Assessment Category</th>
<th>Options for Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree to which FEM element aligns with tested framework</td>
<td>Exactly</td>
</tr>
<tr>
<td></td>
<td>Very closely</td>
</tr>
<tr>
<td></td>
<td>Moderately</td>
</tr>
<tr>
<td></td>
<td>Not at all</td>
</tr>
<tr>
<td>Type of answer requested in in tested framework</td>
<td>Quantitative (#)</td>
</tr>
<tr>
<td></td>
<td>Qualitative (ABC)</td>
</tr>
<tr>
<td></td>
<td>Both Qualitative &amp; Quantitative</td>
</tr>
<tr>
<td></td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Units requested by tested framework (for quantitative answers)</td>
<td>(open field)</td>
</tr>
<tr>
<td>Reference(s)/ specific question(s) of tested framework that maps to FEM question</td>
<td>(open field)</td>
</tr>
</tbody>
</table>

While the social considerations covered in the Facility Module are of tremendous importance, especially in light of reports divulging the harsh working conditions many apparel industry laborers continue to face, analyzing how well these social KPIs are serving the purpose of the Higg Index is beyond the scope of this research. This subject is however being evaluated in close detail by the SAC and working groups with expertise in the areas of human rights and health and safety of workers.
Figure 3. Portion of revised FEM layout including new section for input from other frameworks.
Chapter III

Results

Alignment of FEM and the SAC Database Methodology

In evaluating the current state of the FEM with regard to the data and information requested, it became clear that there were a number of KPIs that could be better covered through slightly rewording questions or expanding on existing questions. In some cases, it would also be helpful to introduce new questions as well. In no cases were data requirements for the impact categories directly relevant to the first FEM KPI Category, “Environmental Management System or Program”.

1) Climate change: With regard to the KPIs of the FEM which would be relevant for including in a GHG calculation, all were represented under the “Energy Use & Greenhouse Gas Emissions” category. In the FEM it is asked how energy is monitored and how frequently, which can be considered helpful supplementary pieces of information offering insight into the quality of energy data provided. The series of energy questions goes on to list sixteen fuel types (with additional space for an “other” type that isn’t listed) for which the monitoring questions should be answered. However, the volume of fuel or equivalent energy associated with these fuel types is not requested apart from the indirect energy sources of electricity and steam.

While the series of questions also provides a space for facilities to enter their GHG emissions should this be something that they calculate independently, there would be no guarantee that the calculation would have been conducted using the same
methodology required for SAC’s database and therefore may be virtually useless for that purpose.

2) Resource depletion: Raw material extraction or cultivation are not covered in KPIs featured in the FEM as these would be outside the scope of assessment of facility impacts. However, the non-renewable fuel usage at a site may be assessed in terms of resource depletion. For this, the volumes of fuel consumed would need to be provided or estimated based on the data currently requested in units of energy.

3) Eutrophication: KPIs related to eutrophication include wastewater and hazardous waste. In the case of wastewater, the FEM requests information for the total volume of wastewater and the types of processes that could lead to contaminated wastewater (i.e. dyeing, tanning, and cleaning). However, there is not currently a dedicated question seeking the volumes of water that could result in contaminated water, nor the quantity or specific types of these contaminants. Similarly, data for the total mass of waste generated at a facility is requested, but not by waste type, which would be required to calculate the potential eutrophication impacts from certain types of waste.

4) Water resources depletion/scarcity: The total water volume consumed by a facility is requested through the FEM. However, the level of detail for volumes of consumption associated with different types of water sources (i.e. municipal, surface, well) is not collected. To accommodate the requirements of the WSI Pfister, this information in addition to basic information about the local watershed would be needed (Jeswani & Azapagic, 2011).

5) Human toxicity and ecotoxicity: The “Wastewater/Effluent”, “Emissions to Air”, “Waste Management”, and “Chemical Management” categories of the FEM are
relevant to the calculation of Human and Ecotoxicity using the USEtox methodology. Similar to what is required for calculating eutrophication, the volumes of contaminants discharged through wastewater and the mass of waste by type and disposal method would be needed to calculate Human- and Eco-toxicity. For emissions to air, the FEM currently requests information on the types of emissions but not the amounts, which would be needed to quantify the relative toxicity. The same is true for chemicals. The FEM requests information for the types of chemicals used in production; however, the volumes of these chemicals, their uses, and residuals remaining on products are data points that would be required for toxicity calculations, but are not captured through the module.

Framework Equivalencies Gap Analysis

In taking a close look at the Environmental Responsibility and Management component of the Fair Trade Standard, there is a clear difference from the FEM in that the indicators categorized under “Monitoring Systems”, “Hazardous Materials”, and “Waste Management” in the FEM do not request detailed information, which is by nature how the Fair Trade Standard is designed. The Standard is predominantly concerned with the continuous progress demonstrated by the certified organization, rather than an evaluation of a facility’s overall environmental impacts at a given point in time, as is the case with the FEM. With this distinction in mind, there is a substantial amount of overlap between the indicators featured in the environmental section of the Fair Trade standard and those found in the FEM. Each element of the Fair Trade standard was covered to some degree in the FEM.
Conversely, the results of the gap analysis between the FEM and the Cradle to Cradle Product Standard (C2C) showed significant gaps. In particular, one of the fundamental features of the C2C is a product’s preferential design in favor of cyclical materials. That is, materials identified as either biological or technical nutrients are favorable in material selection due to their ability to be reused numerous times. Currently, the FEM does not request this level of information about material characterization.

For both the Fair Trade Standard and C2C Product Standard, there are a number of categories used in these assessments which were not compared to the FEM because they were not specifically relevant to environmental KPIs. The Fair Trade Standard, for instance, addresses impacts to the economy, social responsibility, empowerment, and trade agreements – none of which are addressed in the FEM, although some KPIs related to these topics may overlap with the facility module’s social assessment. For the C2C Standard, there were also some topics that were not relevant to the scope of the FEM, including KPIs related to reutilization, which require considering a broader, corporate-level assessment of recycling or take-back programs.

