Assessing the State of Supply Chain Sustainability

by

Laura S. Allegue Lara
Master of Business Administration, Universidad Politécnica de Cataluña, 2015
Bachelor of Science, Accounting, Universidad Nacional de San Juan, 2008
and

Ashley Barrington
Bachelor of Science, Fashion Merchandising, Fashion Institute of Technology, 2009

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Signature of Author: _____
Laura Allegue
Department of Supply Chain Management
May 8, 2020

Signature of Author: _____
Ashley Barrington
Department of Supply Chain Management
May 8, 2020

Certified by: _____
Alexis H. Bateman
Director of MIT Sustainable Supply chains at MIT Center for Transportation & Logistics
Capstone Advisor

Certified by: _____
Yin Jin Lee
Ph.D. Candidate & Research Assistant
Capstone Co-Advisor

Accepted by: _____

Prof. Yossi Sheffi
Director, Center for Transportation and Logistics
Elisha Gray II Professor of Engineering Systems
Professor, Civil and Environmental Engineering

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ABSTRACT

Supply chain sustainability has increased in importance for companies of all sizes, public and private, across a wide range of industries. While there has been increased excitement in tandem with proclamations of lofty goals around the topic of supply chain sustainability, it has proven challenging to operationalize sustainability when many companies focus on short-term financial goals or lack science-and context-based sustainability targets. The focus of this research is to understand current and future supply chain sustainability practices from the perspective of frontline professionals, across industries, geographies, cultures, and regulatory environments in 2019. This research gathered insights and data through a survey distributed to frontline supply chain professionals, executive interviews, and additional research sources. Results confirm increased corporate interest in supply chain sustainability. However, misalignment may exist between executives who set overarching corporate goals and strategies and frontline professionals who are tasked with the tactical implementation of these strategies. Companies struggle to implement sustainability initiatives under constrained resources with conflicting priorities. Results also indicate that companies may be overstating social and environmental goal commitments, as overall investment levels are lower than goal commitment levels.

To better understand these issues and how companies are adopting supply chain sustainability, this research project was commissioned by the MIT Center for Transportation and Logistics and the Council of Supply Chain Management Professionals. To set the stage for future State of Supply Chain Sustainability reports, we will reveal the results of our research on supply chain sustainability in 2019 with an added focus on what the events of 2019-2020, such as the global COVID-19 pandemic that is still unfolding at this writing, could mean for supply chain sustainability in coming years.

Capstone Advisor: Alexis H. Bateman
Title: Director of MIT Sustainable Supply chains at MIT Center for Transportation & Logistics

Capstone Co-Advisor: Yin Jin Lee
Title: Ph.D. Candidate & Research Assistant

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Ashley Barrington

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1. Introduction

In 1987, the United Nations defined sustainable development as meeting "the needs of the present without compromising the ability of future generations to meet their own needs" (The World Commission on Environment and Development, United Nations, 1987). In that defining moment, the importance of sustainability came to the forefront as a global issue. Nearly 30 years later, the 17 Sustainable Development Goals of the United Nations 2030 Agenda for Sustainable Development were adopted by 193 countries in a historic UN Summit and officially went into effect on January 1, 2016 (Leibowitz, Croke, & Araujo, 2019). The goals universally apply to all countries, which committed to mobilizing efforts to end all forms of poverty, fight inequalities, and tackle climate change, while ensuring that no one is left behind. Each of the 17 goals set forth specific targets to be achieved by 2030 (Leibowitz et al., 2019). With this call for action and increasing pressures in the form of regulation and stakeholder demands, the need for companies to play a role in sustainability is clear.

This capstone will focus on understanding current and future practices in achieving supply chain sustainability to better support ongoing progress. Supply chain sustainability has increased in importance for companies of all sizes, public and private, creating pressures to reduce social and environmental impacts. To better understand these issues and how companies are adopting supply chain sustainability, a large-scale survey of supply chain professionals was deployed globally in October 2019 through the MIT Center for Transportation and Logistics (CTL) and the Council of Supply Chain Management Professionals' (CSCMP) networks. The purpose of this survey was to collect data on corporate supply chain sustainability practices, including topics such as goal setting, investment, management tools, reporting, and disclosure practices.

This research does not give guidance on what companies should or should not do but rather provides a broad view on the current adoption of sustainability practices in supply chains to help inform future strategies. To that end, we seek to answer the following research question: What does supply chain sustainability look like in 2019?

1.1 Role of Supply Chains in Sustainability Today

While business sustainability has increasingly come to the forefront as a strategic issue, most of a company's impact lies in the supply chain. Based on corporate disclosures to CDP

(formerly known as the Carbon Disclosure Project), Bové and Swartz (2016) found that supply chains were responsible for 80% of overall greenhouse gas emissions and over 90% of the impact on natural resources.

In the past, many environmental and social issues were treated as independent from one another, but today we understand that climate change heavily interacts with health and poverty. Climate change also threatens biodiversity, endangering supply continuity of crops and putting disadvantaged populations at further risk (Bouchery, Corbett, Fransoo, & Tan, 2017). Georgetown University Medical Center stated that one billion people could be newly exposed to diseases like dengue fever as world temperatures rise (Carlson, Johnson, Mordecai, & Ryan, 2019), particularly impacting supply chains in labor-intensive industries.

There are numerous public health, economic, and political issues that have greatly impacted the supply chain recently at an unprecedented pace, such as the trade dispute between the US and China and the global coronavirus pandemic. As a result of the trade disputes, global supply chains have moved towards a more regionalized paradigm, with sourcing strategies impacted by national and political interests (QIMA, 2020). Companies are trying to navigate this changing landscape and new manufacturing regions are stepping up to seize opportunities; however, this can come at the expense of supply chain sustainability. According to Hong Kong-based quality control company QIMA, companies "consistently prioritized operational concerns over sustainability" in 2019 (Donaldson, 2020). The coronavirus crisis is also shining light on sustainability problems in the global pharmaceutical and medical supply industries. Companies are returning to single-use plastics and many products are in short supply, requiring urgent deliveries with higher carbon emissions levels (Degnarain, 2020).

To provide a perspective on progress and opportunities in supply chain sustainability, the capstone focuses on survey results analysis, executive interviews, content analysis, and literature review on supply chain social and environmental sustainability.

1.2 Supply Chain Sustainability: Pressure Sources

The topic of supply chain sustainability is coming increasingly into focus for companies, frontline professionals, and consumers alike as a result of political and economic factors, and increased access to global information through social media and digital platforms. One source of

that growing focus is pressure for companies to adopt more sustainable supply chain practices. Pressure sources include industrial associations, executives, investors, corporate buyers, end-consumers, government, local communities, non-governmental organization campaigns, and media coverage. Some tangible examples are environmental groups shaming companies or encouraging boycotts of companies that make profits from lands cleared by means of fire in the Amazon forest or that have contributed to deforestation because of palm oil planting in Asia (Parr, Dolsak, & Prakash, 2019).

In the early 1990s and 2000s "name and shame" was a common tactic, with non-governmental organizations and journalists pressuring and exposing companies in consumer facing industries with high brand value. This still happens, but emerging brands are trying to build sustainability into their brand ethos, as this topic is now a basic requirement in the minds of consumers (M. Chung, interview, January 31, 2020). Eddie Chan, CEO of Lever Style, an Asia-based apparel manufacturer that works with many well-established and rising direct-to-consumer, e-commerce brands, mentioned that emerging brands today do not have years to build their brand name, and a focus on sustainability is a way to quickly resonate with consumers with minimal promotion (E. Chan, interview, February 11, 2020).

Sustainability has also come into focus through end-consumers demanding transparency of the supply chain, as it affects the technology, food, and electronics industries, among many others. Mineral extraction operations face challenges including potential impacts in their local communities, environmental biodiversity, pollution, and worker welfare during hazardous activities. Sean Cady, VP Sustainability at VF Corporation, said extraction of raw materials represents half of the company's total carbon emissions (S. Cady, interview, February 10, 2020). Ethical sourcing as a subset of the broader topic of sustainability continues to be a focus for non-governmental organizations. For example, the Alliance for Responsible Mining supports small-scale miners in high-risk countries.

Media coverage is highlighting the negative impacts of overconsumption caused by fast fashion due to abbreviated product lifecycles, creating challenges for post-consumer, end-of-life disposal. The fashion industry emits more carbon than international flights and maritime shipping combined. The fashion industry produces 10% of the world's carbon emissions, is the second-largest consumer of the world's water supply and pollutes the oceans with microplastics. It is also

estimated that 85% of all textiles go to landfills each year (McFall-Johnsen, 2019), causing both negative upstream and downstream impacts on sustainability within the supply chain.

1.3 Supply Chain Sustainability: Adoption Incentives and Challenges

With increased scrutiny on the impacts of the supply chain, the negative impact of non-sustainable activities is becoming harder to ignore. Stakeholders are creating more pressure, demanding that companies be transparent through disclosure of actual practices and reduction of negative impacts. Financial profit, environmental benefits, brand reputation, technology, and transparency are all driving factors behind the increased corporate focus on sustainability within supply chains.

While financial profit is an incentive to adopt sustainable practices, a key challenge faced today is that practitioners struggle with valuing the return on sustainability investment. Although the business world has several universally accepted tools, nothing comparable exists for evaluating social and environmental rewards in dollar terms; so forecasting gains is often a matter of guesswork (Addy, Chorengel, Collins, & Etzel 2020). Numerous organizations have recognized these shortcomings and have sought to better understand impact measurement and management, because "what gets measured gets managed" (Addy, et al., 2020). This work has produced metrics such as the Social Return on Investment, a performance metric used to identify and quantify the financial impacts of sustainability-related initiatives, like brand reputation or investment in local communities (Then, Schober, Rauscher, & Kehl 2017).

The United Nation's Sustainable Development Goals call for a united effort to achieve a shared set of targets and indicators. As a result, the Impact Management Project was launched in 2016 to create consensus on how to define, measure, and manage social and environmental impact. The project seeks to bring together the perspectives of all stakeholders to create a toolkit of best practices that can be referenced globally across firms and industries (Addy, et al. 2020).

Environmental benefits are also an important driver behind the adoption of sustainable practices however measurement is not straightforward. Scopes of emission measurement, as defined from the Greenhouse Gas Protocol Corporate Standard, across the supply chain include (Bouchery, et al., 2017):

- Scope 1: Carbon emissions from sources that are owned or controlled by a company.

- Scope 2: Carbon emissions from the generation of obtained resources, such as electricity purchased and used by a company, with consumption physically taking place at a facility outside the company.
- Scope 3: All other indirect carbon emissions which are a consequence of activities of the company but occur from sources not owned or controlled by the company, such as the extraction and production of materials.

Awareness of the scope in which most of the environmental impact occurs is becoming prevalent. It is essential that sustainability measurement takes a supply chain perspective beyond only Scope 1, as these account for a relatively small amount of total supply chain emissions. As Sean Cady, VP Sustainability at VF Corporation, points out, "99% of environmental impact occurs in Scope 3, so supply chain focus is critical for reducing carbon emissions" (S. Cady, interview, 2020). As another example, when Walmart announced its goal of reducing corporate greenhouse gas emissions by 20 million tons per year by 2020, it realized that its supply chain represented about 95% of its overall carbon footprint. As a result, Walmart worked with suppliers to cut down their emissions, which reduced environmental impact and provided cost savings primarily due to lower fuel consumption (Lyons Hardcastle, 2017).

Environmental impact in the supply chain is not limited to greenhouse gas emissions. Water scarcity, issues with land use, toxic waste, deforestation, air quality, and energy use are all important considerations. Some steps firms are starting to address these issues include driving efficient supply and demand planning to reduce overproduction, optimizing routes to reduce fossil fuel consumption, and consolidating shipments to fully utilize containers in transportation (Blue Global, 2019). This is the case with TAL Apparel, as President/CTO Delman Lee explains: "Greenhouse gases, such as electricity and fuels, are noticeable lines in the P&L making it easier to justify investment in practices to reduce consumption" (D. Lee, interview, February 5, 2020).

Brand reputation is an important driver behind the adoption of sustainable practices. Many corporate brands in recent years have invested in their reputations through corporate social responsibility and sustainability. Research suggests that positive reputation is an integral component of brand equity and that reputation building as a business strategy offers several benefits. The benefits include increasing long-term shareholder value, access to new markets, price premiums, corporate brand trust, and facilitating employee recruitment (Cowan, Kirsten, Guzman, & Francisco, 2018).

Supplier collaboration and transparency also play a part in firms' successful implementation of sustainable supply chain practices. We define transparency as knowledge of what is happening upstream in the supply chain and communicating this knowledge internally and externally (Bateman & Bonanni, 2019). Processes and technologies that can help firms build greater transparency in supply chains include supply chain mapping, traceability, third-party certification, and goal setting. For example, food companies are seeing more requests for supply chain-related data about ingredients, food fraud, animal welfare, and child labor (Bateman & Bonanni, 2019). Companies and stakeholders are increasingly interested in knowing what materials are used to make products, where they are produced, and whether the supply chain can withstand disruptions, among other concerns. When there is a lack of transparency in the supply chain, a company may not be able to fully understand its risks or fully advance its sustainability efforts (Kashmanian, 2017).

Digitization of sourcing processes, new business models, and increased adoption of technological innovation such as virtual sampling in the fashion industry are examples of how process efficiencies are influencing sustainability and reducing waste. Unilever uses software to collect data on whether farmers in its supply chain are using sustainable practices (Bové & Swartz, 2016). Patagonia partnered with a company called Trove, which creates and operates reuse e-commerce platforms, to launch its re-commerce site in 2013 (Makower, 2018). Re-commerce, or "resale commerce", is the process of selling used products or excess inventory to companies or consumers (Kaplan, 2019).

Interest in sustainability efforts has also been driven by consumers who are empowered by easy and frequent access to information on the internet and social media. Consumer interest in transparency and traceability across the supply chain is growing. Younger consumers are eager for companies to share more about the origin of their products and provide more transparency on sustainability-related marketing claims, as they express concern for workers' rights, environmental issues, and seek to influence companies' actions through their buying power.

Challenges in understanding the state of adoption of sustainability practices include the scale, scope, opacity, complexity, and the changing nature of supply chains. There is no common language to define sustainability, and it is still difficult for industry practitioners to talk about sustainability with a shared vocabulary to forge a mutual understanding. The complexity and broadness of the topic of sustainability also makes it challenging for sustainability-related

functions within firms to speak the language of profit and tie their efforts directly to a firm's financial success. Even when an employee can provide tangible financial benefits for a sustainability-related initiative, such projects are often not a company's core business and stakeholders prefer to invest back into their core business to drive topline growth (Aronson 2017).

This research seeks to improve knowledge to better understand the ways companies are adopting sustainable supply chain practices today.

1.4 Research Gap

We identified that existing research does not define the actual state of supply chain sustainability today across industries, geographies, and functional roles within a defined time period. Instead, most reports and articles tend to target specific industries, such as energy, fashion, agriculture, transportation, and logistics, or their specific impacts, like greenhouse gas emissions, ethical sourcing, deforestation, or social compliance issues. We have also identified that the majority of supply chain sustainability-related research focuses on perceptions of company executives and shareholders. Examples include:

- EY's 2016 report *The state of sustainable supply chains: Building responsible and resilient supply chains* mentions employees as a stakeholder in sustainability efforts, however there is no indication of perspectives being provided specifically from frontline supply chain professionals;
- CDP's 2017 report *Missing link: Harnessing the power of purchasing for a sustainable future* provides perspectives primarily from those in top management positions, though most are in sustainability-related roles; and
- McKinsey's 2019 report *Fashion's new must-have: Sustainable sourcing at scale* reflects the perspectives of 64 sourcing executives.

We address the underrepresentation of perspectives from frontline supply chain professionals on supply chain sustainability practices through this capstone. We sought to provide a glimpse into frontline employees' perceived state of adoption of sustainability practices across geographies, industries, functional roles, and demographic characteristics. The level of visibility and importance of supply chain sustainability efforts have increased in recent times, making the topic a key area of interest for many companies in 2019 and beyond.

Supply chain sustainability is inconsistently defined across different types of (and even within the same) companies, industries, and geographies. This issue becomes more complex when coupled with varying regulatory requirements as well as individual firms' willingness, technological, and financial ability to adopt. There is also a lack of industry-wide standardized benchmarks to objectively measure progress and little transparency as to what sustainability efforts other companies are undertaking as well as what progress has been made to date.

The Global Reporting Initiative (GRI, 2016) and the United Nation's 2030 Agenda for Sustainable Development (UN Sustainable Development Goals, 2020) demonstrate the importance of sustainability efforts, but the path to get there is not always clear. Different indexes have been designed to measure sustainability, however, despite these indexes tending to consider the same criteria, the weight given to each component varies according to the party responsible for measuring. As a result, not having globally accepted definitions of how to measure sustainability makes comparison of values almost meaningless.

To that end, we offer generalizable learnings about what constitutes supply chain sustainability from a global perspective, and highlight what that means for the future. This is the first time this study has been conducted from MIT CTL and learnings from this capstone will inform future iterations of the work.

1.5 Research Process Summary

To achieve the objectives stated in Section 1, analysis was performed by substantiating existing knowledge in literature with new evidence from a rich set of survey data, content and archival analysis, and perspectives from interviews with supply chain executives. Data collection included a large-scale survey of professionals (distributed initially to supply chain professionals but also shared on a wider network) that was deployed globally in October 2019. Its objective was to collect data on corporate supply chain sustainability practices, ranging from awareness of the topic, goal setting, investment, management tools, sources of pressure, and reporting.

The methodology to conduct this research included:

- Logistic and linear regression
- Descriptive statistics analysis on correlations

- Aggregation and correlation matrix to identify sustainability practices across types of companies, industries, and regions.
- Content analysis of secondary materials to provide further context on findings of the survey.
- Use of Tableau to exhibit the findings in a clear and visually engaging way so that professionals across backgrounds can clearly understand the findings.

The capstone results are part of a major research project developed by MIT CTL together with CSCMP to deliver the first State of Supply Chain Sustainability report in 2020. Given the outsized impact of the coronavirus pandemic in 2020, we reveal findings from the survey dataset with an added focus on what the events of 2019-2020 mean for supply chain sustainability in coming years.

2. Literature Review

The literature reviewed for this capstone project included news articles on current events, articles from scientific journals covering topics ranging from corporate codes of conduct to sustainable manufacturing, corporate social responsibility reports, publications on the history of sustainability, case studies, industry reports, and books on topics such as business sustainability and international political economics of production. Through the literature review, we sought to understand the historical evolution of sustainability, how and why supply chains came to be understood as linked to sustainability, the framework of regulatory requirements that have influenced sustainability, what current events are influencing supply chain sustainability practices in 2019, and what emerging trends will shape supply chain sustainability for years to come.

We have performed content analysis of existing literature to understand the historical context and evolution of supply chain sustainability while aiming to answer the question: what does supply chain sustainability look like in 2019? We will clarify how expert efforts on defining this matter impacted existing knowledge, and how we observed current practices to evaluate the awareness in sustainability applied to supply chain processes across industries and geographies.

2.1 Sustainability Concept and Knowledge Evolution

The term "sustainability" was originally coined in German as "*Nachhaltigkeit"* which means "sustained yield". The term first appeared in a handbook of forestry published in 1713 and meant to never harvest more than the forest can regenerate. Once ecology became a discipline, the concept of sustainability was defined as the ability of an ecosystem to maintain its biodiversity over time. In the later part of the 20th century, awareness of overuse of resources and dependence on fossil fuels was growing (Rack, 2014).

References to sustainability were observed in literature in 1969 as part of the creation of the National Environmental Policy Act law, which was signed in 1970 (National Environmental Policy Act, 1969) and reinforced later in 1972 in the Stockholm Declaration during the United Nations Conference on the Human Environment. In these early cases, sustainability refers to the capability of achieving profit while focusing on preserving the environment. The U.S. Environmental Protection Agency implemented numerous standards and regulations related to conservation and environmental sustainability in the 1970s, and the first Earth Day was celebrated by 20 million Americans. After the Stockholm Declaration, awareness, community activism and, therefore the global demand for focus on environmental protection, increased (Handl, 2012).

