

DO COMPANIES' ENVIRONMENTAL COMMITMENTS DIFFER ACCORDING TO THEIR SUPPLY CHAIN POSITION?

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ABSTRACT

As concerns around climate change increase, companies have been more eager to adopt environmental sustainability goals. The focus of this research is to provide insights into how a company's position in the overall supply chain impacts their decisions to set environmental sustainability goals and initiatives. In this report, we take both a quantitative and qualitative approach to highlight the sources of pressure that influence companies' setting of net zero goals and how they differ depending on the company and industry type. The quantitative analyses applied use data from the 2023 Survey on Supply Chain Sustainability—an annual questionnaire commissioned by the MIT Center for Transportation and Logistics and the Council of Supply Chain Management Professionals. The qualitative analysis gathered key insights from supply chain executives through interviews. Our findings confirm that, while investors continue to be one of the key drivers for companies to address sustainability as part of the corporate strategy through net zero targets, there are other sources of pressure at play. Our results also show that companies present different behaviors regarding goal setting based on their position within the overall supply chain, with downstream players having the greatest levels of commitment via their net zero goals. However, we learned that when it came to near-term initiatives to reduce Scope 3 emissions in line with the net zero goals, downstream was no different than the upstream and midstream positions—they all show most companies are unprepared to meet their carbon neutrality targets.

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Julia and Samara

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1. INTRODUCTION

1.1. Motivation

In the past decades, globalization has contributed to the development of complex supply chains to help companies meet their profitability goals and extend their reach to new markets. Major events around the world, spanning from ravaging storms to a global pandemic, to escalating geopolitical conflicts, among others, have caused significant disruptions to supply chains in every industry. This global trend of disruptions has increased visibility and awareness of the role of supply chain in a company's success, highlighting the importance of sustainability practices to achieve corporate goals (Stanchik, 2016).

Sustainability covers three pillars that can often conflict with one another: environmental protection, social equity, and economic viability. In recent years, there has been increased attention and concerns around climate change, as its negative effects impact everyone without exception. To address environmental issues, many companies have adopted various objectives related to reducing harmful emissions. These objectives can focus on a variety of strategies, such as reducing water waste, increasing the use of recycled materials, or replacing energy sources with alternative fuels. One of the most popular examples of sustainability commitments exercised by companies is carbon neutrality as reflected by "net zero" targets.

Depending on their industry and supply chain position, companies experience pressures from different stakeholders. Both internal and external sources can influence companies to change the way they conduct business. This influence invites businesses to reduce their impact on the environment with the objective of minimizing exposure to risk. Internal sources can additionally push for sustainability practices as a competitive strategy to stand out from the competition. Given the complexity of supply

chains and the lack of maturity in the topic of sustainability, there is no true consensus to identify where the true responsibility of reducing emissions lies.

In 2019, the Massachusetts Institute of Technology Center for Transportation and Logistics (MIT CTL), in collaboration with the Council of Supply Chain Management Professionals (CSCMP), launched the first-in-its-class global survey to address the knowledge gap in defining and understanding supply chain sustainability, and to showcase the current and future practices to help supply chain professionals attain their goals. The annual survey, titled “State of Supply Chain Sustainability,” seeks to gather data on supply chain sustainability that elucidates goal setting, investment, reporting, and disclosure practices. By conducting it annually, the research captures how supply chain sustainability evolves year-to-year as new social and environmental happenings impact various industries.

1.2. Problem Statement and Research Questions

The previous studies related to this survey have succeeded in presenting a comprehensive snapshot of sustainability practices worldwide for that given year. Additionally, each report sought to address a specific topic within sustainability: in 2019, it provided a general understanding of how supply chain sustainability varies across different industries and geographies; in 2020, the focus was on the impact that COVID-19 had on sustainability; and in 2021, it analyzed how different groups of participants—split by age, gender, and other demographical aspects—interpret sustainability commitments and investments across global supply chains based on demographic information.

By comparing results across industries and regions, the reports presented insights to business professionals to help them shape current and future decisions within their companies and communities. Due to the devastating effects the COVID-19 pandemic had on supply chains across the world, the previous installments focused heavily on its impact on the level of investment and commitment to sustainability initiatives. This year, the survey builds upon the work of previous years and takes a more

in-depth approach to environmental sustainability. The study focuses on how various stakeholders impact each industries' level of commitment and investment in environmental goals and practices, and how these are reflected in their public goals.

As such, this capstone addresses these key questions:

1. What are the sources of pressure that influence a company's commitment to establish net zero goals based on their supply chain position and company type?
2. Do these same sources of pressure have an impact on whether companies with net zero goals implement near-term initiatives to reduce Scope 3 emissions?

1.3. Scope: Project Goals and Expected Outcomes

To answer these key questions, we used both quantitative data from this year's survey, as well as qualitative data from executive interviews with sustainability leaders. The survey was updated to remove questions related to the COVID-19 pandemic in favor of new enquiries delving into the extent of their commitment and investments. The new topics included corporations' adoption of greenhouse gas (GHG) reduction targets through Scope 1, Scope 2, and Scope 3 initiatives (defined in Section 2.3.2), carbon offsets, and net zero goals. These new questions provide readers with additional insights to understand how their industry approaches environmental sustainability in their region. Based on common practices used by their industry, they also can prioritize actions to further improve the sustainability of their companies' supply chains.

Based on last year's sustainability report, we know that investors are a major source of pressure for the adoption of sustainability initiatives. The 2022 report conducted its analysis with a high-level view only. For our project, we hypothesized that companies experience pressure from different sources based on the type of company (public versus private) and on their industry's position within the supply chain (upstream, midstream, and downstream, as described in Section 3.1.1.2). We expected public

companies to be more susceptible to having established net zero goals because of higher pressure from investors compared to private companies. This is because public companies are subject to increased demands from investors relying on Environmental, Social, and Governance (ESG) performance measurements to determine their financial interest in a corporation.

We further theorized that companies in downstream industries would have the greatest levels of commitment and investment in environmental sustainability practices related to the reduction of Scope 3 emissions. Our assumption is based on the fact that end consumers have more visibility into the practices of downstream industries compared to midstream industries, which often pass under the radar of the average consumer.

These hypotheses were explored through a data-driven analysis and qualitative insights to provide a comprehensive analysis for supply chain leaders. The data inputs were built upon responses to the 2023 annual sustainability survey as well as from executive interviews representing a wide range of industries and regions. We theorized that by applying logistic regression, we could identify the true sources of pressure, by industry, to support the claims mentioned above. We investigated the influence each type of stakeholder has on whether a type of company has or not an establish net zero goal. Through statistical analyses and literature reviews, we addressed how the state of supply chain sustainability has evolved to provide potential courses of action for our supply chain professionals to implement based on their industry.

The deliverables of this project include:

1. An updated survey and executive questionnaire to capture the current state of supply chain sustainability and expand on the level of commitment towards reducing greenhouse gas emissions; and

2. A report studying the sources of pressure on net zero goals and the levels of commitment by company type and supply chain position through the implementation of logistics regression.

2. STATE OF THE ART

This section provides an overview of supply chain sustainability based on available literature. We will explore: the concept of sustainability and how its definition has evolved; what corporate sustainability is and how it is impacted by different sources of pressure; and what corporate environmental sustainability entails in 2022. Since our study seeks to understand the influence that the various stakeholders may have on companies' commitments to environmental sustainability initiatives, we will focus on describing different aspects of environmental integrity. Environmental integrity covers aspects such as greenhouse gas emissions (GHG), net zero targets, and practices to reduce carbon emissions.

To effectively describe the topics above, the literature review conducted includes articles from scientific journals, reports on government and regional regulations, consulting reports on current events and surveys, case studies, reports from environmental conferences, and the previous three State of Supply Chain Sustainability reports. This review helps us to provide background details to educate our readers on the topic of corporate environmental sustainability and to identify research gaps that our study will address.

2.1. Concept of Sustainability

While the concept of sustainability has been used for over 300 years (Allegue Lara & Barrington, 2020), its current definition dates to the late 20th century. In 1972, the impact that humans have on the environment was first debated at the United Nations Conference on the Human Environment in Stockholm, Sweden (Handl, 2012). This event elevated the topic from a local matter to the global arena, increasing its relevance and making a call for action.

In the following decades, several groups sought to offer and implement strategies that would help lessen the impact humans have on the environment. For instance, in 1980, the International Union for Conservation of Nature and Natural Resources (IUCN) prepared the first World Conservation Strategy Report. The report recommended sustainable development strategies and frameworks to be implemented by government, conservationists, and development practitioners – including agencies, industries, commerce, and trade unions (World Resources, 1980). Then, in 1987, the World Commission on Environment and Development provided a common definition for sustainable development, which they published in the famous *Brundtland Report*. This report defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Ameer, 2012, p. 61).

In 1992, global leaders and scientists from 179 countries joined the Earth Summit Conference in Rio de Janeiro. During the conference, leaders discussed international cooperation to define a course of action and commitment towards global environmental and development concerns in the 21st century. Leaders also recognized that sustainability cannot be approached from a single perspective, but rather requires an equilibrium between the economic, social, and environmental pillars (United Nations, 2022a). One of the main successes of the 1992 Earth Summit is the publication of the Agenda 21 Report. The report contains strategies, actions, and commitments to accomplish international cooperation in sustainable development. To monitor the implementation of these strategies and commitments, the Commission of Sustainable Development (CSD) was founded. In 1997, the CSD launched its first report describing the achievements tied to the Agenda 21 agreements (Purvis et al., 2019).

Global summits and conferences continue to be hosted to debate the progress and update the strategies for sustainable development. Currently, there are 17 defined goals to achieve sustainable development in all countries. These goals aim to promote economic prosperity while protecting the environment (United Nations, 2022b). In recent years, more corporations have adopted some or all of

these goals as guidance to promote sustainability in the places where they operate. This touches upon the next topic: corporate sustainability.

2.2. Corporate Sustainability

2.2.1. Origin and Definition

Corporate sustainability is a recent, still-evolving concept for academia, corporations, and regulators. In 1987, businesses were associated with sustainability for the first time in the *Brundtland Report*. The report emphasized the role that businesses have in managing the impact they have on the environment (Montiel & Delgado-Ceballos, 2014). It was not until 1992, when the Business Council for Sustainable Development was formed during the Earth Summit Conference, that the concept of corporate sustainability was consolidated as a business concern (Lyon et al., 2014).

Although a variety of incremental definitions have been published over the years, the three pillars continue to be relevant when describing corporate sustainability. In 2005, Szekley and Knirsch added a holistic perspective to the definition when they considered internal and external stakeholders involved in the business. They redefined a sustainable corporation as one capable of “sustaining and expanding economic growth, shareholder value, prestige, corporate reputation, customer relationships, and the quality of products and services as well as adopting and pursuing ethical business practices, creating sustainable jobs, building value for all the stakeholders and attending the needs of the underserved” (as cited in Montiel & Delgado-Ceballos, 2014, p. 120).

2.2.2. Sources of Pressure

Previous research indicates that stakeholders have a strong impact on corporate sustainability performance and strategy definition (Wolf, 2014). For this reason, it is fundamental for each industry to understand which stakeholders are involved, and what are their levels of influence and expectations

towards sustainability practices. These stakeholders are the source of pressure that influences companies' sustainability strategies and their prioritization of initiatives and plans.

The sources of pressure can be categorized under two groups: internal and external (Lyon et al., 2014). The internal stakeholders are members of the company, such as employees, shareholders, and investors. They represent a source of pressure because companies want to retain talent, provide value to shareholders, and attract investors. The external pressures come mainly from the companies' value chain which are present in the upstream and downstream of its supply chains. Some examples are suppliers, downstream consumers and buyers, end consumers, and local communities where the companies operate. Other external members include governments (through policies, regulations, and incentives), non-governmental organizations (NGOs), industry associations, and activists.

2.3. Corporate Environmental Sustainability

2.3.1. Relevance and Challenges

According to a McKinsey report on sustainability (Bové, 2016), supply chains are responsible for 80% of the overall greenhouse gas emissions. To meet global objectives, corporations are expected to create strategies that mitigate their impact on nature. These strategies include an array of initiatives, processes, policies, and governance to minimize the consumption of natural resources and the negative effects their activities have on the environment (Aguilera et al., 2021).

The environmental sustainability challenges encountered by companies go beyond the external alignment of definition and scope; some of the barriers are managed within the companies. One of the main challenges is the allocation of resources to sustainability initiatives and practices. To have a consistent corporate environmental strategy, it is necessary to prioritize internal investments, coordinating the interests of all departments within the organization. The investments also need to have a short payback period, which is difficult to achieve given most environmental initiatives require large

capital investments, and the results and benefits are not expected to be captured in the near-term (Aguilera et al., 2021).

2.3.2. Environmental Indicators

Stakeholders and companies alike rely on environmental indicators to track and monitor the effectiveness of the strategies put in place by companies. One of the best-known indicators is the emission of greenhouse gases (GHG). GHG are gases associated with human activities that, once released into the atmosphere, are responsible for keeping heat on Earth. GHG are a global concern since they compromise the future of the generations to come. These gases remain in the atmosphere, warming up the planet, causing ocean levels to rise, and damaging the entire ecosystem. The three main GHG, in descending order of emission levels, are: carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). Carbon dioxide gas is mostly released into the atmosphere by burning fossil fuels and through manufacturing reactions; methane gas, by the production of coal, natural gas, and oil, and through some agricultural practices; and nitrous oxide gas, mainly by agriculture and some industrial activities such as wastewater treatments (United States Environmental Protection Agency, 2020).

Companies contribute to the emission of greenhouse gases through their entire value chain, but often focus mainly or only on the carbon emissions. To track and trace emissions, the GHG Protocol classifies the different types into three groups called scopes. The first two are within a company's control and are therefore easier to address through corporate sustainability initiatives. The third type is the most complex to manage and reduce because it is associated with emissions generated outside of the company's direct control by its suppliers, distributors, and end users to make, deliver, and dispose of the product or service. For some industry segments, Scope 3 emissions account for 70% of all emissions (Aldridge, 2016; Deloitte, 2022).

The scopes are defined as:

- Scope 1: carbon emissions directly controlled by and produced from the operation of a firm's assets, including manufacturing facilities, offices, and fleet of vehicles.
- Scope 2: emissions related to purchased resources such as steam, heat, electricity, and cooling.
- Scope 3: all other indirect emissions associated with the activities of a company generated by its suppliers, distributors, and end users. To understand the true footprint and develop a strategy to reduce Scope 3 emissions, companies must map their entire supply chain (Aldridge, 2016).

These definitions elucidate a company's carbon emissions and may help them identify opportunities to reduce their footprint. An example of such an opportunity would be switching from energy sources that rely on fossil fuels to those that utilize renewable resources such as wind and solar power, thus lowering the Scope 2 emissions. Without an understanding of their carbon contributions, companies would not be able to attain their net zero targets.

A net zero target refers to the objective of becoming carbon neutral, meaning that all the GHG generated by a company are either removed from the atmosphere or offset, seeking an equilibrium (National Grid, 2022). The United Nations estimates that more than 3,000 businesses and financial institutions have established net zero targets to contribute to the goal of halving global emissions by 2030 (United Nations, 2022c). It remains to be seen whether these net zero goals are backed by credible action and investments.

2.4. Literature Review Conclusions

As evidenced by the works previously cited, the topic of sustainability continues to mature and so does the role that supply chains play in achieving global goals. The increased scrutiny of the impact of supply chains from various sources of pressure drive companies to adopt environmental practices to

remain relevant and profitable. These practices, however, can represent significant changes to how supply chains operate. The changes can translate into large investments. While companies can financially benefit from the implementation of environmental sustainability practices, they may struggle to quantify the return on investment, making it harder for them to make lasting and realistic commitments.