The gaps identified between these frameworks and the FEM suggest that the current state of the FEM is not capable of wholly satisfying the data needs of these frameworks.
Chapter IV
Discussion

The collaboration fostered through the SAC is critical component of the apparel industry’s potential to shift the paradigm of irresponsible practices, and the Higg Index is the mechanism to support this objective. However, the results of this research indicate there are still further modifications required to optimize the practical use of the Higg Index. Specifically, there are opportunities to revise the FEM to ensure that the data and information collected through it are improving the quality of calculations conducted for product LCAs and addressing the most relevant and informative KPIs.

Opportunities to Improve Value Chain Sustainability Assessments

The individual modules of the Higg Index make the assessment of each business segment (brand, facility, and product) easy to assess as discrete elements of the whole value chain. The corresponding modules can be disseminated to the appropriate representatives of the organization for data input, and in doing so, apparel companies may gain valuable insights into making their operations more sustainable.

However, while this approach may serve as a positive first step for the use of the Higg Index, there is a significant opportunity to optimize the usability of data collected through each module by improving the integration of the modules. A deeper integration among the modules would reduce the risk for apparel companies to fall into the trap of managing sustainability through silos and failing to identify synergies in operations. In
addition to the benefits of understanding the sustainability performance on a more comprehensive scale, finding linkages can also improve the quality of assessments performed through each module.

In particular, the collective impacts associated with processes conducted at the facility level is an essential input for calculating an LCA. As one of the five major phases of a product lifecycle, production is often responsible for major contributions to the overall impact of a product across its lifetime. Therefore, improving the data quality of production impacts through the FEM and making these data available for the product assessments would greatly improve the overall quality of LCA calculations.

Through this research, it became clear that introducing more robust quantitative KPIs in the FEM will significantly improve the ability for these data to be used directly in the product LCAs. In addition to the benefit more quantifiable metrics in the FEM would add to the quality of calculations for product impacts, this improvement to the data collection would also provide a far superior overview of the impacts at the facility level and could help inform supply chain decisions made by apparel companies.

It should be noted that there is also a potential risk in requesting quantitative data from facilities with respect to preserving the competitive protection of suppliers. The SAC has made it clear that the data provided through the FEM are intended to be accessible and openly used by all members. For this reason, managers of facilities may be discouraged from entering complete and accurate data out of concern that this level of exposure could result in negative repercussions for their business. To address this concern, the SAC may choose to make quantitative data collected through future FEM iterations available only to direct partners in a value chain. Otherwise, data would be
aggregated anonymously and could be used as the foundation of a benchmarking tool, which could give facilities an indication of how they compare to peers and competitors. Over time, data stored in this type of tool could provide insights to industry best-practices and help facilities identify how they may improve their practices.

While it is clear that more quantitative facility metrics can provide significant value in measuring impacts and strategizing goals for improvements, in practice, the collection and disclosure of these additional metrics may be a challenging endeavor for facility managers. It is often the case that utilities, materials purchased, production operations and other fundamental elements of a facility for which data would be collected are managed by different people. In these cases, data gathering can be a tedious process requiring a representative to locate documents like utility bills and coordinate with other facility representatives. This process may result in poor data quality in cases where no one is actively managing these elements. For this reason, the SAC may consider introducing tutorial resources and a formal verification process.

Despite these challenges, gathering a meaningful set of metrics is critical to understanding the environmental performance of a facility and setting targets that are reasonable and measurable. Therefore, if quantitative data is to be requested in greater detail in the FEM, it would be sensible to request such metrics that would align with the SAC Database Methodology. Analysis of this opportunity showed that each category of the FEM apart from that requesting basic information about environmental management could be enhanced to capture data that would be transferable to the database. It would be of less concern for units of measure to correlate directly to what is used in the LCA impact category methodologies, with the assumption that a conversion calculation could
be made in the backend of the database. Hopefully, this would avoid inconvenience for the user, and improve response rates.

To collect data that would better accommodate the requirements for LCA calculations of products, the following specific revisions are recommended:

- A feature should be included as part of the FEM to include automatic calculations to determine the emissions associated with each type of energy source consumed. This would require using the appropriate emission factors for each fuel type as specified in the IPCC 2013 GWP 100a v1.00 to provide the equivalent kg CO$_2$ emissions.
- If responders to the FEM continue to have the option of inputting self-calculated GHG emissions, a question should be added to identify the methodology and emission factors applied.
- The volume of water consumed should be requested at a more granular level to provide data at the water source level.
- Wastewater volumes should be estimated (if actual data is not available) according to the type of process associated with the discharge.
- It would also be helpful to request more detailed information for the types and volumes of contaminants expected in each type of discharge.
- In addition to requesting the types of emissions released from the facility, the estimated amounts (if actual data is not available) should be requested.
- While the total mass of waste generated a facility is requested, it would be beneficial to request these data at a more detailed level to include the relative mass of waste by type and disposal method.
• Especially with consideration for human and ecotoxicity calculations, it would be helpful to request more specific information about the quantities of chemicals in an inventory form. Additionally, responders should be asked to provide information related to chemicals that may remain on or within the finished good, especially if there could be a health risk associated with exposure.

Another important feature that would be helpful to include in a revised FEM is the ability to choose different options for allocating environmental impacts at a given facility type and/or for specific processes within a facility. This is currently not a feature of the FEM. Users are only asked to select all relevant options pertaining to their supply, type of facility, and different processes. Presumably, if this new feature were to be implemented, some facilities will only be able compile data at the facility level, and may have to make estimations for impacts that may be attributed to certain products based on weight, or impacts that may be attributed to certain processes based on equipment usage. However, for facilities that can clearly distinguish the impacts associated with the production of one product type over another or have systems in place to monitor impacts at different production stages, there should be an option in the FEM to provide data at this more detailed level, which would directly benefit the data quality of an LCA for the associated products.

Opportunities to Leverage Input Collected Through the FEM

The FEM includes a substantial collection of KPIs that help participating organizations understand, at least at a high level, what is being managed and what efforts
are underway to reduce environmental impacts at the facility. This information is useful in its own right, but it can also provide value beyond its direct use to the SAC, as seen through the results of this research involving equivalency gap analyses between the FEM and the Fair Trade and C2C Standards. Through these analyses, it became clear that a significant portion of the environmentally related KPIs of the other frameworks could be satisfied by information collected through the FEM. It is likely that other frameworks that include environmental data and information requests would also have at least some overlap with what is featured in the FEM.

