Meijer Scope 3 Carbon Accounting Framework and Inventory [Redacted]

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Executive Summary

This project was conducted by six University of Michigan's School of Environment and Sustainability graduate students (referred to as the research team) to support Meijer's core values of sustainability by developing a Scope 3 greenhouse gas emissions (GHG) accounting framework and conducting a baseline emissions inventory for the fiscal year of 2021. Meijer has made significant progress in Scope 1 and Scope 2 goal setting and reductions. This research document outlines the foundational framework Meijer will use to carry out its Scope 3 GHG emissions inventory and calculates a benchmark inventory to inform goal-setting in the future.

As a retailer with business activities including procurement, distribution, manufacturing, and retail operations in six U.S. states, Meijer has a vast and complex value chain. In order to expand its sustainability programs and goals outside of its direct operations and into its value chain, Meijer must first complete a Scope 3 inventory to identify the most pertinent areas of impact and the most carbon intensive categories. This report helps establish that baseline.

Scope 3 emissions are defined as "indirect emissions that occur in a company's value chain." These are separate from the Scope 1 and 2 emissions that occur as part of a company's direct operations. Scope 3 is intended to record, measure and manage the emissions occurring in a company's value chain, between a company's suppliers, manufacturers, and customers. The categories are intended to be mutually exclusive to avoid double counting emissions across Scope 3 categories or with Scope 1 or 2 GHG accounting.

The research team utilized the The Corporate Value Chain (Scope 3) Accounting and Reporting Standard as guidance for calculating the relevant and material Scope 3 categories for Meijer. Out of the 15 Scope 3 Categories, 11 were deemed material; the four eliminated categories were excluded based on insignificant materiality to the business. The research team worked with internal Meijer stakeholders to procure data in alignment with the GHG Protocol guidance. Calculation methods were selected given data availability and constraints. A major challenge the research team encountered when mapping the US Environmentally-Extended Input-Output (USEEIO) emission factors, specifically for Category 1, to Meijer's categories of goods and services, were misaligned categories between the two. To identify the business area in both sales and spend data, Meijer uses UNSPSC ID codes. It is difficult to map these codes to the EPA's Emission Factors (EFs), which use NAICS codes, as there are not always direct matches. Additionally, the USEEIO methodology is based on an estimate of economic value of the goods and services, so as Meijer's sales grow in the future, so will Category 1 while using the USEEIO methodology. However, the USEEIO methodology is well suited to illustrate emission "hotspots" and which categories are the highest carbon emitters within Category 1. Going forward, Meijer could use its supplier's Scope 1 and Scope 2 emissions data to calculate Meijer's Scope 3 Purchased Goods and Services, eliminating the need for USEEIO methodology.

As part of this research report, the team inventoried Meijer's emissions for the baseline year of 2021. The results are as follows: The total estimated Scope 3 emissions is 19,200,000 Mt CO_2e. The three most contributing categories are Purchased Goods (65% of total emissions), Use of Sold Products (24% of total emissions), and Downstream Transportation and Distribution (5% of total emissions) as shown in ES 1. For additional reference, Meijer's Scope 1 total was 271,770 Mt CO_2e and Scope 2 total was 666,417 Mt CO_2e (for a combined total of 938,187 Mt CO_2e) for Fiscal Year (FY) 2021.

ES 1. Summary of Scope 3 Emissions per Category, Respective Percentages of Total Emissions and Estimated Level of Certainty Table

Scope 3 Category	**Category Emissions ($MtCO_2e$)**	**Percentage of Total Scope 3 Emissions (%)**	**Estimated Level of Certainty**
Category 1 - Purchased Goods and Services	12,300,00	65%	High
Category 2 - Capital Goods	252,000	1%	Medium
Category 3 - Fuel-and Energy-Related Activities	639,000	3%	High
Category 4 - Upstream Transportation and Distribution*	-	-	
Category 5 - Waste Generated in Operations	66,800	<1%	Low
Category 6 - Business Travel	1,100	<1%	High
Category 7 - Employee Commuting	109,000	1%	Medium
Category 8 - Upstream Leased Assets	83	<1%	High
Category 9 - Downstream Transportation and Distribution	1,030,000	5%	Low
Category 10 - Processing of Sold Products**	-	-	
Category 11 - Use of Sold Products	4,550,000	24%	Low
Category 12 - End-of-Life Treatment of Sold Products	270,000	1%	Low
Category 13 - Downstream Leased	-	-	

Assets**			
Category 14 - Franchises**	-	-	
Category 15 - Investments**	-	-	
TOTAL	**19,200,000**	**100%**	

** This category was not able to be calculated, insufficient data were available*
*** This category was not calculated due to insignificant materiality to Meijer*

In addition to estimating the Scope 3 emissions, the research team highlights a number of factors for future consideration: areas where data availability was limiting, methodology shortcomings particularly given data needs, and challenges with calculating downstream categories where consumer behavior data are not readily available (e.g., within the Downstream Transportation and Distribution Category). These discussions will improve the accuracy of future Meijer Scope 3 inventory calculations.

In Section 5.0 of this report, the research team provides a detailed list of recommendations to lower emissions in each category. The Meijer sustainability team should focus on the highest emitting categories first (i.e., Purchased Goods and Services, Use of Sold Products, and Downstream Transportation and Distribution).

Some examples of ideas the Meijer sustainability team could pursue:

Category 1 - Purchased Goods and Services	Meijer's top three emitting categories within purchased goods and services are Dairy & Frozen, Meat & Seafood, and Direct Store Delivery (DSD). This covers about 32% of the Scope 3 emissions for this category. Some possible ideas to reduce emissions: ● Within the top three categories it is important to understand the most contributing subcategories: ○ Within the Dairy & Frozen category, the most carbon-intense subcategories are Eggs and Milk, Ice Cream, and Frozen Vegetables. ○ In the Meat & Seafood Category, Beef and Packed Meat are the most carbon-intense subcategories ● Identify the main supplier(s) in these subcategories and design a supplier engagement strategy based on their business practice. For example, the engagement strategy for farmers may be different than manufacturers. ● Support development of a platform for suppliers to enter their Scope 1 and Scope 2 emissions data. This platform could be designed by the retail industry, enabling suppliers to enter their emissions data once and automatically share it with all the retailers they work with. ● Particularly for animal-based products (Dairy, Meat, Seafood) consider suppliers that are working on Scope 1 and Scope 2

	reductions within their own value chain. ○ Encourage suppliers to reduce emissions from animal feed: A significant portion of the emissions associated with meat and dairy production come from the production of animal feed. ○ Encourage suppliers to adopt regenerative farming practices, such as rotating crops, reducing tillage, and incorporating cover crops. ○ Encourage suppliers to reduce food waste: Food waste is a significant contributor to greenhouse gas emissions. ○ Encouraging suppliers to reduce emissions from transportation and logistics ○ Encourage suppliers to adopt renewable energy sources, such as solar or wind power. This could include options like renewable energy credits and on-site renewables. ○ Encourage suppliers to report their emissions and set targets for emissions reductions ● Establish a supplier recognition program to incentivize and reward suppliers for making sustainable improvements. Incentives could involve participation in on-site audits, training sessions, and performance improvement plans.
Category 9 - Downstream Transportation and Distribution	Meijer does not have oversight or authority over this category, since it is based on consumers of their products and how the individual transports their items home. However there are a few behavior change tactics Meijer could employ: ● Expand electric vehicle charger offerings at Meijer stores to encourage drivers of electric vehicles to make Meijer a primary shopping location. ● Promote more shared vehicle/carpooling or bike transportation to Meijer stores. ● Consider more "Meijer Grocery" or "Market" format stores to encourage urban dwellers to walk or bike to stores as opposed to driving long distances. ● Prioritize new store locations based on population densities to reduce the amount of vehicle-miles an individual will drive to buy groceries. ● Encourage customers to volume buy over several trips of few items, perhaps incentivize consumers with larger discounts based on basket totals. ● Encourage customers to use more digital grocery delivery fulfillment by third parties (like UberEats, Shipt). This can decrease GHG emissions by 22–65%[1] compared to the base case of an individual grocery shopping in a traditional SUV.
Category 11 - Use of Sold Products	Category 11 has a significant impact on the overall total GHG emissions. Considering that 95% of this category's emissions are tied to the gasoline that

[1] Carbon Footprint of Alternative Grocery Shopping and Transportation Options from Retail Distribution Centers to Customer Nicholas J. Kemp, Luyao Li, Gregory A. Keoleian, Hyung Chul Kim, Timothy J. Wallington, and Robert De Kleine Environmental Science & Technology 2022 56 (16), 11798-11806. DOI: 10.1021/acs.est.2c02050

	is sold at Meijer Express stations it would be beneficial to think about offsetting the gasoline emissions or reducing the volume of gasoline sold over time. A few ideas for Meijer to pursue: ● Invest in certified carbon reduction projects to offset the emissions generated in the use of gasoline. This could be a partnership with a third party that can help measure the offset needed to be carbon neutral (in this category). ● Encourage consumers to electrify their transportation by continuing to promote EV charging stations at Meijer locations and other electrification behavior changes.