By 1987, the concept evolved, and the United Nations defined sustainable development as meeting "the needs of the present without compromising the ability of future generations to meet their own needs" (The World Commission on Environment and Development, United Nations, 1987). In 1992, the Rio Declaration on Environment and Development reaffirmed the Stockholm declaration goals and added a regulatory framework to reinforce environmental practices with development of global standards (Handl, 2012). The main outcome of the conference held in Rio was a call for global partnership to identify the integration of environment and development concerns, as leading factors for the fulfillment of basic needs, improved living standards, and better protected ecosystems. In 1993, the Commission on Sustainable Development was created as a forum tasked with following up on the progress of outcomes of the 1992 United Nations Conference on Environment and Development/Earth Summit. This commission has advanced the sustainable development agenda within the international community (UN Sustainable Development Goals, 2020).

"Although environmental issues started before the 1990s, major streams of sustainable research specific to the supply chain management discipline started in the mid-1990s" (Baah & Jin, 2019). The acceptance of social and other issues related to the environment evolved from what was referred to as "standalone" by Craig and Easton (2011), to the concept we currently refer to as sustainability. The concept of sustainability then started to cover a wider range of impacts, including what was called the three pillars of sustainability in the "triple bottom line theory." The triple bottom line theory is an accounting framework created by John Elkington in the mid-1990s to measure sustainability and went beyond the traditional financial measures of profits to include environmental and social dimensions (Slaper & Hall, 2011). Elkington designed a model including these topics to guide any company strategy pursuing sustainable results: 1) Economic, 2) Environmental, and 3) Social (Elkington, 1994). These three pillars are also informally referred to as profit, planet, and people.

The first pillar, commonly known as the "bottom line," is economic sustainability and it refers directly to profitability. It means that no organization can last if it is not able to generate the appropriate income related to its expenses and investors' expectations. Risk management and compliance activities are also included as part of this pillar. The second pillar of sustainability, environmental, relates to consumption of natural resources, waste generation and disposal, carbon footprint, and deforestation, among other areas. The third pillar, social sustainability, refers to obtaining a license-to-operate, avoiding slave labor, child labor, and conflict minerals, and propitiating fair trade. Overall, this pillar is about considering the organization as a member of the community and the importance of community support for the organization to be sustainable. The triple bottom line theory altered the understanding of the actual value of a company or brand, and led to the need for defining global measurement and reporting rules.

Sustainability standards have grown rapidly in number and importance in global commodity markets over the past decade. The growth of voluntary sustainability standards has occurred in parallel with growing recognition of the importance of economic drivers in implementing sustainable development. These factors are creating new opportunities for stakeholder participation in supply chain decision making. Furthermore, poor sustainability performance, as measured in social and environmental impact, can slow a company's growth (United Nations Conference on Trade and Development, 2019). To make and sell goods,

companies need affordable, reliable supplies of energy and natural resources, as well as permission from investors, consumers, and regulators to conduct business.

For a company to thrive, it must have the ability to effectively evaluate its own sustainability performance. The Dow Jones Sustainability index for investors, a collection of indexes acting as the first global sustainability benchmarks, was launched in 1999 and provides a clear example of the impact the broad concept of sustainability has achieved. Despite this progress, there is ongoing evolution of these indexes, as bias is claimed by analysts because neither the global stakeholders nor the specific industries or markets agree on what weight each pillar should have in the existing indexes (Escrig, Muñoz, & Fernandez, 2010).

Furthermore, each country's national law requires and reinforces sustainable practices according to their resource availability and main social or economic weaknesses. Sustainability is in demand by the global community in 2019, however global standards and policies mainly require voluntary adoption.

2.2 Application of Supply Chain Sustainability

Supply chain sustainability is increasingly recognized as a key component of corporate responsibility involving many complex and interrelated facets. Linton, Klassen, and Jayaraman (2007) drew attention to the joint terms "supply chain" and "sustainability". They reinforced that to optimize the supply chain in any industry, the entire sequence of steps should be analyzed in terms of sustainability because of trade-off between the economic impact and the achievement of sustainability goals. In 2010, the UN Global compact defined the term "supply chain sustainability" as "the management of environmental, social, and economic impacts, and the encouragement of good governance practices, throughout the lifecycles of goods and services." (United Nations Global Compact & BSR, 2010)

By 2019, rising issues such as global warming, energy crisis, and ozone layer depletion, among others, have brought attention to the topic of sustainability in all facets of human existence. Likewise, social sustainability practices, such as fair trade and worker welfare, are of increasing interest to consumers as they seek to know the origins of the products they purchase. As a result of these trends, there has been increased interest in sustainability as part of strategic supply chain decisions.

Companies that look to become more sustainable often start with their own operations, but soon realize that many of their impacts are in their supply chains rather than in-house (Bové & Swartz, 2016). CDP reveals that companies pressuring their suppliers to make changes to be more sustainable can have a significant impact. When CDP's Supply Chain Disclosure started 10 years ago, only 14 companies participated. In 2018, 115 of the world's largest organizations, with a combined purchasing power of over $3.3 trillion, requested environmental information from more than 5,500 suppliers (Scott, 2019).

Although the aim to create a cascade of sustainable practices that flows throughout the supply chain is admirable, it is difficult to realize in practice. Apple, Dell, and HP faced scrutiny for sourcing from companies that required employees to work in hazardous conditions (Villena & Gioia, 2020) and in 2013, the Rana Plaza disaster in Bangladesh killed 1,130 people and injured many others when a building housing several factories producing clothing for US-based brands collapsed (White, 2017). While the topic of supply chain sustainability has evolved significantly over time, the aforementioned tragedies are a stark reminder that there is still much progress to be made.

3. Methodology

This section describes the methodology used for the state of supply chain sustainability research. The methodology followed this chronological order: survey design and distribution, survey data collection, literature review, executive interviews, quantitative analysis including data cleaning, data triaging, and visualization analysis, and discussions on key takeaways.

As a primary research method, a survey was commissioned by MIT CTL in partnership with CSCMP. The main goal of the survey was to understand the state of supply chain sustainability in 2019 with a focus on the perception of frontline employees. Because the survey could reach all networks of supply chain professionals, it included a question to identify the respondent's functional role to allow filtering if required when performing analysis. The overall content in the survey questions drew from different major sources: a) significant knowledge in this topic area from within MIT CTL; b) academic research from the past and current ongoing work in this area; c) existing standards and industry reports, including related reports with a different angle

(based on C-suite executive interviews or focused on specific industries); d) anticipated future trends.

To ensure that potential respondents could understand the survey content, the survey was vetted by experts in the area including CTL researchers, CTL graduate students, the CSCMP Sustainability Committee, the CSCMP board, industry professionals, and external academic professionals. This study also received approval from the MIT Committee on the Use of Humans as Experimental Subjects (COUHES) to involve human subjects. Before going online, the survey was piloted successfully with over 60 supply chain professionals to gauge understanding of the questions' main concepts and the respondents' ability to complete it.

As the understanding of the topic of sustainability within the context of supply chain may differ among survey respondents, the following clarification was included at the beginning of the survey:

> *In this survey, supply chain sustainability refers to the management of **environmental and social** impacts **within and across** companies in networks consisting of suppliers, manufacturers, distributors, and customers.*

The survey was designed to gather data covering 7 major aspects:

1) Categories and Level of Commitment in Sustainability
2) Categories and Level of Investment in Sustainability
3) Disclosure Frequency and Media
4) Type and Effort Level on Applied Practices in Sustainability
5) Source and Level of Pressure for Sustainability
6) Type of Company
7) Respondent Main Characteristics

The initial survey questions gathered information on existence of specific firm practices by respondent, such as existence of publicly stated sustainability goals or whether the firm has invested in increasing supply chain sustainability. Once the surveyed professionals stated their firm's involvement or lack thereof in these areas, the objective of succeeding questions was to understand the main focus areas within the topic by category (for example, carbon emissions

reduction or supplier diversity and inclusion), level of adoption of current practices, level of investment, main sources of pressure, disclosure practices, and disclosure frequency.

The survey was designed and conducted online through Qualtrics web-based platform. Survey routing (also known as Skip Logic) was used to modify the respondent's path through the survey depending on the answers they provided to previously defined questions. For this capstone, the questions that modify the path are named as "root questions" and those that follow a "yes" answer to a root question are named as "branch questions". An example of this is shown in Figure 1. Likert Scale was used in most of the branch questions with the understanding that the perceived attitudes could be measured from 0 to 5 for further numerical analysis once the data was available and ready to be used.

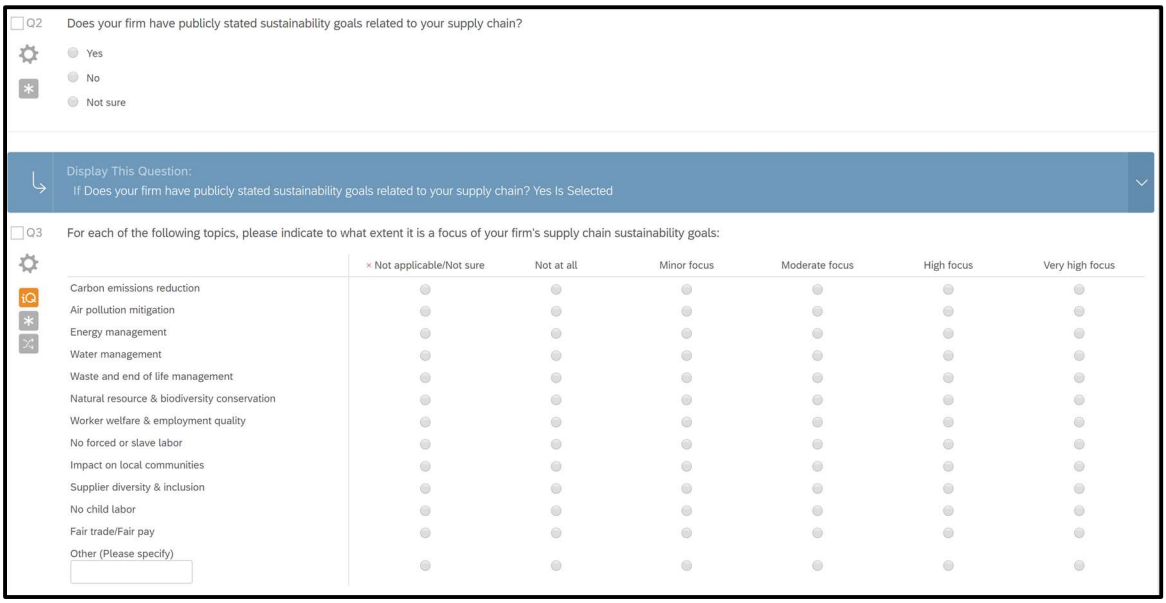

Figure 1: Root and branch question design with binary and Likert scale answer types

From the literature review, we identified that answers might be correlated to specific characteristics of the participants and the companies at which they were employed. Therefore, questions related to the respondents' demographic and professional attributes such as geographic location, gender, age, and functional role as well as the size, type, industry, headquarters' location, and primary consumer markets were included. The survey was anonymous to avoid potential bias that could result if the surveyed audience was concerned about exposing their firm's actual practices.

The survey included count of clicks tracking and measured the amount of time spent on each page of the survey by respondent. The objective of recording amount of time spent was to identify whether the respondent spent time possibly reading long texts carefully or assessing possible answers in questions where many options were available. As there is a minimum number of clicks required to complete the survey, additional clicks may imply a respondent's change of choices while going through the questions.

The survey was open for responses for 40 days, from October 7, 2019, to November 15, 2019. The survey was primarily distributed through CSCMP to their associates as well as CTL's database of contacts, and was shared through other industry associations' e-mail groups. It was also promoted in social media (mainly through LinkedIn) and was shared through the survey respondents' network. Global coverage of frontline supply chain professionals was the goal of selecting this wide audience, and the questions would provide the option to aggregate results and narrow down the scope if deeper analysis was required on a smaller subset of answers.

3.1 News and Industry Journals

Existing literature reveals the concept of sustainability was initially focused on environmental concerns (Handl, 2012), but more recently focus has extended to include a comprehensive perspective based on three pillars 1) Economic, 2) Environmental, and 3) Social (Elkington, 1994). The survey was not designed to cover the economic side of sustainability, as explained in Section 3.3, and this pillar was analyzed by means of secondary research.

The secondary research method provided a clearer understanding on the evolution of sustainability applied to supply chain, and was utilized to challenge or reinforce the survey results. The main sources of data for this step were internet-based including news, business, industry, and sustainability-focused journals, as well as MIT libraries.

3.2 Executive Interviews

We arranged executive interviews to support and increase the *ethos*, defined as the credibility and sense of accuracy, of the collected data for the reader. We conducted 12 interviews with supply chain industry executives based in the US, Europe, and Asia, ranging from upstream

(for example, manufacturing) to downstream (for example, retail) during the data analysis phase. Table 1 shows the number of interviews conducted by industry sector.

Table 1: Number of executive interviews by industry sector

Industry Sector	Sub-Sector	Count of Interviews
Consulting	None	1
Consumer Goods	Household & Personal Products	1
Industry Trade Association	Supply Chain Management	1
Manufacturing	Apparel, Accessories & Footwear	2
Manufacturing	Electronic Manufacturing Services & Original Design Manufacturing	1
Retail	Apparel, Accessories & Footwear	2
Technology & Communications	Semiconductors	1
Transportation & Warehousing	Logistics	2

A semi-structured, open-ended interview guide was prepared and focused on topics including perspectives on supply chain sustainability, level of pressure received to adopt sustainable practices, the role of supply chain professionals, and pressure agents, among others. The main objectives of the interviews were to understand key challenges, if and how sustainable practices are implemented within their own companies, and to gain knowledge on practices that could impact employees' perceptions within their companies. Qualitative findings from executive interviews were used to provide anecdotical insights that can be found in Section 5 and the interview guide can be found in the Appendix B.

Information gathered from the executive interviews bridged the gap between the lofty ambitions from executives pertaining to sustainability goals that are prevalent in the news, and the sometimes-contradictory perspectives from frontline employees.

3.3 Limitations

a) Economic Pillar of Sustainability

The survey focuses on the social and environment sustainability aspects of supply chains because these areas are more often overlooked by businesses, and therefore are interesting for tracking changes over time. The economic pillar of sustainability was intentionally not part of the survey. A deep economic analysis would require data that is private to each company and therefore

it is less feasible to collect information that guarantees global representativeness through an anonymous survey. The absence of survey questions with economic-related content also aimed to protect data privacy of respondents. The survey includes a broad view of sustainability-related questions across geographies and industries, and when designing the survey, we sought to protect the anonymity of respondents, so these factors limited the specificity of responses. However, the firm size, respondent perception of level of investment in environmental and social aspects of sustainability, and whether the firm is publicly or privately held is information that was included in the survey and statistical relationships of these attributes were analyzed.

b) Respondents' duplicated records

Another limitation is that the surveyed audience is anonymous, so we cannot identify if more than one person from the same company participated in the survey, providing similar or different responses. We addressed this problem by removing identifiable duplications in responses.

c) Representativeness of the responses

Questions with fewer than ten answers for a specific industry, headquarters, primary consumer market, geographic location, gender, age range, or position were dismissed for individual analysis as they did not provide enough information for analysis. These responses are considered for aggregated analysis in cases where the objective is not related to the place, person, or industry, but with overall existing practices, goals, investment, pressure received from stakeholders, or disclosure practices.

3.4 Data Cleansing, Preparation, and Modeling

Before proceeding with analyzing the data, it was necessary to confirm that answers were complete and accurate, that typos were not affecting the results potentially causing duplicate or inaccurate data categorization, and that there were not unwanted observations to erase from the sample. The data was then cleaned in order to guarantee accuracy and consistency, and prepared before moving forward with the analysis process.

3.4.1 Data Cleansing

Data cleansing initially focused on locating answers that respondents identified as required but were not listed as possible options to each question, instead they were entered as free form text responses under an "Other" category. The next step was defining whether the exceptions fit existing categories or should be incorporated into a new group that appears relevant for the audience and was not originally considered by the data collection tool.

An example of this was the cleaning of answers in category "Other" from the question regarding focus and level of focus in sustainability (Q3 from the survey can be found in Appendix A). We identified "N/A" comments that were translated into blank answers (as no actual "Other" focus described) and reallocated responses that could be included in existing categories, like "Performance Metrics CO2 reduction for customers" was translated into the existing "Carbon emissions reduction" category. At the end of this process, only three answers remained in "Others" for this question, and considering the low representativeness of these answers, they were left unidentified as "Others" for the analysis phase. The same process was performed with the following survey questions: Q5, Q6, Q9, and Q10. In those cases, where a new proposed category received over 10 answers, the new category was included as an original response, replacing "Others" for the analysis.

3.4.2 Data Preparation

Considering that the primary source of information for this research provided qualitative information related to categorical variables, the collected data was analyzed initially individually and then grouped, applying descriptive statistics, and logistic and linear regression once the categorical responses were turned into numerical data.

The procedure to turn categorical answers into numerical data for the analysis purposes was different depending on the collected information and the expected correlations from each type of question:

A) "Yes" / "No" / "Not Sure" answers: questions that could be answered only with one of these options were turned into binary responses by replacing "Yes" with 1 and "No" or "Not sure" with 0.

B) "Not at all" to "Very High" level answers: questions that could be answered to state a level of pressure, agreement, investment, commitment, or frequency were turned into numerical variables in ranks from 0 to 5 by means of Likert Scale usage. In all cases, a 0 represents the lowest

level or no level according to the question design, while a 5 represents the highest corresponding level.

C) Respondents' age or company size (measured in range of number of employees): Numerical answers providing ranges were turned into the average of each range. As an example, respondents' answers in a range of age between 35 and 44 years old, were turned into a numerical variable by using the average of 39.5 for the regression analysis.

D) Categorical answers: questions to be answered with a continent, country, state, department, or gender that could not be treated as mentioned in the previous A to C statements, were redesigned into a one-column answer per given alternative. Respondents' choices were turned into binary by using 1 in case they selected that option or 0 if they did not.

A data dictionary was created and included in the master file. Its purpose is to guarantee the ability to translate the original database into the final analysis database, providing a tool to researchers in the field working on future State of Supply Chain Sustainability reports. An example of the information stored in the dictionary is detailed in Table 2.

Table 2: Sample of data dictionary for analysis purposes

Categorical to Numerical Variables Criteria

Focus Level	Numerical Index
Blank Answer	NULL
Not at all	0
Minor focus	1
Moderate focus	2
High focus	3
Very high focus	4

Frequency	Numerical Index
Blank Answer	NULL
Never	0
Less frequently	1
Every two years	3
Annually	2
More frequent	4

Level of Engagement	Numerical Index
Blank Answer	NULL
Not at all	0
Indirectly	1
Directly	2
Primary decision-maker	3

Investment Level	Numerical Index
Blank Answer	NULL
No investment	0
Low investment	1
Moderate investment	2
High investment	3
Very high investment	4

Range of Average of employees	Average of employees
Blank Answer	NULL
0-19	10
20-99	60
100-499	300
500-999	750
1,000-4,999	3,000
5,000-9,999	7,500
10,000-49,999	29,500
50,000 or more	50,000

Range of age	Average of age
Blank Answer	NULL
18-24	21
25-34	30
35-44	40
44-54	49
55-64	60
65 or older	65

Pressure Level	Numerical Index
Blank Answer	
No pressure	0
A little pressure	1
Some pressure	2
Moderate pressure	3
Intense pressure	4

Missing data was analyzed according to its origin. If the reason for missing data in a branch question's answer was related with the corresponding root question answer, the missing answer was considered as "skipped", so it was null for linear regression, but considered in the logistic regression of the root question data. If the reason was related to the respondent dropping the survey, the empty entry is considered as null data and this fact is only analyzed with the objective of understanding what could lead to that fact. For all purposes, empty data are not considered as "No" answers and then are not turned into 0 for the regression analysis.