To understand the extent to which other frameworks may have commonalities with the FEM, it is recommended that the SAC reach out to the appropriate representatives of these organizations and request participation in the equivalencies study. This will help the SAC gain a better understanding for what KPIs may be considered highly important for other sustainability evaluations but are missing from the FEM. Conversely, the results of this additional research may shed light on how the KPIs of the existing FEM may be revamped. With this gained knowledge, the SAC may choose to revise the KPIs in the FEM accordingly. As an added benefit, the SAC’s outreach to these external stakeholders has the potential to improve the exposure of the Higg Index and extends the reach of the SAC’s mission.

Revisions that may be made to the FEM based on these additional equivalency studies could enhance the coverage of data and allow for a more comprehensive assessment of a facility’s environmental performance. However, even with a more inclusive set of KPIs in a future iteration of the FEM, the extent to which the Module may serve as a source of data and information that may accommodate other frameworks’
requirements is limited. As seen through the pilot assessment with the Fair Trade and C2C Standards, environmental KPIs are only one portion of the whole sustainability assessment and the correlation of KPIs between these frameworks is not perfect. It would be expected that the other frameworks would show similar degrees of difference. With respect to the non-environmental KPIs included in other frameworks, it is recommended that the equivalency gap analysis be prepared in a similar fashion to compare against the Social Facility Module. Through this extended research, the Facility Module as a whole may be revised to represent the most prominent KPIs featured across frameworks. Even if the data and information collected through the Module cannot serve as direct inputs for other frameworks, it is likely to be a useful baseline from which to begin populating data for such alternative needs.

Another opportunity for utilizing the data captured through the FEM is for the SAC to compile and analyze facility-level performance data for benchmarking purposes. These data may be categorized according to the facility types or processes and serve as a benchmarking tool to compare the performance of one facility against another. If this type of tool were implemented, it may also function as source for capturing and recommending best practices. In particular, the “leading practices” questions of the FEM and the sections requesting information on goals and initiatives to reduce environmental impacts may be analyzed and condensed into recommendations for facilities with similar operations. In this way, facilities could learn from the challenges and successes of peers in the industry. From a broader supply chain perspective, these data could benefit apparel companies in assessing the landscape of impacts across their specific suppliers and strategize where efforts should be concentrated for making improvements.
While the next several years may be used to fine tune the individual modules of
the Higg Index, it could also be helpful for the SAC to consider solutions that would
allow member organizations to visualize the relative environmental and social impacts
across different stages of the company’s value chain in a dashboard view. This would
help shed light on the areas warranting the greatest attention through a complete LCA-
style view of their value chain.

Conclusions

Revisiting the FEM to make the data and information collected through it more
useful for the Product Module is the first step in linking the Higg Index suite of tools
together so they may capture the impacts across supply chains, production processes, and
consumer use more effectively. In turn, this will provide valuable insight into the
environmental impacts across apparel companies’ value chains so that initiatives to
address problem areas can be prioritized and efficiently managed.

Additionally, considering the environmental data facilities must produce for an
assortment of external stakeholders, the FEM may be considered a repository for the
KPIs appearing across multiple frameworks. Over time, the SAC may consider
introducing additional KPIs that are found to be common in other frameworks, but not
yet featured in the current version of the FEM. Through this effort, the SAC can ensure it
is addressing the KPIs most commonly considered material to sustainability performance
assessments. However, it is unreasonable to expect that the FEM may serve as a central
data source that would be capable of meeting the requirements for the majority of
external frameworks. Each of the more than 50 frameworks identified by SAC members
as being highly relevant to the industry has unique objectives related to the data and information collected. Understanding the breadth of these different KPIs and identifying which are consistently addressed across most frameworks would be a worthwhile effort; however, it is unlikely that the FEM would be able to cover an inclusive set of KPIs for all frameworks.

It is important to keep in mind that the apparel industry is a dynamic and highly competitive space. However, acknowledging the industry-wide transformation toward sustainability that the industry requires, many of the largest and most influential apparel companies have partnered through the SAC to set this effort in motion. Much work remains to optimize the Higg Index to allow these companies to measure their sustainability performance in a standardized manner. However, the willingness of major players in the industry to participate is indicative of the proactive approach needed to confront the environmental and social issues of today on both an inter-industry and an international scale. Furthermore, the apparel companies are recognizing that their business depends on their ability to operate sustainably, even if that requires up-front investments. When H&M CEO Karl-Johan Persson was asked how he saw sustainability impacting H&M’s business in an interview with the sustainable business platform 2degrees, he responded:

Our core business idea is quality at the best price. We see sustainability as an integral part of quality. There’s no other option. In the short-term it has cost implications, but in the long-term there is a good business case for it. It will make us a more attractive employer because colleagues care about sustainability; customers also care more and more about it. They are not yet prepared to pay more for it, but they care about it. It is also an opportunity to increase the brand value. There is no doubt that our sustainability efforts are improving our business in the long run, even if it costs us hundreds of millions in the short term (Guillerme & Brummer, 2014).
Persson’s point of view of the business case for sustainability is consistent with the trends seen in the apparel industry at large. Adopting sustainability is no longer an option for individual apparel companies, but rather a prerequisite for remaining an active, competitive player in the industry.