A critical next step will be for Meijer to work closely with its internal stakeholders and suppliers to enact the proposed GHG Scope 3 Action Plan. This partnership with stakeholders and suppliers will enable Meijer to develop strategies towards positive climate action for long-term change. About 95% of Meijer's total estimated emissions are attributed to Scope 3 (based on internal calculations of Scope 1 and Scope 2 emission totals). Therefore, engaging Meijer suppliers will be an effective strategy to reduce the overall carbon footprint. The research team recommends Meijer work collaboratively with suppliers to identify opportunities to reduce emissions. These relationships can lead to new opportunities for emissions reductions and cost savings through the creation of low carbon technologies, products, and strategies.

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Acronyms and Abbreviations

CDP: Carbon Disclosure Project
CO_2e.: Carbon dioxide equivalents
EF: Emission Factor
EPA: Environmental Protection Agency
FY: Fiscal Year
GHG: Greenhouse Gas
GHG Protocol: Greenhouse Gas Protocol
GWP: Global Warming Potential
IPCC: International Panel on Climate Change
kWh: Kilowatt Hours
LCA: Life Cycle Assessment
LCI: Life Cycle Inventory
MPG: Miles Per Gallon
Mt: Metric Tons
$MtCO_2e$: Carbon dioxide equivalents in metric tons
NAICS code:North American Industry Classification System Code
SBTi: Science-Based Targets initiative
SBT: Science-Based Targets
SEAS: School for Environment and Sustainability
TCFD: Task Force on Climate-Related Financial Disclosures
USDA: United States Department of Agriculture
USEEIO: US Environmentally-Extended Input-Output
UNSPSC ID codes: United Nations Standard Products and Services Code

1.0 Introduction and Background

1.1 Project Objective and Scope

More than three dozen of the largest retailers in the United States have established or committed to establishing Science-Based Targets (SBTs) that provide a clear path to reduce greenhouse gas emissions[2]. Businesses must quantify their current emissions, set specific and meaningful carbon reduction targets with measurable interim goals, reduce greenhouse gas emissions, and report on their progress as part of the SBTi process. Retailers face a significant challenge to set and meet SBTi targets. Typically, more than 79% of the emissions associated with their operations occur outside of their direct control as "scope 3" emissions[3] per the Scope 3 GHG Protocol guidelines.

The GHG Protocol Corporate Standard and related standards, developed by the World Resources Institute, categorize a company's emissions into scopes 1, 2, and 3. Scope 1 emissions are owned or directly controlled by a business, such as natural gas consumed to heat a building or diesel to fuel a vehicle. Scope 2 emissions include energy purchases (electricity) for power in owned or leased buildings. Scope 1 and 2 emissions pose fewer challenges to track and manage and, thus, ultimately reduce for the reason that retailers have more direct control over them. Scope 3 emissions are more arduous to manage and reduce because they include the total emissions produced throughout the supply chain of the products sold by retailers (upstream emissions) and the emissions produced after the products leave the retailer's control (downstream emissions).

Meijer is committed to reducing their carbon footprint and has made significant progress in Scope 1 and 2 emissions reduction since they began their first carbon accounting project with University of Michigan's School for the Environment and Sustainability in 2014[4]. Since then, Meijer has reduced its absolute Scope 1 and 2 carbon emissions by 17% and its carbon intensity by 30%, normalized by operational area[3].

In 2022, Meijer publicly announced an ambitious target to reduce Scope 1 and 2 emissions by 50% by 2025. This goal is in accordance with guidance from the IPCC of limiting global warming to 1.5 degrees Celsius increase with a rapid decrease by 2030. Meijer has not made a net-zero commitment. However, since Meijer completes a Scope 1 and Scope 2 inventory annually, this body of work completes the picture of total emissions by providing a baseline level of Scope 3 emissions. With a complete emissions inventory, Meijer can evaluate setting emissions reduction targets that are verified by the SBTi.

This report focuses on creating a framework to capture and account for the GHG emissions included in Scope 3 for the fiscal year of 2021, specifically from January 30, 2021 to January 28,

[2] "NRF | Retailers set science-based targets to address climate change." 8 Nov. 2021, https://nrf.com/blog/retailers-set-science-based-targets-address-climate-change. Accessed 11 Mar. 2023.
[3] "Supply Chain Guidance | US EPA." https://www.epa.gov/climateleadership/supply-chain-guidance. Accessed 8 Feb. 2023.
[4] "Projects - Center for Sustainable Systems - University of Michigan." https://css.umich.edu/research/projects?area=5&field_status_project_value=All&order=title&sort=asc&s=&research_areas=All&status=All&sort_by=date&page=3. Accessed 11 Mar. 2023.

2022. This will become the baseline year for which to compare Scope 3 emission reductions in the future.

1.2 Meijer's History and Climate Initiatives

Meijer was founded in Greenville, Michigan in 1934 by Hendrik Meijer, a Dutch immigrant. In 1962, Hendrick and his son, Fred, pioneered the first supercenter format store in America. The company's growth in store openings was made possible by consolidating the operation of several area warehouses into a distribution center. In 1965, Meijer opened its first distribution center in Walker, Michigan, one of the largest warehouses for food storage in the Western Michigan area, serving 20 Meijer Super Markets and six Thrifty Acres. In 1974, the retailer opened its first distribution center in Lansing, Michigan. The Lansing Distribution Complex would become Meijer's leading Supply Chain and Manufacturing hub, enabling growth to eastern markets in Detroit and Ohio and production of fresh foods under Meijer private label brands.

Meijer now offers a complete one-stop shopping experience with over 40 other departments, including Apparel, Automotive, Grocery, Health and Beauty Care, Home Decor, Pharmacy, Electronics, Pets, and more. About half of the company's 269 stores are in Michigan; the others are in Illinois, Indiana, Kentucky, Ohio, and Wisconsin. The chain is ranked by Forbes as the 13th-largest private company in the United States and is the country's 21st-largest retailer by revenue as of 2020[5].

Meijer is a long time proponent of sustainability dating back to the 1970s. In fact, Fred Meijer spoke at the first Earth Day celebration on April 22, 1970. That is where the company motto "Earth Day Every Day" stems from and is continually used to guide strategic decisions and operational choices. In 2016, the company created the Meijer Environmental Commitment and the Sustainability Council, both of which promote sound environmental decisions, raise sustainability issues and coalesce internal stakeholders. Meijer's environmental sustainability strategies ladder up to four key pillars: carbon emissions reduction, food waste reduction, circular economy, and Great Lakes stewardship.

1.3 Climate Change Risks to the Retail Industry

Retailers worldwide are increasingly establishing science-based targets to lend credibility and accountability to their sustainability initiatives.[6] A significant portion of the discussion surrounding Scope 3 emissions centers on the supply chain, sometimes called "supply chain emissions."[2] For many retailers, Scope 3 emissions can represent over 90% of their total emissions footprint.[7] Figure 1 compares the supply chain's ratio to direct emission of different

[5] "The Largest Private Companies". *Forbes.com*. May 31, 2022. Retrieved May 31, 2022.
[6] "RILA Climate Action Blueprint (2022)." 27 Jan. 2022, https://www.rila.org/focus-areas/sustainability-environment/rila-climate-action-blueprint. Accessed 8 Feb. 2023.
[7] "A guide to Scope 3 emissions reporting - IBM." https://www.ibm.com/downloads/cas/EZVDQ1X5. Accessed 8 Feb. 2023.

sectors.[8] The retail industry, with a ratio of 10.9:1, has the highest ratio compared to the other industries. As a consequence, any risk to the supply chain will have a significant impact on the retail industry. Through their CDP submissions and Task Force on Climate-Related Financial Disclosures (TCFD) reports, companies in the retail sector already disclose numerous domestic and global climate risks to their direct operations, supply chains, and customers. The most frequently cited dangers in 2020[9] included:

- Acute physical risks, such as severe and frequent extreme weather, affecting a company's direct operations and customers
- Their supply chains are impacted by persistent physical hazards (such as flooding and drought)
- Emerging regulations, such as carbon pricing or other carbon-cutting mechanisms, have an impact on their direct operations and supply chain costs
- Market dangers, such as altering customer conduct and rising stakeholder concern or negative stakeholder feedback

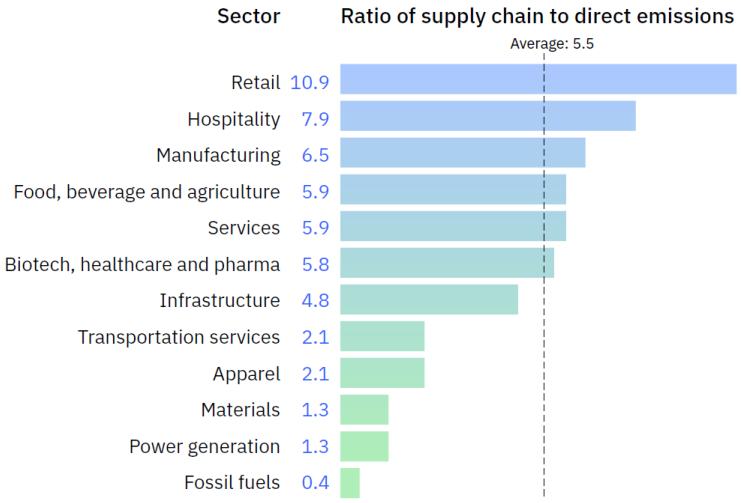

Figure 1. Ratio of supply chain to direct emissions of different sectors[7]
Source: Changing the Chain: Global Supply Chain Report 2019/20, CDP, 2019.