Data aggregation was performed in all cases in which the number of answers did not impact the result of the data analysis. In cases where the number of answers could impact the accuracy of results interpretation, data was normalized by using an average. An example of this is the analysis on level of focus in each sustainability goal commitment grouped by the respondent's industry, as Manufacturing and Transportation and Warehousing industries represent 46% of total responses.

3.4.3 Modeling Data for Logistic and Linear Regression

Given that the survey design used skip logic (see Section 3 and Appendix A), answering "No" to certain root questions led to skipping the branch questions on the same subject. The goal was to not bias the regression analysis by considering unanswered questions with correctly answered questions, as per the survey routing design. The regression from any dependent variable compared to those responses as independent variables was split into a two-step process: 1) utilizing logistic regression to define the correlation of any variable with the "Yes" or "No" answer to the root question, 2) utilizing linear regression to analyze correlations considering only those responses to the branch questions that were obtained after a "Yes" answer to the root question. Dependent variables analyzed by this method were defined according to the main sections of the survey, as detailed in Section 3.

4. Results

4.1 Respondent Characteristics

As exhibited in the heat map with the dark blue color indicating a higher number of responses (Figure 2), respondents with company headquarters in 71 different countries participated in the survey. The United States of America had the highest number of respondents at 44% with most responses from California, New York, and Illinois. The countries with the second- and third-highest number of responses were Malaysia and India, respectively.

Figure 2: Heat map showing respondents' company headquarters' location

Firms from over 19 industries including Manufacturing, Transportation and Warehousing, and Retail participated in the survey. Figure 3 below summarizes the top 10 industries by number of responses.

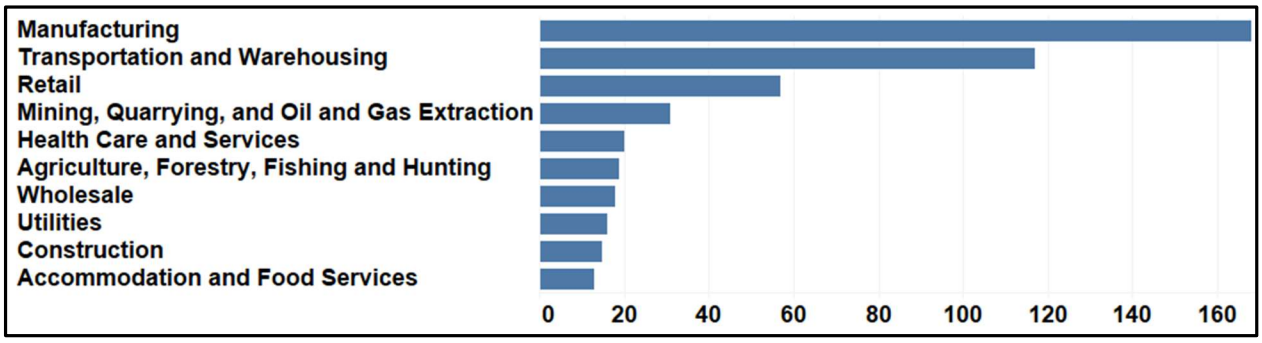

Figure 3: Number of respondents grouped by industry

Answers received from Government or NGOs, Chemicals, Marketing and Social Media, 3PL, and Trading and Finance industries had less than 10 responses, so they are not considered as representative of the industry. However, they were included for aggregated analysis.

Firms of various sizes, categorized and measured by number of employees, were represented in the survey. This can be observed in both extremes with 17% of the respondents coming from companies with over 50,000 employees and 11% between 0 and 19 employees. The size of the firm was analyzed to understand the correlation with level of pressure received from diverse stakeholders, as well as company level of investment in increasing supply chain sustainability.

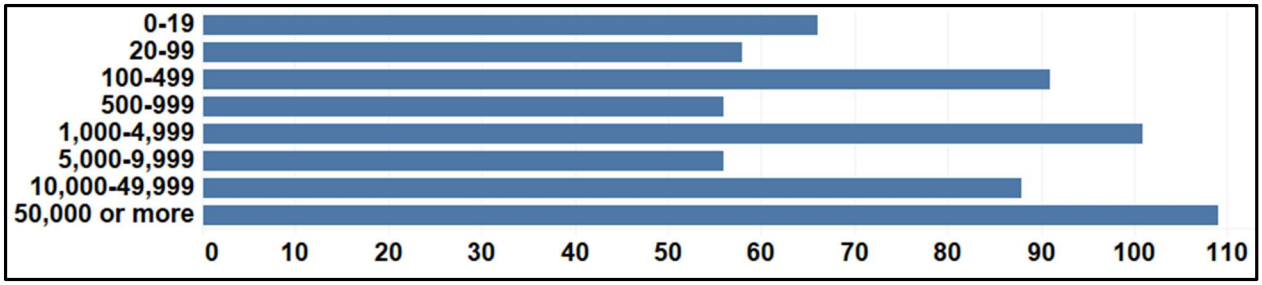

Figure 4: Number of respondents grouped by companies' number of employees

In our analysis we considered the relationship between a company being publicly traded or privately held and its goals, commitments, and main sources of pressure to adopt sustainable practices. The survey shows that 65% of the respondents were from privately-held companies and 35% of respondents were from publicly-traded companies.

One of the major gaps this research is aiming to explain is frontline supply chain employees' perception of the state of adoption of sustainability practices across geographies, industries, and functional roles. Figure 5 illustrates that they are properly represented by the population sample. We observe that the highest number of responses came from people working in procurement and logistics, which represent major areas in the supply chain management field, and that only 5% of answers are from top management professionals.

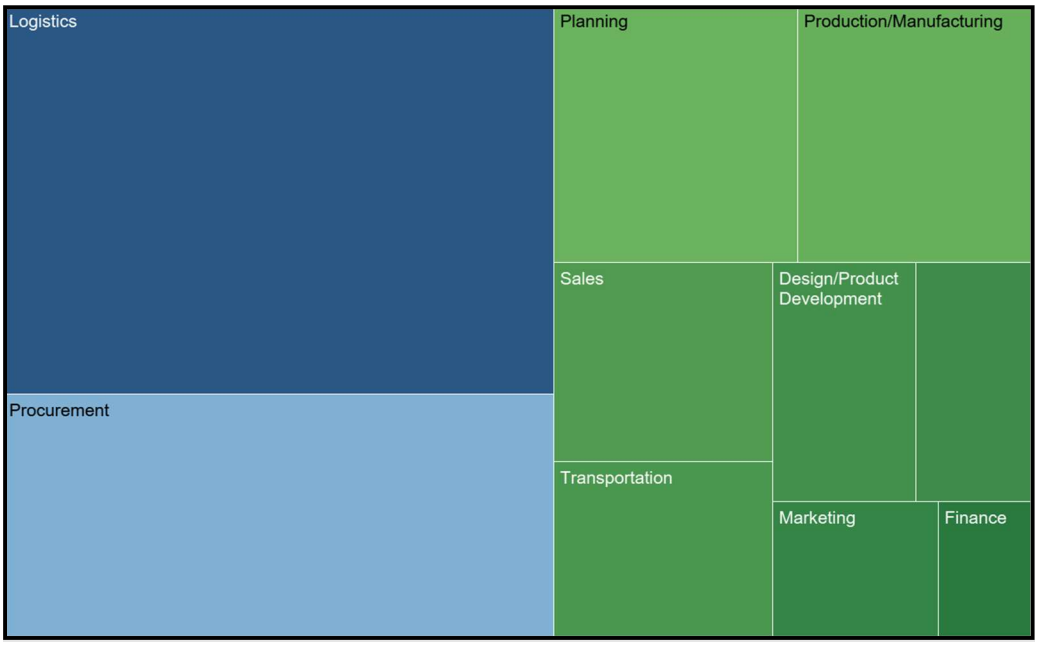

Figure 5: Number of respondents grouped by functional department or position

As shown in Figure 6, over 58% of the surveyed population is between 25 and 44 years old and our sample population consists of 75% male respondents and 25% female respondents. Age range was expected to have a correlation with the level of engagement in a firm's sustainability efforts. Based on content analysis, it was hypothesized that the younger population may be more socially aware of sustainability practices because they have grown up with social media. The results of the correlations of these variables are detailed in subsection 4.2 Results.

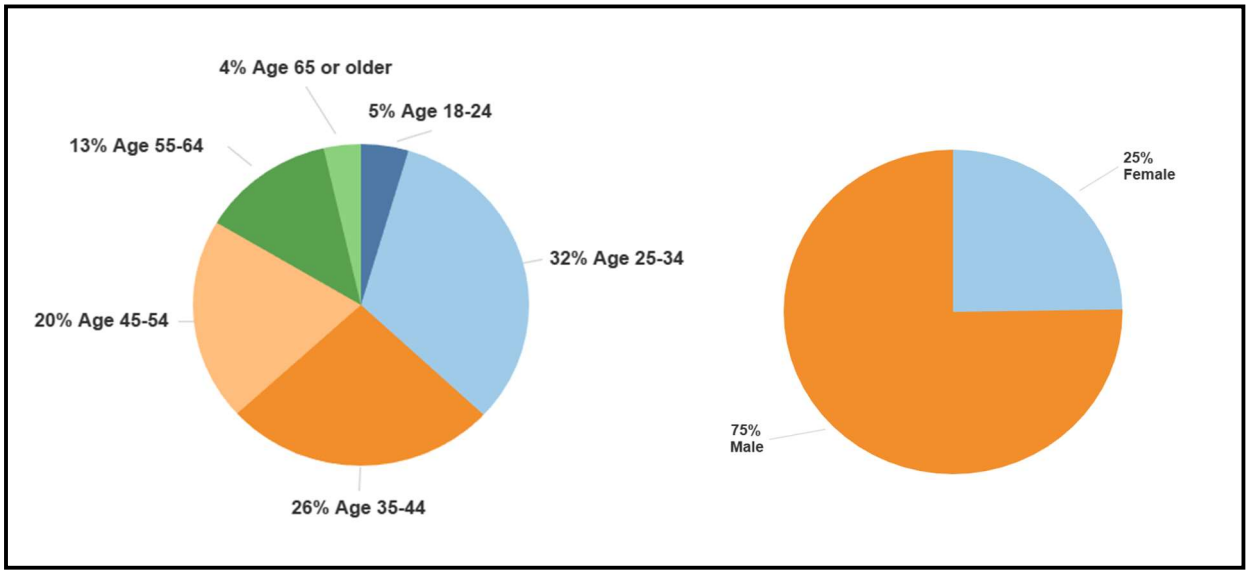

Figure 6: Respondents' age range and gender

Survey results show that 78% of respondents are directly or indirectly engaged with their firm's sustainability efforts in the supply chain. Details on these results are displayed in Figure 7.

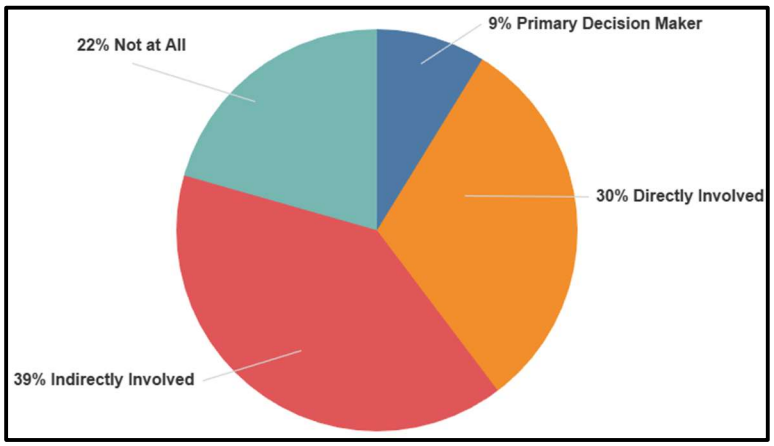

Figure 7: Respondent level of engagement with company supply chain sustainability efforts

4.2 Survey Results

The survey highlighted differences in companies' goals and investment level in supply chain sustainability, current practices, level of pressure received, disclosure frequency, level of effort, and commitment from frontline employees (see Appendix A). The survey completion rate was 54%, calculated as the ratio of the number of completed surveys (through Question 19) compared to the number of respondents who started the survey (answered "Yes" to Question 1). Some respondents dropped out when information regarding sustainability practices, pressure, and investment was requested in detail. We evaluated the total number of responses versus the percentage of respondents who skipped or dropped out at certain questions to see if there was any point in the survey at which the question skip rate was particularly high. The objective was to identify the motivations of respondents in proceeding with the survey, skipping, or dropping out at certain points. As shown in Figure 8, the points at which respondents either dropped out or skipped questions were highest at branch questions. For example, the skip rate was lower for a general root question like "Has your firm invested (financially or with human resources) in increasing the sustainability of your supply chain?" but increased for more specific branch questions where details such as "Please indicate the extent of your firm's investment in the

following: carbon emissions reduction" were requested. A negative skip rate in Figure 8 indicates that respondents returned to the survey after skipping the previous question. Survey results show that approximately 60% of respondents skipped the branch questions when asked to identify category-level sustainability goal commitments and investment. We also found that 66% of respondents skipped questions when asked about investment level in "no forced or slave labor" and "no child labor" categories, which was higher than other categories. Appendix A shows the content of each question by question number.

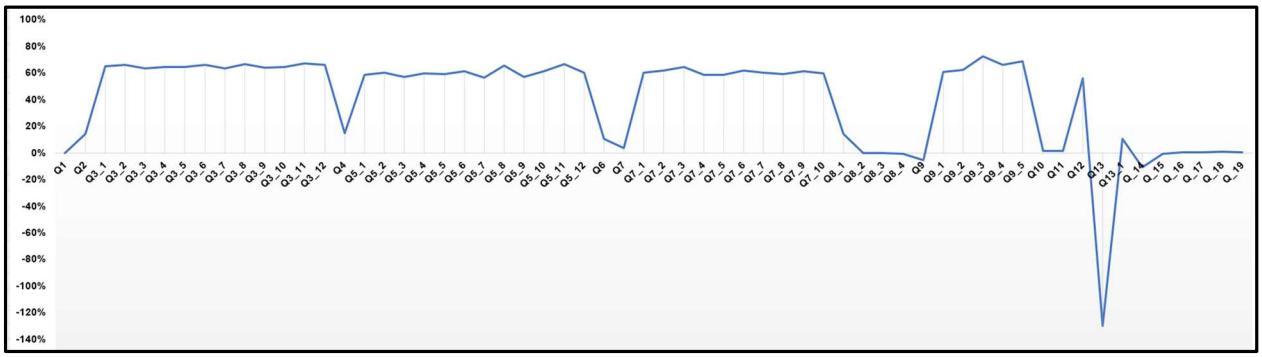

Figure 8: Respondent question skip rate

We used the results to suggest opportunities to revise the order of survey questions to increase the completion rate and gain demographic information on respondents who drop out of the survey for future iterations. Suggestions for future surveys are detailed in Section 6.3.

From the data analysis shown below in Figures 9 and 10, with 4.0 as the highest level, we observed that the focus on sustainability is perceived to be mostly in social sustainability, with a strong emphasis on no child or slave labor and worker welfare. However, investment in these areas is not directly aligned with the goal commitment focus areas. Later analysis was separated between social and environmental pillars to support the idea of categorizing unique sustainability indicators as well as more easily compare the diverse applications of sustainability from survey results. One drawback of this approach is that it can reinforce the idea that the different pillars of sustainability (as defined in Subsection 2.1) have meanings that are independent from one another. One study indicates that it is necessary to understand how the different pillars interact in order to characterize and assess sustainability (Boyer, Peterson, Arora, & Caldwell, 2016).

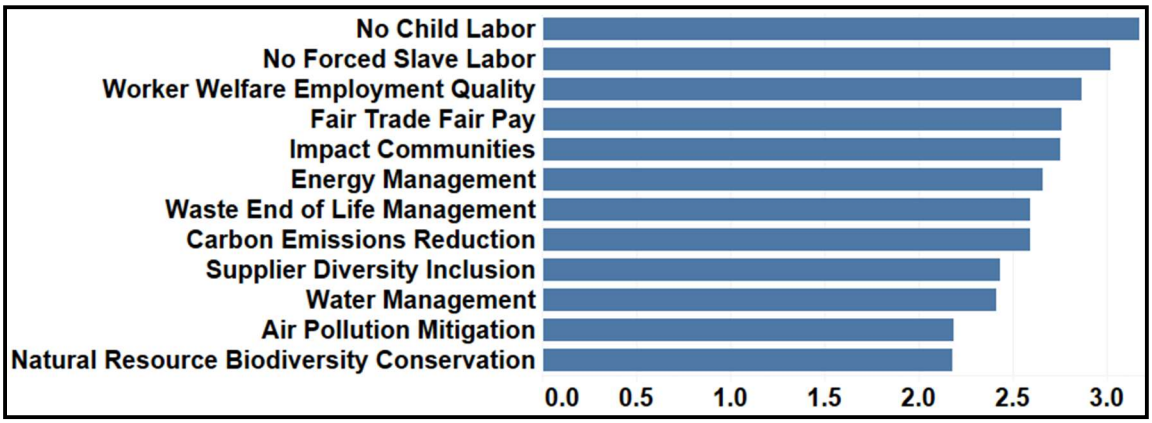

Figure 9: Focus areas for company sustainability goals and commitments

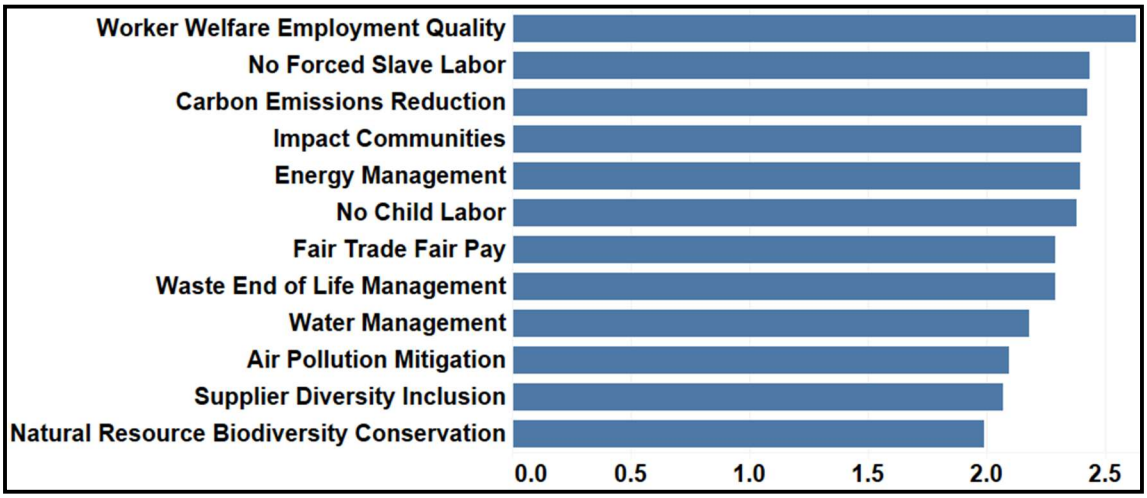

Figure 10: Focus areas for company sustainability investment

Respondents' perceptions indicate that companies have stronger commitment to social sustainability, and therefore are investing more in this area. By splitting the analysis into social and environmental sustainability, as seen in Figures 11 and 12, it is observed that "No child labor" and "Energy management" are the top focus areas in each category.