In recent years, there have been several studies that seek to understand companies' commitments to environmental sustainability efforts. Examples include:

- Julia Wolf's article published in the *Journal of Business Ethics* in 2014 statistically compares 1,621 organizations to understand the relationship between sustainable supply chain management and corporate sustainability performance using stakeholder pressure as a moderator. The findings indicate that stakeholders are not the only drivers positively impacting corporate sustainability performance. Instead, both proactive supply chain management and stakeholder pressure play an important role in improving companies' sustainability scores.
- McKinsey's sustainability report (Banchik et al., 2021) evaluates the setting of environmental commitments by 4,500 companies that publicly reported their GHG emissions in 2020. The study correlates the timeline set to achieve zero targets against the efforts to reduce emissions. It concludes that most companies have set goals to reduce scope 1 and 2 emissions, but only 26% have reported targets to lower scope 3 emissions.
- McKinsey's 2022 *Making Supply-Chain Decarbonization Happen* report presents common challenges companies encounter as they map the pathway toward achieving net zero targets and offers potential solutions to reduce carbon emissions.

Although these and other studies have explored the sources of pressure, net zero goals, and corporate efforts to reduce carbon emissions, there is no current research studying how these vary

depending on a company’s position in the overall supply chain. This report fills this research gap by focusing on how the main sources of stakeholder pressures impact corporate net zero targets and how these targets influence corporate initiatives and commitments to lower carbon emissions throughout their supply chains.

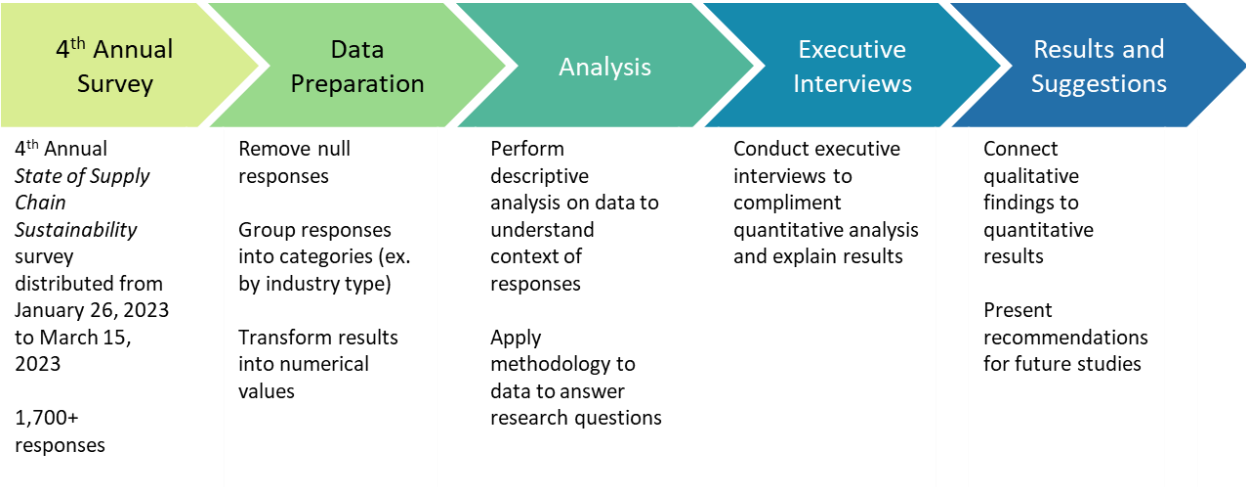
3. METHODOLOGY

This section describes the methodology applied to address our key questions. Our research used data gathered from the fourth annual State of Supply Chain Sustainability survey commissioned by MIT CTL in collaboration with CSCMP. To provide additional context to the results, we conducted one-to-one interviews with executives from different industries.

The sub-sections below present, in chronological order, the methods that we used to gather, measure, and analyze the required data. The overall process followed is shown in Figure 1.

Figure 1

Methodology Approach



3.1. Survey Data

Building upon the work of previous years, we expanded the scope of the survey by replacing COVID-19 pandemic questions with items related to environmental sustainability. More specifically, we added questions to obtain feedback on companies’:

- ability to track and report Scope 1, Scope 2, and Scope 3 emissions;
- timelines to implement initiatives to reduce carbon emissions; and
- setting of net zero targets.

All other questions remained the same to maintain continuity through the years and allow for accurate future year-on-year studies.

As in previous years, the survey was conducted online through a web-based platform called Qualtrics. The survey was structured with a skip logic to modify a participant’s path through the questions depending on the responses to previous questions. For instance, if the respondent stated that the company they represent has a net zero goal, the following question asked for the target year; otherwise, it skipped to the next topic. This method simplified the data cleansing process.

To enable statistical analysis of the responses collected, the survey used the Likert scale to translate perceived attitudes into numerical values. The categories of responses were assigned a value from 0 to 5, where 0 would, for example, represent the option of “Strongly Disagree” and 5 the option of “Strongly Agree” (Robbins, 2014). When the questions were grouped by topic and the values summed up, we could get a general idea of the participant’s company’s level of commitment to various aspects of supply chain sustainability.

The survey was open from January 26, 2023 through March 31, 2023. It was distributed through CSCMP via LinkedIn and promoted through MIT CTL’s contacts and our professional networks to have a

farther reach. The objective was to obtain full coverage of supply chain professionals across different industries and geographical regions to be able to aggregate data and produce strong insights.

3.1.1. Data Processing

3.1.1.1. Limitations

There are several limitations we considered for the application of the survey data in our research. We must assume that participants represent different companies within each industry and that their responses fairly represent the true facts. The identity of the participants extends only to how they categorize their company and their role in it but is otherwise completely anonymous. The anonymity factor helps combat potential biases or fear of repercussions in portraying their organization in a negative way.

Another limitation is the possibility that not enough responses are obtained to conduct fruitful statistical analyses on the data. Data groups that did not produce results using the selected methodology were omitted from the analysis where appropriate.

3.1.1.2. Data Cleansing and Preparation

The data cleansing exercise is essential to obtain quality data and avoid the misinterpretation of results. This stage included removing duplicates, incomplete or unwanted data, and free-form text responses that did not fall into any of the offered choices. Since participants often skipped questions during the survey, rather than omitting all entries with null values, we strategically addressed these information gaps. For instance, if the survey question was not relevant for our analysis and the participant chose not to answer, the participant's answers were kept and the columns pertaining to these superfluous questions were removed from the datasets. This ensured that the datasets we used for our analyses contained only relevant data, which improved overall efficiency and accuracy.

Once the data was cleansed, different types of data preparation were required to address the key research questions of this project. The first data preparation stage involved creating an additional column to classify each entry as belonging to an industry type. Table 1 presents the splits by industry type based on the choice selected by each participant during the survey. Each group represents a supply chain position.

Table 1

Groupings by Industry Type

Group	Sectors in Group
Upstream	Agriculture, Forestry, Fishing and Hunting Mining, Quarrying, and Oil and Gas Extraction Manufacturing Utilities
Midstream	Transportation and Warehousing Construction Wholesale
Downstream	Finance & Accounting Accommodation and Food Services Business Consulting Academia Health Care and Services Retail Technology

The next stage was to assign a numerical value to the answers based on the dictionary summary in Table 2. This was done to allow for statistical analyses to be performed on the data.

Table 2*Data Dictionary to Translate Answers into Numerical Values*

Investment Level	Numerical Index
Not sure/Not applicable	0
No investment	1
Low investment	2
Moderate investment	3
High investment	4
Very high investment	5

Classes for Scope 3 Initiatives	Numerical Index
Not sure/ Not applicable	0
Anticipate in more than 5 years	0
Anticipate in more than 2 years	0
Anticipate within 5 years	0
Anticipate within 2 years	1
Yes. Currently reducing	1

Pressure Level	Numerical Index
Not applicable	0
No pressure	1
A little pressure	2
Some pressure	3
Moderate pressure	4
Intense pressure	5

Answer (Has Net Zero Goals)	Numerical Index
Not sure	Null
No	0
Yes	1

3.1.2. Statistical Methods

3.1.2.1. Logistic Regression

This section describes the statistical method of Logistic Regression that was applied to the prepared data. This type of statistical model is used for predictive analysis when the dependent variable only has two possible outcomes called *classes* (Bertsimas, 2016). Logistic Regression estimates the probability of an event occurring based on a set of independent variables. In our study, we used logistic regression in two ways: a) to unveil the sources of pressure that influence companies to establish net zero targets by industry and company type, and b) to understand whether the same sources of pressure encourage the implementation of initiatives to reduce Scope 3 emissions.

To address part a), net zero target acted as our categorical dependent variable with a response of “Yes, we do have an established net zero target” assigned a value of 1 (class 1), and a response of “No” a value of 0 (class 0). The independent variables were then the sources of pressures. Equations 1

through 3 were used to create the logistic regression models. Since in logistic regression the goal is to predict the probability of an event taking place, we used a nonlinear function that only produces values between 0 and 1, as shown in (1), also called the *logistic response function* (Bertsimas, 2016).

To calculate the odds of the target feature (y) being 1, we looked at the simplified version of the logistics response function, as shown in (2). This equation states that when the probability of class 1 is larger than the probability of class 0, the odds are larger than 0, and vice versa. In other words, the odds capture how likely outcome 1 is to succeed over outcome 0. Our model assumed a cut-off value of 0.5 for the odds.

When we take the logarithm of both sides of (2), we obtain the function called *Logit* (3).

$$P(y = 1) = \frac{1}{1 + e^{-(b_0 + b_1x_1 + b_2x_2 + \dots + b_k b_k)}} \quad (1)$$

$$Odds = \frac{P(y=1)}{P(y=0)} = \frac{P(y=1)}{1-P(y=1)} = e^{(b_0 + b_1x_1 + b_2x_2 + \dots + b_k b_k)} \quad (2)$$

$$\log(Odds) = b_0 + b_1x_1 + b_2x_2 + \dots + b_k b_k \quad (3)$$

where,

$P(y=1)$ = probability of event being in class 1

b_0 = intercept

b_k = coefficients indicating the influence of each independent variable, x

x_k = independent variables

When these equations were applied, the model produced a table with the coefficients associated to each source of pressure, as well as a p-value to state the statistical significance of the produced results (refer to APPENDIX B for an example). A p-value less than or equal to 0.05 signals that

the independent variable in question is statistically significant and thus can be assumed to contribute to the company having a publicly available net zero target.

The second part of the analysis used initiatives to reduce Scope 3 emissions as the categorical dependent variable. Table 2 in the Section 3.1.1.2 defines the classes for this categorical variable as applied to Logistic Regression. The same p-values as above were employed.

The independent variables used were:

- End consumers
- Corporate buyers
- Investors
- Employees
- Company executives
- NGOs and other third parties
- Industry associations
- Governments
- Mass media
- Local communities

3.1.2.2. Proportion Test Statistic

We applied a statistical model to explain some of the findings from our descriptive analysis regarding the differences across the supply chain positions of companies when it comes to net zero goal targets. Since the objective is to compare two independent population proportions, we conducted a hypothesis test where the null hypothesis states that the two proportions are the same; that is

$H_0: p_1 = p_2$ against the alternative hypothesis $H_0: p_1 \neq p_2$.

This test statistic compares the proportion of successes in the two populations—as shown in (4)—combined to produce a Z-value—as demonstrated in (5). In our case, the number of participants that have a net zero goal or near-horizon initiatives to reduce Scope 3 emissions represent the successes (Y) and the ones that do not represent the failures (n). For a one-tailed analysis, we use a Z-value of 1.64 (the equivalent of a p-value of 0.05) to establish if one sample is higher than the other. For a two-tailed analysis, we use a Z-value of 1.96 (the equivalent of a p-value of 0.05) to reject the null hypothesis that the samples are equal.

$$\hat{p} = \frac{Y_1 + Y_2}{n_1 + n_2} \quad (4)$$

$$Z = \frac{(\hat{p}_1 - \hat{p}_2)}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \quad (5)$$

3.2. Executive Interviews

To round out our research with a qualitative aspect, we conducted semi-structured, open-ended interviews with supply chain executives from different industries in North America and Europe. This also helped us corroborate trends in our quantitative analyses.

A semi-structured interview refers to an interview guided with a pre-defined list of questions that allows for topical discussions that stray from the list (Barriball & While, 1994). The deviations provided additional insights into how industries approach environmental sustainability that were not directly addressed through the structured questions.

While we had a blueprint of the executive interviews from past years, we added more specialized questions to obtain information regarding environmental sustainability. Since our project looked at sources of pressures by company and industry type, we interviewed executives belonging to

different industries to capture the varying perspectives. The executive interviewee summary is shown in Table 3.

Table 3
Executive Interviews by Industry Sector

Industry Sector	Supply Chain Position	Count of Interviews
Consulting	Downstream	1
Technology & Communications	Downstream	4
Transportation & Warehousing	Midstream	1
Manufacturing	Upstream	1
Industry Trade Association	N/A	1

4. RESULTS

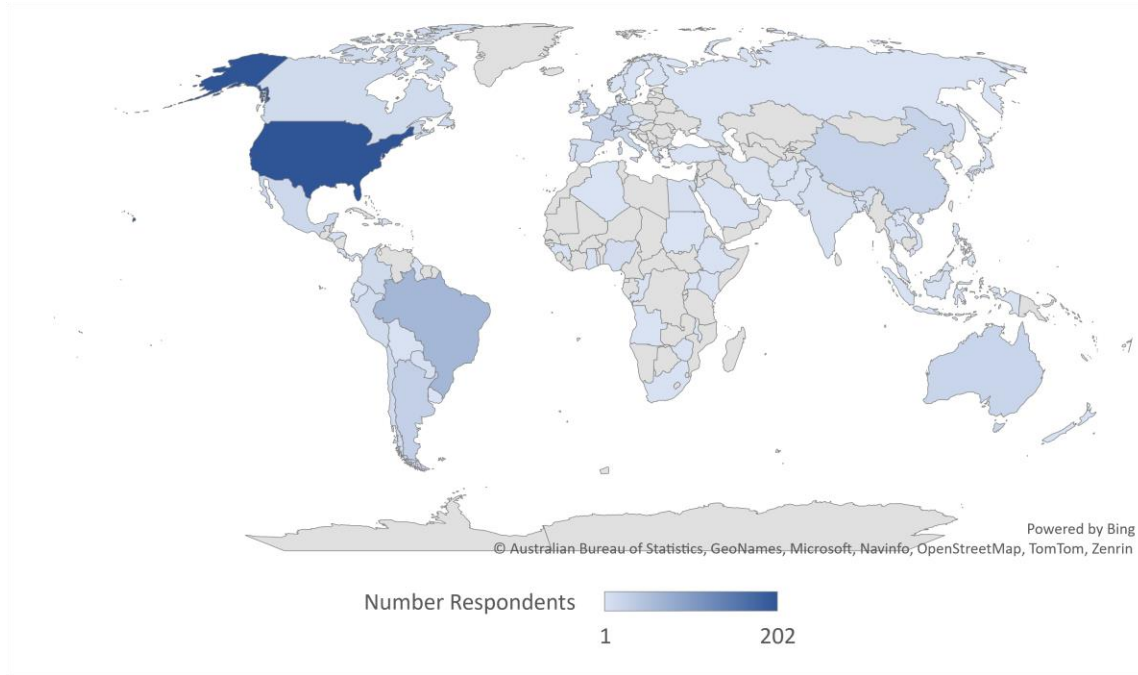
This chapter contains the summary of results obtained from the State of Supply Chain Sustainability 2023 survey and executive interviews as it pertains to our key research questions. The findings include: a summary of the participants’ profile to provide context to the responses, a quantitative analysis of the survey results using various statistical methods, and a qualitative analysis that captures insights from executive interviews performed to round out the research.