Given the risks involved, there are more viable options for the retail industry than continuing with business as usual. Significant action is required to create a sustainable course of action moving forward.

2.0 Methodology and Process

2.1 GHG Protocol Overview

[8] "A guide to Reporting and Reducing Scope 3 Emissions -Envizi." https://www.ibm.com/topics/scope-3-emissions. Accessed 11 Mar 2023.
[9] "Climate related risk drivers and their transmission channels." https://www.bis.org/bcbs/publ/d517.pdf. Accessed 11 Mar. 2023.

Scope 3 emissions are defined as "indirect emissions that occur in a company's value chain."[10] These are separate from the Scope 1 and 2 emissions that occur as part of a company's direct operations. Scope 3 is intended to record, measure and manage the emissions occurring in a company's value chain, between a company's suppliers, manufacturers, and customers. The categories are intended to be mutually exclusive as to not double count emissions across categories or with Scope 1 or 2 GHG accounting.

2.2 Description of the Scope 3 Categories

The GHG Protocol standardizes and defines the 15 categories emissions categories. Below are the definitions utilized for this project per category:[11]

Category 1 - Purchased Goods and Services	This category includes all upstream (i.e., cradle-to-shelf) emissions from the extraction, production, and transportation of goods and services purchased or acquired by the reporting company in the reporting year. Products include both goods (tangible products) and services (intangible products).
Category 2 - Capital Goods	This category includes all upstream (i.e., cradle-to-shelf) emissions from the production of capital goods purchased or acquired by the reporting company in the reporting year. Capital goods are final products that have an extended life and are used by the company to manufacture a product, provide a service, or sell, store, and deliver merchandise. In financial accounting, capital goods are treated as fixed assets or as plant, property, and equipment (PP&E). Emissions from the use of capital goods by the reporting company are accounted for in either scope 1 (e.g., for fuel use) or scope 2 (e.g., for electricity use), rather than in scope 3.
Category 3 - Fuel- and energy-related activities	This category includes emissions related to the production of fuels and energy purchased and consumed by the reporting company in the reporting year that are not included in scope 1 or scope 2.
Category 4 - Upstream transportation and distribution	This category includes transportation and distribution of products purchased by the reporting company in the reporting year between a company's tier 1 suppliers and its own operations (in vehicles and facilities not owned or controlled by the reporting company). Additionally, transportation and distribution services purchased by the reporting company in the reporting year, including inbound logistics, outbound logistics (e.g., of sold products), and transportation and distribution between a company's own facilities (in vehicles and facilities not owned or controlled by the reporting company)
Category 5 - Waste generated in operations	This category includes emissions from third-party disposal and treatment of waste generated in the reporting company's owned or controlled operations in the reporting year. This category includes emissions from disposal of both solid waste and wastewater.
Category 6 - Business travel	This category includes emissions from the transportation of employees for business related activities in vehicles owned or operated by third parties, such as aircraft, trains, buses, and passenger cars.

[10] "Technical Guidance for Calculating Scope 3 emissions (version 1.0)" https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf. Accessed 18 Mar 2023.
[11] "Technical Guidance for Calculating Scope 3 emissions (version 1.0)" https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf. Accessed 18 Mar 2023.

Category 7 - Employee Commuting	This category includes emissions from the transportation of employees between their homes and their worksites.Emissions from employee commuting may arise from: Automobile travel, Bus travel, Rail travel, Air travel, Other modes of transportation (e.g., subway, bicycling, walking). Companies may include emissions from teleworking (i.e., employees working remotely) in this category.
Category 8 - Upstream Leased Assets	This category includes emissions from the operation of assets that are leased by the reporting company in the reporting year and not already included in the reporting company's scope 1 or scope 2 inventories. This category is applicable only to companies that operate leased assets (i.e., lessees). For companies that own and lease assets to others (i.e., lessors).
Category 9 - Downstream Transportation and Distribution	This category includes emissions that occur in the reporting year from transportation and distribution of sold products in vehicles and facilities not owned or controlled by the reporting company.
Category 10 - Processing of Sold Products	This category includes emissions from processing of sold intermediate products by third parties (e.g., manufacturers) subsequent to sale by the reporting company. Intermediate products are products that require further processing, transformation, or inclusion in another product before use (see box 5.3 of the Scope 3 Standard), and therefore result in emissions from processing subsequent to sale by the reporting company and before use by the end consumer. Emissions from processing should be allocated to the intermediate product.
Category 11 - Use of Sold Products	This category includes emissions from the use of goods and services sold by the reporting company in the reporting year. A reporting company's scope 3 emissions from use of sold products include the scope 1 and scope 2 emissions of end users. End users include both consumers and business customers that use final products.
Category 12 - End-of-Life Treatment of Sold Products	This category includes emissions from the waste disposal and treatment of products sold by the reporting company (in the reporting year) at the end of their life. This category includes the total expected end-of-life emissions from all products sold in the reporting year.
Category 13 - Downstream Leased Assets	This category includes emissions from the operation of assets that are owned by the reporting company (acting as lessor) and leased to other entities in the reporting year that are not already included in scope 1 or scope 2. This category is applicable to lessors (i.e., companies that receive payments from lessees).
Category 14 - Franchises	This category includes emissions from the operation of franchises not included in scope 1 or scope 2. A franchise is a business operating under a license to sell or distribute another company's goods or services within a certain location. This category is applicable to franchisors (i.e., companies that grant licenses to other entities to sell or distribute its goods or services in return for payments, such as royalties for the use of trademarks and other services). Franchisors should account for emissions that occur from the operation of franchises (i.e., the scope 1 and scope 2 emissions of franchisees) in this category
Category 15 - Investments	This category includes scope 3 emissions associated with the reporting company's investments in the reporting year, not already included in scope 1 or scope 2. This category is applicable to investors and companies that provide financial services. This category also applies to investors that are not profit driven and the same calculation methods should be used. Investments are categorized as a downstream scope 3 category because providing capital or financing is a service provided by the reporting company.

2.3 Determining Company Relevant Scope 3 Categories

The GHG Protocol Guidance outlines 15 categories to account for an organization's Scope 3 emissions. Not all 15 categories are relevant to Meijer's operations. Four of the 15 categories were determined to be non-relevant, as it was not a pertinent business activity. The four categories omitted are:

- Processing of Sold Goods
- Downstream Leased Assets
- Franchises
- Investments

This report includes the remaining 11 categories, as they are deemed material in contributing to GHG emissions for the baseline year of FY21. Per the GHG Protocol guidance, categories should be included in the Scope 3 inventory if they are a large contributor to a company's emissions, they provide a significant risk to the company if unaddressed, the company has the opportunity to influence the category with reduction goals, stakeholders deem it significant, etc.[12] The decision to exclude certain categories was based on the boundaries requirement outlined by the GHG Protocol. The GHG Protocol allows for companies to exclude categories if they are "not applicable."[13] Processing of Sold Goods, Downstream Leased Assets, Franchises, and investments fall under this designation. These four categories are not relevant to the Meijer business model and thus are not significant contributors to GHG emissions.

2.4 Selecting the Calculation Method and Emission Factors

This report follows the methodology that is outlined in the GHG Protocol Technical Guidance for Calculating Scope 3 Emissions, specifically to account and report on Scope 3 emissions. Of the 11 categories that are accounted for, decisions were made about which methodology to follow when calculating the emissions.

For instance, Category 6, Business Travel highlights three different methodologies that can be used to calculate emissions from transportation of employees for business purposes on vehicles, planes, ships, etc. owned by third parties. In order to select the calculation methodology that was most appropriate for this category, discussions between the Meijer and the SEAS team occurred to understand what type of data was currently captured, accessible and usable. This determined what methodology was pursued for the baseline calculations. Recommendations on future data capture are made throughout this document, as this is a framework to build upon.

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[12] "Corporate value chain (Scope 3) Accounting and Reporting Standard" https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf. Accessed 18 Mar, 2023.
[13] "Corporate value chain (Scope 3) Accounting and Reporting Standard" https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf. Accessed 18 Mar, 2023.

Additionally, based on the implemented calculation methodology, the team used different published emission factor databases to calculate total emissions per category, most notably: the 2021 EPA's Emission Factors for Greenhouse Gas Inventories and GREET.

2.5 Benchmarking to the Industry Standards

In order to better understand the methodology and frameworks employed for Scope 3 emissions accounting in retail environments, the team researched major retailers: Target, Walmart, Costco, and Starbucks. This included researching their publicly disclosed reports, including their CDP submissions. Additionally the team referenced a recent study completed with Ford Motor Company[14] and the University of Michigan.[15] The companies were assessed on several dimensions.