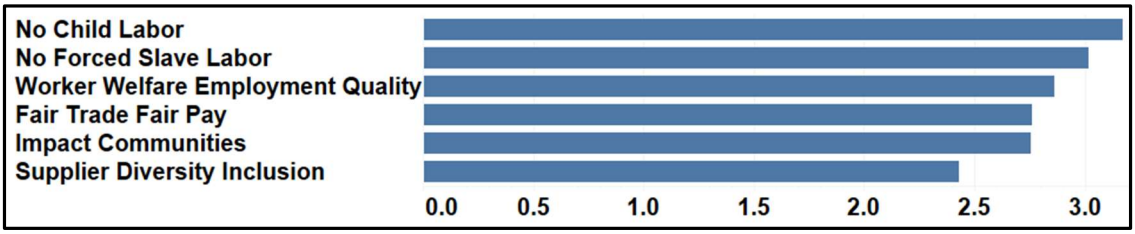

Figure 11: Average level of company commitment to social sustainability goals by category

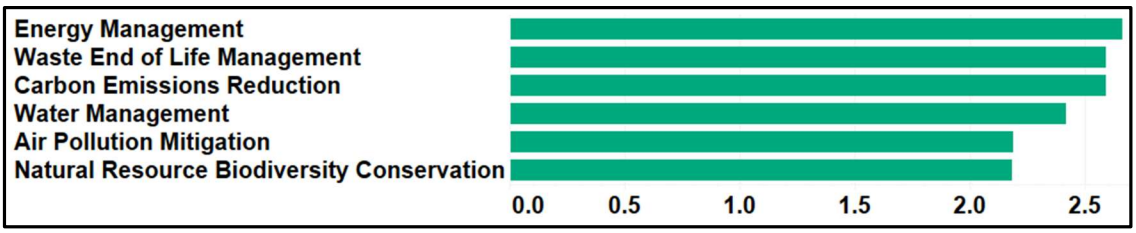

Figure 12: Average level of company commitment to environmental sustainability goals by category

When analyzing companies' level of commitment to sustainability goals by industry, it is observed in the three industries with the highest number of respondents from the survey (manufacturing, retail, and transportation and warehousing) that:

- The main commitment to social over environmental sustainability prevails.
- The top 3 social goals in these industries are the same: no child labor, no forced labor, and worker welfare.
- The top environmental goal exhibited by each industry (water management, waste and end of life management, and carbon emissions) may be related to related industry practices, as seen in Figure 13.

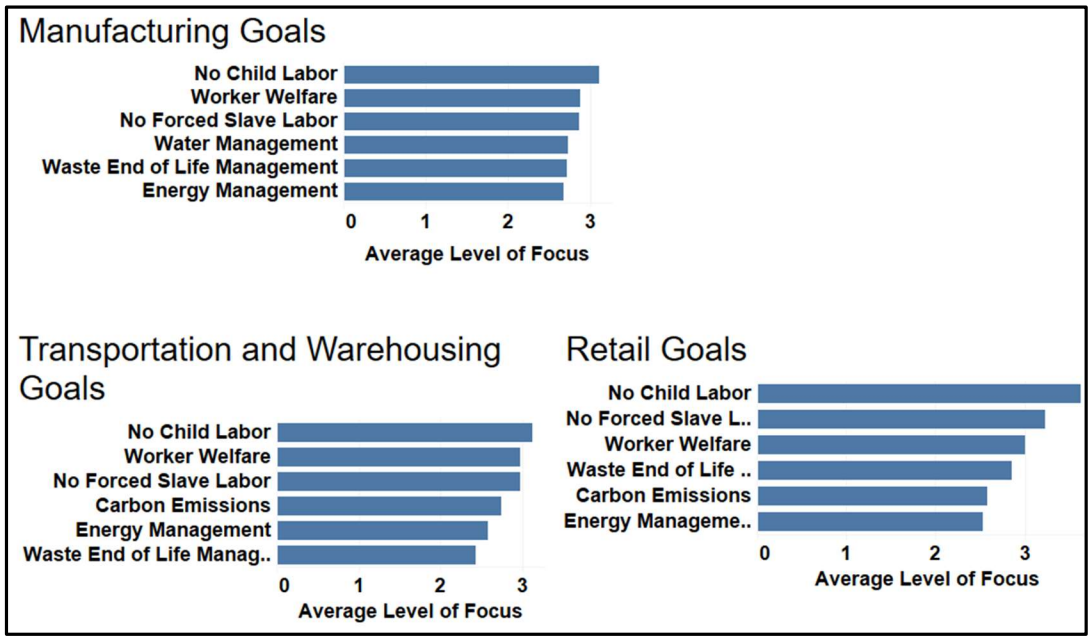

Figure 13: Top social and environmental sustainability goals ranked by industry

Table 3 shows a correlation matrix between social and environmental sustainability goal commitments, where the green color indicates a higher correlation and the yellow and red colors indicate a lower correlation. Table 3 demonstrates that there is a high correlation between goal commitment categories within the social and environmental sustainability pillars, however the correlation is lower when the goal commitment categories fall under separate sustainability pillars. For example, if a company has goal commitments in carbon emission reduction, this is strongly correlated with having goal commitments in air pollution mitigation but not as strongly correlated with social sustainability goal commitments, such as no forced or slave labor.

Table 3: Correlation matrix demonstrating relationship between social and environmental sustainability goal commitment

	Goals_Carbon_Emissions_Reduction	Goals_Air_Pollution_Mitigation	Goals_Energy_Management	Goals_Water_Management	Goals_Waste_End_of_Life_Management	Goals_Natural_Resource_Biodiversity_Conservation	Goals_Worker_Welfare_Employment_Quality	Goals_No_Forced_Slave_Labor	Goals_Impact_Communities	Goals_Supplier_Diversity_Inclusion	Goals_No_Child_Labor	Goals_Fair_Trade_Fair_Pay
Goals_Carbon_Emissions_Reduction	100%											
Goals_Air_Pollution_Mitigation	88%	100%										
Goals_Energy_Management	87%	87%	100%									
Goals_Water_Management	85%	85%	90%	100%								
Goals_Waste_End_of_Life_Management	84%	85%	88%	86%	100%							
Goals_Natural_Resource_Biodiversity_Conservation	83%	84%	84%	86%	86%	100%						
Goals_Worker_Welfare_Employment_Quality	83%	83%	86%	84%	84%	84%	100%					
Goals_No_Forced_Slave_Labor	74%	76%	78%	77%	76%	78%	85%	100%				
Goals_Impact_Communities	82%	82%	85%	83%	83%	84%	90%	83%	100%			
Goals_Supplier_Diversity_Inclusion	80%	82%	85%	83%	83%	82%	87%	83%	89%	100%		
Goals_No_Child_Labor	74%	73%	75%	76%	73%	79%	79%	87%	81%	79%	100%	
Goals_Fair_Trade_Fair_Pay	78%	79%	80%	80%	78%	81%	86%	87%	86%	85%	85%	100%

Table 4 shows a correlation matrix between sustainability commitments and levels of investment, where the green color indicates a higher correlation and the yellow color indicates a lower correlation. Table 4 demonstrates that company sustainability goal commitments and investment levels are not perfectly correlated, however category-level goal commitments and investment levels are mostly aligned. For example, having a carbon emissions-reduction goal commitment is most highly correlated with investment in carbon emissions reduction. There are also certain categories, such as investment in impact on local communities, that are correlated with relatively higher goal commitments in other areas that are as well related to community impact. These areas include air pollution mitigation, energy management, waste and end of life management, natural resource and biodiversity conservation, worker welfare and employment quality, and supplier diversity and inclusion. Investment in social categories has a higher

correlation with investment in other related social and environmental categories, while investment in environmental categories tends to be most highly correlated with investment in other environmental categories.

Table 4: Correlation matrix demonstrating relationship between sustainability goal commitment and investment level

	Goals_Carbon_Emissions_Reduction	Goals_Air_Pollution_Mitigation	Goals_Energy_Management	Goals_Water_Management	Goals_Waste_End_of_Life_Management	Goals_Natural_Resource_Biodiversity_Conservation	Goals_Worker_Welfare_Employment_Quality	Goals_No_Forced_Slave_Labor	Goals_Impact_Communities	Goals_Supplier_Diversity_Inclusion	Goals_No_Child_Labor	Goals_Fair_Trade_Fair_Pay
Investment_Carbon_Emissions_Reduction	49%	49%	46%	45%	43%	45%	43%	40%	44%	44%	41%	43%
Investment_Air_Pollution_Mitigation	46%	51%	46%	45%	44%	45%	42%	40%	44%	45%	42%	43%
Investment_Energy_Management	45%	47%	49%	46%	45%	44%	43%	41%	44%	47%	40%	43%
Investment_Water_Management	42%	44%	43%	45%	42%	43%	39%	39%	40%	43%	39%	41%
Investment_Waste_End_of_Life_Management	44%	47%	44%	45%	48%	47%	43%	42%	44%	45%	42%	44%
Investment_Natural_Resource_Biodiversity_Conservation	47%	49%	47%	44%	45%	51%	45%	43%	46%	45%	45%	46%
Investment_Worker_Welfare_Employment_Quality	47%	49%	48%	46%	47%	48%	49%	46%	47%	50%	44%	47%
Investment_No_Forced_Slave_Labor	42%	45%	43%	44%	41%	44%	41%	49%	42%	45%	50%	47%
Investment_Impact_Communities	45%	49%	48%	45%	47%	47%	47%	45%	51%	50%	43%	47%
Investment_Supplier_Diversity_Inclusion	45%	49%	47%	45%	44%	46%	44%	44%	45%	49%	43%	47%
Investment_No_Child_Labor	45%	48%	46%	45%	43%	46%	43%	50%	44%	47%	51%	49%
Investment_Fair_Trade_Fair_Pay	41%	45%	43%	42%	42%	43%	42%	45%	43%	44%	44%	48%

Over 45% of survey respondents mentioned receiving some level of pressure to increase their firms' supply chain sustainability. The average level of pressure received by all stakeholders was between 1.3 and 2.8 points on a Likert Scale, ranging from 0 (no pressure), 1 (a little pressure), 2 (some pressure), 3 (moderate pressure), and 4 (intense pressure). Overall, the party applying the most pressure to increase supply chain sustainability was company executives, but the average level of pressure received from any source ranged from "a little pressure" to between "some pressure" and "moderate pressure." An analysis of the level of pressure by industry found that mining, quarrying, and oil and gas extraction; agriculture, forestry, fishing and hunting, and construction industries received the most pressure.

The level of pressure received from different sources also varies by companies' primary consumer market locations. While companies with consumer markets in Latin American and Caribbean regions show a higher level of pressure received from government and local communities, companies with North American consumer markets exhibit higher pressure received from executives and corporate buyers. At the same time, companies with European consumer markets receive the highest level of pressure from end consumers. Overall, companies with primary consumer markets in Asia and Africa receive the highest level of pressure to increase supply chain sustainability from all sources. Further detail can be observed in Table 5.

Table 5: Average level of pressure to increase supply chain sustainability by source and primary consumer market location

	Primary Consumer Markets Location				
	Africa	Asia	Europe	Latin America and Caribbean	North America
Corporate Buyers	2.2	2.1	1.6	2.1	2.3
Employees	2.1	2.1	1.7	1.6	1.9
End Consumers	2.3	2.3	2.3	1.9	2.2
Executives	2.6	2.6	1.7	1.8	2.3
Government	2.8	2.4	1.7	2.2	1.6
Industry Associations	2.4	2.1	1.5	1.4	1.7
Investors	2.6	2.2	1.4	1.8	2.0
Local Communities	2.4	2.0	1.3	2.2	1.5
Mass Media	2.6	2.0	1.8	2.0	1.7
NGO	2.5	2.1	1.4	1.4	1.9

Supply chain sustainability practices are tools companies adopt to measure and improve performance. Survey results indicate that 53% of companies have practices in place to manage supply chain sustainability. Practices were defined as follows: 1) External standards defined by an entity outside of the company; 2) Internal standards defined internally by a company for its supply chain; and 3) Internal interventions defined as those that apply to a company's supply chain but do not have defined production standards (Thorlakson, de Zegher, & Lambin, 2018). The data shows that having a code of conduct, an internal standard, is the most prevalent supply chain sustainability practice across industries, with 74% of respondents having a code of conduct in place (detailed in Table 6).

Supplier audits, an internal standard, were the second-most prevalent supply chain sustainability practice across industries, with 53% of respondents having supplier audits in place. The second-most prevalent supply chain sustainability practices contained many more practices that were categorized as external and internal intervention standards. Table 6 shows the grouping of supply chain sustainability practice categories represented in the survey.

Table 6: Top Sustainability Practices by Industry

Industry	Number One Practice Category	Number Two Practice Category
Accommodation and Food Services	Sustainability Standards Certifications	Supplier Benchmarking Environmental Impact Assessment Audit
Agriculture, Forestry, Fishing, and Hunting	Code of Conduct	Sustainability Standards Certification Supply Chain Mapping Supplier Audit
Construction	Audit Material Traceability	Code of Conduct Sustainability Standards Certification
Health Care and Services	Code of Conduct Due Diligence	Supplier Collaboration Sustainability Standards Certification
Manufacturing	Code of Conduct	Supplier Audit
Mining, Quarrying, and Oil and Gas Extraction	Code of Conduct	Supplier Audit
Retail	Code of Conduct	Sustainability Standards Certification
Transportation and Warehousing	Code of Conduct	Supplier Training Environmental Impact Assessment Supplier Benchmarking Supplier Audit Due Diligence Supplier Collaboration
Wholesale	Code of Conduct Due Diligence	Supplier Collaboration

Table 7: Sustainability Practices Group

Practice Category	Group
Code of Conduct	Internal Standard
Environmental Impact Assessment	Internal Intervention
NGO or Third Party Collaboration	External Standard
Regulatory Due Diligence	External Standard
Supplier Audit	Internal Intervention
Supplier Benchmarking	Internal Intervention
Supplier Collaboration	Internal Intervention
Supplier Training	Internal Intervention
Supply Chain Mapping	Internal Intervention
Sustainability Standards or Certifications	External Standard
Third Party Verification	Internal Intervention
Traceability of Materials	Internal Intervention

The regression analysis provided the following insights regarding correlations within the dataset:

- As shown in Table 8 model ID #1, 2, and 3, companies with publicly stated supply chain sustainability goals are correlated with allocating budget to invest in supply chain sustainability ($p < 0.001$) and having disclosure practices ($p < 0.001$).
- As shown in Table 8 model ID #5, companies with publicly stated supply chain sustainability goals are correlated with having a primary consumer market in North America ($p = 0.01$) and/or in Asia ($p = 0.002$).
- As shown in Table 8 model ID #7, companies having publicly stated supply chain sustainability goals are correlated with Health Care and Services, Wholesale, and Other industries ($p < 0.10$). The "Other" industry category includes Standards Organization, Travel Planner, and Water Management.
- As shown in Table 8 model ID #8, companies having publicly stated supply chain sustainability goals are not highly correlated with company size measured by average number of employees (model #8, $p = 0.82$).
- As shown in Table 8 model ID #9, companies' level of investment in supply chain sustainability is correlated with having practices in place to manage supply chain sustainability

($p < 0.001$), being publicly held ($p = 0.02$), company size measured by average number of employees ($p = 0.05$), and pressure received from stakeholders ($p = 0.02$).

- As shown in Table 9 model ID #1, companies' level of commitment in environmental sustainability is highly correlated with pressure from executives ($p = 0.04$) and pressure from local communities ($p = 0.04$).
- As shown in Table 9 model ID #2, companies' level of commitment in social sustainability is highly correlated with pressure from executives ($p = 0.01$), following by pressure from government ($p = 0.05$).
- As shown in Table 9, companies with higher level of investment in both environmental (model ID #14) and social (model ID #15) sustainability are correlated with being perceived as highly successful in their sustainability efforts by respondents ($p < 0.10$).
- As shown in Table 9 model ID #16 and 19, the level of frequency of disclosure practices through websites and CSR reports is correlated with increased level of pressure received from investors, executives, and NGOs ($0.03 < p < 0.05$).
- As shown in Table 9 model ID #18, 19, and 20, pressure from corporate buyers and end-consumers is correlated with companies' disclosure practices through reporting organizations, CSR reports, and business case studies ($0.018 < p < 0.079$).

The results of the logistic and linear regression models referenced above are detailed in Table 8 and Table 9, respectively. The full results from all logistic and linear regression models are detailed in the Appendix C and D.

Table 8: Logistic regression models and results

Logistic Models			Analyzed Observations	Standardized coefficients			
ID #	Dependent	Independent Variables		Value	Standard error	Pr > Chi²	R2
1	Investment Supply Chain Sustainability	Goals Publicly Stated Supply Chain Sustainability	810	0.70	0.05	< 0.0001	0.36
2	Goals Publicly Stated Supply Chain Sustainability	Pressure Supply Chain Sustainability	701	0.26	0.04	< 0.0001	0.07
3	Disclose Practices	Goals Publicly Stated Supply Chain Sustainability	643	0.68	0.05	< 0.0001	0.36
5	Goals Publicly Stated Supply Chain Sustainability	USA Headquarter	545	0.02	0.14	0.88	0.11
		EUROPE Headquarters	545	0.17	0.12	0.15	
		ASIA Headquarters	545	0.12	0.12	0.34	
		AFRICA Headquarters	545	0.13	0.10	0.18	
		Latin America and Caribean Headquarter	545	0.10	0.11	0.39	
		Primary consumer market in North America	545	0.18	0.07	0.02	
		Primary consumer market in Latin America and Caribean	545	-0.02	0.07	0.76	
		Primary consumer market in Africa	545	0.05	0.08	0.54	
		Primary consumer market in Asia	545	0.21	0.07	0.00	
		Primary consumer market in Europe	545	0.06	0.07	0.33	
		Primary consumer market in Oceania	545	0.03	0.07	0.73	
		Gender	545	0.07	0.05	0.13	
7	Goals Publicly Stated Supply Chain Sustainability	Transportation and Warehousing	631	-0.07	0.09	0.48	0.03
		Health Care and Services	631	**-0.13**	**0.06**	0.05	
		Manufacturing	631	-0.05	0.10	0.61	
		Retail	631	-0.10	0.08	0.21	
		Utilities	631	-0.03	0.06	0.59	
		Construction	631	-0.06	0.06	0.28	
		Wholesale	631	-0.10	0.06	0.09	
		Agriculture, Forestry, Fishing and Hunting	631	0.03	0.06	0.62	
		Software and Technology	631	-0.09	0.06	0.16	
		Other	631	-0.11	0.06	0.07	
		Consulting	631	-0.06	0.06	0.35	
		Mining, Quarrying, and Oil and Gas Extraction	631	-0.09	0.06	0.16	
		Accommodation and Food Services	631	-0.01	0.05	0.79	
		Education	631	-0.06	0.06	0.33	
8	Goals Publicly Stated Supply Chain Sustainability	Number Employees	427	0.01	0.06	0.82	0.44
		Investment Supply Chain Sustainability	427	**0.35**	**0.08**	< 0.0001	
		Practices Supply Chain Sustainability	427	**0.30**	**0.08**	0.00	
		Pressure Supply Chain Sustainability	427	0.03	0.07	0.63	
		Disclose Practices	427	**0.37**	**0.07**	< 0.0001	
9	Investment Supply Chain Sustainability	Number Employees	424	0.14	0.07	0.05	0.52
		Goals Publicly Stated Supply Chain Sustainability	424	0.32	0.08	< 0.0001	
		Practices Supply Chain Sustainability	424	0.57	0.08	< 0.0001	
		Firm Public Or Private	424	0.18	0.07	0.02	
		Pressure Supply Chain Sustainability	424	0.19	0.08	0.02	
		Disclose Practices	424	0.11	0.08	0.15	