4.1. Participant Summary

This capstone analyzed data collected from January 26, 2023, through March 14, 2023. During the period of 48 days, 1,648 respondents started the survey, of which 668 respondents completed it entirely. The 668 responses in the dataset represented 79 countries on four continents. United States of America is the most represented country in terms of respondents, with 202 responses (30%), followed by Brazil, Argentina, United Kingdom, and France with 63, 28, 26 and 24 responses, respectively. The heat map in Figure 2 captures the level of participation for all countries.

Figure 2

Heatmap Capturing the Respondents' Company Headquarters' Location



In 2023, the survey was translated and distributed in four languages. English was the most common language with 64% of the respondents, followed by Spanish (19%), Portuguese (12%), and Mandarin Simplified Chinese (5%). Portuguese was first translated in 2023 and was promoted online in Brazil, which explains why Brazil had the second highest number of responses for this edition of the survey. Please refer to APPENDIX A for more information regarding participation by language and other relevant details about the respondents.

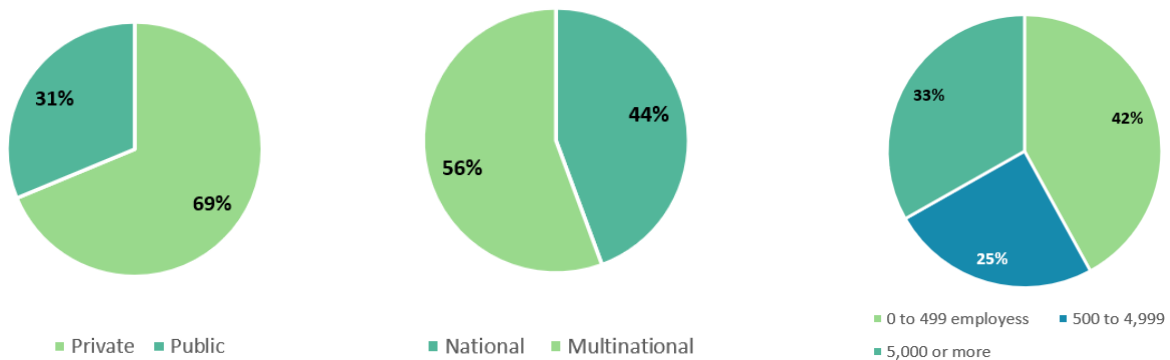
Additional information was asked to gain a deeper understanding of the respondent's company's profile, including the company's headquarters' location. Regarding company type, 69% of the responses are from private companies. In the survey, private companies were defined as not having any publicly traded shares. The companies' area served is balanced for both segments: 56% have a multinational presence and 44% are present in only one country. Evaluating the companies' size by

number of employees, 42% of the responses are from small companies, with up to 499 employees.

Figure 3 shows the breakdown by company type and size.

Figure 3

Company's Profile: Private vs Public; National vs Multinational; Number of Employees



The database consists of a total of 14 industry sectors, the most representative industries are manufacturing, transportation and warehousing, and technology, with each sector accounting for 19%, 17% and 10%, respectively, of the responses. The least representation in the database comes from Finance & Accounting and Accommodation & Food Service, each with 2% of the responses. All 14 industry sectors were classified according to their supply chain position: upstream, midstream, and downstream. Downstream supply chain sectors, closer to end-consumer, are the most representative ones for the analysis. Figure 4 describes the industry sectors and supply chain position for the dataset.

Most of the respondents are employed in core supply chain areas, like supply chain coordination, logistics, and procurement, at 22%, 17% and 10%, respectively. Only 13% of the respondents do not work in any supply chain area or related departments. The most common areas included in others category are general management, law, academic and technology. Most of the respondents' age range is 35 to 44 years old, indicating professionals with significant experience.

Figure 5 represents the percentage per department and age range.

Figure 4

Representation by Industry Sector and Industry Type According to Supply Chain Positioning

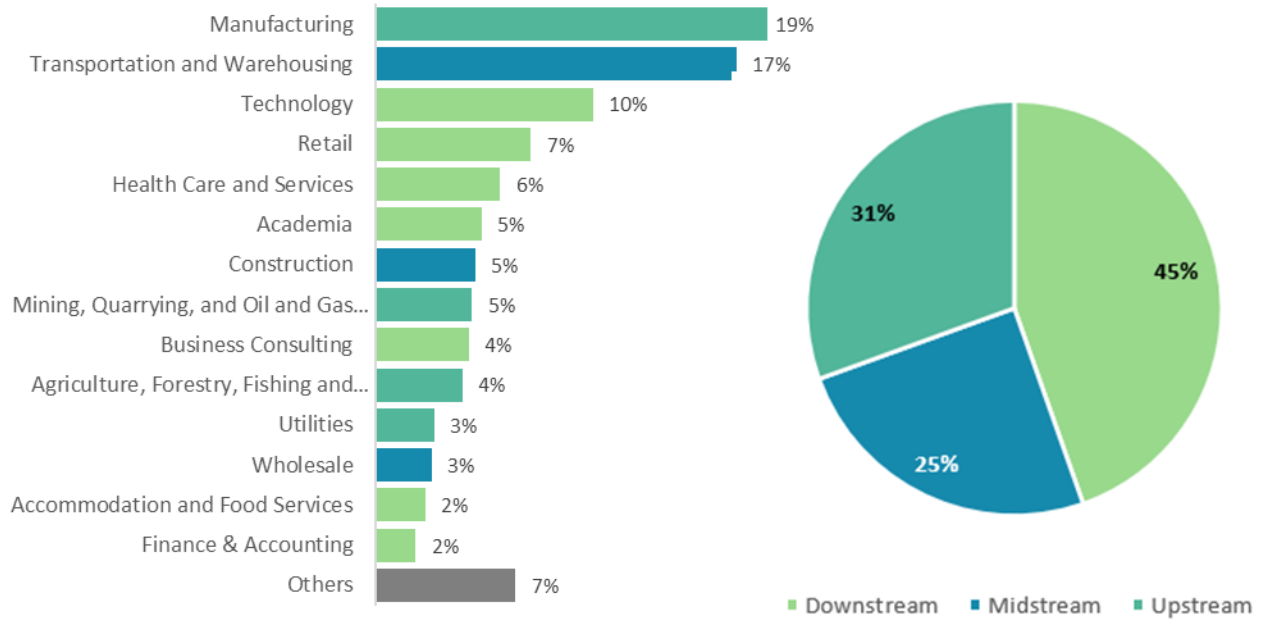
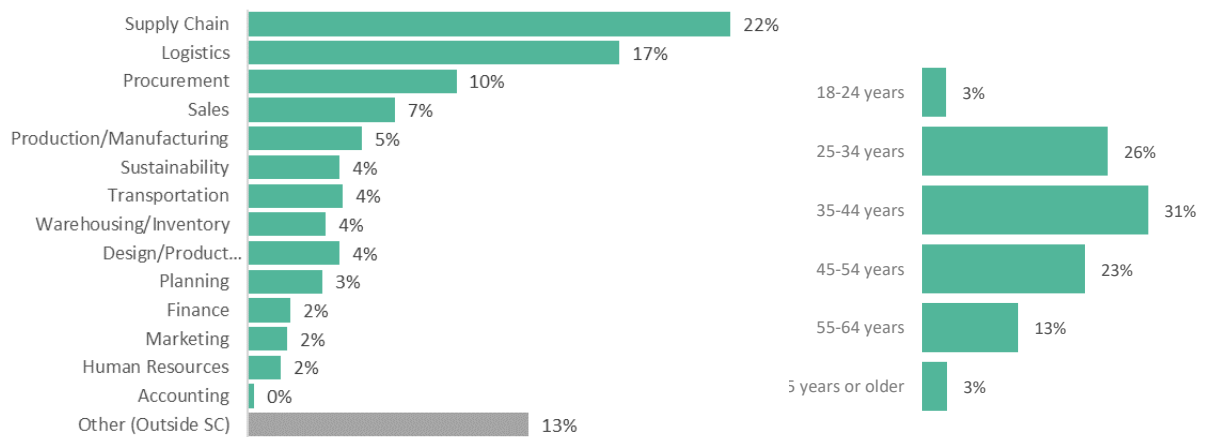


Figure 5

Respondents Department Employed and Age Range



4.2. Environmental Sustainability Commitments

Our research explores the sources of pressure that influence companies to establish net zero targets. It also investigates whether the call to action associated to net zero goals translates into actual plans through the implementation of initiatives to reduce Scope 3 emissions within the next 2 years. To do this, we present, in this section, the descriptive analysis based on the survey data as well as the results from our Logistic Regression analysis. We complement the data with feedback from supply chain executives in various industries to provide a more holistic response to our key research questions.

4.2.1. Summary of Environmental Sustainability Commitments

In this section we present a descriptive analysis from the participants' responses related to environmental sustainability practices. In the 2023 survey, 56% of the participants affirmed that their companies have publicly stated sustainability goals, and 62% reported that their companies are increasing the sustainability of their supply chains through financial or human resources investments. Figures 6 and 7 summarize the respondents' perceptions of their companies' goals and investments in supply chain sustainability, including both social and environmental dimensions.

Figure 6

Percentage of Responses with Companies' Publicly Stated Sustainability Goals

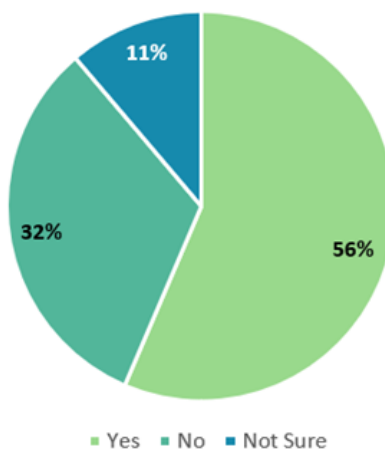
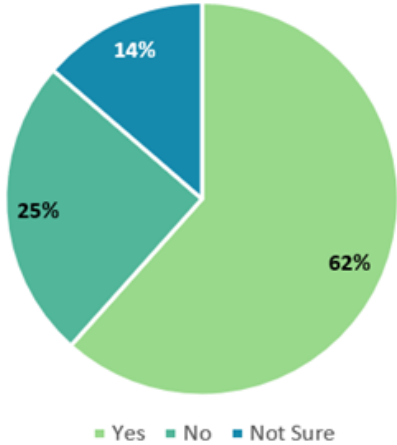


Figure 7

Percentage of Respondents Reporting Investments in Supply Chain Sustainability



The survey also included the respondents' understanding of their company's prioritization of social and environmental sustainability dimensions, and how this prioritization translates into sustainability goals and investments. We observed the top two dimensions prioritized by respondents for sustainability goals and investments are similar. Per Figure 8, 77% of the respondents perceive *employee welfare & safety* as a high, or very high, priority in their company for supply chain sustainability goals. This high prioritization of the goals also is also reflected in the investment priority, with 65% of the responses classifying investments as having a high, or very high, priority (see Figure 9). The second dimension prioritized is *energy savings and renewable energy*, in which 73% of the respondents identify as a high, or very high, goal priority; 66% also observe it as a prioritized investment for driving sustainability in the organization. The additional dimensions have some differences in the prioritized goals and commitments, as well as the respondents' perception of prioritized investments.

Figure 8

Firm's Priorities for Supply Chain Sustainability Goals by Dimension

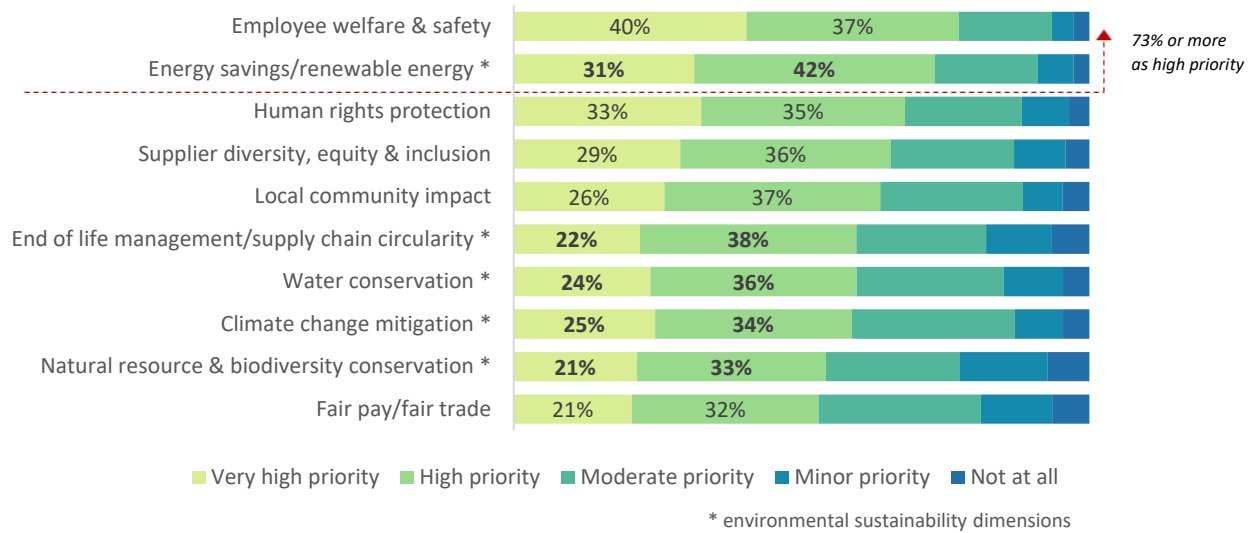
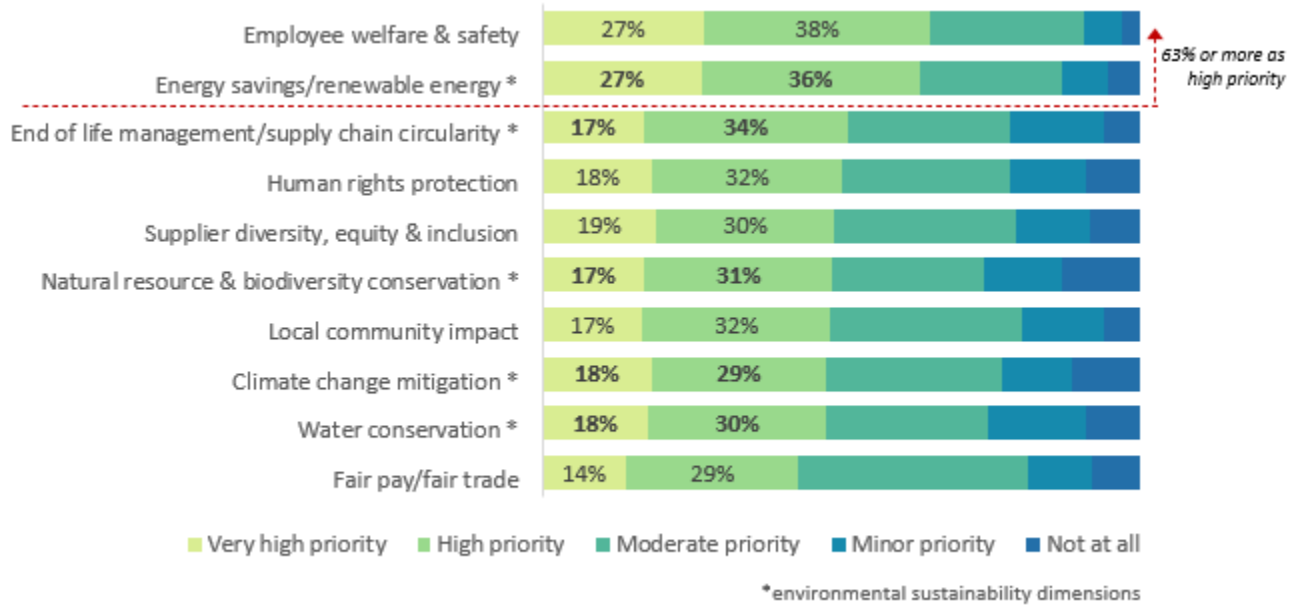