- Boundary of the Report
- CDP Report
- Date of Report
- Committed to SBTi
- Standard or Methods for scope 1
- Standard or Methods for scope 2
- Standard or Methods for scope 3
- Base Year
- Target Year
- Progress to date
- Timeline
- Absolute emission target on scope 3
- Is the target approved by SBTi
- GHG protocol categories accounted
- GHG protocol categories excluded
- Upstream scope 3 emissions
- Downstream scope 3 emissions
- Availability of Risk Assessment Analysis
- Verification/assurance status that applies to report
- Absolute emission reduction in each category

[14] "Scope 3 Emissions Assessment and Circular Economy Protocol Development at Ford Motor Company" 17 Apr. 2019, https://css.umich.edu/publication/scope-3-emissions-assessment-and-circular-economy-protocol-development-ford-motor. Accessed 19 Mar. 2023.
[15] "Scope 3 Purchased Goods Emissions Accounting." 30 Apr. 2022, https://css.umich.edu/research/projects/scope-3-purchased-goods-emissions-accounting. Accessed 19 Mar. 2023.

This benchmarking was done as preliminary research to better understand at a foundational level what major retailers and companies are doing to account for Scope 3 emissions. This research yielded mixed results. The research team discovered that some major retailers disclose their total Scope 3 emissions and methodologies in detail for the 15 categories, while others do not.

An example is Walmart's Project Gigaton.™ In FY 21, Walmart reported a Scope 3 total of 242,835,480 Mt CO_2e.[16] This is more than 12 times the amount of carbon emitted by Meijer in the same fiscal year. However, Walmart's footprint is much larger than that of Meijer, and includes international operations and stores. Walmart is descriptive in the CDP report with methodology used and pertinent information is disclosed.

One challenge the research team discovered is that retailers are still in the nascent stages of Scope 3 accounting and may not share a robust methodology or publication to draw upon for learnings. Additionally, the retailer reports could contain non-public or sensitive information that a company does not want to disclose. This was most representative in incomplete CDP reports.

3.0 Scope 3 Greenhouse Gas Inventory

3.1 Category 1 - Purchased Goods and Services

Introduction and Methodology

This category includes all upstream (cradle-to-shelf) GHG emissions generated from purchased goods and services for retail and indirect procurement. Products include both goods, all available products for sale in retail stores, and services that Meijer buys or uses for its own operations in different business areas. This category is material and highly significant to Meijer's Scope 3 emissions, given that Meijer is a major retailer and their suppliers' activities directly impact their upstream Scope 3 emissions inventory. After conducting the GHG emissions inventory, purchased goods and services was identified as the largest category because it includes all emissions generated from all Meijer suppliers' activities and accounts for a large portion of Meijer's spend. These emissions also significantly contribute to the company's risk of exposure to climate change.

References for data sources and emission factors used to calculate this category:

- Data Sources: Meijer's sales Department, Division, and Group level data on PG and Meijer spend data on goods and services Department, Division, and Group level
- Emission Factors Used: EPA's "Supply Chain GHG Emission Factors for US Commodities and Industries v1.1-2016"

[16] Welcome to your CDP Climate Change Questionnaire 2020 C0. Introduction. (2020, September 30). Walmart Corporate. Retrieved March 20, 2023, from https://corporate.walmart.com/esgreport/media-library/document/walmart-inc-cdp-climate-change-questionnaire-2020-wednesday-september-30-2020/_proxyDocument?id=0000017a-5896-de8c-a17a-7ab7a1b40000

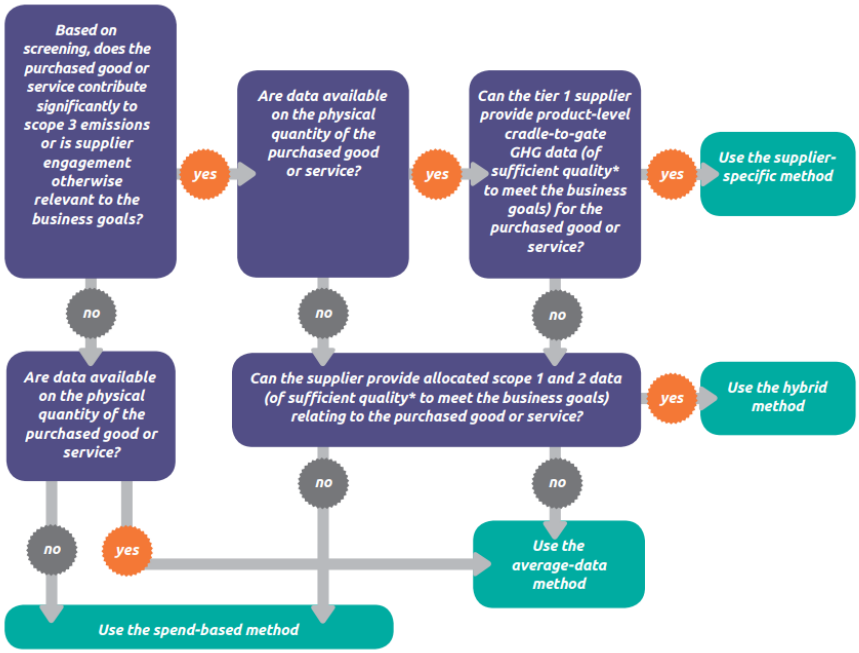

Figure 2. Decision tree for selecting a calculation method for emissions from purchased goods and services: Sourced from Technical Guidance for Calculating Scope 3 Emissions[17]

Results

All results are calculated in CO_2e value in metric tons (Mt CO_2e)

Purchased Goods	11,800,000 Mt CO_2e
Services (Indirect Procurement)	500,000 Mt Mt CO_2e
Total	**12,300,000 Mt CO_2e**

Table 1 shows the percentage of GHG emissions among the Purchased Goods Category. Dairy and Frozen, Meat and Seafood, and Direct Store Delivery (DSD), which includes beverages, candies, and snacks, are the three most carbon-intense categories for Meijer. Table 2 and Table 3 illustrate the percentage of total emissions by subcategories: Dairy and Frozen, Meat and Seafood, respectively. By separating the category into subcategories, it is easier to understand and identify the emission "hotspots." This will allow Meijer to focus on the suppliers within these categories and bring significant opportunities for reducing Scope 3 emissions. To address

[17] "Technical Guidance for Calculating Scope 3 Emissions - GHG Protocol." https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf. Accessed 9 Apr. 2023.

some of these “hotspots,” Meijer has launched a new project with SEAS to continue to focus on the Purchased Goods footprint through their supplier engagement.

Additionally, EEIO methods can help focus on identifying “hotspots” based on how the particular industry impacts the environment. As a result, the percentage of emissions from each subcategory doesn't match the percentage of spending. For example, the amount spent on prescriptions is the highest, but the amount of pollution they cause is the fifth lowest, at 8%. When it comes to total emissions, the emission factors of different industries play a key role in the aggregate emissions. By understanding which product categories have the highest emissions, Meijer can prioritize engaging with suppliers in those categories to reduce overall Scope 3 emissions. Considering that meat and dairy are the most carbon-intensive categories in the Meijer store, a supplier management strategy should be developed to address emissions specifically attributable to this Category. In Section 5, "Recommendations," there are suggestions and ideas on how to lower these carbon-intensive subcategories.

Table 4 illustrates the sum of emissions in metric tons of Meijer’s indirect procurement spend and compares it against category spend percentages. The most carbon-intensive category is “untitled.” Meijer uses a software management system to register purchase requests. Most orders are categorized by their department and business area, but for uncategorized line items, the business area is not recognized. To figure out the emissions for line items that don't fit into any specific category, the average emission factor for all other indirect procurement categories is used.

Table 1. Percentage breakdown of carbon emissions for each of Meijer’s sales categories

Category	Percentage of Emission
Dairy & Frozen	18%
Meat & Seafood	14%
DSD	12%
Dry Grocery	10%
Prescription	8%
Hardlines	8%
Produce	7%
Softline	5%
Meijer Express	4%
Bakery-Deli	4%
Beauty-Cosmetic	3%
Consumables	3%
Alcohol	2%
Pet	2%
Automotive	1%

Table 2. Percentage breakdown of carbon emission within the dairy and frozen category

Categories	Percentage of Emission
Eggs and Milk	33%
Ice Cream and Vegetables	25%
Yogurt Rfrg Dairy	11%
Frozen Meal	9%
Frozen Pizza and Snacks	8%
Butter Margarine Spread Rfrg	6%
Shreds Chunks Pkgd Cheese	2%
Baked Goods Dough Rfrg Dairy	1%
Juice and Juice Drink Rfrg	1%
Cream Cheese Pkgd Cheese	1%
Dessert Rfrg Dairy	1%
Sandwich Pkgd Cheese	1%
Snacking Pkgd Cheese	1%
Refrigerated Pasta	0%

Table 3. Percentage breakdown of carbon emission within the meat and seafood category

Categories	Percentage of Emission
Beef	29%
Packaged Meat	26%
Pork	10%
Poultry	16%
Seafood	18%

Table 4. Percentage breakdown of carbon emission within the indirect procurement category

Categories	Percentage of Emission
Uncategorized	33%
Marketing	15%
Supplies	11%
Professional Services	11%
Construction Services	10%
IT	6%
Logistics	5%
Finance Services	4%
MRO	2%
Business Services	2%
Packaging	0%

3.2 Category 2 - Capital Goods

Introduction and Methodology

Capital goods are final products that have an extended life and are used by Meijer to carry out its operating activities. Meijer makes large investments into expanding its operations by growing its distribution and retail footprints. Unlike many other retailers, Meijer owns the majority of its facilities and therefore acts as the purchaser for large volumes of capital goods. Suppliers of these goods and services are unable to provide product-level, cradle-to-gate or gate-to-shelf information on the emissions related to the supply chain. Given this constraint, the spend-based method was appropriate to capture Scope 3 emissions. Because Meijer's construction and procurement teams document Meijer's capital spend in these activities and categorized data for the FY 2021, it is achievable to create a repeatable framework that Meijer's sustainability team can use for future Scope 3 emissions inventories.