This December, 195 nations, plus the European Union, will be meeting in Paris to devise a universal agreement for curbing GHG emissions and devising plans around a new carbon economy (COP21, 2015). These nations could learn from corporate leaders like many of those in the apparel industry who came to terms with the downfalls of their practices and embraced the opportunity to collaborate with one another. Through this approach, there is far greater potential to collectively address the most pressing challenges facing their industry, stakeholders, and the environment.
## Appendix 1  Newly Introduced Categories for FEM KPIs

<table>
<thead>
<tr>
<th>FEM Category</th>
<th>New Sub-Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENVIRONMENTAL MANAGEMENT SYSTEM OR PROGRAM</td>
<td>Environmental Impacts: Awareness &amp; Responsibility</td>
</tr>
<tr>
<td></td>
<td>Regulations/ Permits &amp; Compliance Status</td>
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<tr>
<td></td>
<td>Continuous Improvement &amp; Training</td>
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<td></td>
<td>Impact Reduction &amp; Long-Term Targets</td>
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<tr>
<td></td>
<td>Suppliers &amp; Subcontractor Engagement</td>
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<tr>
<td></td>
<td>System Certification/ Auditing</td>
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<tr>
<td></td>
<td>Publically Available Information</td>
</tr>
<tr>
<td>ENERGY USE &amp; GREENHOUSE GAS (GHG) EMISSIONS</td>
<td>Energy Monitoring</td>
</tr>
<tr>
<td></td>
<td>Energy Consumption and GHG Emissions</td>
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<tr>
<td></td>
<td>Energy Reduction Targets</td>
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<tr>
<td></td>
<td>GHG Reduction Targets</td>
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<td></td>
<td>Energy Audit</td>
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<tr>
<td></td>
<td>Energy Reduction Measures</td>
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<td></td>
<td>GHG Reduction Measures</td>
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<td></td>
<td>Leading practice</td>
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<tr>
<td>WATER USE</td>
<td>Water Monitoring</td>
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<td></td>
<td>Water Consumption</td>
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<td>Water Reduction Targets</td>
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<td></td>
<td>Water Reduction Measures</td>
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<tr>
<td></td>
<td>Leading practice</td>
</tr>
<tr>
<td>Category</td>
<td>Details</td>
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<td>--------------------------------</td>
<td>-------------------------------------------------------------------------</td>
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<tr>
<td>WASTE WATER / EFFLUENT</td>
<td>Waste water Sources</td>
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<td></td>
<td>Domestic Waste water</td>
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<td></td>
<td>Industrial Waste water</td>
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<tr>
<td></td>
<td>Waste water Monitoring</td>
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<tr>
<td></td>
<td>Waste water Improvement Targets</td>
</tr>
<tr>
<td></td>
<td>Waste water Improvement Measures</td>
</tr>
<tr>
<td></td>
<td>Leading practice</td>
</tr>
<tr>
<td>EMISSIONS TO AIR</td>
<td>Emissions Monitoring</td>
</tr>
<tr>
<td></td>
<td>Emission Reduction Targets</td>
</tr>
<tr>
<td></td>
<td>Emission Reduction Measures</td>
</tr>
<tr>
<td></td>
<td>Leading practice</td>
</tr>
<tr>
<td>WASTE MANAGEMENT</td>
<td>Waste Monitoring</td>
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<tr>
<td></td>
<td>Quantity of Waste</td>
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<td></td>
<td>Waste Handling</td>
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<tr>
<td></td>
<td>Waste Reduction Targets</td>
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<tr>
<td></td>
<td>Waste Reduction Measures</td>
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<tr>
<td></td>
<td>Leading practice</td>
</tr>
<tr>
<td>CHEMICALS MANAGEMENT</td>
<td>Leading practice</td>
</tr>
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<td></td>
<td>Chemicals Monitoring</td>
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<td></td>
<td>Chemical Use Targets</td>
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<tr>
<td></td>
<td>Chemical Usage Improvement Measures</td>
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<td></td>
<td>Collaboration with Brands and Suppliers</td>
</tr>
<tr>
<td></td>
<td>Chemical Reduction</td>
</tr>
</tbody>
</table>
### Appendix 2  Condensed Results of Equivalencies Gap Analyses