Table 9: Linear regression models and results

Linear Models			Analyzed Observations	Standardized coefficients				R2	Adj R2
ID #	Dependent Variable	Independent Variables		Value	Standard error	t	Pr > |t|		
1	Aggregated Environmental Level of Focus	Pressure End Consumers	183	0.85	0.46	1.85	0.66	28.8	24.6
		Pressure Corporate Buyers	183	0.30	0.52	0.58	0.56		
		Pressure Investors	183	0.60	0.55	1.09	0.28		
		Pressure Employees	183	0.20	0.54	0.38	0.71		
		Pressure Executives	183	1.26	0.62	2.04	0.04		
		Pressure NGO	183	-0.01	0.53	-0.01	0.99		
		Pressure Industry Associations	183	-0.42	0.66	-0.64	0.52		
		Pressure Government	183	0.79	0.52	1.51	0.13		
		Pressure Mass Media	183	-0.52	0.62	-0.84	0.40		
		Pressure Local Communities	183	1.30	0.63	2.07	0.04		
2	Aggregated Social Level of Focus	Pressure End Consumers	183	0.11	0.07	1.42	0.16	29.5	25.4
		Pressure Corporate Buyers	183	0.02	0.08	0.31	0.76		
		Pressure Investors	183	0.05	0.09	0.55	0.58		
		Pressure Employees	183	0.08	0.08	0.96	0.34		
		Pressure Executives	183	0.26	0.09	2.82	0.01		
		Pressure NGO	183	0.03	0.09	0.35	0.73		
		Pressure Industry Associations	183	-0.09	0.11	-0.83	0.41		
		Pressure Government	183	0.19	0.10	1.94	0.05		
		Pressure Mass Media	183	-0.13	0.11	-1.25	0.21		
		Pressure Local Communities	183	0.19	0.11	1.81	0.07		
14	Aggregated Level of investment in ENVIRONMENTAL goals	Supply Chain Not Environmentally Sustainable	575	0.16	0.04	3.79	0.00	0.358	0.354
		Effort Environmental Sustainability Successful	575	0.31	0.05	6.53	0.00		
		Supply Chain Not Socially Sustainable	575	0.08	0.04	1.96	0.05		
		Effort Social Sustainability Successful	575	0.18	0.05	3.88	0.00		
15	Aggregated Level of investment in SOCIAL goals	Supply Chain Not Environmentally Sustainable	575	0.13	0.04	2.90	0.00	0.321	0.316
		Effort Environmental Sustainability Successful	575	0.21	0.05	4.32	0.00		
		Supply Chain Not Socially Sustainable	575	0.11	0.04	2.55	0.01		
		Effort Social Sustainability Successful	575	0.26	0.05	5.36	0.00		
16	Disclose Practices Frequency Website	Pressure End Consumers	117	0.13	0.11	1.24	0.22	0.17	0.095
		Pressure Corporate Buyers	117	-0.10	0.11	-0.99	0.32		
		Pressure Investors	117	-0.25	0.13	-1.97	0.05		
		Pressure Employees	117	-0.11	0.12	-0.94	0.35		
		Pressure Executives	117	0.37	0.12	3.04	0.00		
		Pressure NGO	117	0.02	0.13	0.13	0.89		
		Pressure Industry Associations	117	0.07	0.14	0.53	0.60		
		Pressure Government	117	0.10	0.13	0.78	0.44		
		Pressure Mass Media	117	0.09	0.15	0.58	0.56		
		Pressure Local Communities	117	0.05	0.16	0.30	0.76		
18	Disclose Practices Frequency Reporting Organization	Pressure End Consumers	97	-0.19	0.12	-1.67	0.10	0.30	0.223
		Pressure Corporate Buyers	97	0.01	0.11	0.11	0.91		
		Pressure Investors	97	-0.03	0.14	-0.18	0.85		
		Pressure Employees	97	-0.03	0.12	-0.26	0.80		
		Pressure Executives	97	0.25	0.13	1.88	0.06		
		Pressure NGO	97	0.12	0.13	0.93	0.36		
		Pressure Industry Associations	97	0.07	0.14	0.48	0.63		
		Pressure Government	97	0.31	0.14	2.25	0.03		
		Pressure Mass Media	97	-0.27	0.17	-1.64	0.11		
		Pressure Local Communities	97	0.31	0.17	1.79	0.08		
19	Disclose Practices Frequency Sustainability CSR Report	Pressure End Consumers	107	-0.14	0.12	-1.20	0.23	0.18	0.093
		Pressure Corporate Buyers	107	0.00	0.12	0.03	0.98		
		Pressure Investors	107	-0.01	0.14	-0.05	0.96		
		Pressure Employees	107	0.11	0.12	0.96	0.34		
		Pressure Executives	107	0.02	0.13	0.12	0.90		
		Pressure NGO	107	0.14	0.13	1.06	0.29		
		Pressure Industry Associations	107	-0.03	0.14	-0.21	0.84		
		Pressure Government	107	0.24	0.14	1.69	0.09		
		Pressure Mass Media	107	-0.22	0.16	-1.37	0.18		
		Pressure Local Communities	107	0.30	0.16	1.90	0.06		
20	Disclose Practices Frequency Business Case Studies	Pressure End Consumers	101	0.26	0.12	2.29	0.02	0.25	0.164
		Pressure Corporate Buyers	101	0.07	0.11	0.61	0.54		
		Pressure Investors	101	0.04	0.13	0.33	0.75		
		Pressure Employees	101	-0.11	0.12	-0.90	0.37		
		Pressure Executives	101	-0.10	0.13	-0.79	0.43		
		Pressure NGO	101	0.18	0.13	1.35	0.18		
		Pressure Industry Associations	101	0.06	0.14	0.40	0.69		
		Pressure Government	101	0.10	0.13	0.75	0.45		
		Pressure Mass Media	101	-0.04	0.16	-0.24	0.81		
		Pressure Local Communities	101	0.14	0.17	0.85	0.40		

Survey responses regarding disclosure practices show that 43% of the respondents indicated that their company discloses supply chain sustainability practices (57% from privately held companies), while 15% of respondents indicated that they did not disclose practices but had plans to do so.

Responses for supply chain sustainability disclosure frequency were ranked on a Likert scale of 0 (never disclose), 1 (disclose less frequently than annually), 2 (disclose every two years), 3 (disclose annually), and 4 (disclose more frequently). Results for supply chain sustainability disclosure frequency by industry and channel are displayed in Table 10, with scores of 3 or above highlighted in red. Overall, websites are the channel where practices are most frequently disclosed, followed by press releases, sustainability CSR reports, business case studies, and reporting organizations.

Table 10: Average level of disclosure frequency by industry sector and channel, scores above 3 on Likert scale highlighted in red

Industry Sector	Business Case Studies	Press Releases	Reporting Organization	Sustainability CSR Report	Website
Accommodation and Food Services	2.0	3.0	2.7	3.0	3.0
Agriculture, Forestry, Fishing and Hunting	2.6	3.5	3.1	3.1	3.4
Construction	1.8	2.3	2.8	2.3	2.2
Health Care and Services	2.0	4.0	3.0	3.5	3.5
Manufacturing	2.5	2.9	2.9	3.0	3.2
Mining, Quarrying, and Oil and Gas Extraction	3.0	3.2	3.0	3.1	3.6
Retail	2.9	3.2	2.3	3.1	3.6
Transportation and Warehousing	2.9	3.0	2.3	2.6	3.3
Utilities	2.7	3.5	2.5	3.0	4.0
Wholesale	1.8	3.3	2.5	3.3	3.8

Table 11 shows the average level of supply chain sustainability disclosure frequency based on primary consumer market location. Africa, Asia, and North America were the locations of the primary consumer markets with the highest level of disclosure frequency. Reporting organizations were a frequently used channel for firms with primary consumer markets in Africa and Asia, but not for North America, Europe, or Latin America and the Caribbean.

Table 11: Average level of disclosure frequency by primary consumer market and channel, scores above 2.6 on Likert scale highlighted in red

	Business Case Studies	Press Releases	Reporting Organization	Sustainability CSR Report	Website
Accommodation & Food Services	2.0	3.0	2.7	3.0	3.0
Agriculture, Forestry, Fishing & Hunting	2.6	3.5	3.1	3.1	3.4
Construction	1.8	2.3	2.8	2.3	2.2
Health Care & Services	2.0	4.0	3.0	3.5	3.5
Manufacturing	2.5	2.9	2.9	3.0	3.2
Mining, Quarrying, and Oil & Gas Extra..	3.0	3.2	3.0	3.1	3.6
Retail	2.9	3.2	2.3	3.1	3.6
Transportation & Warehousing	2.9	3.0	2.3	2.6	3.3
Utilities	2.7	3.5	2.5	3.0	4.0
Wholesale	1.8	3.3	2.5	3.3	3.8

5. Qualitative Findings from Executive Interviews

A semi-structured, open-ended interview guide was prepared to focus on topics including perspectives and pressure to pursue supply chain sustainability, and the roles of supply chain professionals in implementing sustainable supply chain practices. The executive interviews conducted along with a systematic literature review revealed the following overall themes, with direct quotes from interviewees as well as supporting examples of related challenges and perspectives.

I. There is increased interest and commitment to sustainability goals.

"…let's put a goal in front of ourselves that we have no idea how to achieve, but we think it constitutes goodness. And then let's be unflinchingly honest with ourselves about what we are doing and what we need to do better. The goal is to continuously move forward, learn from it, share with others, and learn from it."

Jackie Sturm, Vice President Global Supply, Intel

a. Sustainability and responsible sourcing are a very different conversation today versus 20 years ago. Before, only a few large companies that had resources were starting to think about it, however today it is much more of an everyday conversation across the supply chain.
b. Products and services offered must be sustainable, not just operations within a company's own four walls.

c. Consumers are looking for sustainable products that still offer similar quality and comparable performance at the same price, but with a smaller environmental impact.
d. Companies must be able to demonstrate that they are a brand with purpose and values.

II. There is desire for greater supply chain transparency, however implementation is challenging.

"...NGO connection has given us early awareness of a situation we were not at all informed about, which was forced and bonded labor, to understand modern indenture in the work force."

Jackie Sturm, Vice President Global Supply, Intel

a. It is difficult to discover recruitment fees paid by migrant workers, who may become indebted to unscrupulous agents and effectively end up in bonded labor. Their employer may not be aware of recruitment fees paid before they were hired, and it becomes difficult to trace what fees were paid, to whom, when, and where.
b. In industries where subcontracting is common, the supply chain can go many tiers deep. Traceability to the deepest tiers of the supply chain and ensuring decent working conditions is challenging.
c. Individual companies will never have the internal resources to find every problem and supplier at every tier in the supply chain. However, having a transparent feedback loop about supply chain practices – whether that comes from a local community, NGO, or labor group – can elevate issues to be prioritized and fixed by the company.

III. Supply chain sustainability investment is primarily taking place in the upstream supply chain.

"The more upstream supply chain members actually care more. For example, if you are a cotton farmer in Xinjiang, China water is a very important resource. So, if you don't find a sustainable way to grow cotton, you are unable to survive. You have more urgency to do it right."

Eddie Chan, CEO, Lever Style

a. Untapped potential opportunities include helping upstream suppliers reduce electricity consumption and waste, which can reduce the cost of goods for players across the supply chain.
b. There is increased awareness of the science behind where environmental impact truly rests. The majority of environmental impact lies in Scope 3 and comes from the supply chain.

IV. Labor is one of the key issues in supply chain social compliance.

"We helped NGO [GFEMS] build on a study on modern day slavery on the apparel side in Vietnam and India. In India, there are a lot of home sewers and we helped [GFEMS] track exactly how many layers of subcontracting exist – there are 4 layers."

"How do you trace it? How do you maintain it and ensure the working conditions are fine?"

Delman Lee, President & CTO, TAL Apparel

a. Excessive overtime is a problem that is difficult to control due to seasonality, orders not being placed at once, operational inefficiencies, and pressure on manufacturers to meet on time delivery.
b. Taking an operations and business partnership approach can help to identify operational root causes of excessive overtime, justifying changes with outcomes of more controlled working hours, cost savings, and efficiency gains.

V. There is increasing pressure to adopt sustainable practices, and pressure sources have changed.

"Sustainability for VF and our brands is part of the core ethos of the company. I would add that investors are a pressure source. We're a publicly traded company. We see ESG investors ask more questions around how we actually manage social and environmental issues at the company."

Sean Cady, Vice President Sustainability, VF Corporation

a. Brands, retailers, and original equipment manufacturers are looking to make sustainability claims about their supply chains, such as products were produced entirely with renewable energy or without any waste.
b. Regulatory schemes are increasing pressure, as legal compliance is a foundational element pressuring companies to be sustainable. The UK Modern Slavery Act and taxes imposed in the European Union to limit the amount of packaging are two such examples.
c. Emerging brands are trying to build sustainability into their brand ethos due to increased peer pressure and trying to keep up with other brands.
d. Employee interest in sustainability is growing.
e. Investors that have environmental, social, and governance (ESG) priorities are another active pressure source.

VI. Advancing sustainability is a collaborative effort, requiring participation from companies throughout the supply chain, investors, government, and research institutions to be effective.

"To drive fundamental changes needed over the next decade, you have to be willing to think big, look outside of manufacturing to your entire supply chain, and actively partner to drive sustainability at scale."

James McCall, Global Product Supply Sustainability Leader, P&G

a. A high level of collaboration is required to tackle sustainability problems. For example, waste may be generated in a factory, and used products may be taken back at multiple locations or discarded. Many players are needed to capture materials, products, develop solutions to utilize components, and upcycle.
b. Partnership with RBA (**Responsible Business Alliance**) allows manufacturers to leverage efforts in conflict minerals, responsible sourcing of minerals, responsible labor, diversity and inclusion, and chemical management task forces that would not be possible without combined effort.
c. Industry-academic partnerships and venture capital funds with an explicit focus on sustainability-related areas are emerging to tackle today's sustainability challenges.

VII. Technology is important but a "one size fits all" approach will not work.

"…the issue for electronics is we've got very complex products – the bill of materials could number in the hundreds, if not thousands of separate components. And so, it becomes much more challenging to address that simply with blockchain."
Bruce Klafter, Vice President Corporate and Social Responsibility, Flex

a. Worker voice technology is used to keep a pulse on the workforce in factories and includes surveys and learning modules, allowing companies to reach out to a large number of workers on a regular basis.
b. The emergence of the sharing economy across industries and its consequent impact in sustainability (for example, clothing rental and ride sharing) has changed the way some supply chains operate and forced companies to adapt.

VIII. Technological, physical, and financial barriers exist.

"Cost is always going to be a challenge until scale is reached. Apparel in general is a low margin business and it can be really tough to justify something that costs more – that's probably the biggest, most practical barrier."
Marcus Chung, Vice President, Supply Chain and Manufacturing, ThirdLove

a. There are technological barriers that make the circular economy infeasible today. For example, if a garment is made of a material with mixed fibers it is difficult to recycle.
b. Many aspects of sustainability cannot be reduced easily to a blockchain entry, most notably labor and social issues.
c. China banned the import of waste from foreign countries in 2018. Supply chains must be re-engineered to set up recycling plants in new locations.

IX. Frontline supply chain professionals play a large role in driving adoption of sustainable practices.

"…supply chain professionals need to recognize that what they're asked to do is deliver a multi-variable solution. And the variables that we care about are cost, quality, availability,

technology, and sustainability. And you need to do all of those things concurrently to deliver a viable solution."
Jackie Sturm, Vice President Global Supply, Intel

a. Most corporate sustainability teams are small and centralized, while supply chain or procurement teams are larger, have direct interaction with suppliers, and have relationships with buyers, allowing them to drive sustainable practices in their everyday work.
b. There is opportunity to educate supply chain professionals on how to implement sustainable practices and drive learning across companies and industries.
c. Supply chain professionals can help mitigate and improve the environmental impacts that companies have through their day-to-day work, for example, exploring more sustainable raw materials without corporate mandate.

6. Discussion

This section serves to synthesize the findings of our research results. We have also included a subsection on the potential impact of the coronavirus pandemic on supply chain sustainability, which is likely to play a large role in the 2020 State of Supply Chain Sustainability report.

6.1 Key Inferences from Research

The concept of sustainability is continually evolving in response to exogenous events, moving from a primary focus on environmental elements to encompass social and economic aspects that form a dynamic, interconnected system.

Several critical factors influence the implementation of sustainability in supply chains and affect outcomes. One factor is managerial orientation towards sustainability, which refers to how managers and decision-makers view sustainability and what drives their motivations to implement related initiatives. Another factor is the nature of the institutional context within which supply chains operate. Literature suggests that complexity in institutional contexts leads to highly volatile business environments (Smart & Vertinsky, 1984, Leonard-Barton 1992) where it is difficult for

companies to learn, innovate, and improve sustainability in their supply chains. A similar theme was found in survey results through anecdotal respondent comments. One respondent stated that their country was facing an economic crisis, so their company was focused on cost reduction and improving cash flow, and as a result sustainability was not a major concern.

Our research found that while there is excitement and interest around supply chain sustainability, there also are many challenges in diffusing the adoption of sustainable practices throughout the supply chain, some of which include:

1) Lack of shared vocabulary around the topic of sustainability and lack of consistent measurement tools create confusion among supply chain practitioners regarding how to implement sustainable practices in their day-to-day work.

2) There are not yet consistent ways to operationalize and commercialize sustainability. Marcus Chung, VP Supply Chain and Manufacturing at ThirdLove, shared his perspective: "…most of the technologies and solutions that support sustainability efforts haven't been proven yet, so anybody who's making these investments has to be a first mover, and it's scary because there's a lot of risk in being a first mover." (Chung, interview, 2020)

3) Consumer interest and awareness of sustainability is increasing, along with demand for sustainable products, but consumers are not willing to pay more.

4) Supply chains are enormous, global, complex, and fragmented with many disparate players involved. As a result, it can be difficult to align incentives for adoption of sustainable practices.

5) When confronted with financial challenges and economic turmoil, sustainability may become a lower priority for companies unless it is already deeply ingrained within a company's culture, governance structure, and operations.

Research shows that there is increased interest and awareness of supply chain sustainability, with companies announcing ambitious goals, and considering environmental, social, and governance factors during investment processes. Media scrutiny and increased pressure from customers and stakeholders to improve sustainability indicate a higher level of cognizance. Stakeholders are creating more pressure and demanding that companies be transparent and reduce their impacts. Simultaneously, the challenges and risks faced by companies are increasing as current business models are under threat, natural disasters continue to grow in frequency, and

serious public health and political issues that impacted supply chain sustainability arose in 2019 and 2020.

The survey completion rate was 54%. When we analyzed why respondents dropped out at certain points, the results indicated that respondents are reluctant to provide information regarding company level of investment and publicly stated goal commitments. This could be because some companies do not disclose actual practices or meet their stakeholder's expected efforts in sustainability, and prefer to avoid exposure due to potential "name and shame" campaigns that are still observed in the media as well as competitive threats.

Survey results show that categories related to human rights compliance are ranked at the top for companies when defining the focus of efforts in sustainability. However, results show that there is not complete alignment between goal commitments and level of investment in these categories (see Table 3). As a result, "no child labor" and "no forced or slave labor" categories, which are indicated as top company sustainability goal commitment areas, may be showing bias in result accuracy. No company wants to be perceived as responsible for this type of issue, but this does not mean they are necessarily addressing these issues as a direct focus in their sustainability strategies and investing accordingly. This understanding is supported with the fact that the highest skipped category for the branch questions regarding level of investment was "no child labor".

There are also certain categories, such as investment in impact on local communities, that are correlated with relatively higher goal commitments in other areas related to community impact, such as air pollution mitigation and natural resource and biodiversity conservation. Investment in social categories has a higher correlation with investment in other related social and environmental categories, while investment in environmental categories tends to be most highly correlated with investment only in other environmental categories. The reason could be that companies investing only in environmental categories are doing so primarily for cost optimization incentives, or they simply less mature in their sustainability journeys, which may necessitate a narrow focus on the "low hanging fruit."

Energy and product end-of-life management top the environmental commitments ranking. This could be related to the lack of use of science- and context-based targets to effectively evaluate sustainability performance, so there is an incentive to invest in areas that provide a clear economic benefit. In contrast, companies that are investing in social categories may be more mature in their sustainability journey. Such companies may be working towards a broader definition of

sustainability to meet the needs of a wider range of stakeholders, and have incorporated this approach as part of their governance structure. One tangible example of this is companies that are certified benefit corporations (B-corps), such as Patagonia and S'well.