Additionally, the spend-based method utilizes capital spend dollar values and relevant industry emission factors to calculate average emissions for Category 2. Therefore, to calculate these emissions, Meijer pulled spend data from their internal capital spend database. This dataset was large (n>100,000) and it was not feasible to link each line item to a respective emission factor. To overcome this challenge and create a repeatable process with a shorter processing time, the research team consolidated the dataset down to 268 commodities, using a consistent methodology of collapsing categories. For emissions factors, the research team looked to EPA's "Supply Chain GHG Emission Factors for US Commodities and Industries v1.1" as a publically available source of relevant commodity emissions in CO2 eq./2018 USD purchase price.

References for data sources and emission factors used to calculate this category:

- Data Sources: Meijer's Capital goods spend data from Capital Accounting, Finance and Indirect Procurement Departments. Also WorkBook Structure definitions from the Indirect Procurement Department.
- Emission Factors Used: EPA's "Supply Chain GHG Emission Factors for US Commodities and Industries v1.1-2016"

Results

All results are calculated in CO_2e value in metric tons.

Capital Goods	252,000 Mt CO_2e
Total	**252,000 Mt CO_2e**

The total emission for this category considered 268 commodities categories. Additionally, Category 2 emissions were also calculated for each of the 12 business areas within Meijer that led to the cumulative emissions mentioned above. They are shown in Table 5 below.

Table 5 Distribution of Category 2 emissions by business areas within meijer arranged in descending order of emissions. The column to the left represents 12 business areas within Meijer that cause capital expenses. The middle column represents capital spends made by respective business areas as a percentage of the grand total. The column to the right represents emissions in Mt CO_2e. For each business area arranged in descending order of magnitude.

Business Area	Percentage of Total Emissions (Mt CO2
Property Development	38.82%
ITS	27.21%
Distribution	14.83%
Retail Facilities Maintenance	6.57%
Retail Operations	4.55%
Real Estate	3.14%
Retail Merchandising	2.25%
Corporate	0.98%
Logistics	0.90%
Manufacturing	0.71%
Human Resources	0.03%
Office/Finance	0.00%
Total	**100.00%**

Discussion and Limitations

Table 5 shows that business areas within Meijer, when sorted by spend and emissions from largest to smallest, follow the same order. The top three business areas were responsible for 81% of the emissions. These business areas were Property Development, IT Services and Distribution, all of which are core to Meijer's business operations and growth. However, these comparisons

are based on absolute values of spend and emissions which would by default favor larger spending business areas. To gain clarity on which business areas within Meijer have higher emissions per USD spent, the research team divided each business area's total emissions by respective spend to calculate the emission factors (or emissions per $ spent) for each business area shown in Table 6.

Table 6. Emissions per dollar spent by each business area within Meijer, arranged in descending order.

Business Area	Emissions per $ spent
Retail Merchandising	0.41
Retail Operations	0.37
Retail Facilities Maintenance	0.32
Distribution	0.31
Corporate	0.31
Logistics	0.31
Manufacturing	0.31
Human Resources	0.31
Office/Finance	0.31
Real Estate	0.30
ITS	0.30
Property Development	0.27
Total	

Table 6 illustrates that when business areas are sorted from largest to smallest with respect to their emissions per $ spent, the top two spenders, Property Development and IT Services, were actually the ones that had the lowest emissions per dollar spent. The third largest spender, Distribution, does not seem to follow this pattern, but there are a few possible reasons for this. The biggest reason is that it did not have a properly defined Cost Code Structure for this category. The business areas that show 0.31 emissions factors in Table 6 almost exclusively did not have properly defined (or no) Cost Code numbers or purchase order texts to deduce emissions factors and therefore we had to use average emissions factors for expense line items in these business areas. As the average emissions factors that we used in such cases were 0.31, these categories collectively also show an emission factor of 0.31. Hence, to understand if any patterns emerge we looked at the result in table 6 without the business areas that had the average 0.31 emissions factors as shown in table 7. We saw a general trend that business areas that had higher spending showed lower emissions per dollar spent or a lower emissions intensity. This points to a trend that as Meijer's spending increases its carbon intensity actually begins to decline.

Table 7. Emissions per dollar spent by business area within meijer, arranged in descending order after omitting business areas with 0.31 emissions factor

Business Area	Percentage of Total Emissions (Mt CO2 eq.)	Emissions per $ spent
Retail Merchandising	2.25%	0.41
Retail Operations	4.55%	0.37
Retail Facilities Maintenance	6.57%	0.32
Real Estate	3.14%	0.30
ITS	27.21%	0.30
Property Development	38.82%	0.27

There are significant limitations in Meijer's internal data collection protocols that make calculating Category 2 difficult. The business areas within Meijer are non-uniform in reporting their expenses which creates difficulties with data management and matching spend data with emissions factors. Therefore, the research team used average emissions factors for expenses with unknown Cost code numbers, reducing the accuracy of the calculation. Hence, a uniform reporting standard amongst different business areas would reduce errors. These uniform reporting standards should involve:

1. Fully defining activity identifiers of Cost code numbers to 5 digits for every budgeted purchase. This will allow better alignment of emission factors to each line item rather than using average emissions.
2. Each line item should also include purchase order text which would allow the sustainability team to accurately match Cost code numbers with EPA NAICS commodity codes for the matching process.

Currently, data exist for only about half of the 268 unique Cost code activity identifiers within Meijer's systems. An exhaustive list that covers all of the remaining half Cost code activity identifiers is required to remove errors which could be caused by manually defining these through purchase order texts. The research team is cognizant that this is the first calculation Meijer has completed for Category 2 and by utilizing the spend method, it uncovered limits in the current data set. In the future annual emission inventories, this category will have a better level of accuracy due to the suggested recommendations on how to streamline the process.

One of the inherent set backs with Category 2 emissions is that as Meijer grows it will spend more on capital goods which would translate to increasing emissions in future years from a spend perspective. However, EPA's emissions factors represent industry averages and depend heavily on the electricity and transportation sector emissions. The current administration's ambitious target of 100% clean electrical grid by 2035[18] coupled with the Inflation Reduction

[18] "Biden-Haris administration releases blueprint to decarbonize America's transportation sector" 10 Jan, 2023, https://www.transportation.gov/briefing-room/biden-harris-administration-releases-first-ever-blueprint-decarbonize-americas. Accessed 8 Feb. 2023.

Act - that incentivises clean energy and vehicle electrification through tax credits[19] - will see these industry average emission factors go down over the next decade thereby reducing Meijer's emissions from Category 2.

The biggest spending business areas like Property Development and IT Services are the heavy hitters for Category 2 emissions. Property Development expenses involve goods procurement for new stores construction and setup. Property Development also involves construction and development related activities that Meijer outsources to general and subcontractors. Meijer's ITS business areas involve mostly electrical and electronic equipment needed to operate its stores and distribution centers. As shown in Table 5, these two categories together cause approximately 66% of category 2 emissions. As seen in Table 7, Meijer emissions per dollar spent for these two business areas are low as these business areas tend to be high volume in nature. The suppliers/contractors of these two business areas are bigger in size and are therefore well placed to reduce their own Scope 1 and 2 emissions due to economies of scale without having a large impact on their bottom line. As a large consumer, Meijer is also well placed to engage these suppliers in tracking and setting their own decarbonization goals. Hence, Meijer has an opportunity to make cleaner procurement decisions and/or engage these business area suppliers to lower Scope 3 emissions impact on Category 2.

3.3 Category 3 - Fuel and Energy Related Activities Not Included in Scope 1 or 2

Introduction and Methodology

Category 3 accounts for emissions related to the production and delivery (well to wheel) of fuels and energy purchased and consumed by Meijer. This excludes emissions from the combustion of fuels or electricity consumed by Meijer since they are included in Scope 1 or Scope 2 calculations. There are four bucketed activities that comprise Category 3, but only activities A, B, and C are relevant to Meijer and its operations during FY 2021:

A. Upstream emissions of purchased fuels: extraction, production, and transportation of fuels consumed by Meijer
B. Upstream emissions of purchased electricity: Extraction, production, and transportation of fuels consumed in the generation of electricity, steam, heating, and cooling that is consumed by Meijer
C. Transmission and distribution (T&D) losses: Generation of electricity, steam, heating, and cooling that is lost from transmission and distribution of those resources to Meijer
D. Generation of purchased electricity that is sold to end users: Generation of electricity, steam, heating, and cooling that is purchased by Meijer and sold to end users *(not relevant to Meijer)*

[19] The Inflation Reduction Act: Here's What's in it." 24 Oct, 2022, https://www.mckinsey.com/industries/public-and-social-sector/our-insights/the-inflation-reduction-act-heres-whats-in-it. Accessed 8 Feb. 2023

To calculate the upstream emissions from activities A and B, there are two methods that can be utilized:

- Supplier-specific method: collect data from specific fuel providers on upstream emissions of fuel consumed by Meijer if it is available
- Average-data method: estimate emissions by using published industry average emission factors for upstream emissions for each unit consumed

Supplier-specific data was unavailable for each of the consumed values, so the research team utilized the average-data method and values published in GREET_2021.