#### Facility Module -- Environment

**Equivalency Gap Analyses: Fair Trade and Cradle to Cradle**

<table>
<thead>
<tr>
<th>Environmental Management System or Program</th>
<th>Correlation</th>
<th>Framework Reference</th>
<th>Correlation</th>
<th>Framework Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAC-1.1 Level 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental Impact Assessment &amp; Responsibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC-1.1.1 Do you know what the site’s environmental impacts are (positive or negative)?</td>
<td>Exactly</td>
<td>MR-MS 1</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>If “yes” above, what are the site’s most significant impacts?</td>
<td>Exactly</td>
<td>Not at all</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>If “yes” above, list the name(s), size(s), and contact information (phone and email) of all people responsible.</td>
<td>Exactly</td>
<td>Not at all</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>Regulations/Permits &amp; Compliance Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC-1.1.2 Does your site have a program or system for monitoring environmental regulations and permits required for operation?</td>
<td>Exactly</td>
<td>MR-MS 1</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>If “yes” above, what environmental areas does your site have permits for (e.g., air emissions, wastewater, hazardous waste, a general facility; if required, are you able to provide copies of these permits)?</td>
<td>Exactly</td>
<td>Not at all</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>Are any environmental permits expired or pending renewal from government authorities?</td>
<td>Exactly</td>
<td>MR-MS 1</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>PAC-1.1.3 Has your site facility been in compliance with all legal requirements/permits during the past 12 months?</td>
<td>Exactly</td>
<td>MR-MS 1</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>If “no” above, please describe the challenges given to your site by the government from being out of compliance and indicate whether they have been resolved. If they have not been resolved, please specify the timeline for resolution.</td>
<td>Exactly</td>
<td>Not at all</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>FAC-1.2 Level 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous Improvement &amp; Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC-1.2.1 Does your environmental management program or system allow you to understand and continually improve this site’s environmental impacts?</td>
<td>Exactly</td>
<td>MR-MS 1</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>If “yes” above, please summarize the key elements of your environmental management system or program. How are employees being trained about your program?</td>
<td>Exactly</td>
<td>Not at all</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>Are you aware of any management reviews of this system/program held?</td>
<td>Exactly</td>
<td>MR-MS 1</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>Impact Reduction &amp; Long-Term Targets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC-1.2.2 Does your site have an overarching environmental strategy that prioritizes impact reduction areas and sets long-term targets (3-5 years) to achieve significant environmental performance improvements?</td>
<td>Exactly</td>
<td>MR-MS 2</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>If “yes” above, are you able to provide a copy of your environmental strategy (if requested)?</td>
<td>Exactly</td>
<td>MR-MS 2</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>FAC-1.3 Level 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suppliers &amp; Subcontractor Engagement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC-1.3.1 Does your site assess and work with its production suppliers or subcontractors to improve their environmental performance across any relevant impact areas (e.g., energy, greenhouse gas emissions, water use, waste, etc.)?</td>
<td>Exactly</td>
<td>MR-MS 1</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>If “yes” above, describe how you work with suppliers to improve their environmental performance across any or all relevant impact areas.</td>
<td>Exactly</td>
<td>Not at all</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>Describe how you work with suppliers to improve their environmental performance across any or all relevant impact areas.</td>
<td>Exactly</td>
<td>Not at all</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>System Certification/ Auditing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC-1.3.2 Are the site’s environmental management systems certified and/or audited by an independent third party auditor or an accredited internal auditor?</td>
<td>Exactly</td>
<td>MR-MS 1</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>If “yes” above, are you able to provide the certificate or audit report upon request? If certified or audited, do you use the results?</td>
<td>Exactly</td>
<td>Not at all</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>If certified or audited, who conducted the audit and was it an internal or external audit?</td>
<td>Exactly</td>
<td>Not at all</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>Publicly Available Information</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC-1.3.3 Does your site make information on its air emissions, greenhouse gas emissions, water discharges and waste generation available to the public?</td>
<td>Exactly</td>
<td>MR-MS 3</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>If “yes” above, how is information made available? If it is provided on a public website, please list the website address.</td>
<td>Exactly</td>
<td>Not at all</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>PAC-1.3.4 Does your site make information on its resource consumption (energy and water use) available to the general public?</td>
<td>Exactly</td>
<td>MR-MS 3</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>If “yes” above, how is this information made available? If it is provided on a public website, please list the website address.</td>
<td>Exactly</td>
<td>Not at all</td>
<td>Not at all</td>
<td></td>
</tr>
<tr>
<td>FAC-2.1.1</td>
<td>Level 1</td>
<td>Energy/GHG Management</td>
<td>FAC-2.2.1</td>
<td>Level 2</td>
</tr>
<tr>
<td>-----------</td>
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<td>------------------------</td>
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<td>---------</td>
</tr>
<tr>
<td><strong>ENERGY USE &amp; GREENHOUSE GAS (GHG) EMISSIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Energy Monitoring</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAC-2.2.2.1 Does this site track and measure, at least annually, energy use from all sources, including energy used on-site (direct) and purchased energy (indirect)?</td>
<td>Exactly</td>
<td>BMM MS 3</td>
<td>Exactly</td>
<td>Renewable Energy and Carbon Management - energy and emissions associated with product</td>
</tr>
<tr>
<td>&quot;Yes&quot; above, what is the frequency of measurements (Continuous, Weekly, Monthly, Bi-Monthly, Quarterly, Annually)?</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>What is the method of tracking/Measuring usage (Meters, Invoices, Estimates, Land Usage, Weight/Gauges, Other)?</td>
<td>Moderately</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>For the following fuel types:</td>
<td>Moderately</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>Furnished Energy</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>Furnished Steam</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>Furnished Chilled Water</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>Fuel Oil NOx</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>Fuel Oil NOx</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>LPG (Liquid Petroleum Gas)</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>LNG (Liquid Natural Gas)</td>
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<td>Very closely</td>
<td>Very closely</td>
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<tr>
<td>Propane</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
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<tr>
<td>Coal</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
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<tr>
<td>Diesel</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
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<tr>
<td>Gasoline</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>Methane</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>ETH (ethylene)</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>Biomass (please specify)</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>Other renewable (please specify)</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>FAC-2.2.2.2 Do you know how much electricity your site uses each year?</td>
<td>Exactly</td>
<td>BMM MS 3</td>
<td>Exactly</td>
<td>Renewable Energy and Carbon Management - energy and emissions associated with product</td>
</tr>
<tr>
<td>&quot;Yes&quot; above, what is the value and unit (kWh, MWh, GWh, MW, MmBTU, kWh/Thermal)?</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>FAC-2.2.2.3 Do you know how much steam your site uses each year?</td>
<td>Exactly</td>
<td>BMM MS 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy and emissions associated with product</td>
</tr>
<tr>
<td>&quot;Yes&quot; above, what is the value and unit (lbs, MMBtu, GMBtu, MWh, MMBtu, THERMAL, kg, MMT, TMT, MT, MTU)</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>FAC-2.2.2.4 Does your site calculate and track, at least annually, its greenhouse gas (GHG) emissions?</td>
<td>Very closely</td>
<td>BMM MS 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy and emissions associated with product</td>
</tr>
<tr>
<td>&quot;Yes&quot; above, what tool or guide did you use to calculate your greenhouse gas (GHG) emissions?</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>What energy sources are the GHG emission calculations based on?</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>FAC-2.2.3</td>
<td>Level 2 Goal Setting</td>
<td><strong>Energy Reduction Targets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAC-2.2.2.1 Do you set and monitor at least annually improvement targets for reducing energy use (excluding fuel use for on-site transportation if applicable)?</td>
<td>Exactly</td>
<td>BMM MS 2</td>
<td>Exactly</td>
<td>Renewable Energy and Carbon Management - energy and emissions management strategy developed</td>
</tr>
<tr>
<td>&quot;Yes&quot; above, provide the following information on your current formal energy reduction targets (requested in table format):</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>1. Target Name</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>2. Specify whether target is absolute or normalized</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>3. Baseline Year</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>4. Target Year (end date)</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>5. Percent reduction -</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>6. Metrics for normalized targets (e.g., revenue, headcount)</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>7. Description of plans/strategies to make progress toward target</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>FAC-2.2.2.2 Do you set and monitor at least annually improvement targets for reducing greenhouse gas (GHG) emissions?</td>
<td>Exactly</td>
<td>BMM MS 2</td>
<td>Exactly</td>
<td>Renewable Energy and Carbon Management - energy and emissions management strategy developed</td>
</tr>
<tr>
<td>&quot;Yes&quot; above, provide the following information on your current formal Ziel reduction targets (requested in table format):</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>1. Target Name</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>2. Specify whether target is absolute or normalized</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>3. Baseline Year</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>4. Target Year (end date)</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>5. Percent reduction</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>6. Metrics for normalized targets (e.g., revenue, headcount)</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>7. Description of plans/strategies to make progress toward target</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
<td>Very closely</td>
</tr>
<tr>
<td>FAC-2.2.3 Does your site have an energy audit conducted in the last three years by a certified professional to identify potential energy and cost savings?</td>
<td>Not at all</td>
<td>Not at all</td>
<td>Not at all</td>
<td>Not at all</td>
</tr>
<tr>
<td>&quot;Yes&quot; above, when was the audit conducted?</td>
<td>Not at all</td>
<td>Not at all</td>
<td>Not at all</td>
<td>Not at all</td>
</tr>
<tr>
<td>What opportunities for reducing energy were identified in the audit (e.g., lighting, heating)?</td>
<td>Not at all</td>
<td>Not at all</td>
<td>Not at all</td>
<td>Not at all</td>
</tr>
<tr>
<td>Which recommended measures did you implement or any you planning to implement?</td>
<td>Not at all</td>
<td>Not at all</td>
<td>Not at all</td>
<td>Not at all</td>
</tr>
</tbody>
</table>
### FAC-2.3 Level 3 Reduction Initiatives