Figure 9

Firm's Priorities for Supply Chain Sustainability Investment by Dimension

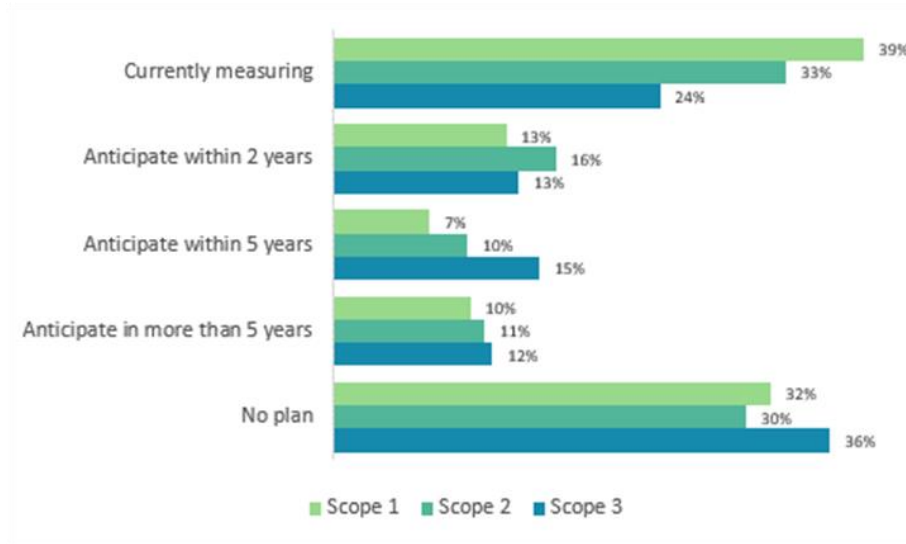


The 2023 survey also included a comprehensive analysis of companies' commitments regarding greenhouse gas (GHG) emissions. The GHG is one of the best-known indicators to translate environmental goals and commitments in tangible metrics and initiatives to reduce emissions. The GHG commitments are usually tracked using the following four metrics: net zero (GHG neutral), Scope 1, Scope 2, and Scope 3 emissions (defined in Section 2.3.2). Despite an increase of adopting emissions neutral goals, only 36% of the respondents confirmed their companies have goals to become net zero in a pre-defined timeline.

To become net zero, companies need to measure and reduce emissions in their entire value chain, by netting emissions in Scope 1, Scope 2, and Scope 3. The survey assessed the companies' ability to measure their emissions, as well as how the goals are translated into actions and initiatives. In the 2023 survey, we observed similar behaviors for measurements and initiatives; companies are more confident in reducing their emissions in Scope 1 and Scope 2. Per Figure 11, 43% and 34% of the respondents observed their companies are currently reducing Scope 1 and Scope 2, respectively; for Scope 3, 36% of the respondents affirm that their companies have no plan to measure (Figure 10) and 34% have no plan to define initiatives to reduce the emissions in the near term.

Figure 10

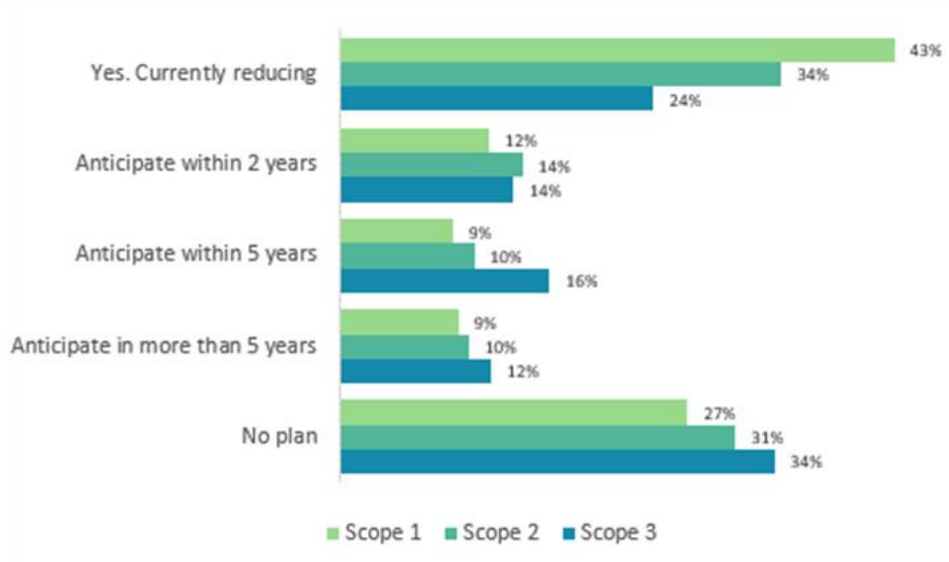
Companies' Expected Readiness to Measure Scope 1, Scope 2, and Scope 3 Emissions



Note: Percentage represents the level of respondent participation by target timeline

Figure 11

Companies' Expected Readiness to Implement Scope 1, Scope 2, and Scope 3 Reduction Initiatives

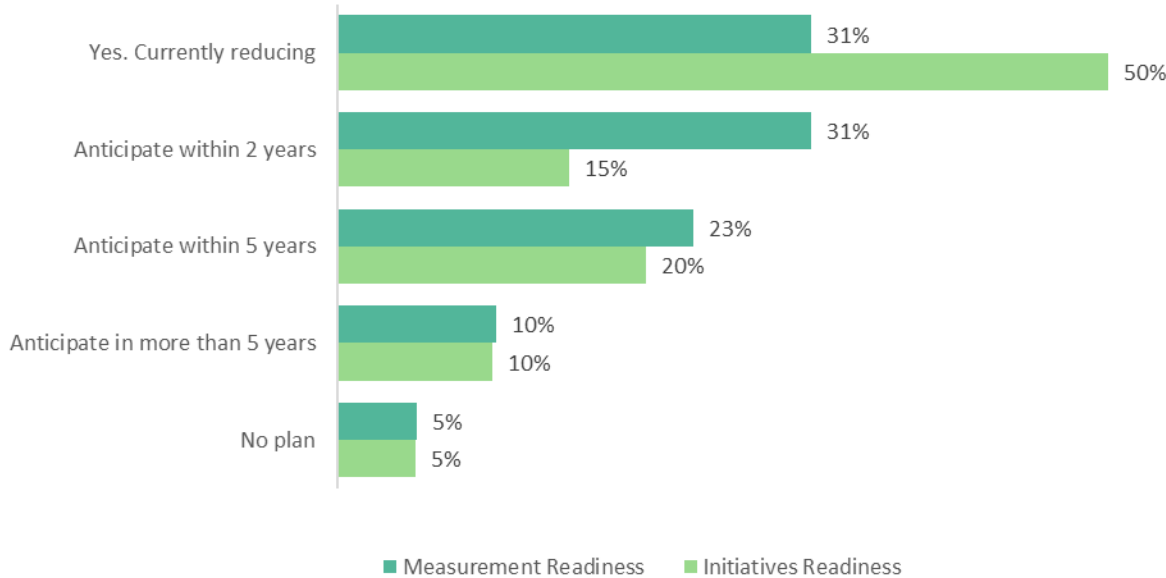


Note: Percentage represents the level of respondent participation by target timeline

In our research, we also analyzed how ready the companies with net zero commitments are to achieve their goals, by examining their plans for implementing Scope 3 initiatives in the coming years. In our database, 48 companies have made net zero goal commitments by 2030, and only a few are already measuring and reducing their Scope 3 emissions. Additionally, 15% of the companies that have publicly committed to reach net zero by 2030 have no plan to implement initiatives to reduce their Scope 3 emissions within the next 5 years. Figure 12 shows the current and anticipated ability to measure and the timeline for implementing initiatives to reduce Scope 3 emissions by companies with a net zero goal by 2030.

Figure 12

Companies’ Readiness to Measure and Implement Scope 3 Reduction Initiatives When They Have Net Zero Goals



Note: Data includes only companies with 2030 as their net zero targets

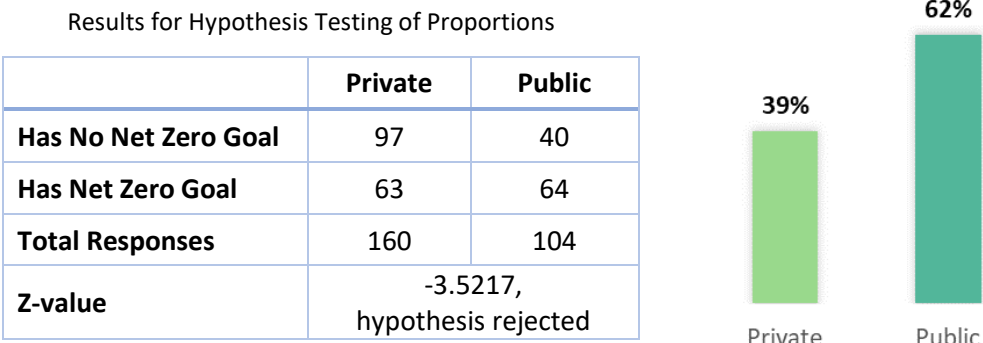
4.2.2. Net Zero Targets

The 4th survey continued to reveal differences in companies’ goals and investments levels towards environmental sustainability. This year was the first time that the survey included a question on

net zero targets. Based on the responses obtained, we discovered that more public companies—meaning those with publicly traded shares—have established net zero goals when compared to private companies. Figure 13 presents the Z-value of -3.5217 for the statistical analysis performed on the two percentages. Since it is smaller than -1.64 (equivalent to a 95% confidence level), there is sufficient evidence to conclude that the two populations of private versus public differ with respect to setting net zero goals.

Figure 13

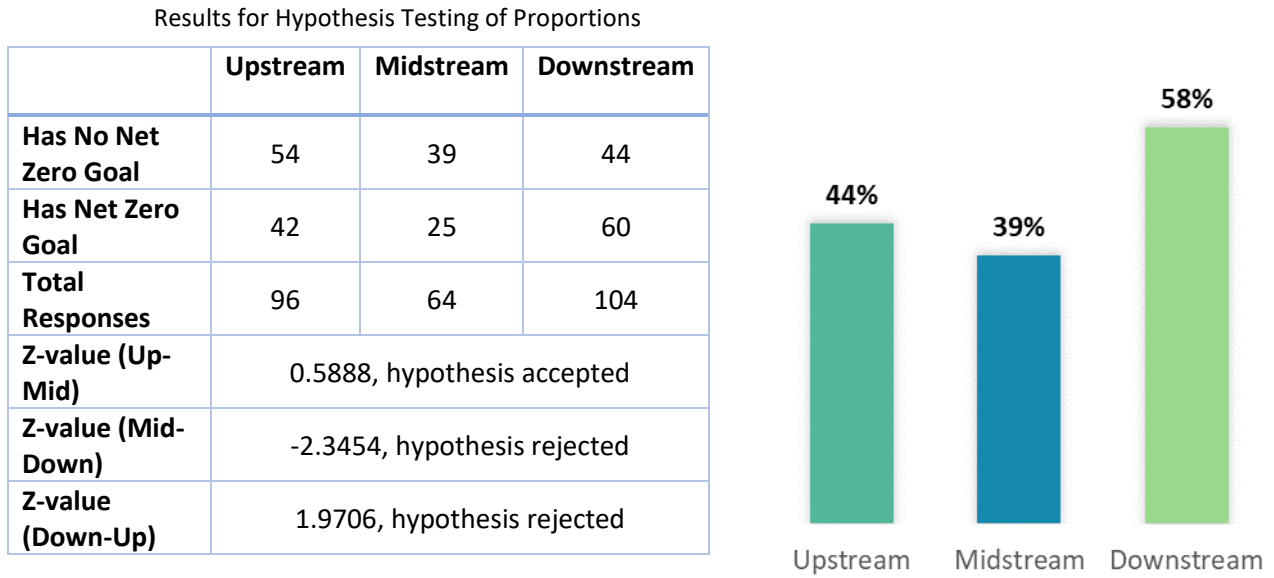
Comparison of Net Zero Goal Setting by Company Type with Statistical Analysis



Additionally, when we look at the percentage of companies with net zero goals by supply chain position, we learn that more companies in the downstream industries have net zero goals compared to industries further away from the end consumers (Figure 14). Based on the statistical test performed to compare the groups, we can conclude that the downstream supply chain position differs from the other two. There is not enough evidence to reject the null hypothesis that the upstream and midstream positions are not the same in terms of net zero goal setting as the Z-value for the test resulted in 0.5888 (<1.96).

Figure 14

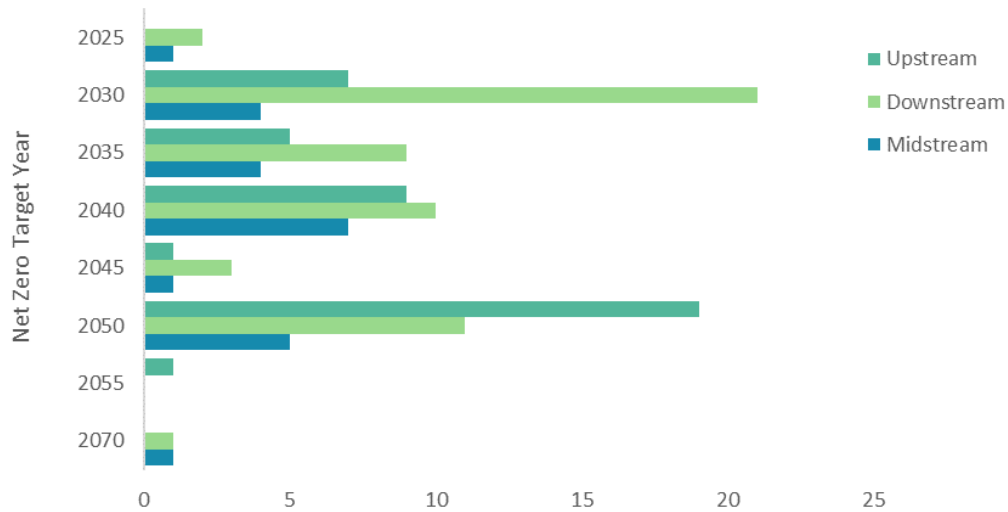
Comparison of Net Zero Goal Setting by Supply Chain Position with Statistical Analysis



Focusing only on companies with net zero targets, those in the downstream supply chain position tend to have more aggressive timelines compared to those in the upstream and midstream industries, as shown in Figure 15.

Figure 15

Number of Respondents Citing Net Target Year, by Supply Chain Position



The logistic regression analysis performed on the survey responses produced the results summarized in Table 4. As expected, based on previous studies on the subject, investors play a crucial role in applying pressure to have set targets on environmental sustainability such as net zero goals. Public companies are heavily influenced by investors compared to private companies, as expressed by the higher coefficient contributing to a company having a net zero goal.