Working with the Meijer sustainability team, amounts were gathered for the following fuel and electricity categories from their sustainability data platform:

- Fuel
    - Diesel - Stationary
    - Fleet - Diesel
    - Fleet - Gasoline Passenger Car (distance)
    - Jet Fuel (Jet A or A-1)
    - Natural Gas
- Electricity (eGrid region)
    - MRO East
    - NPCC Long Island
    - RFC Michigan
    - RFC West
    - SERC Midwest
    - SERC Tennessee Valley
    - WECC California

Each of these values were converted to a unit that aligned with the emissions factors units present in GREET_2021, which typically was mmBTU. These totals were multiplied by their emissions factor from GREET_2021 (g/mmBTU) to provide a total amount of grams of CO2e which was converted to Mt CO2e.

For activity C, the total kWh for each eGrid region was combined and multiplied by the U.S. T&D loss rate of 4.45% (EIA) and then multiplied by the same emissions factor used from GREET_2021 that was utilized in activity B.

Results

All results are calculated in CO_2e value in metric tons.

Activity A: Upstream emissions of purchased fuels	53,700 Mt CO_2e

Activity B: Upstream emissions of purchased electricity	561,000 Mt CO_2e
Activity C: Transmission and distribution (T&D) losses	24,300 Mt CO_2e
Activity D: Not Applicable	-
Total	**639,000 Mt CO_2e**

Discussion and Limitations

The usage totals for each category came from internal reporting mechanisms within Meijer. One consideration, to improve the accuracy of emissions totals for Category 3, would be to use the supplier-specific method (versus the average-data method) for activities A and B. In order to change methodologies, Meijer would need to capture fuel totals and the respective upstream emissions for each fuel from every supplier to Meijer, which could prove unfeasible. There are a few Meijer-reported totals that are worth noting:

- Fleet - Diesel is reported in miles that are pulled from the odometer of every vehicle and the resulting gallons consumed are computed by each individual vehicle's computer system.
- Fleet - Gasoline Passenger Car (distance) is reported in miles as well and in order to calculate total gallons of fuel consumed, the miles were equally split across the fleet that consists of 30 cars, 20 SUVs, 15 trucks, and 28 vans. Utilizing miles per gallons (MPG) averages for each vehicle from the U.S. Department of Energy, total gallons consumed was calculated and then input into the model. Meijer could instead track fuel consumption for each vehicle if so desired.

Emissions factors for each eGrid region were the same, due to limited information from GREET_2021 that only provides a U.S. average and not one specific to each eGrid.

Starting in 2022, Meijer has entered into Virtual Power Purchase Agreements (VPPA) with a wind farm and solar farm based in Texas. Depending on the specific arrangements and if Meijer ends up selling electricity back to the grid, the power generated from these two sources could fall under Activity D for the next reporting year. More information will be needed

3.4 Category 4 - Upstream Transportation and Distribution

Introduction and Methodology

Category 4 accounts for all emissions from third party logistic providers. This excludes Meijer's private fleet of trucks, which are accounted for in their Scope 1 accounting. There are three

different methodologies that can be used to calculate the upstream transportation emissions per the GHG Protocol Guidance:[20]

- Fuel-based method, which involves determining the amount of fuel consumed (i.e., Scope 1 of transport providers) and applying the appropriate emission factor for that fuel.
- Distance-based method, which involves determining the mass, distance, and mode of each shipment, then applying the appropriate mass-distance emission factor for the vehicle used.
- Spend-based method, which involves determining the amount of money spent on each mode of business travel transport and applying secondary (EEIO) emission factors.

Given the data accessible from Meijer's logistics systems, the distance-based methodology is the most appropriate to use; additionally it is more accurate than the spend-based method, which uses approximations (see decision tree below in Figure 3). The inputs needed to calculate the emissions are:

- Mass of the shipment (kg)
- Distance the shipment travels (ton-mile)
- Mode of each shipment delivered by the transportation providers (e.g., rail, truck, ship, etc.)

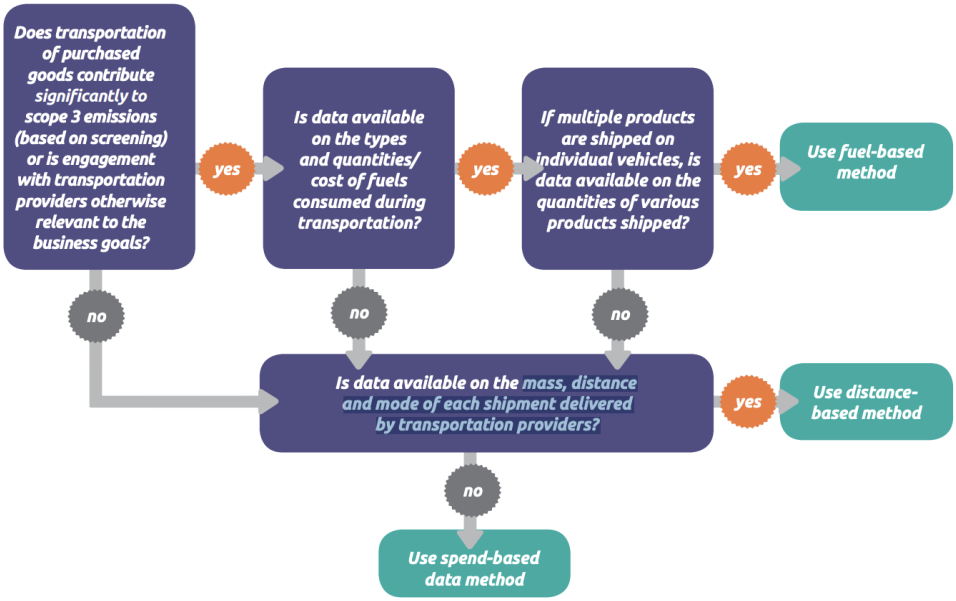

Figure 3. Decision tree for selecting a calculation method for emissions from upstream transportation[21]

In terms of calculations, the Meijer team will need to assess at what level/granularity of product categories would be useful to report GHG emissions. For instance, the mass of the items could be

[20] *Category 4: Upstream Transportation and Distribution*. (n.d.). Greenhouse Gas Protocol |. Retrieved February 15, 2023, from https://ghgprotocol.org/sites/default/files/standards_supporting/Chapter4.pdf

[21] *Category 4: Upstream Transportation and Distribution*. (n.d.). Greenhouse Gas Protocol |. Retrieved February 15, 2023, from https://ghgprotocol.org/sites/default/files/standards_supporting/Chapter4.pdf

on a per pallet/shipment basis or per specific categories (e.g., dairy or frozen foods). That designation will need to be determined by the Meijer sustainability team.

Furthermore the Meijer team will need to utilize the EF specified for the mode of transportation from the EPA's Emission Factors for Greenhouse Gas Inventories, 2021, in Appendix C.

Results

The total emissions could not be calculated for this category due to:

- Double counting with Category 1 (explained in the limitations section)
- Lack of supplied data from Meijer Logistics

Discussion and Limitations

The main challenge with Category 4 is the current overlap between this category and Categories 1 and 2, Purchased Goods and Services and Capital Goods. Currently, Meijer's data set for purchased goods is based on the "customer price," versus using the "producer's price." This limits the accuracy of Category 4 and would lead to double counting of carbon emissions between the two categories if both categories were calculated and reported in this baseline assessment.

In order for Category 4 to be measured in the future, the prices of the goods and services (pertinent for Category 1) will need to be reported in producer prices, to eliminate the need for EF "Supply Chain EF with Margin." Therefore in this baseline assessment, the upstream transportation emissions are included in Category 1 as a rough estimate. To increase the accuracy of the upstream transportation and supply chain emissions, it is necessary to capture producer pricing.

Additionally, for warehousing emissions, as part of the Category 4, this is immaterial to Meijer. The majority of the warehouses are owned by Meijer and have been included in the prior Scope 1 and 2 analysis.

3.5 Category 5 - Waste Generated in Operations

Introduction and Methodology

Category 5 encompasses emissions from the disposal and treatment of waste. The waste treatment facilities are owned and operated by third parties. Possible waste treatment activities may include landfill disposal, recycling, incineration, composting, waste-to-energy (WTE) or energy-from-waste (EfW), and wastewater treatment. The methods of disposal used by Meijer are recycling, composting, disposal in a landfill and wastewater treatment. The materials that are captured in this section encompass upstream waste that is generated from the production, transporting and packaging of their products.

There are three potential calculation methods used to calculate the Category 5 emissions produced by a company:

- Supplier-specific method, which takes account of the waste-specific scope 1 and scope 2 emissions data collected from waste treatment companies.
- Waste-type-specific method, which involves using emission factors for specific waste types and waste treatment methods.
- Average-data method, which takes account of the estimated emissions based on total waste going to each disposal method and average emission factors for each disposal method.