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat Exchange or Heat Recovery</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
<tr>
<td>Improper Ventilation Fix/Repair</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
<tr>
<td>Central Building Management System (Control)</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
<tr>
<td>High Efficiency Motors and/or Variable Frequency Drives</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
<tr>
<td>Commissioned Facility (Climate Control)</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
<tr>
<td>Optimize Compressed Air System</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
<tr>
<td>Boiler Repairs/Replacement</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
<tr>
<td>Steam Leak Repair Program</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
<tr>
<td>Maintain Steam Traps</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
<tr>
<td>Insulate Pipes and Hot Vessels and Tends</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
<tr>
<td>Fuel Switch</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
<tr>
<td>Daylighting</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
<tr>
<td>Employee Engagement/Behavior</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
<tr>
<td>Other (please specify):</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GHG Reduction Measures</th>
<th>Very closely</th>
<th>ERM-M 3</th>
<th>Very closely</th>
<th>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have demonstrated evidence of reducing the amount of energy used for your site?</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
<tr>
<td>If “yes” above, please explain your energy reduction achievement:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Which sources of energy were reduced?</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
<tr>
<td>What is the absolute or normalized amount of the reduction? (For example: energy consumption reduced by 22 kWh per unit produced)</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
<tr>
<td>Over what time period did you achieve the reduction?</td>
<td>Very closely</td>
<td>ERM-M 3</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Leading Practice</th>
<th>Very closely</th>
<th>ERM-M 2 and 1</th>
<th>Very closely</th>
<th>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please list and describe any practices, programs, technology, or methods you utilize at your site that you consider to be a “leading practice” for managing and significantly reducing energy use and/or greenhouse gas emissions.</td>
<td>Very closely</td>
<td>ERM-M 2 and 1</td>
<td>Very closely</td>
<td>Renewable Energy and Carbon Management - energy sourced/offset with renewable energy projects</td>
</tr>
</tbody>
</table>
### WATER USE

#### FAC-3.0
Does this facility site only use Domestic Water?

- **Not at all**
- **Not at all**

#### FAC-3.1 Level 1: Water Management

**Water Monitoring**

**FAC-3.1.1** Do you measure and track total water consumption for your site (including domestic and process water)?

- **Frequently**
- **Moderately**

**FAC-3.1.2** If "yes", provide information/data on the following (recorded in table format):

<table>
<thead>
<tr>
<th>Source</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>Monthly</td>
</tr>
</tbody>
</table>

**Water Consumption**

**FAC-3.1.3** How much water do you use each year at your site?

- **Very closely**
- **Moderately**

**FAC-3.2 Level 2: Goal Setting**

**Water Reduction Targets**

**FAC-3.2.1** Do you set and review at least annually for water reduction targets for your facility?

- **Frequently**
- **Not at all**

**FAC-3.2.1.1** If "yes", provide the following information on your current formal water reduction targets (recorded in table format):

<table>
<thead>
<tr>
<th>Target</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Energy saving</td>
</tr>
</tbody>
</table>

**FAC-3.2.2** Have you set and reviewed at least annually for water reduction targets for your facility?

- **Frequently**
- **Not at all**

**FAC-3.3 Level 3: Reduction Initiatives**

**Water Reduction Measures**

**FAC-3.3.1** Have you demonstrated evidence of reducing the quantity of water used at this site, such as by reusing large water or capturing condensate and recycling?

- **Frequently**
- **Very closely**

**FAC-3.3.2** If "yes", answer the following questions:

- **What specific changes have you made to your site or operations (including internal use)?**
- **Where is the water captured and where is it re-used?**
- **Describe all changes.**

**Leading practice**

**FAC-3.4** Please list and describe any practices, programs, technology, or methods you utilize at your site that you consider to be a "leading practice" for managing and significantly reducing water use.

- **Very closely**
- **Moderately**

**FAC-3.5** If "yes", provide the following information on your current formal water reduction targets (recorded in table format):

<table>
<thead>
<tr>
<th>Description</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy saving</td>
<td>Weekly</td>
</tr>
</tbody>
</table>

**FAC-3.5.1** Provide a brief description of the steps/strategies you have taken to achieve water reduction targets.

- **Very closely**
- **Moderately**

**FAC-3.5.2** Have you reviewed at least annually for water reduction targets for your facility?

- **Frequently**
- **Not at all**

**FAC-3.5.3** Have you demonstrated evidence of reducing the quantity of water used at this site, such as by reusing large water or capturing condensate and recycling?

- **Frequently**
- **Very closely**

**FAC-3.5.4** If "yes", answer the following questions:

- **What specific changes have you made to your site or operations (including internal use)?**
- **Where is the water captured and where is it re-used?**
- **Describe all changes.**

**Leading practice**

**FAC-3.5.5** Please list and describe any practices, programs, technology, or methods you utilize at your site that you consider to be a "leading practice" for managing and significantly reducing water use.

- **Very closely**
- **Moderately**

**FAC-3.5.6** Have you reviewed at least annually for water reduction targets for your facility?

- **Frequently**
- **Not at all**

**FAC-3.5.7** Have you demonstrated evidence of reducing the quantity of water used at this site, such as by reusing large water or capturing condensate and recycling?