Supply chain sustainability practices, such as codes of conduct, supplier audits, and supplier training, among others, are becoming basic requirements for any company pursuing sustainability goals today. Table 5 shows that code of conduct has turned into a basic tool with nearly every industry adopting this practice. Increasingly, industry bodies are collaborating to develop codes of conduct specifically targeting known issues in their sectors. Supplier audits were the second most frequently used tool among the surveyed industries. Our main takeaway was that companies are working towards sustainable supply chain practices by applying internal tools, and the application of these tools is not just internal but also external with companies considering their suppliers as part of an integral system. It is important to note the priority of practices with codes of conduct being most common, followed by supplier audits. This order of practices may indicate that, while nearly all companies have a stated code of conduct, fewer companies may enforce this code of conduct through supplier audits. The barriers to enforcing a code of conduct through supplier audits include the investment required to manage such an initiative, as well as the nature of supply chains as risk exists many tiers deep in the supply chain. These findings are aligned with the executive interviews (see Section 5) that indicate sustainability requires collaboration among all supply chain players, as Scope 3 emissions represent the majority of emissions in many industries and risk increases in the deep tiers of the supply chain where companies lack visibility and direct control.

In 2019, many news articles indicated that end consumers and NGOs were applying increased pressure for companies to improve sustainable practices, however this is not entirely supported by the survey data. Responses show that pressure is received equally from all stakeholder pressure sources. This means that companies are not obliged to only show compliance in response to government regulations or NGOs' requests, but that they should respond to the requirements of local communities, corporate buyers, and industry associations, among others. Firms that aim to incorporate sustainability in their culture should understand that no stakeholder can be ignored or considered less important than others.

Supply chains are increasingly the focus of attention from a variety of external stakeholders seeking information that includes and sometimes exceeds what a company is legally obligated to

disclose. In our survey, 43% of respondents indicated that their company disclosed supply chain sustainability practices, and 15% of respondents indicated that they did not currently disclose practices but had plans to do so. Survey results also show that 57% of respondents who indicated that their firm had disclosure practices were from a privately-held company. Jackie Sturm, VP Global Supply at Intel, provided a perspective that illustrates how much the topic of disclosure has evolved in the past 20 years: "At Intel, we were one of the first signers – and first deliverer -- of a corporate CSR [Corporate Social Responsibility] report. I think back in 2000, almost nobody was doing it." The fact that over half of the surveyed audience was interested or engaged in some level of disclosure regarding sustainability practices further demonstrates the increased importance of the topic, even for companies that are not legally obligated to publicly disclose financial performance.

Technology is another factor that is creating awareness of untapped opportunities within supply chain sustainability. Examples of technology used to increase sustainability in supply chains include blockchain, processes to reuse and recycle materials, and innovations to reduce greenhouse gas emissions. The use of blockchain has the potential to create more efficient processes through providing a high level of transparency and auditability. Companies will also benefit from technologies that allow products to be reused and recycled to move towards a circular economy, with the focus on the reuse of products rather than on "end of life." While these technologies are promising, the executive interviews pointed that a "one size fits all" approach to technology will not work, and serious technical, physical, and financial barriers exist. For example, many social aspects of sustainability cannot be easily reduced to a blockchain entry. There are also technical and physical barriers that make the recycling or reuse of many items, such as garments made of materials mixed with fibers, infeasible today. Furthermore, most recycling plants are in China, but China banned the import of waste from foreign countries in 2018. This has led to re-engineering of the supply chain, with recycling plants being set up in new locations.

Given the insights gathered from the survey disseminated by MIT CTL and CSCMP in 2019, content analysis, literature review, executive interviews, and the outsized impact of the coronavirus pandemic in 2020, we will focus next on what the events of 2019-2020 mean for supply chain sustainability today and in coming years.

6.2 The Impact of the Coronavirus Pandemic on Supply Chain Sustainability

The global focus on COVID-19 (a new coronavirus disease) from the beginning of 2020 has shifted the priorities for all businesses and individuals globally, seemingly overnight. The impact of the virus has spread across the globe, with hot spots moving from China to Europe and the United States. As the coronavirus pandemic spread globally in March 2020 and we face a period of unprecedented disruption, the 2019 levels of commitment in supply chain sustainability are changing.

The pandemic has affected social and environmental compliance in the supply chain in many ways. During one of the interviews we conducted, a manufacturer mentioned that their employees would have to work overtime due to a government mandate for production of virus-resistant masks. This would result in failed audits, as they would still need to meet the same production timeline to fulfill already planned orders. Non-essential businesses and manufacturing plants around the globe were forced to close their doors for an indefinite amount of time to slow the spread of the virus. Reduction in operations forced them to lay off or furlough employees, and social distancing is requiring firms to redesign their offices, plants, and warehouses to continue operating in the future.

As the COVID-19 pandemic accelerates, the hoarding of food continues across the United States. Even though retailers and food manufacturers express confidence that food supply is in a good state, the meat supply is already undergoing a supply-crunch with intermittent shortages as a result of the pandemic outbreak at meatpacking plants. The most critical element is keeping reliable labor for efficient production and shipping, which means maintaining a healthy supply chain labor force is essential (Kafarakis, 2020). Food, protective equipment, and health care supply chains are hot topics in the news, as there is an increased understanding on how a border closing or social distancing practices in distribution centers and ports can disrupt shipments.

It will be up to the 2020 State of Supply Chain Sustainability report to determine whether the economic challenges faced today are changing perspectives and priorities regarding supply chain sustainability. The 2019 survey comments highlighted that when a country is undergoing a major financial crisis, the goal for many companies is survival. Our major concern for sustainability efforts in 2020 is that due to the global recession, most economies will take between two and three years to return to pre-pandemic levels (Goodman, 2020). The negative impacts of a

looming economic recession are beginning to appear. It was only recently that the fashion industry began to adopt sustainability, however this seems to have shifted with the unprecedented uncertainty the world is facing today. In one week's time, $1.5 billion of already placed orders were cancelled in Bangladesh, potentially putting more than four million workers at risk of not being paid and losing employment (Hertzman, 2020). Meanwhile, companies across a wide range of industries have committed to provide ongoing pay and benefits to their employees affected by temporary closures, and even modified their production lines to manufacture personal protective equipment to be donated to the community.

The world today and after coronavirus could mean reduced physical interactions, more online shopping, less time spent in public places, less foreign travel, and less shopping overall with manufacturing mirroring this change (Roshitsh, 2020). The focus today is on the short term, highlighting the sustainability challenges faced in the global pharmaceutical and medical supply chains, due to a surge in demand for single-use plastic products. After COVID-19 peaks, there will likely be a lot of surplus equipment. Furthermore, many countries do not have bio-hazardous waste protocols, which could lead to a secondary environmental crisis with billions of small, hazardous, single-use plastics ending up in waterways and oceans around the world (Degnarain, 2020).

The recent volatility in financial markets due to the coronavirus pandemic may cause investors to increase pressure on their portfolio companies by focusing on topics such as supply chain management, worker welfare, and other governance policies. The pandemic has demonstrated on a global scale the importance of supply chain-related factors to environmental, social, and governance investors, including disaster preparedness, risk management, and continuity planning (Broughton & Sardon 2020).

Some of the biggest challenges will be making new investments and continuing prior investments in sustainability if the negative economic impacts of the coronavirus pandemic continue to grow. For some companies, sustainability efforts are a "tack on" to their core business and are viewed as a cost center, which could mean efforts are reduced when the bottom line is under pressure. There are other companies that have adopted more holistic strategies, adapting their business models to include sustainable practices as part of their DNA, and they may find that they do not need to make trade-offs even during difficult economic times. Jackie Sturm, VP Global Supply at Intel, shares her perspective on how sustainability practices are related supplier resilience during times of crisis: "…after people come out of COVID, I think it's important to have

a framework of how to work with suppliers, to qualify them and measure their performance, it gives the opportunity to selectively and concurrently adjust and fine tune to get to the right answer… There are different variables I can move by knowing where they are, knowing a supplier's capability, and knowing where tolerances might be acceptable and not injurious to the environment or work force," (J. Sturm, Interview, April 2020).

The coronavirus outbreak is an example of how easily traditional supply chains can be disrupted, imposing inherent risk with the outcome being "expensive at best and catastrophic at worst" (Evans, 2020). Such disruptions impact a company's ability to deliver product, operate profitably, and can cause brand damage. As this is still an ongoing crisis, we do not have a clear picture of whether embracing supply chain sustainability, or not, will prevail in a post-pandemic world. It will be interesting to see what innovations are born out of the pandemic and how those innovations relate to supply chain sustainability. Companies that rely on global supply chains, have been slowly moving towards new technologies to build robust, transparent, agile, and sustainable supply chains (Evans, 2020). A black swan event is characterized by its extreme rarity, severe impact, and being perceived as predictable in hindsight (Chapellow, 2020). The coronavirus is one such black swan event whose impact may incentivize companies to commercialize and adopt technologies at a faster rate as they seek to cultivate more resilient and sustainable supply chains.

6.3 Recommendations to Inform Future Work / Surveys

After a deep analysis of the survey results and information gathered from executive interviews, we identified improvement recommendations for the research team working on the next State of Supply Chain Sustainability report.

In order to gather more information about characteristics of non-respondents, or those who drop out of the survey at certain points, the order of questions could be revised to request demographic and company information at the beginning of the survey, such as department, industry, number of employees, company headquarters location, primary consumer markets, age range, and gender, among others. This could help to address the potential issue of non-respondents differing from respondents in meaningful ways, which may mean respondents are not representative of the population and survey results may be biased.

We suggest including “supply chain management” as an option for the respondents’ “department” in the survey. The 2019 survey, did not mention it explicitly, and instead answers were broken down into departments that may fall within supply chain management, such as procurement or logistics. This addition was also requested by the surveyed audience when completing the survey.

Improvement opportunities regarding company information include clarifying the “headquarters location”, as several respondents mentioned their company has more than one headquarters by region or activity. A misleading question could bias the results, so providing a definition such as “headquarters refers to the company foundation city or legal location,” would provide more accurate responses to analyze. In questions 10 and 11, the survey asked for location information on the respondent’s company headquarters by country and state, but did not ask for the respondent’s geographic location. The respondent’s location could be different from the company headquarters and could influence their perspective on sustainability, so we recommend including this question.

Regarding question design, we recommend that all questions be shaped positively, and avoid phrasing like “My firm’s supply chain is not environmentally (or socially) sustainable.” Furthermore, providing an example of what terms such as “successful” mean for the purposes of the survey could help to improve respondents’ understanding, considering that the term “successful” may mean different things to different people and companies.

Considering the strong impact social sustainability goals may have in influencing the perception of the surveyed audience, it is recommended to separate social and environmental pillars for supply chain sustainability goals and investment. The objective would be not to force the audience to select one option over another, which could bias the stated levels of commitment, due to the high emotional impact implied by statements such as “no child labor” and “no forced or slave labor”.

For the survey question “has your firm invested (financially or with human resources) in increasing the sustainability of your supply chain?” it would be interesting to analyze *how* companies are investing. In order to obtain this information, future surveys could ask respondents to indicate how their companies are investing by type of initiative as well as level of investment in specific initiatives.

The existing categories within each sustainability pillar show consistency with the surveyed audience's expectations, as no significant additional answers were included in the blank "other" space. However, it may be worthwhile to revisit the wording to soften expressions such as "slave labor" or "child labor." These terms could be replaced by "decent work in compliance with fundamental rights," an expression used in the United Nations in the 17 Sustainable Development Goals (Leibowitz et al., 2019).

Lastly, including a question related to the main barrier observed to the adoption and application of supply chain sustainability practices would be a worthwhile element to add to the survey. We suggest options such as budget availability, lack of C-suite commitment, and lack of proper communication. Respondents could also provide information to support other choices, which would avoid having these issues mentioned as a general, anecdotal comment at the end of the survey making it difficult to analyze.

7. Conclusion and Future Directions for Research

The data and content analysis developed show that the level of awareness in supply chain sustainability has been increasing, mainly due to global communication and media coverage of current global environmental and social concerns. This is also reflected in the fact that sustainability already appears to be embedded in the top management decisions and strategies of firms across industries and around the world. Even the structure of C-suite leadership teams is moving towards having sustainability as a core function that is tightly tied to company operations. For example, the position of Chief Supply Chain Officer is now being merged with the role of Chief Sustainability Officer in some large companies, and H&M recently promoted its former head of sustainability to Chief Executive Officer.

It is still challenging to state a single concept of sustainability and even more difficult to identify the actual connection with supply chain management, as the term "supply chain" has been evolving in response to shifts in regulatory requirements, globalization, technology, consumer behavior, and market trends. Equivalent difficulties are observed in attempting to measure the return on investment from sustainable practices and the actual value it creates for a company.

Even though challenges exist in implementing sustainable practices, the higher level of awareness from companies' stakeholders and increased level of pressure from a range of sources demonstrates that sustainable practices are non-negotiable for companies that aim maintain positive brand equity. Even so, a lack of proper training and communication cascaded to frontline employees to implement sustainable practices in their day-to-day work may cause a lack of engagement, possibly putting the outcome of a corporate sustainability strategy at risk due to internal misalignment.

As we come into 2020, a new disruption has arisen: the global coronavirus pandemic. Suddenly, survival instincts became the main goal for companies and the global population, while leaders around the world struggle to deal with the implicit trade-offs in their decisions. The way companies behave during this extreme disruption will bring to light their true values and eventually confirm, or not, the theory that sustainability is a major commitment.

There is no doubt that the 2020 State of Supply Chain Sustainability report will be shaped by firms' actual responses to these extreme conditions and preparedness for disruption, and so, setting the basis for understanding and comparing these effects beginning in 2019 based on the results of this capstone has increased its relevance significantly.

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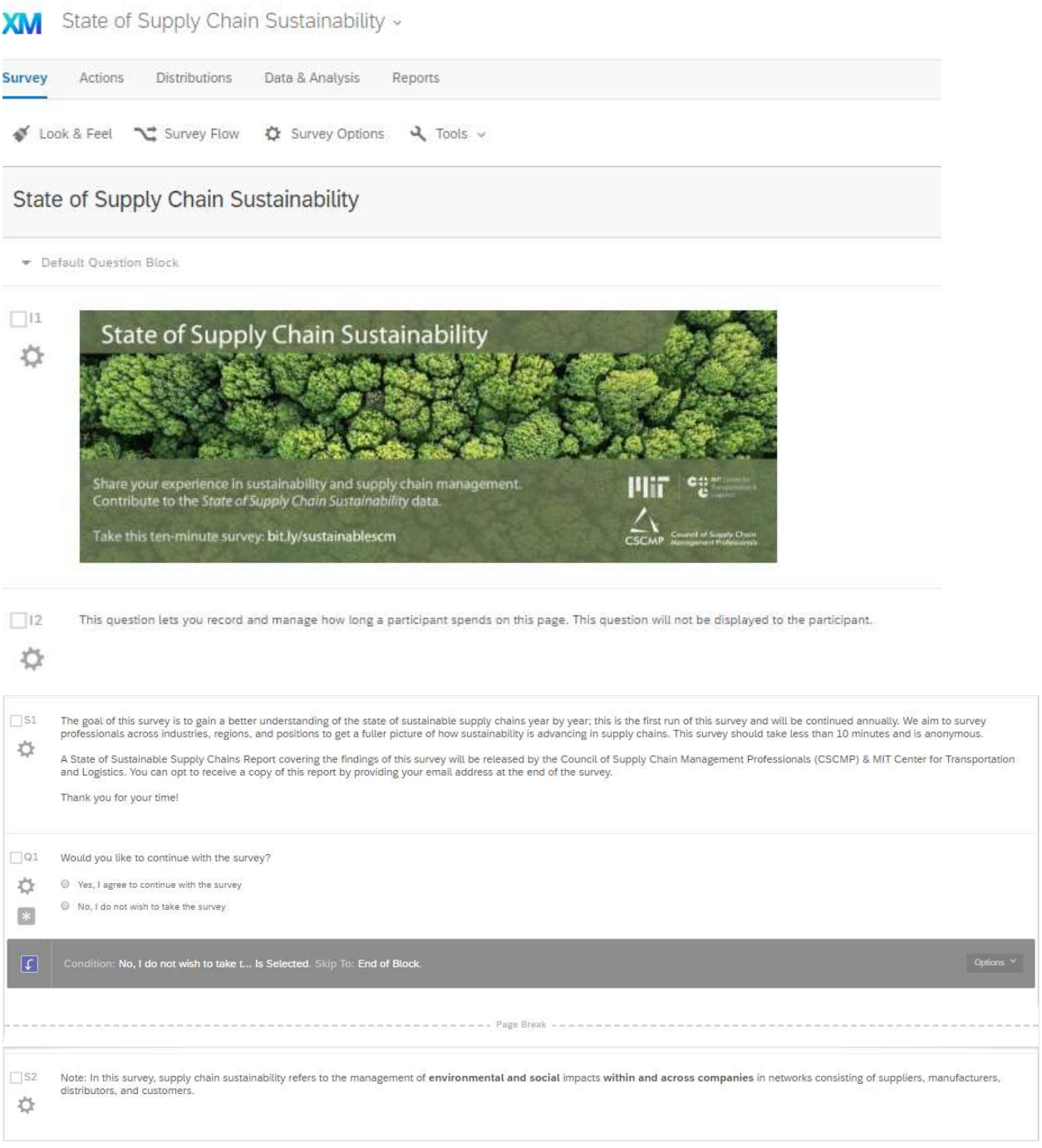
APPENDIX A – Survey

To better understand the state of supply chain sustainability a large-scale survey of supply chain professionals was deployed globally in October 2019 through the MIT Center for Transportation and Logistics (CTL) and the Council of Supply Chain Management Professionals' (CSCMP) networks, with the following structure:



Q2 Does your firm have publicly stated sustainability goals related to your supply chain?

- Yes
- No
- Not sure

Display This Question:
If Does your firm have publicly stated sustainability goals related to your supply chain? Yes Is Selected

Q3 For each of the following topics, please indicate to what extent it is a focus of your firm's supply chain sustainability goals:

	× Not applicable/Not sure	Not at all	Minor focus	Moderate focus	High focus	Very high focus
Carbon emissions reduction						
Air pollution mitigation						
Energy management						
Water management						
Waste and end of life management						
Natural resource & biodiversity conservation						
Worker welfare & employment quality						
No forced or slave labor						
Impact on local communities						
Supplier diversity & inclusion						
No child labor						
Fair trade/Fair pay						
Other (Please specify)						

I3 This question lets you record and manage how long a participant spends on this page. This question will not be displayed to the participant.

Page Break

Q4 Has your firm invested (financially or with human resources) in increasing the sustainability of your supply chain?

- Yes
- No
- Not sure

Display This Question:
If Has your firm invested (financially or with human resources) in increasing the sustainability of... Yes Is Selected

Display This Question:
If Has your firm invested (financially or with human resources) in increasing the sustainability of... Yes Is Selected

Q5 Please indicate the extent of your firm's investment in your supply chain in each of the following:

	× Not sure/Not applicable	No investment	Low investment	Moderate investment	High investment	Very high investment
Carbon emissions reduction						
Air pollution mitigation						
Energy management						
Water management						
Waste and end of life management						
Natural resource & biodiversity conservation						
Worker welfare & employment quality						
No forced or slave labor						
Impact on local communities						
Supplier diversity & inclusion						
No child labor						
Fair trade/Fair pay						
Other (Please specify)						

I4 This question lets you record and manage how long a participant spends on this page. This question will not be displayed to the participant.

Page Break

Q6a Does your firm have practices in place to manage its supply chain sustainability?

- Yes
- No
- Not sure

Display This Question:
If Does your firm have practices in place to manage its supply chain sustainability? Yes Is Selected

Q6 Which of the following practices does your firm have in place to manage supply chain sustainability? (Please select all that apply)

- Code of conduct
- Regulatory due diligence
- Supplier audit
- Sustainability standards or certifications
- Supplier benchmarking
- NGO or third party collaboration
- Third party verification
- Supply chain mapping
- Supplier training
- Supplier collaboration
- Environmental impact assessment
- Traceability of materials
- Other (Please specify)

I5 This question lets you record and manage how long a participant spends on this page. This question will not be displayed to the participant.

Q7 Does your firm receive pressure to increase sustainability in the supply chain?