Based on the decision tree in Figure 4, the waste-type-specific method was chosen.[22] Meijer captured various metrics from their waste streams during FY2021. The waste types captured include general waste, more specifically mixed plastics, PET, LDPE, HDPE and polypropylene amongst others. To calculate the emissions, the units were first determined by dividing the pounds of material by 2000. Then the emission factors were multiplied by those determined units. The estimated emissions of each waste type were then combined to determine the total emissions of waste generated in operations.

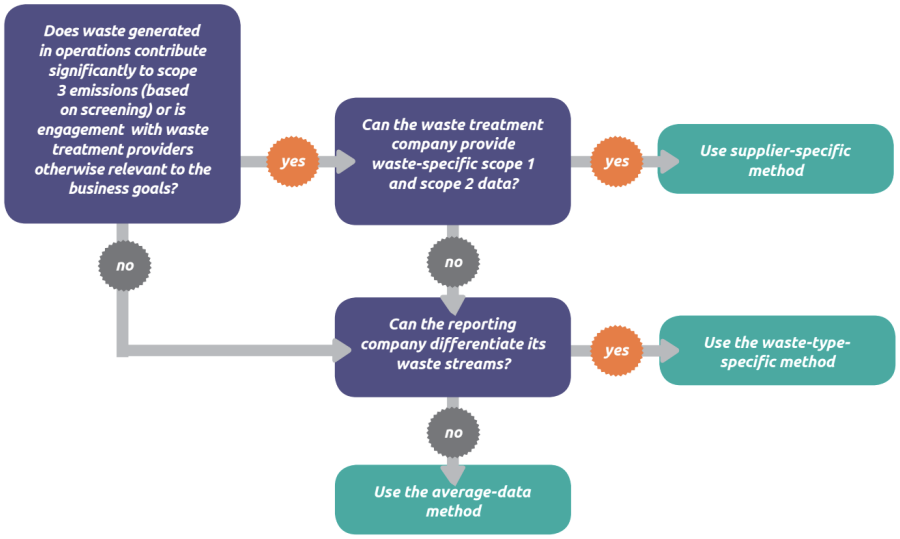

Figure 4. Decision tree for selecting a calculation method for emissions generated from waste in operations[23]

Results

All results are calculated in CO_2e value in metric tons.

[22] Category 5: Waste Generated in Operations. (n.d.). Greenhouse Gas Protocol |. Retrieved March 19, 2023, from https://ghgprotocol.org/sites/default/files/standards_supporting/Ch5_GHGP_Tech.pdf.

[23] Category 5: Waste Generated in Operations. (n.d.). Greenhouse Gas Protocol |. Retrieved March 19, 2023, from https://ghgprotocol.org/sites/default/files/standards_supporting/Ch5_GHGP_Tech.pdf.

Waste Generated in Operations	66,800 Mt CO_2e
Total	**66,800 Mt CO_2e**

Discussion and Limitations

The largest contribution to Category 5 emissions is mixed municipal solid waste (MSW) being disposed of in landfills. To reduce these emissions, Meijer team members must be more precise in sorting waste and diverting any recyclable or reusable material. To go a step farther, Meijer should encourage their suppliers to optimize packaging to reduce Meijer's overall waste generated.

According to the U.S Environmental Protection Agency, food is the single largest category of material sent to municipal landfills, where it emits methane. Approximately 85% of GHG emissions from landfilled food waste results from upstream activities including production, transport, processing, and distribution.[24] Meijer has partnered with local food banks who are a part of the Feeding America network to rescue food from landfills and support local community efforts. Meijer also reduces their GHG emissions by diverting food away from landfills and sending it to be composted or made into animal feed. Composting not only helps reduce potent methane gasses generated in landfills but also can offer a nutrient-dense product, soil, that can promote regenerative soil and agriculture practices.

3.6 Category 6 - Business Travel

Introduction and Methodology

Category 6 includes emissions from the transportation of employees for business purposes on vehicles, planes, ships, etc. owned by third parties. Emissions for transportation of employees from company-owned vehicles are included in Scope 1 accounting. There are three methods that could be used to calculate this category depending on availability of information. Figure 6 below shows the decision tree businesses can utilize to determine the best method for them.[25]

[24] United States 2030 Food Loss and Waste Reduction Goal | US EPA. (n.d.). Environmental Protection Agency. Retrieved April 16, 2023, from https://www.epa.gov/sustainable-management-food/united-states-2030-food-loss-and-waste-reduction-goal

[25] Category 6: Business Travel. (n.d.). Greenhouse Gas Protocol |. Retrieved March 19, 2023, from https://ghgprotocol.org/sites/default/files/standards_supporting/Chapter6.pdf

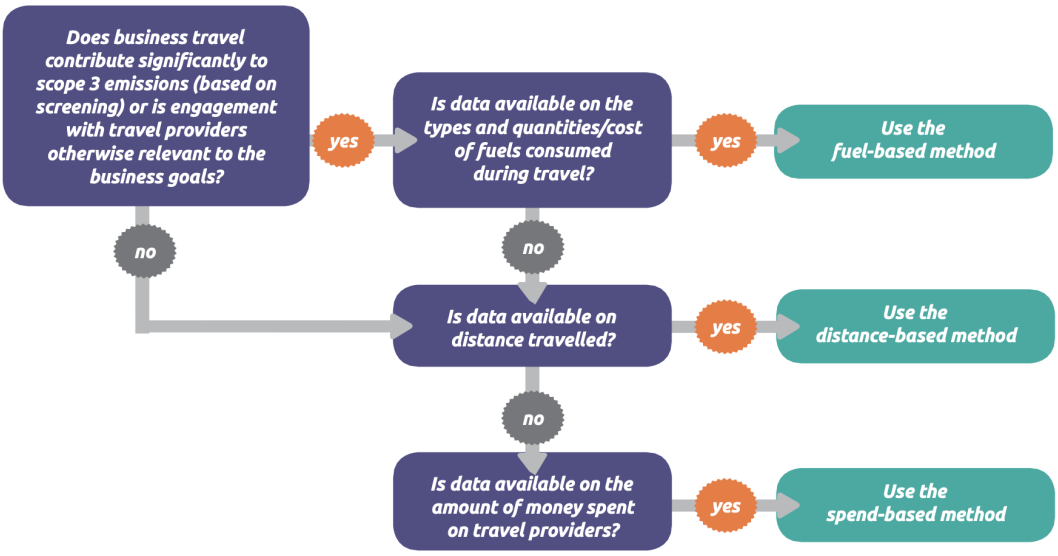

Figure 5. Decision tree for selecting a calculation method for emission from business travel[26]

Due to the availability of information from Meijer's vendors, the research team was able to collect emissions data directly from these third party platforms. There are two primary forms of third-party transportation that Meijer employees take for business travel: air and automobile.

Air travel emissions were calculated by the expense reporting company Concur, using their internal calculation process that is done in conjunction with CWT AnalytIQs. The full details for their calculation are found in Appendix B. The research team reviewed the methodology against GHG protocol to ensure alignment and validity of the approach.

Automobile emissions were calculated using the internal computation methods of the car rental companies utilized, Enterprise and National. Total miles driven per type of vehicle were aggregated within their system and then converted to gallons of gasoline for miles driven with the subsequent CO2e resulting from the use of that gasoline. The full details of their calculations were taken from the report "Commercial Rental Car Data - Meijer Emissions Report Summary TP-Global 202102-202201" provided by Enterprise and National to Meijer and found in Appendix B.

[26] Category 6: Business Travel. (n.d.). Greenhouse Gas Protocol |. Retrieved March 19, 2023, from https://ghgprotocol.org/sites/default/files/standards_supporting/Chapter6.pdf

Results
All results are calculated in CO_2e value in metric tons.

Business Travel by Air	100 Mt CO_2e
Business Travel by Automobile	1,000 Mt CO_2e
Total	**1,100 Mt CO_2e**

Discussion and Limitations
Since both of these totals were computed by external vendors, it will be important for Meijer to stay updated on the methods used to ensure they are in line with the GHG Protocol standards for Scope 3 reporting. If Meijer alters business travel options (for instance the incorporation of trains) new calculations and reporting systems will need to be created as well. Finally, the GHG Protocol provides instructions on incorporating lodging for business travelers into this category, but it is optional. Moving forward, Meijer can assess if this is a calculation they want to pursue.

3.7 Category 7 - Employee Commuting
Introduction and Methodology
Category 7 includes emissions from the transportation of employees from their home to work. There are three methods that could be used to calculate this category depending on availability of information:[27]

- Fuel-based method: determine the amount of fuel consumed during commuting and apply the emissions factor for that fuel type
- Distance-based method: collect data from employees about their commute including distance and vehicle used and apply the emissions factor for each distance and mode of transit
- Average-data method: estimate the emissions from employee commuting based on average or representative data available

Based on the information available, the research team took a hybrid approach of the distance-based method with average-data method. Working with Meijer's HR team, the research team compiled anonymized employee data and split it into three groups:

- Corporate
- Retail
- Supply Chain

Corporate had a total of 1,167 employees split into three distinct groups:

- 586 Hybrid - assuming an average of 3 days in the office a week

[27] Category 7: Employee Commuting. (n.d.). Greenhouse Gas Protocol |. Retrieved March 19, 2023, from https://ghgprotocol.org/sites/default/files/standards_supporting/Chapter7.pdf

- 364 Fully Remote - no commute days (not pertinent to calculations)
- 217 Flex Remote - assuming an average of 1 day in the office a week (this varies greatly per employee and could be 1 day a week or 1 a month with variability)

The totals for each corporate employee were multiplied by the days of the week in the office, the trips per day (2) converted to weekly and then annual trips to give us the total corporate trips per year which was 205,400.