- **Frequently**
- **Very closely**

**FAC-3.5.8** If "yes", answer the following questions:

- **What specific changes have you made to your site or operations (including internal use)?**
- **Where is the water captured and where is it re-used?**
- **Describe all changes.**

**Leading practice**

**FAC-3.5.9** Please list and describe any practices, programs, technology, or methods you utilize at your site that you consider to be a "leading practice" for managing and significantly reducing water use.

- **Very closely**
- **Moderately**
<table>
<thead>
<tr>
<th>FAC-4.0</th>
<th>WASTEWATER / EFFLUENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wastewater Sectors</strong></td>
<td><strong>Moderately</strong></td>
</tr>
<tr>
<td><strong>Domestic Wastewater</strong></td>
<td><strong>Moderately</strong></td>
</tr>
<tr>
<td><strong>Industrial Wastewater</strong></td>
<td><strong>Very closely</strong></td>
</tr>
<tr>
<td><strong>FAC-4.1 Level 1: Waste Water Management</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Wastewater Monitoring</strong></td>
<td></td>
</tr>
<tr>
<td><strong>FAC-4.3.1 Is all wastewater that is produced at your site being treated with primary and secondary treatment?</strong></td>
<td><strong>Moderately</strong></td>
</tr>
<tr>
<td><em><em>If yes</em> above, where is the primary or secondary treatment occurring (on-site, off-site, or a combination of both)?</em>*</td>
<td><strong>Very closely</strong></td>
</tr>
<tr>
<td><strong>If treatment is occurring off-site, what is the treatment facility used (wet, mixed)?</strong></td>
<td><strong>Very closely</strong></td>
</tr>
<tr>
<td><strong>If you are monitoring the quantity and quality of wastewater produced at your site?</strong></td>
<td><strong>Moderately</strong></td>
</tr>
<tr>
<td><em><em>If yes</em> above, what contaminants do you monitor?</em>*</td>
<td><strong>Very closely</strong></td>
</tr>
<tr>
<td><strong>At what frequency are these measured?</strong></td>
<td><strong>Very closely</strong></td>
</tr>
<tr>
<td><strong>What is the daily wastewater production at your site?</strong></td>
<td><strong>Very closely</strong></td>
</tr>
<tr>
<td><strong>Unit of measure (gal, ft, gal, mm, acre-foot, cft, cfr, BOD, gallons, lb, l, kg, mol, ml, m3, mg)</strong>*</td>
<td></td>
</tr>
<tr>
<td><strong>FAC-4.2 Level 2: Goal Setting</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Wastewater Improvement Targets</strong></td>
<td><strong>Very closely</strong></td>
</tr>
<tr>
<td><strong>Do you set and review at least annually formal targets for improving wastewater quality for your site?</strong></td>
<td><strong>Very closely</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Wastewater Improvement Measures</strong></td>
<td></td>
</tr>
<tr>
<td><strong>FAC-4.3.1 Have you demonstrated evidence of improving the wastewater quality for this site?</strong></td>
<td><strong>Very closely</strong></td>
</tr>
<tr>
<td><em><em>If yes</em> answer the following questions:</em>*</td>
<td></td>
</tr>
<tr>
<td><strong>Please explain your wastewater quality improvement:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Which types of pollutants were reduced?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>What is the absolute or normalized amount of the reduction?</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Leading practice</strong></td>
<td></td>
</tr>
<tr>
<td><strong>FAC-4.3.2 Please list and describe any practices, programs, technology, or methods you utilize at your site that you consider to be a &quot;leading practice&quot; for managing and significantly improving water quality.</strong></td>
<td></td>
</tr>
</tbody>
</table>
## Emissions to Air

### FAC-5.1 Level 1: Emissions to Air Management

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes/No</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAC-5.1.1</td>
<td>Yes/No</td>
<td>Do you maintain a current list (&quot;inventory&quot;) of emissions to air and their sources at this site?</td>
<td>Moderately</td>
</tr>
<tr>
<td>FAC-5.1.2</td>
<td>Yes/No</td>
<td>Are air emissions at your site regularly tested and monitored by a certified professional or laboratory?</td>
<td>Moderately</td>
</tr>
<tr>
<td>FAC-5.1.3</td>
<td>Yes/No</td>
<td>If &quot;yes&quot; above, how frequently does testing take place?</td>
<td>Moderately</td>
</tr>
<tr>
<td>FAC-5.1.4</td>
<td>Yes/No</td>
<td>If requested, are you able to provide a copy of the test report?</td>
<td>Moderately</td>
</tr>
</tbody>
</table>

### FAC-5.2 Level 2: Goal Setting

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes/No</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAC-5.2.1</td>
<td>Yes/No</td>
<td>Do you set, and review at least annually, formal targets for reducing emissions to air at your site?</td>
<td>Moderately</td>
</tr>
<tr>
<td>FAC-5.2.2</td>
<td>Yes/No</td>
<td>If &quot;yes&quot;, provide the following information on your current formal emission reduction targets (requested in tabular format):</td>
<td>Moderately</td>
</tr>
<tr>
<td>FAC-5.2.3</td>
<td>Yes/No</td>
<td>Percent reduction</td>
<td>Moderately</td>
</tr>
</tbody>
</table>

### FAC-5.3 Level 3: Reduction Initiatives

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes/No</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAC-5.3.1</td>
<td>Yes/No</td>
<td>Have you demonstrated evidence of reducing the quantity of emissions to air for your site beyond reductions resulting from reducing energy use?</td>
<td>Moderately</td>
</tr>
<tr>
<td>FAC-5.3.2</td>
<td>Yes/No</td>
<td>Please answer the following questions:</td>
<td>Moderately</td>
</tr>
<tr>
<td>FAC-5.3.3</td>
<td>Yes/No</td>
<td>Over what time period did you achieve the reduction?</td>
<td>Moderately</td>
</tr>
<tr>
<td>FAC-5.3.4</td>
<td>Yes/No</td>
<td>What specific changes to your site or operations reduced the emissions to air?</td>
<td>Moderately</td>
</tr>
</tbody>
</table>