Table 4

Logit Coefficients for Sources of Pressure to Have Net Zero Targets by Company Type

Source of Pressure	Overall	Public	Private
End consumers	-0.0665	-0.0915	-0.0543
Corporate buyers	-0.1367	0.1228	-0.2344
Investors	0.3755 **	0.5254 *	0.3085 *
Employees	0.1242	0.1048	0.0925
Company executives	-0.1485	-0.3630	-0.0517
NGOs and other third parties	0.0938	0.0570	0.1369
Industry associations	-0.2630	-0.3002	-0.2541
Governments	-0.2037	-0.2912	-0.2211
Mass media	0.1000	0.2485	0.1089
Local communities	0.1963	0.1555	0.1663

Note: * *p*-value ≤ 0.05 , ** *p*-value = 0.00

Table 5 highlights that investors continue to be the main drivers for companies in the midstream and downstream supply chain positions to have net zero goals.

Table 5*Logit Coefficients for Sources of Pressure to Have Net Zero Targets by Supply Chain Position*

Source of Pressure	Upstream	Midstream	Downstream
End consumers	-0.1138	-0.0275	-0.1947
Corporate buyers	0.0665	-0.3520	-0.0859
Investors	0.2207	0.5343 *	0.4731 *
Employees	0.1296	0.1994	-0.0748
Company executives	-0.1412	-0.5160	0.2613
NGOs and other third parties	-0.0801	0.3738	0.0189
Industry associations	-0.1534	-0.2501	-0.5836 *
Governments	-0.1683	-0.2457	-0.2617
Mass media	0.0553	-0.1350	0.2155
Local communities	0.1642	0.4996	0.3945

Note: * $p\text{-value} \leq 0.05$, ** $p\text{-value} = 0.00$

In the upstream position, there were no statistically significant sources of pressure. Since the reason for this result may be related to competing influences within the industries belonging to the upstream supply chain position, we further broke down the data into more precise sets, analyzing each group by both supply chain position and company type. The results are summarized in Table 6 and 7.

Table 6*Logit Coefficients for Sources of Pressure to Have Net Zero Targets of Private Companies by Supply Chain Position*

Source of Pressure	Upstream Private	Midstream Private	Downstream Private
End consumers	-0.0207	-0.0729	-0.4683
Corporate buyers	-0.1159	-0.5212	0.1843
Investors	0.5342	0.5989	0.2232
Employees	0.3456	-0.1910	-0.3612
Company executives	-0.3030	-0.4775	0.7989 *
NGOs and other third parties	0.2548	0.8670	-0.4946
Industry associations	-0.5243	-0.3366	-0.2159
Governments	-0.4715	-0.1559	-0.2241
Mass media	-0.6478	0.5265	0.1585
Local communities	0.8809 *	-0.1500	0.4951

Note: * $p\text{-value} \leq 0.05$, ** $p\text{-value} = 0.00$

Table 7

Logit Coefficients for Sources of Pressure to Have Net Zero Targets of Public Companies by Supply Chain Position

Source of Pressure	Upstream Public	Midstream Public	Downstream Public
End consumers	-0.2419	Not enough data points	-0.0122
Corporate buyers	0.7745		0.0317
Investors	-0.4830		1.1910 *
Employees	-0.4781		-0.1796
Company executives	-0.5825		-0.3515
NGOs and other third parties	-0.3107		0.5116
Industry associations	0.1144		-1.1110
Governments	0.2353		-0.7369
Mass media	1.1753 *		-0.0734
Local communities	-0.1057		1.0410

*Note: * p-value ≤ 0.05, ** p-value = 0.00*

Due to the lack of data points for the midstream industries, we were not able to explore the differences between private and public midstream companies. Instead, we only gather that, for the midstream private sector, there are not statistically significant sources of pressures with a confidence level of 95%. For the upstream private, local communities are an important influencer given its large coefficient of 0.8809. For upstream public sector, mass media’s coefficient of 1.1753 signals that media is a strong source of influence. Looking at the downstream position in the private sector, company executives are highly influential as shown by the logit coefficient of 0.7989; in the public sector, investors remain as the main—and only statistically significant—source of pressure.

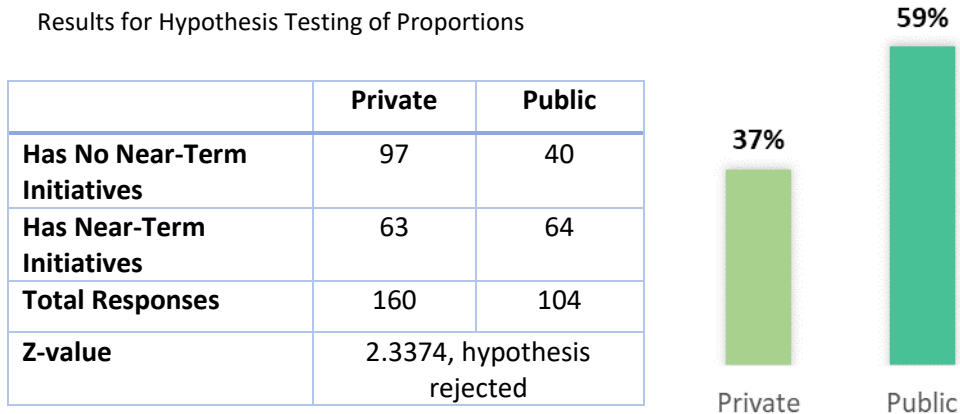
The Section 4.2.3 in this report explores whether these calls for action through net zero targets translate into plans for action.

4.2.3. Initiatives to Reduce Scope 3 Emissions

From the results outlined in Section 4.2.2, we learned that public companies are more likely to have net zero goals compared to private companies. We conducted a one-tailed hypothesis test to investigate if public companies with net zero goals are more likely to have near-term initiatives focused on reducing Scope 3 emissions compared to private companies. The Z-value of -2.3374 for this one-tailed test allowed us to reject the null hypothesis that both private and public companies behave the same towards initiative setting with a confidence level of 95% (equivalent to a Z-value of 1.64). Figure 16 shows how, in line with previous findings, public companies are more likely to have near-term initiatives to reduce Scope 3 emissions.

Figure 16

Comparison of Initiative Setting to Reduce Scope 3 by Company Type with Statistical Analysis



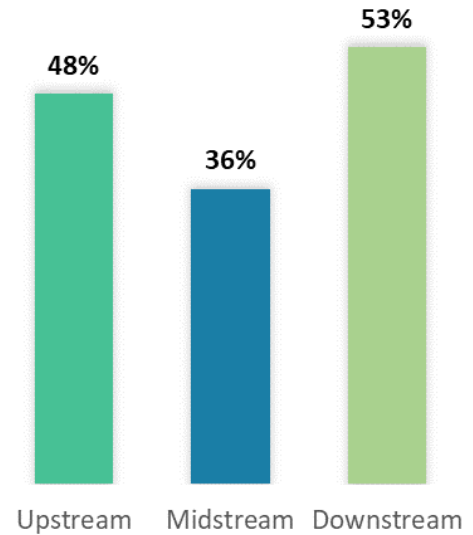
When looking at the differences by supply chain position, we found that despite the varying percentages (with the downstream industries showing higher percentage of companies with Scope 3 initiatives in the near term), we cannot confidently reject the hypothesis that companies behave differently depending on their supply chain position. The Z-values for the two-tailed hypothesis tests conducted and the percentages for each supply chain position are summarized in Figure 17.

Figure 17

Comparison of Initiative Setting by Supply Chain Position with Statistical Analysis

Results for Hypothesis Testing of Proportions

	Upstream	Midstream	Downstream
Has No Near-Term Initiatives	54	39	44
Has Near-Term Initiatives	42	25	60
Total Responses	96	64	104
Z-value (Up-Mid)	-1.2395, hypothesis accepted		
Z-value (Mid-Down)	0.8454, hypothesis accepted		
Z-value (Down-Up)	0.3613, hypothesis accepted		



Since our hypothesis also addressed the influence that sources of pressure could have on the creation and implementation of activities to reduce Scope 3 emissions, we conducted a logistic regression analysis similar to that done in Section 4.2.2. The target variable was whether the company has initiatives that are ongoing or anticipated within 2 years; the independent variables were the same as before. The dataset for this study included only entries where the participant declared that a net zero goal had been set by their company. Due to the small sample size for the Midstream sub-dataset, the model could not converge, so Midstream was excluded from the results. Table 8 presents the Logit coefficients for each source of pressure from the analysis. As evidenced by the lack of p-values less than or equal to 0.05, the same sources of pressure that influenced companies to set net zero targets are not influencing companies to create initiatives to reduce Scope 3 emissions.

Table 8*Logit Coefficients for Sources of Pressure to Have Initiatives to Reduce Scope 3 Emissions*

Source of Pressure	Overall	Upstream	Downstream	Public	Private
End consumers	0.0816	0.1936	-0.0133	0.2976	-0.0468
Corporate buyers	-0.1952	-0.1695	0.0039	-0.3361	0.0495
Investors	0.1692	0.0196	0.2650	0.0639	0.0410
Employees	0.2506	0.2995	0.0609	0.2426	0.5993
Company executives	-0.1265	0.1269	0.0307	-0.2126	-0.0617
NGOs and other third parties	-0.1037	-0.1065	-0.3149	-0.2929	-0.3669
Industry associations	0.1781	0.1994	0.1543	0.4625	0.2379
Governments	-0.0473	-0.2348	0.3691	-0.0720	0.0653
Mass media	-0.0039	0.0003	-0.5528	0.2952	-0.5183
Local communities	-0.2336	-0.3523	0.0934	-0.3069	-0.1572

Note: * p -value ≤ 0.05 , ** p -value = 0.00

4.3. Executive Interview Insights

This section consists of key insights from supply chain leaders related to the importance of environmental sustainability. A total of eight semi-structured executive interviews were conducted with supply chain leaders from companies in different supply chain positions. Five of the interviewed companies are positioned in the downstream supply chain, two in the upstream, and one in the midstream. Additionally, some of the interviewed companies are consulting or technology providers, sharing their perspective on observed sustainability trends in their industry. The interviews followed an open conversation with questions set as guidance to discuss supply chain sustainability, focusing on environmental goals and initiatives and the main sources of pressure. Please refer to APPENDIX A for the executive interview questions guide.

- I. **Relevance of environmental sustainability:** As a result of increasing pressures from stakeholders, companies are focusing more on environmental sustainability. Comparing the results from 2023 Report with previous years, environmental sustainability has risen to the top priorities for supply chain sustainability goals and initiatives (see Figure 8). In 2020, the year the survey was launched, we observed higher prioritization of social sustainability compared to the rest, with the top 3 items all belonging to the social sustainability pillar. This year, *energy savings and renewable energy use* was the number two priority for companies' commitments and investments, showing that environmental has becoming more relevant.

Feedback from a consulting company servicing players across the three supply chain positions corroborates this trend:

"We have been observing an increase in environmental compliance among our customers as well. [Companies] are allocating more budget and staff for environmental regulations and some customers are even self-regulating themselves."

Chief Product and Marketing Officer at a contractor management software company – downstream supply chain position

- II. **Public companies are more likely to have net zero goals:** Public companies have more stakeholders to respond to when compared to companies in the private sector. The different pressures stakeholders exert on them will increase the probability for a company to adopt net zero goals. Two of our interviewees shared their insights regarding the topic.

"Public companies certainly see equity in [adopting net zero goals] and I think they're more engaged in many ways, making more investments."

Senior Vice President at Council of Supply Chain Management Professionals

“By far the large majority [of companies with net zero goals] is public [...] because they do not have the same type of requirements that [private] companies do.”

Vice President, ESG at a large North American third part logistics company – midstream supply chain position

- III. Sustainability goals vary by supply chain position:** A company will adopt sustainability targets, like net zero goals, depending on the pressures it experiences based on their place in the supply chain. When asked if companies closer to the end consumer will have more goals and initiatives, the Senior Vice President at CSCMP confirmed that this is indeed the case. According to his perspective, this is because downstream players look at sustainability to protect their brand.

“That is absolutely true. The way I describe this and the challenge that this is confronted with is it’s a brand equity issue and it’s a social responsibility within the company”.

Senior Vice President at Council of Supply Chain Management Professionals

- IV. The lack of net zero goals does not mean a lack of focus on environmental sustainability.** The quantitative results presented in Section 4.2 show that most companies have not established a net zero goal. When discussing this phenomenon with industry professionals, we obtained similar feedback from all three supply chain positions: sustainability targets may come in different forms regardless of whether the company is in the upstream, midstream, or downstream position.

“[Several companies] do have sustainability goals. When asked what type of targets they have, companies selected targets like net zero goals, B-corp, [or] carbon neutral certifications.”

Head of Product Marketing at an environmental platform company – downstream supply chain position

“Before we can make any [net zero] goals, we need to understand where we are. We are working on determining what the sources of data are to calculate our inventory. With this data we can start to model and see what the objective would be and any tactics that would be required to achieve it.”

Vice President, ESG at a large North American third part logistics company – midstream supply chain position

“For environmental sustainability we have net zero emissions for Scope 1 and Scope 2, but not for Scope 3. Due to supply chain complexities, limited control over our supplier’s supply chains, and lack of consistent industry methodologies for measuring Scope 3, our target is to reduce Scope 3 30% by 2030 from what it would be without action.”

Director of Global Reverse Logistics at an electronics manufacturing company – upstream supply chain position

- V. **Sustainability as an advantage for downstream players.** While companies may have different reasons to adopt sustainability goals, in the downstream position it is often seen as a strategic method to remain relevant and competitive. When discussing reasons for companies in the downstream position to adopt net zero goals, two companies mentioned that many of their customers seek to use sustainability as a competitive advantage.

“In the supply chain space, [companies] are often triggered to act and build sustainable solutions by a reactive, competitive fear that they won’t be the first to market. Clearly, there is some sort of end-customer value to them.”

Head of Product Marketing at an environmental platform company – downstream supply chain position

“The growing consumer demand for sustainable products [...] is really driving companies to adopt more sustainable practices in order to remain competitive. You have the rise of social media in digital communication channels which have made it easier for consumers to share information and raise awareness about environmental issues.”

Chief Executive Officer at a logistics platform company – downstream supply chain position

- VI. **The absence of Scope 3 initiatives when there’s net zero goals may be explained by:**
Social license to operate: Using net zero goals as a method to foster a positive reputation among consumers and establishing long-term brand loyalty. Companies may seek to adopt net zero targets

as a way to be recognized as an entity concerned with matters beyond their brand, like climate change. According to the CEO of a company servicing downstream entities, companies may set net zero goals to show commitment to environmental sustainability in front of investors without necessarily having a clear plan to achieve the targets.

“There are a few investors that are more sensitive to [environmental sustainability] than others. [Most investors] ask if you have a goal but do not take the time to understand the impact of Scope 3 emissions related to the company.”

Chief Executive Officer at a reverse logistics platform company – downstream supply chain position

Complexity and/or lack of standardization for measuring Scope 3 emissions. The second, more common, cited reason behind the absence of defined Scope 3 reduction plans is that companies lack a standardized methodology and framework to define their baseline. This means there is no clarity as to how to track and monitor emissions. Without this clear direction, companies are not able to establish realistic milestones towards achieving their net zero goals.

“...you need to narrow [sustainability objectives] down to something that can be measured. If you can’t measure it, then you can’t track it [or] trace it. So unless it is measurable, it is very hard to hold people accountable because it becomes very subjective.”

Senior Vice President at Council of Supply Chain Management Professionals

“It is fundamental to make sure [companies] have a strong methodology and framework to calculate their baseline and future reports. This process avoids recalculations and unintentional misleading reports”.

Chief Product and Marketing Officer at a contractor management software company – downstream supply chain position

“Most companies have a good understanding about their Scope 1 and Scope 2 emissions and controlling it, but the Scope 3 emissions are a little harder and not all companies are clear about what their Scope 3 footprint looks like.”

Executive at a supply chain software company – downstream supply chain position

The qualitative insights from the professionals we interviewed helped us explain some of the results from our quantitative analysis. Section 5 combines the quantitative and qualitative outcomes from our research to provide an interpretation and give additional information supply chain professionals can use to understand the state of environmental sustainability for each supply chain position.