- Yes
- No
- Not sure

Display This Question:
If Does your firm receive pressure to increase sustainability in the supply chain? Yes Is Selected

Q7a Please rate how intensely the following parties pressure your firm to increase supply chain sustainability:

	× Not applicable	No pressure	A little pressure	Some pressure	Moderate pressure	Intense pressure
End consumers						
Corporate buyers						
Investors						
Current and prospective employees						
Company executives						
NGOs and other third parties						
Industry associations						
Governments & international governing bodies						
Mass media						
Local communities						

I6 This question lets you record and manage how long a participant spends on this page. This question will not be displayed to the participant.

Q8 Please indicate how strongly you agree or disagree with the following statements:

	× Not applicable	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
My firm's supply chain is not **environmentally** sustainable	○	○	○	○	○	○
My firm's effort around **environmental** sustainability in the supply chain is successful	○	○	○	○	○	○
My firm's supply chain is not **socially** sustainable	○	○	○	○	○	○
My firm's effort around **social** sustainability in the supply chain is successful	○	○	○	○	○	○

I7 This question lets you record and manage how long a participant spends on this page. This question will not be displayed to the participant.

Page Break

Q9 Does your firm disclose practices around supply chain sustainability?

- Yes
- No
- No, but plan to

Display This Question:
If Does your firm disclose practices around supply chain sustainability? Yes Is Selected

Q9a How often does your firm disclose about its supply chain sustainability practices in the following channels?

	× Not sure/ Not applicable	Never	Less frequent	Every two years	Annually	More frequent
Website	○	○	○	○	○	○
Press releases	○	○	○	○	○	○
Reporting organization (such as GRI, CDP or others)	○	○	○	○	○	○
Sustainability/CSR Report	○	○	○	○	○	○
Business case studies	○	○	○	○	○	○
Other (Please specify)	○	○	○	○	○	○

I8 This question lets you record and manage how long a participant spends on this page. This question will not be displayed to the participant.

Page Break

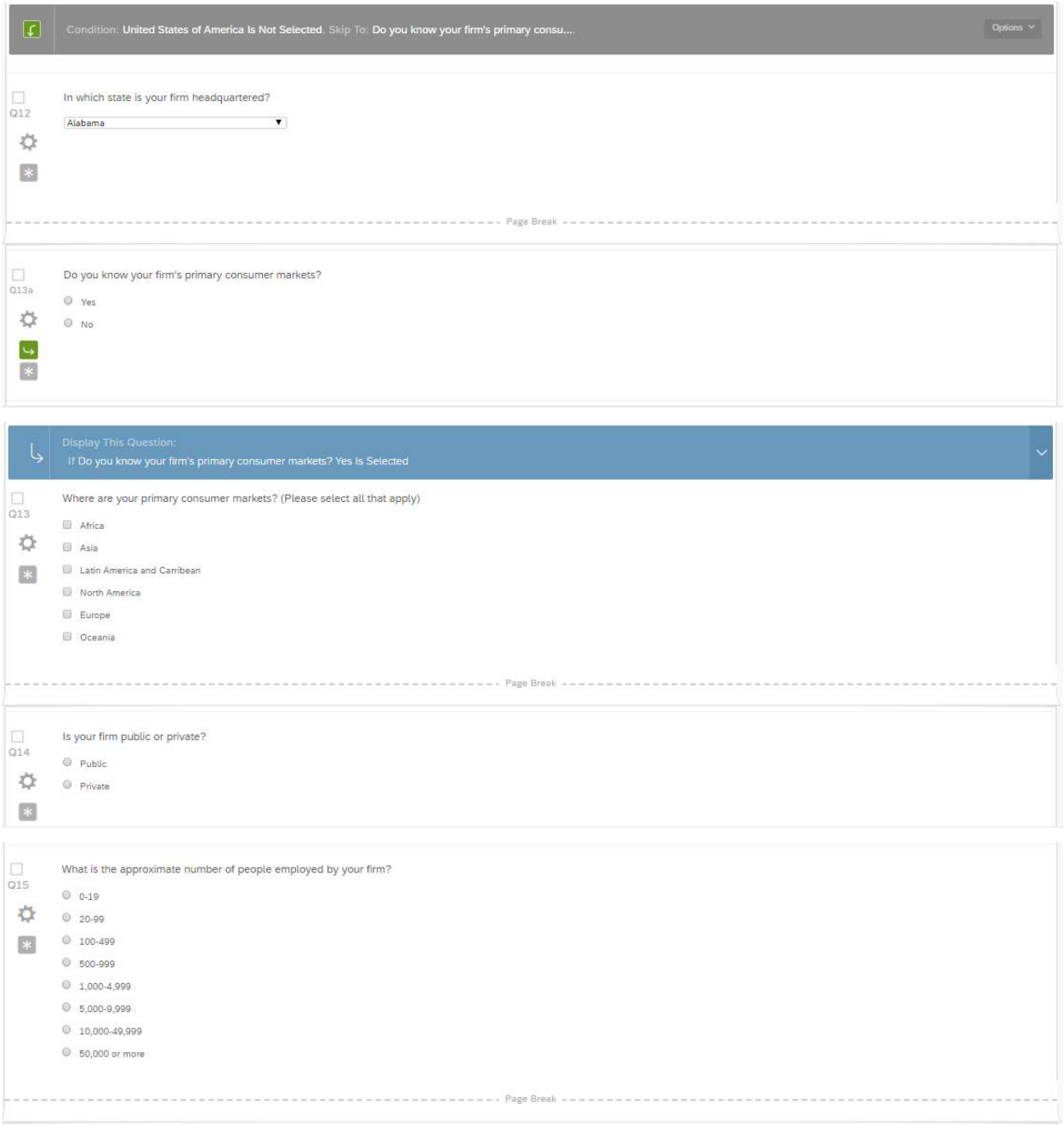
Q10 Which of the following best describes your firm's industry sector?

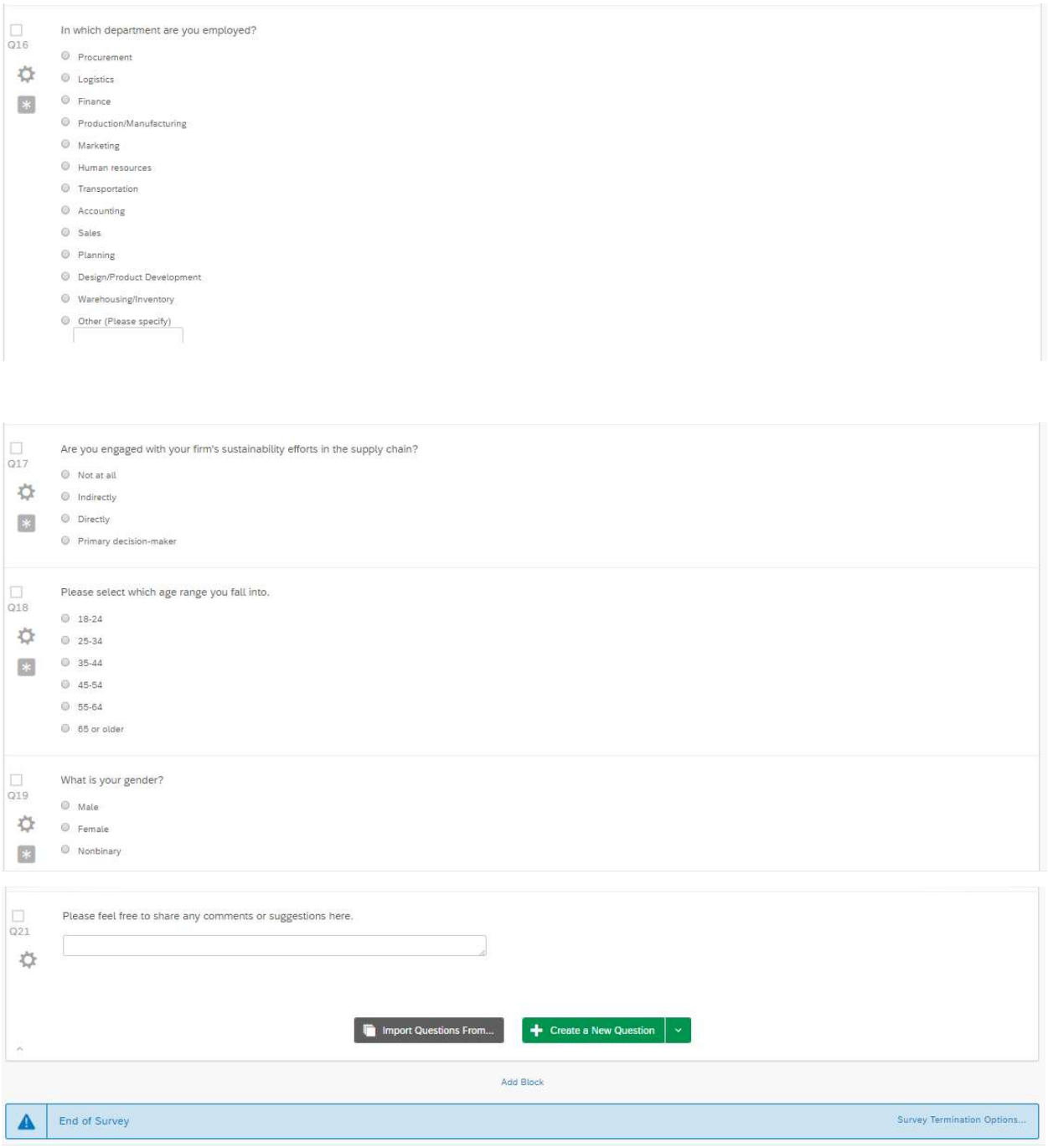
- Agriculture, Forestry, Fishing and Hunting
- Mining, Quarrying, and Oil and Gas Extraction
- Utilities
- Construction
- Manufacturing
- Wholesale
- Retail
- Transportation and Warehousing
- Health Care and Services
- Accommodation and Food Services
- Other (Please specify)

Page Break

Q11 In which country is your firm located?

Afghanistan ▼


Condition: United States of America Is Not Selected. Skip To: Do you know your firm's primary consu...
Options
Q12
In which state is your firm headquartered?
Alabama
Page Break
Q13a
Do you know your firm's primary consumer markets?
Yes
No
Display This Question:
If Do you know your firm's primary consumer markets? Yes Is Selected
Q13
Where are your primary consumer markets? (Please select all that apply)
Africa
Asia
Latin America and Carribean
North America
Europe
Oceania
Page Break
Q14
Is your firm public or private?
Public
Private
Q15
What is the approximate number of people employed by your firm?
0-19
20-99
100-499
500-999
1,000-4,999
5,000-9,999
10,000-49,999
50,000 or more
Page Break


Q16
In which department are you employed?
Procurement
Logistics
Finance
Production/Manufacturing
Marketing
Human resources
Transportation
Accounting
Sales
Planning
Design/Product Development
Warehousing/Inventory
Other (Please specify)
Q17
Are you engaged with your firm's sustainability efforts in the supply chain?
Not at all
Indirectly
Directly
Primary decision-maker
Q18
Please select which age range you fall into.
18-24
25-34
35-44
45-54
55-64
65 or older
Q19
What is your gender?
Male
Female
Nonbinary
Q21
Please feel free to share any comments or suggestions here.
Import Questions From...
Create a New Question
Add Block
End of Survey
Survey Termination Options...

APPENDIX B - Executive interview questions

- How do you see supply chain sustainability in your industry currently?
- Do you think the pressure has increased for companies to pursue supply chain sustainability? Recently, in the last five or ten years? Or is it still coming?
- Why (do you think) is your company (or industry) choosing (or not) to pursue supply chain sustainability?
- What role do supply chain professionals have in pursuing sustainability?
- Who does the most pressuring companies in your industry to act?
- What areas are most in focus for your industry? (for example, labor, emissions, waste, water management)
- How does your company (or industry) decide how to tackle an issue?
- How and where do you report and disclose your progress?
- Can you talk about a particular program you have that is achieving significant progress in supply chain sustainability? What parts of that program have made it successful?
- Related to the last question, what are common approaches you use in pursuing supply chain sustainability across the initiatives?
- Are there emerging technologies that you feel will play a role in enabling supply chain sustainability?
- What are the biggest challenges to supply chain sustainability? Opportunities?
- How do you see the future of supply chain sustainability?
- How do you think professionals supply chain professionals can prepare?

APPENDIX C – Logistic regression model results

Logistic Models			Analyzed Observations	Standardized coefficients						
ID #	Dependent	Independent Variables		Value	Standard error	Pr > Chi²	Wald Lower bound (95%)	Wald Upper bound (95%)	R2	AUC - ROC Curve
1	Investment Supply Chain Sustainability	Goals Publicly Stated Supply Chain Sustainability	810	0.70	0.05	**< 0.0001**	0.61	0.80	0.36	0.78
2	Goals Publicly Stated Supply Chain Sustainability	Pressure Supply Chain Sustainability	701	0.26	0.04	**< 0.0001**	0.18	0.35	0.07	0.61
3	Disclose Practices	Goals Publicly Stated Supply Chain Sustainability	643	0.68	0.05	**< 0.0001**	0.57	0.78	0.36	0.78
4	Goals Publicly Stated Supply Chain Sustainability	Firm Public Or Private	621	0.18	0.04	**< 0.0001**	0.09	0.27	0.04	0.59
5	Goals Publicly Stated Supply Chain Sustainability	USA Headquarter	545	0.02	0.14	0.88	-0.26	0.30	0.11	0.68
		EUROPE Headquarters	545	0.17	0.12	0.15	-0.06	0.39		
		ASIA Headquarters	545	0.12	0.12	0.34	-0.12	0.36		
		AFRICA Headquarters	545	0.13	0.10	0.18	-0.06	0.33		
		Latin America and Caribean Headquarter	545	0.10	0.11	0.39	-0.12	0.32		
		Primary consumer market in North America	545	0.18	0.07	**0.02**	0.03	0.32		
		Primary consumer market in Latin America and Caribean	545	-0.02	0.07	0.76	-0.17	0.12		
		Primary consumer market in Africa	545	0.05	0.08	0.54	-0.11	0.21		
		Primary consumer market in Asia	545	0.21	0.07	**0.00**	0.07	0.34		
		Primary consumer market in Europe	545	0.06	0.07	0.33	-0.06	0.19		
		Primary consumer market in Oceania	545	0.03	0.07	0.73	-0.12	0.17		
		Gender	545	0.07	0.05	0.13	-0.02	0.17		
6	Goals Publicly Stated Supply Chain Sustainability	USA Headquarter	620	0.06	0.14	0.68	-0.21	0.32	0.02	0.58
		EUROPE Headquarters	620	0.15	0.10	0.13	-0.04	0.35		
		ASIA Headquarters	620	0.13	0.11	0.26	-0.10	0.35		
		AFRICA Headquarters	620	0.07	0.08	0.39	-0.08	0.22		
		Latin America and Caribean Headquarter	620	-0.01	0.10	0.91	-0.20	0.18		
7	Goals Publicly Stated Supply Chain Sustainability	Transportation and Warehousing	631	-0.07	0.09	0.48	-0.25	0.12	0.03	0.59
		Health Care and Services	631	**-0.13**	**0.06**	**0.05**	**-0.25**	**0.00**		
		Manufacturing	631	-0.05	0.10	0.61	-0.26	0.15		
		Retail	631	-0.10	0.08	0.21	-0.25	0.06		
		Utilities	631	-0.03	0.06	0.59	-0.15	0.08		
		Construction	631	-0.06	0.06	0.28	-0.17	0.05		
		Wholesale	631	-0.10	0.06	**0.09**	-0.22	0.01		
		Agriculture, Forestry, Fishing and Hunting	631	0.03	0.06	0.62	-0.09	0.15		
		Software and Technology	631	-0.09	0.06	0.16	-0.21	0.03		
		Other	631	-0.11	0.06	**0.07**	-0.23	0.01		
		Consulting	631	-0.06	0.06	0.35	-0.19	0.07		
		Mining, Quarrying, and Oil and Gas Extraction	631	-0.09	0.06	0.16	-0.22	0.03		
		Accommodation and Food Services	631	-0.01	0.05	0.79	-0.12	0.09		
		Education	631	-0.06	0.06	0.33	-0.18	0.06		
8	Goals Publicly Stated Supply Chain Sustainability	Number Employees	427	0.01	0.06	0.82	-0.11	0.14	0.44	0.85
		Investment Supply Chain Sustainability	427	**0.35**	**0.08**	**< 0.0001**	**0.19**	**0.50**		
		Practices Supply Chain Sustainability	427	**0.30**	**0.08**	**0.00**	**0.14**	**0.45**		
		Pressure Supply Chain Sustainability	427	0.03	0.07	0.63	-0.10	0.17		
		Disclose Practices	427	**0.37**	**0.07**	**< 0.0001**	**0.23**	**0.51**		
9	Investment Supply Chain Sustainability	Number Employees	424	0.14	0.07	**0.05**	0.00	0.28	0.52	0.87
		Goals Publicly Stated Supply Chain Sustainability	424	0.32	0.08	**< 0.0001**	0.17	0.48		
		Practices Supply Chain Sustainability	424	0.57	0.08	**< 0.0001**	0.42	0.72		
		Firm Public Or Private	424	0.18	0.07	**0.02**	0.03	0.32		
		Pressure Supply Chain Sustainability	424	0.19	0.08	**0.02**	0.03	0.35		
		Disclose Practices	424	0.11	0.08	0.15	-0.04	0.26		
10	Gender: 1 - Male / 0 - Female	Transportation and Warehousing	609	-0.04	0.12	0.73	-0.28	0.19	0.05	0.60
		Health Care and Services	609	-0.05	0.07	0.51	-0.19	0.09		
		Manufacturing	609	-0.02	0.13	0.91	-0.27	0.24		
		Retail	609	-0.14	0.09	0.14	-0.32	0.04		
		Utilities	609	-0.06	0.07	0.40	-0.19	0.08		
		Construction	609	0.02	0.07	0.77	-0.12	0.16		
		Wholesale	609	0.02	0.08	0.83	-0.13	0.16		
		Agriculture, Forestry, Fishing and Hunting	609	-0.13	0.06	**0.05**	-0.25	0.00		
		Software and Technology	609	-0.04	0.07	0.57	-0.18	0.10		
		Other	609	-0.11	0.06	**0.08**	-0.24	0.01		
		Consulting	609	0.00	0.08	0.96	-0.16	0.17		
		Mining, Quarrying, and Oil and Gas Extraction	609	0.02	0.08	0.85	-0.15	0.18		
		Accommodation and Food Services	609	-0.09	0.06	0.12	-0.21	0.02		
		Education	609	-0.04	0.07	0.62	-0.18	0.11		
11	Gender: 1 - Male / 0 - Female	Sustainability Effort Engagement	608	0.01	0.05	0.81	-0.09	0.11	0.00	0.51
12	Gender: 1 - Male / 0 - Female	Logistic	609	0.08	0.05	0.15	-0.03	0.18	0.00	0.52