### Leading Practice

- FAC-5.3.5: Please list and describe any practical, programs, technology, or methods you utilize at your site that you consider to be a "leading practice" for managing and significantly reducing air emissions.
## WASTE MANAGEMENT

### FAC-6.1 Level 1: Waste Management Level 1: Waste Management

**Waste Monitoring**

1. **FAC-6.1.4** (Do you measure and record, at least annually, waste generated from all waste streams at your site?)
   - **Indicator**: DMM-MS 3
   - **Not at all**: DMM-MS 2
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 2
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 2
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 2
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 2
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 2
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 2
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 2
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 2
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 2
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 2
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 2

**Quantity of Waste**

1. **FAC-6.2.2** How much solid waste is generated at your site each year?
   - **Unit of Measure**: kg, lb, MT, short ton
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2

**Waste Handling**

1. **FAC-6.4.4** (Does your site segregate hazardous and non-hazardous waste AND provide training to personnel on handling and segregating waste?)
   - **If "yes", who conducted the last training on waste handling for this task? Please list company, name(s), and title(s):**
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2
   - **Very closely**: DMM-WM 1
   - **Not at all**: DMM-WM 2

### FAC-6.2 Level 2: Goal Setting

**Waste Reduction Targets**

1. **FAC-6.6.6** (Do you set and review at least annually improvement targets to reduce the quantity of waste generated for this site?)
   - **If "yes", provide the following information on your current formal waste reduction targets (reported in table format):**
   - **Indicator**: DMM-MS 2
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 1
   - **Not at all**: DMM-MS 3

**FAC-6.5 Level 3: Reduction Initiatives**

**Waste Reduction Measures**

1. **FAC-6.6.6** (Do you demonstrate evidence of reducing the quantity of waste generated for this site?)
   - **If "yes", answer the following questions:**
   - **Please explain your waste reduction achievement:**
     - **Very closely**: DMM-MS 1
     - **Not at all**: DMM-MS 3
     - **Very closely**: DMM-MS 1
     - **Not at all**: DMM-MS 3
     - **Very closely**: DMM-MS 1
     - **Not at all**: DMM-MS 3
     - **Very closely**: DMM-MS 1
     - **Not at all**: DMM-MS 3
     - **Very closely**: DMM-MS 1
     - **Not at all**: DMM-MS 3
     - **Very closely**: DMM-MS 1
     - **Not at all**: DMM-MS 3
     - **Very closely**: DMM-MS 1
     - **Not at all**: DMM-MS 3
     - **Very closely**: DMM-MS 1
     - **Not at all**: DMM-MS 3
     - **Very closely**: DMM-MS 1
     - **Not at all**: DMM-MS 3
     - **Very closely**: DMM-MS 1
     - **Not at all**: DMM-MS 3
     - **Very closely**: DMM-MS 1
     - **Not at all**: DMM-MS 3
     - **Very closely**: DMM-MS 1
     - **Not at all**: DMM-MS 3

**Leading practice**

1. **FAC-6.5.5** (Impact and describe any practices, programs, technology, or methods you utilize at your site that you consider to be a "leading practice" for managing and significantly reducing waste.)
   - **Very closely**: DMM-MS 2 and 3
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 2 and 3
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 2 and 3
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 2 and 3
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 2 and 3
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 2 and 3
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 2 and 3
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 2 and 3
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 2 and 3
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 2 and 3
   - **Not at all**: DMM-MS 3
   - **Very closely**: DMM-MS 2 and 3
   - **Not at all**: DMM-MS 3
## CHEMICALS MANAGEMENT

### FAC-7.2 Level 1: Chemicals Management

#### Leading practice

**MAC-7.1.1 Leading Practice: Chemicals Management Module IETA** - Has the facility assessed its chemicals management performance using the Chemicals Management Module "Supplier" indicator (chemicalindustry.org)?

- **Note:** If "yes", what was the score from your most recent completed assessment?
- If requested, could you provide your facility's most recent completed assessment?

**MAC-7.1.2 Yes, what is the name of the person in charge of this task?

**MAC-7.1.3 Does the facility have a clear process to ensure compliance with all Occupational Safety Health (OSHA) or EU specific legislation?

- If "yes", can you provide documentation of any corrective action taken as a result of OSHA non-compliance?
- If "yes", can you provide documentation of any corrective action taken as a result of EU non-compliance?

**MAC-7.1.4 Does the facility have a documented inventory of chemicals used to make your product, and the respective supplier for each chemical?

- If "yes", can you provide this documentation upon request?

#### Chemicals Monitoring

**MAC-7.2.1 Chemicals Use Targets**

- **MAC-7.2.1.1 Does the facility have an action plan to improve chemicals management performance that is reviewed and updated at least annually?** (The plan should include specific, measurable, and time-bound goals and action steps to improve performance.)

- If "yes", can you provide this action plan upon request?

**MAC-7.2.2 Does the facility restrict chemicals used in manufacturing processes and/or residing in final product that goes beyond a list of regulated chemicals and ETS?

- If "yes", can you provide the names of the restricted chemical and the substitution?

#### FAC-7.3 Level 2: Reduction Initiatives

**MAC-7.3.1 Chemical Usage Improvement Measures**

- **MAC-7.3.1.1 Can the facility demonstrate evidence of chemicals management performance improvement on an annual basis through Chemicals Management Improvement Measures?

- If "yes", can you provide documentation of this achievement upon request?

**MAC-7.3.2 Collaboration with Suppliers and Consumers**

- **MAC-7.3.2.1 Does the facility collaborate with suppliers and consumers to promote and assist chemicals assessment from substances of concern and/or restricted substances list?

- If yes, please describe which chemicals currently in use have been prioritized for alternatives assessment and ultimate phase out.

**MAC-7.3.3 Chemical Reduction**

- **MAC-7.3.3.1 How has the facility reduced the use of chemicals by the substitution of biological enzymes in any of your processes?

- If "yes", what is the temperature used in the enzyme process and how many years have been realized from this substitution?

- **MAC-7.3.3.2 How has the facility reduced the use of any chemicals by recovering and reusing them (for example, with cascading use)?

- If "yes", what chemicals are you recovering from which processes and where are they being reused?
References


Sustainable Apparel Coalition. (2015). Introduction to the MSI.