5. DISCUSSION

Section 4 described the main findings of our analysis, covering both the quantitative and qualitative aspects of our research. This section provides our interpretation of the results to address the key research questions of this report. We first discuss what are the sources of pressure that influence a company’s commitment to establish net zero goals based on both their company type and their supply chain position. Then, we focus only on the companies with net zero goals and explained whether the same sources influence these companies to implement near-term initiatives to reduce Scope 3 emissions.

5.1. Net Zero Targets

As concerns around climate change intensify, companies have been more eager to adopt environmental sustainability goals. Comparing the results from 2023 Report to previous years, environmental sustainability has risen to the top priorities for supply chain sustainability goals and initiatives. In 2020, the year the survey was launched, we observed higher prioritization of social sustainability compared to the rest, with the top 3 items belonging to the social sustainability pillar

(Allegue Lara & Barrington, 2020). This year, *energy savings and renewable energy* use was the number two priority for companies' commitments and investments, showing that environmental is becoming more relevant.

To understand whether this increased prioritization of environmental sustainability goals is influenced by different stakeholders, we investigated the sources of pressure that impact a company's decision to set net zero goals based on their type (private or public) and their position in the overall supply chain.

First, we examined net zero goal setting by company type. As expected from previous studies on the subject, investors play a crucial role in applying pressure to have set targets on environmental sustainability such as net zero goals. In their article *Big Three Power, and Why it Matters*, Bebchuk and Hirst describe how the largest three index fund managers in the United States have a significant voting power on corporate decisions. They explain that "clients representing more than \$3.3 trillion in assets entrusted to [one of the Big Three] have made net zero commitments" (Bebchuk et al., 2022, para. 2). Boss and Edkins then discuss, in their own article, how one of three index fund managers looks at ESG initiatives to make decisions. According to their findings, the index fund managers advocate for providing investors with climate-related disclosures "given the role of climate risk and opportunities will play" in investor's portfolios (Boss et al., 2022, para. 1).

While all types of companies are influenced by investors, public companies experience a higher pressure compared to private companies as expressed by the larger coefficient (0.5254 versus 0.3085) contributing to a company having a net zero goal. This increased pressure from investors on public companies is also evident when we apply hypothesis testing to compare the proportions of companies that have net zero goals versus those that do not, by company type (refer to Figure 13). The test results show there is sufficient evidence to conclude that the two populations of private versus public differ

with respect to setting net zero goals. Given the higher percentage of participants with net zero goals in public companies (62% versus 39% in private companies), we can confidently infer that public companies do indeed receive more pressure to set net zero goals.

Interviews with supply chain executives further corroborated our findings on this subject, as demonstrated in Section 4.3. Public companies have more stakeholders to respond to when compared to companies in the private sector. The different pressures stakeholders exert on them will increase the probability for a company to adopt net zero goals. The Senior Vice President at CSCMP confirmed that “public companies certainly see equity” (personal communication, April 24, 2023) and show more commitment towards sustainability through investments compared to private companies. According to a player in the midstream sector, this is because public companies “do not have the same type of requirements” (personal communication, March 3, 2023), signaling that the company type is relevant to the setting of net zero goals.

Once we uncovered the sources of pressure by company type, we explored which stakeholders have an impact on net zero goal setting according to a company’s supply chain position. Based on the statistical test performed to compare the three groups (upstream, midstream, downstream), we can conclude that the downstream supply chain position differs from the other two. There is not enough evidence to reject that the upstream and midstream positions are not the same in terms of net zero goal setting as the Z-value for the test resulted in 0.5888 (<1.96). Additionally, when looking at the target year for achieving net zero goals, companies in the downstream position have the most aggressive timelines (see Figure 15). This validates part of our hypothesis, which established that the closer a company is to the end consumer, the different the behaviors to address environmental concerns would be.

Regarding the sources themselves, both midstream and downstream players are strongly influenced by investors, as denoted by their large, statistically significant coefficients of 0.5343 and 0.4731, respectively. However, downstream industries additionally experience strong pressures (coefficient of -0.5836) from industry associations to not implement net zero goals. This finding was unexpected. While our quantitative findings cannot explain the reason behind this phenomenon, the executive interviews we performed, along with external resources, may provide some insights.

When discussing the absence of net zero goals with the Chief Executive Officer of company servicing customers in the downstream supply chain position, he explained that downstream players often have an issue with a “lack of data, lack of systems, lack of framework” (personal communication, April 19, 2023). Given the challenges to standardize what sustainability means and how it is to be measured and implemented, it is likely industry associations fail to give a good direction for companies to feel confident in setting net zero goals. In his book *Balancing Green: When to Embrace Sustainability in a Business (and When Not To)*, Sheffi (2018, p. 130) talks about how industry standards may result in “weak standards relative to what individual companies might create.” He cites two main reasons for this: 1) company members of the association who may be behind in their journey towards sustainability, and 2) competing standard bodies which result in the “easiest, least costly, and least rigorous code” to be chosen. The selection of the weakest code may contribute to the discouragement by industry associations for downstream players to not adopt net zero goals.

The lack of net zero goals may not necessarily be a negative thing when it comes to environmental sustainability. According to feedback received from interviewees across all supply chain positions (Section 4.3), the absence of net zero goals does not strictly mean an absence of sustainability goals. In the upstream space, the Director of Global Reverse Logistics at an electronics manufacturing company mentioned they do not have a net zero goal, but they do have a set target to reduce Scope 3 emissions by 30% by 2030 (personal communication, April 21, 2023); in the midstream position, the Vice

President of ESG at a large North American logistics company talked about how companies often want to establish their baseline and truly understand their inputs before establishing net zero goals (personal communication, March 6, 2023); and in the downstream, the International Account Executive at a Fintech company discussed that businesses may be setting different sustainability targets such as becoming certified as a B-Corporation or other (personal communication, April 12, 2023).

Going back to our quantitative results from the survey, we could not identify statistically significant sources of pressure for the upstream position in our analysis. Since the reason for this result may be related to competing influences within the industries belonging to the upstream supply chain position, we further broke down the data into more precise sets, analyzing each group by both supply chain position and company type.

According to the survey results and our analysis, private upstream companies receive strong pressures from mainly local communities as denoted by the statistically significant corresponding coefficient of 0.8809. For public upstream companies, the only relevant source of pressure was mass media with a statistically significant coefficient of 1.1753. Being more distanced from the end consumer, the upstream industries are less susceptible to scrutiny coming from outside sources. This is evidenced by the fact that end consumers and non-governmental organizations (NGOs) do not play an active role in companies committing to net zero emissions.

To explain the reason for mass media and local communities exerting pressure on the upstream position, we look into the context of the companies in this space. Upstream industries include those involved in the extraction of non-renewable (such as minerals and hydrocarbons) and renewable (such as forestry, agriculture, fishing, and hunting), as well as manufacturing. These industries are often perceived as having a negative impact to the environment when performed at a commercial level. While they are subject to regulations—which vary widely from one region to another—their impact is mainly

felt by the communities that live in the areas of extraction. When major environmental incidents occur—such as the deforestation of a major park or the accidental or purposeful contamination of waterways—local communities may raise a flag to the mass media to bring attention to the subject seeking retribution and a way forward to undo the damages. For major disasters, mass media, through news segments, documentaries, and social media, may apply pressure to companies to mitigate and correct the damage.

For the downstream private companies, it was interesting to see that the main source of pressure to have net zero targets was that applied by company executives; for public companies in this domain, the main source was the investors. The fact that company executives heavily influence (coefficient of 0.7989) the decision to have net zero targets in downstream private companies signals that sustainability is seen as a strategic advantage. As consumers worry about the future state of the environment, they demand to see their values reflected in the brands they purchase from. To attract and retain these consumers, companies must represent their brands as sustainable, concerned with the environmental and social impacts they may have. The executive interviews we conducted also reflected this finding. When discussing reasons for companies in the downstream position to adopt net zero goals, the International Account Executive at a company in this supply chain position mentioned that many of their private customers seek to use sustainability “as an advantage to generate loyalty and attract customers” (personal communication, April 12, 2023). The Chief Executive Officer of a technology company in the downstream position also voiced that sustainability is crucial for business to remain competitive in a market where being a responsible player is becoming more important (personal communication, April 5, 2023).

Overall, through our quantitative and qualitative analyses, we corroborated previous findings that investors are a main source of pressure for companies to adopt sustainability practices. We also identified sources of stakeholder pressure by company and industry type and explained why these are

different. This information may help supply chain professionals understand the key stakeholders in their industries.

Section 5.2 discusses whether the same sources of pressure influencing companies to have net zero goals exert pressure on companies to implement initiatives that reduce Scope 3 emissions.

5.2. Initiatives to Reduce Scope 3 Emissions

Once we investigated the sources of pressure influencing net zero goal setting, we studied whether companies with net zero goals are indeed implemented initiatives to lower their Scope 3 emissions. We expected to see the same levels of commitment across the different company types, as without initiatives in place, the achievement of the established net zero goals is not realistic. However, we learned that, similarly to net zero goal setting, public companies are more likely to have current or near-term initiatives compared to private companies. The percentage of participation in setting initiatives is lower than expected for all companies, regardless of their type: only 59% of public companies with net zero goals have initiatives in place, compared to 37% of private companies.

When examining companies by their supply chain position, we cannot confidently reject the hypothesis that companies behave differently depending on their supply chain position. The percentage of participation in setting initiatives addressing Scope 3 emissions is between 36% and 53%. In Section 5.1, when we explored downstream player' behaviors towards net zero goals, we found that downstream industries are more likely to adopt these targets. However, we saw that when it came to near-term initiatives to reduce Scope 3 emissions in line with their net zero goals, downstream was no different than upstream and midstream—most companies are simply unprepared to meet their targets.

While it is possible to explain some of the lack of ongoing or near-term initiatives by looking at the target year, we still find 54% of companies with a target of net zero by 2030 do not currently have

initiatives covering their Scope 3 emissions. To understand what the driver behind this behavior may be, we examined the sources of pressure persuading companies to implement near-term initiatives. As evidenced by the lack of p-values under 0.05 in Table 8, the same sources of pressure that influence companies to set net zero targets are not influencing companies to create initiatives to reduce Scope 3 emissions. In fact, companies are not receiving meaningful pressures to apply near-term initiatives at all. These results are concerning, as they put into question the validity of net zero goals and the motivations for stakeholders to pressure for supply chain sustainability. To provide some insights as to this phenomenon, we relied on interviews with supply chain executives.

There were two main findings from our qualitative analysis that help elucidate on the lack of initiatives: 1) the complexity and absence of proper standardization for measuring Scope 3 emissions make it challenging for companies to adopt meaningful initiatives; and 2) companies may be using the setting of net zero goals as a method to build social license to operate.

Regarding the first point, the Senior Vice President at CSCMP explained that companies need to be able to measure and track their emissions, because without this ability, it is not possible to introduce accountability (personal communication, April 24, 2023). Two consulting companies also shared this same view when stating that companies need to have a “strong methodology and framework” to properly calculate Scope 3 emissions (personal communication, April 14, 2023) and that most companies find it hard to understand and control Scope 3 emissions (personal communication, April 13, 2023). The descriptive analysis we performed in Section 4.2 also demonstrates that there are more currently companies with initiatives to reduce Scope 3 emissions than there are companies able to measure Scope 3 emissions. This points to the fact that challenges around tracking Scope 3 emissions may be at the source of the absence of near-term initiatives. Companies are still seeking to understand their GHG impact before they can create initiatives that will contribute to their corporate objectives. Since these initiatives require capital, their value must be shown before the resources can be allocated. Without

clarity on what the true impact of the initiatives will be, it is easier to understand why companies are not adopting Scope 3 reduction programs.

Addressing the second finding, it is also possible companies are setting net zero goals to generate goodwill and reputation among their stakeholders. As previously discussed, companies may be seeking to use sustainability as a part of their brand to remain competitive and attract the growing market of consumers looking for products that are eco-friendly. The CEO of a downstream company also shared that, while investors are focusing on net zero goals, they are generally not asking companies to back these targets with distinctive plans (personal communication, April 19, 2023). This puts into question whether companies are setting net zero goals to obtain backing from investors without prioritizing the actual achievement of these goals.

Our report can only provide the insights from our research without necessarily making conclusions on this topic. We recommend that further studies are performed on this topic to understand why there are discrepancies between the sources of pressures and levels of commitment to net zero goals versus Scope 3 reduction programs.

6. CONCLUSIONS

6.1. Summary and Closing Comments

Our findings confirm that investors continue to be one of the key drivers for companies to address sustainability as part of the corporate strategy through net zero targets. Public companies do show higher levels of commitment and investments related to environmental objectives compared to private companies. While the investors are important, there are other sources of pressure depending on the company and industry type that will influence companies' decisions regarding sustainability.

Our results also show that companies present different behaviors regarding goal setting based on their positioning within the overall supply chain. As hypothesized, downstream players have the greatest levels of commitment via their net zero goals. However, we saw that when it came to near-term initiatives to reduce Scope 3 emissions in line with the net zero goals, downstream was no different than the upstream and midstream positions—they all show companies are generally unprepared to meet their carbon neutrality targets.

These insights put into question the motivation for companies to adopt sustainability targets and set the floor for future research. Are companies using net zero goals to generate goodwill with the public? To brand themselves as sustainable for competitive advantage?

In the end, whatever investments companies make towards sustainability practices need to provide a value to the company. With the growing demand for eco-friendly products, the value may not be easily quantifiable through direct financial metrics, but the efficiencies, increased resiliency to avoid business disruptions, and brand recognition these investments can generate should not be overlooked.

6.2. Recommendations for Future Work

Based on the findings and limitations of this report, we recommend that future research investigate the trends around the setting of net zero targets and Scope 3 reduction initiatives through the years. Part of the future research can delve more deeply into the motivations stakeholders—namely investors—have to pressure for supply chain sustainability: Is it social license to operate? Regulatory compliance? Or something else?

We also suggest that the survey be expanded to new languages to capture a broader audience. This may allow for a better understanding of how the region a company is in plays a role in the type of sustainability goals and commitments implemented by companies throughout the world. Additional

executive interviews spanning a broader range of industries and regions may help to provide new perspectives on supply chain sustainability.