13	Pressure End Consumers	Disclose Practices Frequency Website	145	0.03	0.13	0.81	-0.22	0.28	0.05	0.62
		Disclose Practices Frequency Press Releases	145	0.13	0.13	0.33	-0.13	0.39		
		Disclose Practices Frequency Reporting Organization	145	0.09	0.15	0.55	-0.21	0.39		
		Disclose Practices Frequency Sustainability CSR Report	145	0.05	0.14	0.74	-0.23	0.33		
		Disclose Practices Frequency Business Case Studies	145	-0.03	0.12	0.81	-0.27	0.21		
14	Pressure Investors	Disclose Practices Frequency Website	145	0.18	0.14	0.20	-0.09	0.45	0.24	0.75
		Disclose Practices Frequency Press Releases	145	-0.12	0.15	0.42	-0.40	0.17		
		Disclose Practices Frequency Reporting Organization	145	0.20	0.15	0.19	-0.10	0.51		
		Disclose Practices Frequency Sustainability CSR Report	145	0.29	0.15	**0.05**	0.00	0.58		
		Disclose Practices Frequency Business Case Studies	145	0.05	0.13	0.68	-0.20	0.30		
15	Pressure Executives	Disclose Practices Frequency Website	145	0.28	0.14	**0.04**	0.01	0.56	0.11	0.67
		Disclose Practices Frequency Press Releases	145	-0.07	0.15	0.65	-0.37	0.23		
		Disclose Practices Frequency Reporting Organization	145	0.07	0.17	0.69	-0.26	0.39		
		Disclose Practices Frequency Sustainability CSR Report	145	0.14	0.16	0.38	-0.17	0.44		
		Disclose Practices Frequency Business Case Studies	145	-0.10	0.13	0.43	-0.37	0.16		
16	Pressure NGO	Disclose Practices Frequency Website	145	0.03	0.14	0.83	-0.24	0.29	0.16	0.69
		Disclose Practices Frequency Press Releases	145	0.04	0.15	0.79	-0.25	0.32		
		Disclose Practices Frequency Reporting Organization	145	0.15	0.16	0.34	-0.16	0.46		
		Disclose Practices Frequency Sustainability CSR Report	145	0.32	0.15	**0.03**	0.03	0.62		
		Case Studies	145	-0.20	0.13	0.13	-0.47	0.06		
17	Disclose Practices Website	Pressure End Consumers	184	-3.70	2.70	0.17	-8.99	1.60	0.03	0.57
		Pressure Corporate Buyers	184	3.53	2.70	0.19	-1.77	8.82		
		Pressure Investors	184	0.00	0.00					
		Pressure Employees	184	0.00	0.00					
		Pressure Executives	184	0.00	0.00					
		Pressure NGO	184	0.00	0.00					
		Pressure Industry Associations	184	0.00	0.00					
		Pressure Government	184	0.00	0.00					
		Pressure Mass Media	184	0.00	0.00					
		Pressure Local Communities	184	0.00	0.00					
18	Disclose Practices Press Releases	Pressure End Consumers	184	0.29	2.58	0.91	-4.77	5.34	0.01	0.50
		Pressure Corporate Buyers	184	-0.45	2.58	0.86	-5.51	4.60		
		Pressure Investors	184	0.00	0.00					
		Pressure Employees	184	0.00	0.00					
		Pressure Executives	184	0.00	0.00					
		Pressure NGO	184	0.00	0.00					
		Pressure Industry Associations	184	0.00	0.00					
		Pressure Government	184	0.00	0.00					
		Pressure Mass Media	184	0.00	0.00					
		Pressure Local Communities	184	0.00	0.00					
19	Disclose Practices Reporting Organization	Pressure End Consumers	184	-5.44	2.67	**0.04**	-10.68	-0.20	0.04	0.60
		Pressure Corporate Buyers	184	5.31	2.67	**0.05**	0.07	10.55		
		Pressure Investors	184	0.00	0.00					
		Pressure Employees	184	0.00	0.00					
		Pressure Executives	184	0.00	0.00					
		Pressure NGO	184	0.00	0.00					
		Pressure Industry Associations	184	0.00	0.00					
		Pressure Government	184	0.00	0.00					
		Pressure Mass Media	184	0.00	0.00					
		Pressure Local Communities	184	0.00	0.00					
20	Disclose Practices Sustainability CSR Report	Pressure End Consumers	184	-6.48	2.74	**0.02**	-11.85	-1.11	0.05	0.61
		Pressure Corporate Buyers	184	6.33	2.74	**0.02**	0.96	11.70		
		Pressure Investors	184	0.00	0.00					
		Pressure Employees	184	0.00	0.00					
		Pressure Executives	184	0.00	0.00					
		Pressure NGO	184	0.00	0.00					
		Pressure Industry Associations	184	0.00	0.00					
		Pressure Government	184	0.00	0.00					
		Pressure Mass Media	184	0.00	0.00					
		Pressure Local Communities	184	0.00	0.00					
21	Disclose Practices Business Case Studies	Pressure End Consumers	184	-4.79	2.65	**0.07**	-9.99	0.41	0.03	0.59
		Pressure Corporate Buyers	184	4.66	2.65	**0.08**	-0.53	9.86		
		Pressure Investors	184	0.00	0.00					
		Pressure Employees	184	0.00	0.00					
		Pressure Executives	184	0.00	0.00					
		Pressure NGO	184	0.00	0.00					
		Pressure Industry Associations	184	0.00	0.00					
		Pressure Government	184	0.00	0.00					
		Pressure Mass Media	184	0.00	0.00					
		Pressure Local Communities	184	0.00	0.00					

APPENDIX D – Linear regression model results

Linear Models			Analyzed Observations	Standardized coefficients						R2	Adj R2
ID #	Dependent Variable	Independent Variables		Value	Standard error	t	Pr > |t|	Lower bound (95%)	Upper bound (95%)		
1	Aggregated Environmental Level of Focus	Pressure End Consumers	183	0.85	0.46	1.85	0.66	-0.06	1.76	28.8	24.6
		Pressure Corporate Buyers	183	0.30	0.52	0.58	0.56	-0.72	1.32		
		Pressure Investors	183	0.60	0.55	1.09	0.28	-0.48	1.68		
		Pressure Employees	183	0.20	0.54	0.38	0.71	-0.86	1.27		
		Pressure Executives	183	1.26	0.62	2.04	**0.04**	0.04	2.47		
		Pressure NGO	183	-0.01	0.53	-0.01	0.99	-1.06	1.05		
		Pressure Industry Associations	183	-0.42	0.66	-0.64	0.52	-1.72	0.88		
		Pressure Government	183	0.79	0.52	1.51	0.13	-0.24	1.82		
		Pressure Mass Media	183	-0.52	0.62	-0.84	0.40	-1.74	0.70		
		Pressure Local Communities	183	1.30	0.63	2.07	**0.04**	0.06	2.55		
2	Aggregated Social Level of Focus	Pressure End Consumers	183	0.11	0.07	1.42	0.16	-0.04	0.25	29.5	25.4
		Pressure Corporate Buyers	183	0.03	0.08	0.31	0.76	-0.13	0.18		
		Pressure Investors	183	0.05	0.09	0.55	0.58	-0.13	0.24		
		Pressure Employees	183	0.08	0.08	0.96	0.34	-0.08	0.24		
		Pressure Executives	183	0.26	0.09	2.82	**0.01**	0.08	0.44		
		Pressure NGO	183	0.03	0.09	0.35	0.73	-0.15	0.21		
		Pressure Industry Associations	183	-0.09	0.11	-0.83	0.41	-0.31	0.13		
		Pressure Government	183	0.19	0.10	1.94	**0.05**	0.00	0.38		
		Pressure Mass Media	183	-0.13	0.11	-1.25	0.21	-0.34	0.08		
		Pressure Local Communities	183	0.19	0.11	1.81	**0.07**	-0.02	0.40		
3	Aggregated Disclosure Frequency	USA Headquarter	379	1.54	1.09	1.41	0.16	-0.61	3.69	43	40.5
		EUROPEHeadquarters	379	1.62	1.35	1.20	0.23	-1.04	4.28		
		ASIA Headquarters	379	0.94	1.21	0.78	0.44	-1.44	3.31		
		AFRICA Headquarters	379	0.61	1.61	0.38	0.71	-2.56	3.77		
		Latin America and CaribeanHeadquarter	379	2.33	1.36	1.72	**0.09**	-0.34	4.99		
		Other Countries Headquarters	379	0.00	0.00						
		Primary consumer market in North America	379	0.17	0.64	0.26	0.79	-1.10	1.43		
		Primary consumer market in Latin America and Caribean	379	-1.08	0.68	-1.59	0.11	-2.42	0.25		
		Primary consumer market in Africa	379	0.77	0.92	0.84	0.40	-1.03	2.58		
		Primary consumer market in Asia	379	0.46	0.59	0.79	0.43	-0.69	1.61		
		Primary consumer market in Europe	379	-0.09	0.56	-0.16	0.88	-1.19	1.02		
		Primary consumer market in Oceania	379	1.13	1.01	1.12	0.26	-0.86	3.12		
		Firm Public Or Private	379	-0.71	0.53	-1.35	0.18	-1.75	0.33		
		Number Employees	379	0.00	0.00	0.83	0.41	0.00	0.00		
		Aggregated Environmental level of focus	379	0.17	0.06	2.88	**0.00**	0.05	0.29		
		Aggregated Social level of focus	379	0.13	0.05	2.63	**0.01**	0.03	0.23		
		Agg Level of Pressure to Receive	379	0.15	0.02	6.83	**< 0.0001**	0.10	0.19		
4	Pressure Government	Transportation and Warehousing * Firm Public Or Private	156	0.17	0.97	0.17	0.87	-1.76	2.09	24.6	10.8
		Health Care and Services * Firm Public Or Private	156	0.00	0.00						
		Manufacturing * Firm Public Or Private	156	-0.85	0.91	-0.93	0.35	-2.65	0.96		
		Retail * Firm Public Or Private	156	-0.74	1.03	-0.72	0.47	-2.77	1.29		
		Utilities * Firm Public Or Private	156	-0.60	1.28	-0.47	0.64	-3.13	1.93		
		Construction * Firm Public Or Private	156	0.13	1.60	0.07	0.94	-3.05	3.28		
		Wholesale * Firm Public Or Private	156	0.89	1.59	0.56	0.58	-2.27	4.04		
		Agriculture, Forestry, Fishing and Hunting * Firm Public Or Private	156	-0.93	1.60	-0.58	0.57	-4.08	2.24		
		Software and Technology * Firm Public Or Private	156	-2.21	1.65	-1.34	0.18	-5.48	1.06		
		Other * Firm Public Or Private	156	-1.28	1.68	-0.76	0.45	-4.60	2.04		
		Consulting * Firm Public Or Private	156	0.00	0.00						
		Mining, Quarrying, and Oil and Gas Extraction * Firm Public Or Priva	156	-0.66	1.07	-0.61	0.54	-2.78	1.47		
		Accommodation and Food Services * Firm Public Or Private	156	0.00	0.00						
		Education * Firm Public Or Private	156	-1.02	1.25	-0.82	0.41	-3.49	1.44		
		USA Headquarter	156	-1.52	0.62	-2.48	**0.01**	-2.74	-0.31		
		EUROPEHeadquarters	156	-0.32	0.75	-0.43	0.67	-1.80	1.16		
		ASIA Headquarters	156	-0.17	0.68	-0.25	0.80	-1.51	1.17		
		AFRICA Headquarters	156	0.26	0.90	0.29	0.77	-1.53	2.04		
		Latin America and CaribeanHeadquarter	156	-0.45	0.78	-0.57	0.57	-1.99	1.09		
		Other Countries Headquarters	156	0.00	0.00						
		Primary consumer market in North America	156	0.57	0.36	1.58	0.12	-0.14	1.28		
		Primary consumer market in Latin America and Caribean	156	0.47	0.39	1.21	0.23	-0.30	1.24		
		Primary consumer market in Africa	156	0.05	0.47	0.11	0.92	-0.89	0.99		
		Primary consumer market in Asia	156	0.47	0.31	1.50	0.14	-0.15	1.09		
		Primary consumer market in Europe	156	-0.38	0.34	-1.10	0.27	-1.05	0.30		
		Primary consumer market in Oceania	156	-0.30	0.51	-0.59	0.56	-1.31	0.71		
		Firm Public Or Private	156	0.80	0.74	1.09	0.28	-0.66	2.26		
		Number Employees	156	0.00	0.00	1.58	0.12	0.00	0.00		
5	Practices Supply Chain Sustainability	Firm Public Or Private	334	0.15	0.07	2.12	**0.03**	0.01	0.28	16.6	15.6
		Number Employees	334	0.00	0.00	0.11	0.91	0.00	0.00		
		Sustainability Effort Engagement	334	0.25	0.03	7.81	**< 0.0001**	0.17	0.28		
		Age Range	334	0.00	0.00	-0.14	0.89	0.00	0.00		
6	Supply Chain Not Environmentally Sustainable	Aggregated Level of investment in ENVIRONMENTAL goals	603	0.43	0.04	11.72	**0.00**	0.36	0.50	0.186	0.185
7	Supply Chain Not Socially Sustainable	Aggregated Level of investment in SOCIAL goals	602	0.37	0.04	9.74	**0.00**	0.30	0.44	0.137	0.135
8	Supply Chain Not Socially Sustainable	Aggregated Level of investment in ENVIRONMENTAL goals	602	0.19	0.07	2.84	**0.00**	0.06	0.33	0.148	0.145
		Aggregated Level of investment in SOCIAL goals	602	0.21	0.07	3.09	**0.00**	0.08	0.34		
9	Supply Chain Not Socially Sustainable	Aggregated Environmental level of focus	602	0.12	0.08	1.47	0.14	-0.04	0.28	0.097	0.094
		Aggregated Social level of focus	602	0.20	0.08	2.51	**0.01**	0.04	0.36		
10	Supply Chain Not Environmentally Sustainable	Aggregated Level of investment in ENVIRONMENTAL goals	603	0.34	0.07	5.19	**0.00**	0.21	0.47	0.189	0.187
		Aggregated Level of investment in SOCIAL goals	603	0.11	0.07	1.59	0.11	-0.02	0.24		
11	Supply Chain Not Environmentally Sustainable	Aggregated Environmental level of focus	603	0.29	0.08	3.68	**0.00**	0.13	0.44	0.150	0.147
		Aggregated Social level of focus	603	0.11	0.08	1.39	0.16	-0.04	0.26		
12	Effort Environmental Sustainability Successful	Aggregated Environmental level of focus	603	0.39	0.07	5.27	**0.00**	0.25	0.54	0.230	0.227
		Aggregated Social level of focus	603	0.09	0.07	1.26	0.21	-0.05	0.24		
13	Effort Social Sustainability Successful	Aggregated Environmental level of focus	607	0.13	0.08	1.70	**0.09**	-0.02	0.29	0.167	0.164
		Aggregated Social level of focus	607	0.29	0.08	3.69	**0.00**	0.13	0.44		

14	Aggregated Level of investment in ENVIRONMENTAL goals	Supply Chain Not Environmentally Sustainable	575	0.16	0.04	3.79	**0.00**	0.08	0.25	0.358	0.354
		Effort Environmental Sustainability Successful	575	0.31	0.05	6.53	**0.00**	0.22	0.41		
		Supply Chain Not Socially Sustainable	575	0.08	0.04	1.96	**0.05**	0.00	0.16		
		Effort Social Sustainability Successful	575	0.18	0.05	3.88	**0.00**	0.09	0.27		
15	Aggregated Level of investment in SOCIAL goals	Supply Chain Not Environmentally Sustainable	575	0.13	0.04	2.90	**0.00**	0.04	0.22	0.321	0.316
		Effort Environmental Sustainability Successful	575	0.21	0.05	4.32	**0.00**	0.12	0.31		
		Supply Chain Not Socially Sustainable	575	0.11	0.04	2.55	**0.01**	0.03	0.19		
		Effort Social Sustainability Successful	575	0.26	0.05	5.36	**0.00**	0.16	0.35		
16	Disclose Practices Frequency Website	Pressure End Consumers	117	0.13	0.11	1.24	0.22	-0.08	0.35	0.17	0.095
		Pressure Corporate Buyers	117	-0.10	0.11	-0.99	0.32	-0.31	0.11		
		Pressure Investors	117	-0.25	0.13	-1.97	**0.05**	-0.51	0.00		
		Pressure Employees	117	-0.11	0.12	-0.94	0.35	-0.35	0.12		
		Pressure Executives	117	0.37	0.12	3.04	**0.00**	0.13	0.61		
		Pressure NGO	117	0.02	0.13	0.13	0.89	-0.24	0.27		
		Pressure Industry Associations	117	0.07	0.14	0.53	0.60	-0.20	0.34		
		Pressure Government	117	0.10	0.13	0.78	0.44	-0.16	0.36		
		Pressure Mass Media	117	0.08	0.15	0.58	0.56	-0.21	0.39		
		Pressure Local Communities	117	0.05	0.16	0.30	0.76	-0.26	0.36		
17	Disclose Practices Frequency Press Releases	Pressure End Consumers	114	0.21	0.10	2.02	**0.05**	0.00	0.42	0.22	0.144
		Pressure Corporate Buyers	114	-0.34	0.10	-3.22	**0.00**	-0.55	-0.13		
		Pressure Investors	114	-0.13	0.13	-1.01	0.32	-0.38	0.13		
		Pressure Employees	114	0.00	0.11	-0.02	0.99	-0.23	0.23		
		Pressure Executives	114	0.01	0.12	0.05	0.96	-0.23	0.24		
		Pressure NGO	114	0.16	0.12	1.31	0.19	-0.08	0.41		
		Pressure Industry Associations	114	0.23	0.13	1.76	**0.08**	-0.03	0.49		
		Pressure Government	114	-0.11	0.13	-0.89	0.37	-0.37	0.14		
		Pressure Mass Media	114	0.18	0.15	1.21	0.23	-0.11	0.47		
		Pressure Local Communities	114	0.06	0.16	0.40	0.69	-0.25	0.37		
18	Disclose Practices Frequency Reporting Organization	Pressure End Consumers	97	-0.19	0.12	-1.67	**0.10**	-0.42	0.04	0.30	0.223
		Pressure Corporate Buyers	97	0.01	0.11	0.11	0.91	-0.22	0.24		
		Pressure Investors	97	-0.03	0.14	-0.18	0.85	-0.31	0.26		
		Pressure Employees	97	-0.03	0.12	-0.26	0.80	-0.27	0.21		
		Pressure Executives	97	0.25	0.13	1.88	**0.06**	-0.01	0.51		
		Pressure NGO	97	0.12	0.13	0.93	0.36	-0.14	0.39		
		Pressure Industry Associations	97	0.07	0.14	0.48	0.63	-0.20	0.33		
		Pressure Government	97	0.31	0.14	2.25	**0.03**	0.04	0.59		
		Pressure Mass Media	97	-0.27	0.17	-1.64	0.11	-0.60	0.06		
		Pressure Local Communities	97	0.31	0.17	1.79	**0.08**	-0.03	0.65		
19	Disclose Practices Frequency Sustainability CSR Report	Pressure End Consumers	107	-0.14	0.12	-1.20	0.23	-0.37	0.09	0.18	0.093
		Pressure Corporate Buyers	107	0.00	0.12	0.03	0.98	-0.23	0.23		
		Pressure Investors	107	-0.01	0.14	-0.05	0.96	-0.29	0.27		
		Pressure Employees	107	0.11	0.12	0.96	0.34	-0.12	0.35		
		Pressure Executives	107	0.02	0.13	0.12	0.90	-0.24	0.27		
		Pressure NGO	107	0.14	0.13	1.06	0.29	-0.12	0.41		
		Pressure Industry Associations	107	-0.03	0.14	-0.21	0.84	-0.30	0.25		
		Pressure Government	107	0.24	0.14	1.69	**0.09**	-0.04	0.51		
		Pressure Mass Media	107	-0.23	0.16	-1.37	0.18	-0.53	0.10		
		Pressure Local Communities	107	0.30	0.16	1.90	**0.06**	-0.011	0.61		
20	Disclose Practices Frequency Business Case Studies	Pressure End Consumers	101	0.26	0.12	2.29	**0.02**	0.04	0.49	0.25	0.164
		Pressure Corporate Buyers	101	0.07	0.11	0.61	0.54	-0.15	0.29		
		Pressure Investors	101	0.04	0.13	0.33	0.75	-0.22	0.31		
		Pressure Employees	101	-0.11	0.12	-0.90	0.37	-0.34	0.13		
		Pressure Executives	101	-0.100	0.13	-0.79	0.43	-0.36	0.16		
		Pressure NGO	101	0.18	0.13	1.35	0.18	-0.09	0.44		
		Pressure Industry Associations	101	0.06	0.14	0.40	0.69	-0.23	0.34		
		Pressure Government	101	0.10	0.13	0.75	0.45	-0.16	0.36		
		Pressure Mass Media	101	-0.04	0.16	-0.24	0.81	-0.35	0.27		
		Pressure Local Communities	101	0.14	0.17	0.85	0.40	-0.19	0.47		