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APPENDIX A

Summary of Survey Data

Table A1

Number of Responses by Survey Language

Language	# of Responses	% of Responses
English	427	64%
Portuguese	82	12%
Spanish	124	19%
Simplified Chinese	35	5%
Total	668	100%

Table A2

Number of Responses by Gender

Gender	# of Responses	% of Responses
Male	471	72%
Female	158	24%
Prefer not to say	26	4%
Total	655	100%

Table A3

Number of Responses by Age Range

Age Range	# of Responses	% of Responses
18-24 years	22	3%
25-34 years	170	26%
35-44 years	207	31%
45-54 years	149	23%
55-64 years	88	13%
65 years or older	23	3%
Total	659	100%

Table A5*Number of Responses by Supply Chain Position*

Supply Chain Position	# of Responses	% of Responses
Downstream	298	45%
Midstream	166	25%
Upstream	204	31%
Total	668	100%

Table A6*Number of Responses by Industry Segment*

Industry Segment	# of Responses	% of Responses
Manufacturing	126	19%
Transportation and Warehousing	116	17%
Technology	70	10%
Retail	50	7%
Health Care and Services	40	6%
Academia	34	5%
Construction	32	5%
Mining, Quarrying, and Oil and Gas Extraction	31	5%
Business Consulting	30	4%
Agriculture, Forestry, Fishing and Hunting	28	4%
Utilities	19	3%
Wholesale	18	3%
Accommodation and Food Services	16	2%
Finance & Accounting	13	2%
Others	45	7%
Total	668	100%

Table A7*Number of Responses by Industry Type*

Industry Type	# of Responses	% of Responses
Private	457	69%
Public	208	31%
Total	665	100%

Table A8*Number of Responses by Industry Area Served*

Industry Area Served	# of Responses	% of Responses
National	295	44%
Multinational	370	56%
Total	665	100%

Table A9*Number of Responses by Industry Size in Number of Employees*

Number of Employees	# of Responses	% of Responses
0-19	78	12%
20-99	100	15%
100-499	99	15%
500-999	50	8%
1,000-4,999	113	17%
5,000-9,999	46	7%
10,000-49,999	74	11%
50,000 or more	99	15%
Total	659	100%

Table A10*Number of Responses by Headquarters' Location*

Headquarters' Location	# of Responses	% of Responses
United States of America	202	30%
Brazil	63	9%
Argentina	28	4%
United Kingdom of Great Britain and Northern Ireland	26	4%
France	24	4%
China	23	3%
Germany	22	3%
Australia	21	3%
Italy	20	3%
Mexico	16	2%
Switzerland	15	2%
Colombia	14	2%
Canada	13	2%
Chile	12	2%
Peru	11	2%

Headquarters' Location (Continuation)	# of Responses	% of Responses
Spain	10	1%
Nigeria	9	1%
India	7	1%
Denmark	6	1%
Netherlands	6	1%
Egypt	5	1%
Paraguay	5	1%
Venezuela, Bolivarian Republic of...	5	1%
Ghana	4	1%
Japan	4	1%
Portugal	4	1%
Bangladesh	3	0%
Belgium	3	0%
Bolivia	3	0%
Ecuador	3	0%
Ireland	3	0%
New Zealand	3	0%
Saudi Arabia	3	0%
South Africa	3	0%
Sweden	3	0%
United Arab Emirates	3	0%
Viet Nam	3	0%
Afghanistan	2	0%
Bhutan	2	0%
Dominican Republic	2	0%
Ethiopia	2	0%
Finland	2	0%
Guinea	2	0%
Guyana	2	0%
Honduras	2	0%
Indonesia	2	0%
Iran	2	0%
Israel	2	0%
Kenya	2	0%
Luxembourg	2	0%
Malaysia	2	0%
Pakistan	2	0%
Panama	2	0%
Uganda	2	0%
Zimbabwe	2	0%
Algeria	1	0%
Angola	1	0%

Headquarters' Location (Continuation)	# of Responses	% of Responses
Austria	1	0%
Bahrain	1	0%
Congo, Republic of the...	1	0%
Costa Rica	1	0%
Czech Republic	1	0%
Gambia	1	0%
Greece	1	0%
Haiti	1	0%
Lao People's Democratic Republic	1	0%
Lebanon	1	0%
Malawi	1	0%
Norway	1	0%
Philippines	1	0%
Russian Federation	1	0%
Singapore	1	0%
Slovakia	1	0%
Slovenia	1	0%
South Korea	1	0%
Sudan	1	0%
Thailand	1	0%
Turkey	1	0%
Uruguay	1	0%
Total	668	100%

APPENDIX B

Logistic Regressions Results for Net Zero Goals Analysis

Figure B1

Summary of Logistic Regression Results for Net Zero Goals Analysis for the Overall Data

Logit Regression Results						
Dep. Variable:	NetZeroGoal	No. Observations:	264			
Model:	Logit	Df Residuals:	254			
Method:	MLE	Df Model:	9			
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.07560			
Time:	13:51:26	Log-Likelihood:	-168.98			
converged:	True	LL-Null:	-182.80			
Covariance Type:	nonrobust	LLR p-value:	0.001095			
		coef	std err	z	P> z 	[0.025 0.975]
Pressure End consumers		-0.0665	0.098	-0.678	0.498	-0.259 0.126
Pressure Corporate buyers		-0.1367	0.102	-1.337	0.181	-0.337 0.064
Pressure Investors		0.3755	0.105	3.574	0.000	0.170 0.581
Pressure Employees		0.1242	0.128	0.972	0.331	-0.126 0.375
Pressure Company executives		-0.1485	0.125	-1.183	0.237	-0.394 0.097
Pressure NGOs and other third parties		0.0938	0.117	0.800	0.424	-0.136 0.324
Pressure Industry		-0.2630	0.144	-1.820	0.069	-0.546 0.020
Pressure Governments		-0.2037	0.119	-1.709	0.087	-0.437 0.030
Pressure Mass media		0.1000	0.127	0.787	0.431	-0.149 0.349
Pressure Local Communities		0.1963	0.132	1.489	0.136	-0.062 0.455

Figure B2

Summary of Logistic Regression Results for Net Zero Goals Analysis for Public Companies

Logit Regression Results						
Dep. Variable:	NetZeroGoal	No. Observations:	104			
Model:	Logit	Df Residuals:	94			
Method:	MLE	Df Model:	9			
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.1231			
Time:	13:51:27	Log-Likelihood:	-60.763			
converged:	True	LL-Null:	-69.293			
Covariance Type:	nonrobust	LLR p-value:	0.04777			
		coef	std err	z	P> z 	[0.025 0.975]
Pressure End consumers		-0.0915	0.185	-0.495	0.621	-0.454 0.271
Pressure Corporate buyers		0.1228	0.198	0.621	0.535	-0.265 0.510
Pressure Investors		0.5254	0.223	2.358	0.018	0.089 0.962
Pressure Employees		0.1048	0.210	0.500	0.617	-0.306 0.515
Pressure Company executives		-0.3630	0.242	-1.503	0.133	-0.836 0.110
Pressure NGOs and other third parties		0.0570	0.191	0.299	0.765	-0.317 0.431
Pressure Industry		-0.3002	0.257	-1.170	0.242	-0.803 0.203
Pressure Governments		-0.2912	0.211	-1.378	0.168	-0.705 0.123
Pressure Mass media		0.2485	0.240	1.035	0.300	-0.222 0.719
Pressure Local Communities		0.1555	0.216	0.720	0.471	-0.268 0.579

Figure B3

Summary of Logistic Regression Results for Net Zero Goals Analysis for Private Companies

Logit Regression Results					
Dep. Variable:	NetZeroGoal	No. Observations:	160		
Model:	Logit	Df Residuals:	150		
Method:	MLE	Df Model:	9		
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.02965		
Time:	13:51:27	Log-Likelihood:	-104.08		
converged:	True	LL-Null:	-107.26		
Covariance Type:	nonrobust	LLR p-value:	0.7034		
	coef	std err	z	P> z	[0.025 0.975]
Pressure End consumers	-0.0543	0.121	-0.450	0.653	-0.291 0.182
Pressure Corporate buyers	-0.2344	0.128	-1.835	0.066	-0.485 0.016
Pressure Investors	0.3085	0.124	2.493	0.013	0.066 0.551
Pressure Employees	0.0925	0.166	0.558	0.577	-0.232 0.417
Pressure Company executives	-0.0517	0.156	-0.331	0.741	-0.358 0.254
Pressure NGOs and other third parties	0.1369	0.162	0.847	0.397	-0.180 0.454
Pressure Industry	-0.2541	0.186	-1.368	0.171	-0.618 0.110
Pressure Governments	-0.2211	0.156	-1.420	0.156	-0.526 0.084
Pressure Mass media	0.1089	0.162	0.671	0.502	-0.209 0.427
Pressure Local Communities	0.1663	0.174	0.958	0.338	-0.174 0.507

Figure B4

Summary of Logistic Regression Results for Net Zero Goals Analysis for Companies in the Upstream Position

Logit Regression Results					
Dep. Variable:	NetZeroGoal	No. Observations:	96		
Model:	Logit	Df Residuals:	86		
Method:	MLE	Df Model:	9		
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.03303		
Time:	13:51:26	Log-Likelihood:	-63.617		
converged:	True	LL-Null:	-65.790		
Covariance Type:	nonrobust	LLR p-value:	0.8872		
	coef	std err	z	P> z	[0.025 0.975]
Pressure End consumers	-0.1138	0.170	-0.668	0.504	-0.447 0.220
Pressure Corporate buyers	0.0665	0.182	0.366	0.714	-0.289 0.422
Pressure Investors	0.2207	0.178	1.243	0.214	-0.127 0.569
Pressure Employees	0.1296	0.234	0.554	0.580	-0.329 0.588
Pressure Company executives	-0.1412	0.208	-0.678	0.498	-0.550 0.267
Pressure NGOs and other third parties	-0.0801	0.200	-0.400	0.689	-0.472 0.312
Pressure Industry	-0.1534	0.223	-0.689	0.491	-0.590 0.283
Pressure Governments	-0.1683	0.169	-0.997	0.319	-0.499 0.163
Pressure Mass media	0.0553	0.185	0.299	0.765	-0.307 0.418
Pressure Local Communities	0.1642	0.200	0.819	0.413	-0.229 0.557

Figure B5

Summary of Logistic Regression Results for Net Zero Goals Analysis for Companies in the Midstream Position

Logit Regression Results					
Dep. Variable:	NetZeroGoal	No. Observations:	64		
Model:	Logit	Df Residuals:	54		
Method:	MLE	Df Model:	9		
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.1501		
Time:	13:51:27	Log-Likelihood:	-36.391		
converged:	True	LL-Null:	-42.818		
Covariance Type:	nonrobust	LLR p-value:	0.1694		
	coef	std err	z	P> z	[0.025 0.975]
Pressure End consumers	-0.0275	0.196	-0.140	0.889	-0.412 0.357
Pressure Corporate buyers	-0.3520	0.238	-1.477	0.140	-0.819 0.115
Pressure Investors	0.5343	0.237	2.255	0.024	0.070 0.999
Pressure Employees	0.1994	0.324	0.616	0.538	-0.435 0.834
Pressure Company executives	-0.5160	0.286	-1.802	0.072	-1.077 0.045
Pressure NGOs and other third parties	0.3738	0.321	1.164	0.244	-0.256 1.003
Pressure Industry	-0.2501	0.371	-0.675	0.500	-0.977 0.477
Pressure Governments	-0.2457	0.307	-0.800	0.424	-0.847 0.356
Pressure Mass media	-0.1350	0.357	-0.378	0.706	-0.835 0.565
Pressure Local Communities	0.4996	0.361	1.382	0.167	-0.209 1.208

Figure B6

Summary of Logistic Regression Results for Net Zero Goals Analysis for Companies in the Downstream Position

Logit Regression Results					
Dep. Variable:	NetZeroGoal	No. Observations:	104		
Model:	Logit	Df Residuals:	94		
Method:	MLE	Df Model:	9		
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.1463		
Time:	13:51:27	Log-Likelihood:	-60.486		
converged:	True	LL-Null:	-70.852		
Covariance Type:	nonrobust	LLR p-value:	0.01390		
	coef	std err	z	P> z	[0.025 0.975]
Pressure End consumers	-0.1947	0.190	-1.025	0.305	-0.567 0.178
Pressure Corporate buyers	-0.0859	0.180	-0.477	0.634	-0.439 0.267
Pressure Investors	0.4731	0.190	2.484	0.013	0.100 0.846
Pressure Employees	-0.0748	0.214	-0.349	0.727	-0.495 0.345
Pressure Company executives	0.2613	0.237	1.104	0.270	-0.203 0.725
Pressure NGOs and other third parties	0.0189	0.198	0.095	0.924	-0.369 0.406
Pressure Industry	-0.5836	0.291	-2.003	0.045	-1.155 -0.012
Pressure Governments	-0.2617	0.272	-0.961	0.337	-0.795 0.272
Pressure Mass media	0.2155	0.284	0.758	0.449	-0.342 0.773
Pressure Local Communities	0.3945	0.257	1.532	0.126	-0.110 0.899

Figure B7

Summary of Logistic Regression Results for Net Zero Goals Analysis for Private Companies in the Upstream Position

Logit Regression Results			
Dep. Variable:	NetZeroGoal	No. Observations:	58
Model:	Logit	Df Residuals:	48
Method:	MLE	Df Model:	9
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.1743
Time:	13:51:27	Log-Likelihood:	-30.851
converged:	True	LL-Null:	-37.363
Covariance Type:	nonrobust	LLR p-value:	0.1616
	coef	std err	z P> z [0.025 0.975]
Pressure End consumers	-0.0207	0.283	-0.073 0.942 -0.575 0.534
Pressure Corporate buyers	-0.1159	0.295	-0.393 0.694 -0.694 0.462
Pressure Investors	0.5342	0.281	1.902 0.057 -0.016 1.085
Pressure Employees	0.3456	0.338	1.021 0.307 -0.318 1.009
Pressure Company executives	-0.3030	0.311	-0.976 0.329 -0.912 0.306
Pressure NGOs and other third parties	0.2548	0.351	0.727 0.467 -0.432 0.942
Pressure Industry	-0.5243	0.381	-1.375 0.169 -1.272 0.223
Pressure Governments	-0.4715	0.330	-1.430 0.153 -1.118 0.175
Pressure Mass media	-0.6478	0.347	-1.866 0.062 -1.328 0.033
Pressure Local Communities	0.8809	0.409	2.152 0.031 0.078 1.683

Figure B8

Summary of Logistic Regression Results for Net Zero Goals Analysis for Private Companies in the Midstream Position

Logit Regression Results			
Dep. Variable:	NetZeroGoal	No. Observations:	46
Model:	Logit	Df Residuals:	36
Method:	MLE	Df Model:	9
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.2164
Time:	13:51:27	Log-Likelihood:	-22.758
converged:	True	LL-Null:	-29.043
Covariance Type:	nonrobust	LLR p-value:	0.1830
	coef	std err	z P> z [0.025 0.975]
Pressure End consumers	-0.0729	0.271	-0.269 0.788 -0.603 0.458
Pressure Corporate buyers	-0.5212	0.335	-1.557 0.119 -1.177 0.135
Pressure Investors	0.5989	0.322	1.860 0.063 -0.032 1.230
Pressure Employees	-0.1910	0.491	-0.389 0.697 -1.154 0.772
Pressure Company executives	-0.4775	0.379	-1.260 0.208 -1.220 0.265
Pressure NGOs and other third parties	0.8670	0.456	1.900 0.057 -0.027 1.761
Pressure Industry	-0.3366	0.505	-0.667 0.505 -1.326 0.652
Pressure Governments	-0.1559	0.422	-0.370 0.712 -0.983 0.671
Pressure Mass media	0.5265	0.524	1.005 0.315 -0.501 1.553
Pressure Local Communities	-0.1500	0.502	-0.299 0.765 -1.134 0.834

Figure B9

Summary of Logistic Regression Results for Net Zero Goals Analysis for Private Companies in the Downstream Position

Logit Regression Results					
Dep. Variable:	NetZeroGoal	No. Observations:	56		
Model:	Logit	Df Residuals:	46		
Method:	MLE	Df Model:	9		
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.1295		
Time:	13:51:28	Log-Likelihood:	-33.791		
converged:	True	LL-Null:	-38.816		
Covariance Type:	nonrobust	LLR p-value:	0.3465		
	coef	std err	z	P> z	[0.025 0.975]
Pressure End consumers	-0.4683	0.267	-1.751	0.080	-0.993 0.056
Pressure Corporate buyers	0.1843	0.259	0.711	0.477	-0.324 0.693
Pressure Investors	0.2232	0.237	0.943	0.345	-0.241 0.687
Pressure Employees	-0.3612	0.302	-1.195	0.232	-0.953 0.231
Pressure Company executives	0.7989	0.381	2.095	0.036	0.052 1.546
Pressure NGOs and other third parties	-0.4946	0.320	-1.548	0.122	-1.121 0.132
Pressure Industry	-0.2159	0.366	-0.590	0.555	-0.934 0.502
Pressure Governments	-0.2241	0.388	-0.578	0.563	-0.984 0.536
Pressure Mass media	0.1585	0.365	0.434	0.664	-0.558 0.875
Pressure Local Communities	0.4951	0.383	1.294	0.196	-0.255 1.245

Figure B10

Summary of Logistic Regression Results for Net Zero Goals Analysis for Public Companies in the Upstream Position

Logit Regression Results					
Dep. Variable:	NetZeroGoal	No. Observations:	38		
Model:	Logit	Df Residuals:	28		
Method:	MLE	Df Model:	9		
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.2631		
Time:	13:51:28	Log-Likelihood:	-19.060		
converged:	True	LL-Null:	-25.864		
Covariance Type:	nonrobust	LLR p-value:	0.1370		
	coef	std err	z	P> z	[0.025 0.975]
Pressure End consumers	-0.2419	0.380	-0.636	0.524	-0.987 0.503
Pressure Corporate buyers	0.7745	0.501	1.546	0.122	-0.208 1.757
Pressure Investors	-0.4830	0.503	-0.960	0.337	-1.469 0.503
Pressure Employees	-0.4781	0.495	-0.967	0.334	-1.447 0.491
Pressure Company executives	-0.5825	0.457	-1.276	0.202	-1.477 0.312
Pressure NGOs and other third parties	-0.3107	0.394	-0.788	0.431	-1.084 0.462
Pressure Industry	0.1144	0.452	0.253	0.800	-0.772 1.001
Pressure Governments	0.2353	0.367	0.640	0.522	-0.485 0.956
Pressure Mass media	1.1753	0.476	2.470	0.014	0.243 2.108
Pressure Local Communities	-0.1057	0.362	-0.291	0.771	-0.816 0.605

Figure B11

Summary of Logistic Regression Results for Net Zero Goals Analysis for Public Companies in the Downstream Position

Logit Regression Results					
Dep. Variable:	NetZeroGoal	No. Observations:	48		
Model:	Logit	Df Residuals:	38		
Method:	MLE	Df Model:	9		
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.3618		
Time:	13:51:28	Log-Likelihood:	-19.499		
converged:	True	LL-Null:	-30.553		
Covariance Type:	nonrobust	LLR p-value:	0.008544		
		coef	std err	z	P> z [0.025 0.975]
Pressure End consumers		-0.0122	0.413	-0.030	0.976 -0.821 0.797
Pressure Corporate buyers		0.0317	0.398	0.080	0.936 -0.749 0.812
Pressure Investors		1.1910	0.528	2.256	0.024 0.156 2.226
Pressure Employees		-0.1796	0.455	-0.395	0.693 -1.071 0.711
Pressure Company executives		-0.3515	0.619	-0.568	0.570 -1.564 0.861
Pressure NGOs and other third parties		0.5116	0.365	1.400	0.162 -0.205 1.228
Pressure Industry		-1.1110	0.754	-1.474	0.140 -2.588 0.366
Pressure Governments		-0.7369	0.654	-1.128	0.259 -2.018 0.544
Pressure Mass media		-0.0734	0.880	-0.083	0.933 -1.797 1.651
Pressure Local Communities		1.0410	0.619	1.681	0.093 -0.173 2.255

APPENDIX C

Logistic Regression Results for Scope 3 Analysis

Figure C1

Summary of Logistic Regression Results for Scope 3 Analysis for the Overall Data

Logit Regression Results					
Dep. Variable:	Scope3_Initiatives	No. Observations:	127		
Model:	Logit	Df Residuals:	117		
Method:	MLE	Df Model:	9		
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.02928		
Time:	13:51:30	Log-Likelihood:	-85.356		
converged:	True	LL-Null:	-87.931		
Covariance Type:	nonrobust	LLR p-value:	0.8210		
	coef	std err	z	P> z	[0.025 0.975]
Pressure End consumers	0.0816	0.146	0.560	0.575	-0.204 0.367
Pressure Corporate buyers	-0.1952	0.160	-1.221	0.222	-0.509 0.118
Pressure Investors	0.1692	0.171	0.991	0.322	-0.166 0.504
Pressure Employees	0.2506	0.191	1.310	0.190	-0.124 0.626
Pressure Company executives	-0.1265	0.197	-0.642	0.521	-0.513 0.260
Pressure NGOs and other third parties	-0.1037	0.184	-0.564	0.573	-0.464 0.257
Pressure Industry	0.1781	0.228	0.780	0.435	-0.269 0.626
Pressure Governments	-0.0473	0.195	-0.243	0.808	-0.430 0.335
Pressure Mass media	-0.0039	0.200	-0.019	0.984	-0.395 0.387
Pressure Local Communities	-0.2336	0.205	-1.141	0.254	-0.635 0.168

Figure C2

Summary of Logistic Regression Results for Scope 3 Analysis for Public Companies

Logit Regression Results					
Dep. Variable:	Scope3_Initiatives	No. Observations:	64		
Model:	Logit	Df Residuals:	54		
Method:	MLE	Df Model:	9		
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.06891		
Time:	13:51:30	Log-Likelihood:	-40.251		
converged:	True	LL-Null:	-43.230		
Covariance Type:	nonrobust	LLR p-value:	0.7441		
	coef	std err	z	P> z	[0.025 0.975]
Pressure End consumers	0.2976	0.226	1.315	0.188	-0.146 0.741
Pressure Corporate buyers	-0.3361	0.234	-1.437	0.151	-0.795 0.122
Pressure Investors	0.0639	0.301	0.212	0.832	-0.527 0.654
Pressure Employees	0.2426	0.273	0.889	0.374	-0.292 0.778
Pressure Company executives	-0.2126	0.314	-0.677	0.498	-0.828 0.403
Pressure NGOs and other third parties	-0.2929	0.276	-1.060	0.289	-0.834 0.249
Pressure Industry	0.4625	0.371	1.248	0.212	-0.264 1.189
Pressure Governments	-0.0720	0.277	-0.260	0.795	-0.615 0.471
Pressure Mass media	0.2952	0.282	1.048	0.295	-0.257 0.847
Pressure Local Communities	-0.3069	0.298	-1.029	0.304	-0.892 0.278

Figure C3

Summary of Logistic Regression Results for Scope 3 Analysis for Private Companies

Logit Regression Results				
Dep. Variable:	Scope3_Initiatives	No. Observations:	63	
Model:	Logit	Df Residuals:	53	
Method:	MLE	Df Model:	9	
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.06674	
Time:	13:51:31	Log-Likelihood:	-38.586	
converged:	True	LL-Null:	-41.346	
Covariance Type:	nonrobust	LLR p-value:	0.7869	
		coef	std err	z P> z [0.025 0.975]
	Pressure End consumers	-0.0468	0.217	-0.216 0.829 -0.471 0.378
	Pressure Corporate buyers	0.0495	0.260	0.190 0.849 -0.460 0.559
	Pressure Investors	0.0410	0.237	0.173 0.863 -0.424 0.506
	Pressure Employees	0.5593	0.358	1.563 0.118 -0.142 1.261
	Pressure Company executives	-0.0617	0.286	-0.216 0.829 -0.622 0.498
	Pressure NGOs and other third parties	-0.3669	0.349	-1.052 0.293 -1.051 0.317
	Pressure Industry	0.2379	0.372	0.639 0.523 -0.492 0.967
	Pressure Governments	0.0653	0.339	0.193 0.847 -0.598 0.729
	Pressure Mass media	-0.5183	0.352	-1.471 0.141 -1.209 0.172
	Pressure Local Communities	-0.1572	0.342	-0.459 0.646 -0.828 0.514

Figure C4

Summary of Logistic Regression Results for Scope 3 Analysis for Companies in the Upstream Position

Logit Regression Results				
Dep. Variable:	Scope3_Initiatives	No. Observations:	42	
Model:	Logit	Df Residuals:	32	
Method:	MLE	Df Model:	9	
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.04854	
Time:	13:51:30	Log-Likelihood:	-27.654	
converged:	True	LL-Null:	-29.065	
Covariance Type:	nonrobust	LLR p-value:	0.9710	
		coef	std err	z P> z [0.025 0.975]
	Pressure End consumers	0.1936	0.288	0.671 0.502 -0.372 0.759
	Pressure Corporate buyers	-0.1695	0.344	-0.493 0.622 -0.843 0.504
	Pressure Investors	0.0196	0.425	0.046 0.963 -0.814 0.853
	Pressure Employees	0.2995	0.426	0.702 0.483 -0.536 1.135
	Pressure Company executives	0.1269	0.378	0.336 0.737 -0.614 0.868
	Pressure NGOs and other third parties	-0.1065	0.390	-0.273 0.785 -0.871 0.658
	Pressure Industry	0.1994	0.457	0.437 0.662 -0.696 1.094
	Pressure Governments	-0.2348	0.341	-0.689 0.491 -0.903 0.433
	Pressure Mass media	0.0003	0.364	0.001 0.999 -0.713 0.713
	Pressure Local Communities	-0.3523	0.358	-0.985 0.325 -1.054 0.349

Figure C5

Summary of Logistic Regression Results for Scope 3 Analysis for Companies in the Downstream Position

Logit Regression Results					
Dep. Variable:	Scope3_Initiatives	No. Observations:	60		
Model:	Logit	Df Residuals:	50		
Method:	MLE	Df Model:	9		
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.05542		
Time:	13:51:30	Log-Likelihood:	-39.158		
converged:	True	LL-Null:	-41.455		
Covariance Type:	nonrobust	LLR p-value:	0.8681		
	coef	std err	z	P> z	[0.025 0.975]
Pressure End consumers	-0.0133	0.264	-0.050	0.960	-0.531 0.504
Pressure Corporate buyers	0.0039	0.252	0.015	0.988	-0.490 0.498
Pressure Investors	0.2650	0.247	1.072	0.284	-0.220 0.750
Pressure Employees	0.0609	0.261	0.234	0.815	-0.450 0.572
Pressure Company executives	0.0307	0.320	0.096	0.924	-0.597 0.659
Pressure NGOs and other third parties	-0.3149	0.267	-1.178	0.239	-0.839 0.209
Pressure Industry	0.1543	0.313	0.493	0.622	-0.459 0.767
Pressure Governments	0.3691	0.324	1.141	0.254	-0.265 1.003
Pressure Mass media	-0.5528	0.394	-1.405	0.160	-1.324 0.218
Pressure Local Communities	0.0934	0.346	0.270	0.787	-0.584 0.771

Figure C6

Summary of Logistic Regression Results for Scope 3 Analysis for Private Companies in the Upstream Position

Logit Regression Results					
Dep. Variable:	Scope3_Initiatives	No. Observations:	20		
Model:	Logit	Df Residuals:	10		
Method:	MLE	Df Model:	9		
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.2031		
Time:	13:51:31	Log-Likelihood:	-10.968		
converged:	True	LL-Null:	-13.763		
Covariance Type:	nonrobust	LLR p-value:	0.7802		
	coef	std err	z	P> z	[0.025 0.975]
Pressure End consumers	0.7969	0.837	0.952	0.341	-0.844 2.438
Pressure Corporate buyers	-0.2170	0.774	-0.280	0.779	-1.735 1.300
Pressure Investors	-0.9796	0.997	-0.982	0.326	-2.934 0.975
Pressure Employees	0.8800	1.114	0.790	0.429	-1.303 3.063
Pressure Company executives	0.5720	0.766	0.747	0.455	-0.929 2.073
Pressure NGOs and other third parties	-0.7259	1.012	-0.718	0.473	-2.709 1.257
Pressure Industry	0.3430	1.146	0.299	0.765	-1.903 2.589
Pressure Governments	-0.4563	1.401	-0.326	0.745	-3.202 2.289
Pressure Mass media	-0.9973	1.160	-0.860	0.390	-3.270 1.276
Pressure Local Communities	0.5388	1.395	0.386	0.699	-2.196 3.274

Figure C7

Summary of Logistic Regression Results for Scope 3 Analysis for Private Companies in the Downstream Position

Logit Regression Results						
Dep. Variable:	Scope3_Initiatives	No. Observations:	28			
Model:	Logit	Df Residuals:	18			
Method:	MLE	Df Model:	9			
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.4039			
Time:	13:51:31	Log-Likelihood:	-10.879			
converged:	True	LL-Null:	-18.249			
Covariance Type:	nonrobust	LLR p-value:	0.09833			
		coef	std err	z	P> z	[0.025 0.975]
Pressure End consumers		-0.5855	0.568	-1.030	0.303	-1.700 0.528
Pressure Corporate buyers		-0.2981	0.877	-0.340	0.734	-2.016 1.420
Pressure Investors		1.9587	1.059	1.849	0.064	-0.117 4.035
Pressure Employees		0.5709	0.755	0.756	0.450	-0.909 2.051
Pressure Company executives		0.2631	0.737	0.357	0.721	-1.182 1.708
Pressure NGOs and other third parties		-2.0130	1.127	-1.787	0.074	-4.221 0.195
Pressure Industry		0.0863	0.811	0.106	0.915	-1.504 1.676
Pressure Governments		2.5388	1.300	1.952	0.051	-0.010 5.088
Pressure Mass media		-2.2390	1.069	-2.094	0.036	-4.334 -0.144
Pressure Local Communities		-0.9453	1.031	-0.917	0.359	-2.966 1.076

Figure C8

Summary of Logistic Regression Results for Scope 3 Analysis for Public Companies in the Upstream Position

Logit Regression Results						
Dep. Variable:	Scope3_Initiatives	No. Observations:	22			
Model:	Logit	Df Residuals:	12			
Method:	MLE	Df Model:	9			
Date:	Thu, 20 Apr 2023	Pseudo R-squ.:	0.2451			
Time:	13:51:32	Log-Likelihood:	-11.512			
converged:	True	LL-Null:	-15.249			
Covariance Type:	nonrobust	LLR p-value:	0.5879			
		coef	std err	z	P> z	[0.025 0.975]
Pressure End consumers		0.4589	0.467	0.983	0.326	-0.456 1.374
Pressure Corporate buyers		-1.2399	0.830	-1.494	0.135	-2.867 0.387
Pressure Investors		1.4805	1.036	1.429	0.153	-0.551 3.512
Pressure Employees		0.2960	0.911	0.325	0.745	-1.489 2.081
Pressure Company executives		-0.5301	0.665	-0.797	0.426	-1.834 0.774
Pressure NGOs and other third parties		-0.2682	0.669	-0.401	0.688	-1.579 1.043
Pressure Industry		0.8544	0.877	0.974	0.330	-0.865 2.574
Pressure Governments		0.2268	0.686	0.331	0.741	-1.118 1.572
Pressure Mass media		0.1002	0.575	0.174	0.862	-1.026 1.226
Pressure Local Communities		-1.4904	1.023	-1.457	0.145	-3.496 0.515

APPENDIX D

2023 Executive Interview Questions

- In your view, how important is SC sustainability in your industry? How might this change in this next five years?
- Which areas of SC sustainability—e.g., labor, climate change, emissions, waste, water use—are afforded the highest priority in your company and industry?
- In your industry, how relevant is environmental sustainability compared to other sustainability efforts and initiatives?
- Does your company receive external or internal pressure to commit to environmental sustainability?
- Has the pressure increased? Recently, in the last five or ten years, or not at all? Please explain your answer.
- Does your company have net zero goals? If so, are they a result of external or internal pressures?
- What kind of initiatives does your company/industry have to meet its net zero goals? How are you addressing SCOPE 1, 2 and 3?
- What role do SC professionals generally play in pursuing environmental sustainability? How can they make a difference in this space?
- What are the biggest barriers to supply chain sustainability success and the practices that are the hardest to implement in your industry and company?