Retail had a total of 62,500 employees with an average of 232,000 shifts per week. The research team made the assumption that for each shift worked, 2 trips were made (to the store and back), which was converted to weekly and then annual trips, for a total of 24,128,000 retail trips per year.

Supply chain had a total of 5,430 employees with an average of 23,980 shifts per week. Similarly, the research team made the assumption that for each shift worked, 2 trips were made (to the supply chain facility and back), which was converted to weekly and then annual trips, for a total of 2,493,920 supply chain trips per year.

For all three employee groups, there were a total of 26,827,320 trips made per year, that we multiplied by a national average commute distance of 12.22 miles one way (2017 National Household Travel Survey). This gave us a total passenger vehicles miles of 327,829,850 which was multiplied by the emissions factors for CO2 (.332kg/mi), CH4 (.007g/mi), and N2O (.007g/mi) taken from EPA's Emission Factors for Greenhouse Gas Inventories (Appendix A), converted to kilograms, and multiplied by their respective GWPs of 1, 25, and 298, respectively. These were all combined and converted to metric tons to provide a total Mt CO_2e for the category.

Results (CO2 value)
All results are calculated in CO_2e value in metric tons.

Employee Commuting by Automobile	109,000 Mt CO_2e
Total	**109,000 Mt CO_2e**

Discussion and Limitations
Due to the assumptions and estimations required to complete this category, there are a number of considerations to note:

- Corporate employees had estimated trips to the office based on policy for each group, but a more accurate method in the future could be unique badge scans on a daily basis to

determine who commuted to the office that day. This has been highlighted as a potential change for the future to improve accuracy of these emissions totals.

- Retail and supply chain employees were assumed to make one round trip commute per shift worked, though it is possible for employees to work multiple shifts before commuting home. More robust reporting could potentially cut down on trips made for these employees who make up the majority of Meijer commuting employees.
- The assumed vehicle used for commuting was a passenger vehicle (non truck or SUV). Although employees do commute with non-passenger vehicles, the breakdown is hard to estimate based on reputable, available information. The selected EFs do account for the average vehicle age on the road currently.

3.8 Category 8 - Upstream Leased Assets

Introduction and Methodology

Category 8 includes emissions from the operation of assets that are leased by the reporting company. Meijer has very few leased assets, however the exception is three office spaces located in Hong Kong (two offices) and Bangladesh (one office). For FY 2021, electricity usage invoices were used for an accurate assessment of what kWh were consumed across the three locations, making it easy and accurate to find the information.

Using the total kWh of electricity consumed, the number was multiplied by the country's specific production fuel mix factor (kgCO2e per kWh). This yielded the total kgCO2e consumed, which was then converted to metric tons.

To note:

1. Any additional leases (such as a select group of retail stores) were included in the Scope 2 emissions assessment and thus were not included in the report.
2. For the Hong Kong office, there are two different electricity companies: Hong Kong Electric Company and CLP Group. The Meijer offices are located in the CLP Group's district, which uses an emissions factor of 0.65 (instead of 0.71).

Results (CO2 value)

All results are calculated in CO_2e value in metric tons.

Office One: Hong Kong 1 (TST)	42 Mt CO_2e
Office Two: Hong Kong 2 (Excel)	24 Mt CO_2e
Office Three: Bangladesh	17 Mt CO_2e
Total	**83 Mt CO_2e**

Discussion and Limitations

This calculation and category was relatively straightforward given the accurate and ample data available through utility records and invoices. Going forward using the most accurate conversion factor for the specific country will be important.

3.9 Category 9 - Downstream Transportation and Distribution

Introduction and Methodology

Category 9 includes emissions that occur from the transportation and distribution of sold products in vehicles and facilities not owned or controlled by Meijer. Considering the nature of Meijer's business model, it is assumed that the downstream transportation that is material to Meijer is concerning the customer driving to the grocery store, purchasing their items and driving home. Since Meijer has little-to-no control over the customers' behavior, many assumptions were made for this category's calculation:

- The total number of transactions for FY21 was used as a proxy for the total number of trips made by customers in a year. The assumption is that one transaction would translate to one customer's trip to Meijer.
- Approximate percentages of consumers who drive a passenger car (45%) versus a light duty truck (55%) was based on the EPA's data report "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019."[28]
- The total round-trip distance to a consumer's primary grocery store was also approximated at 7.58 miles and based on a 2015 USDA article.[29]

Using the EPA's data report from 2019, the breakdown of vehicles on the road in 2019 was 45% passenger cars (passenger cars, minivans, SUVs, and small pickup trucks) and 55% light duty trucks (full-size pickup trucks, full-size vans, and extended-length SUVs). Knowing this, the research team could approximate how many vehicles of which type could be on the road today. Next the research team used the total mileage per the two vehicle categories to calculate the total emissions factor per the GWP factors (see Appendix A for the specific EF used for the mode of transportation from the EPA's Emission Factors for Greenhouse Gas Inventories, 2021)

[28]Camobreco, V., Roberts, S., & Geidosch, J. (2021, April 14). *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019 – Main Text - Corrected Per Corrigenda, Updated 05/2021*. Environmental Protection Agency. Retrieved March 1, 2023, from https://www.epa.gov/sites/default/files/2021-04/documents/us-ghg-inventory-2021-main-text.pdf

[29]Morrison, R. M., & Mancino, L. (2015, August 3). *Most U.S. Households Do Their Main Grocery Shopping at Supermarkets and Supercenters Regardless of Income*. USDA ERS. Retrieved March 1, 2023, from https://www.ers.usda.gov/amber-waves/2015/august/most-us-households-do-their-main-grocery-shopping-at-supermarkets-and-supercenters-regardless-of-income/

Results
All results are calculated in CO_2e value in metric tons.

Downstream Transportation for Passenger Vehicles	387,000 Mt CO_2e
Downstream Transportation for Light-Duty Trucks	643,000 Mt CO_2e
Total	**1,030,000 Mt CO_2e**

Discussion and Limitations
Meijer has little-to-no control or line of sight over the downstream transportation category; Meijer can only encourage customers in terms of behavior change (for instance, putting more electric vehicle (EV) charging stations in the parking lot to encourage EV usage). Additionally, this category is predicated on many assumptions. In future Scope 3 inventories, it could be useful to complete a survey with customers, and extrapolate the data, to better understand:

- Average distance traveled by customers to the Meijer store
- Type of car driven and year purchased
- Frequency of shopping trips to the Meijer store

If the Meijer sustainability team could obtain more specific and granular details on consumer's downstream transportation habits, this category calculation would be more accurate.

3.10 Category 10 - Processing of Sold Products

Category 10 is not relevant to the Meijer business model, as a grocery retailer supercenter. There are no emissions related to processing of sold products.

3.11 Category 11 - Use of Sold Products

Introduction and Methodology
Category 11 includes emissions from the use of goods and services sold by Meijer. Meijer sells a variety of products across several different categories. The use of sold products is a complicated and difficult category to calculate since it considers the emissions related to the consumer's usage, for which there is limited data.

There are two types of emissions related to the use of sold products:

- Direct use-phase emissions
- Indirect use-phase emissions.

Companies only need to account for indirect use-phase emissions of sold products when the indirect use-phase emissions are expected to be significant. In Meijer's case, they are not because Meijer does not sell a significant amount of products that use indirect fuels or electricity. To keep

the calculations feasible, the research team estimated the direct use-phase emissions from products that directly consume energy (fuels or electricity). Hence, the major Meijer products that fall under this guidance are gasoline and electronic appliances for the kitchen, office, and home categories.

The data needed from Meijer to calculate this included the categories of products and quantity of products sold in the reporting period of FY2021. This was obtained from Meijer's sales database. Several sources based on web searches were utilized to identify product lifetime and electricity use for each product category during its entire lifetime. Given the range of products sold within each category, the research team conducted these web searches for top selling items (based on quantity) to carry out the estimation. The emission factors for fuels were obtained from the U.S. Energy Information Administration's (EIA) "Carbon Dioxide Emission Coefficients" table.

Results

Table 8 below shows the calculations for each product category within Category 11. The highest emissions were from gasoline sales and the lowest were from cellular phone devices.

Table 8. Final Calculations for Category 11

Product Type	Percentages
GASOLINE	95.298%
KITCHEN SMALL ELECTRICS(toaster)	1.213%
TVS AND SOUNDBARS	1.162%
COMPUTER ACCESSORIES	0.812%
AUDIO	0.497%
KITCHEN LARGE ELECTRICS (microwave 900W)	0.433%
AV ACCESSORIES (LED strip, remote controls)	0.147%
KEROSENE	0.123%
FLOOR CLEANING (vacuums)	0.116%
OFFICE DEVICES	0.105%
IRONS AND STEAMERS	0.083%
KITCHEN FOOD PREP (hand mixer)	0.007%
ELECTRONIC WEARABLES	0.002%
MOBILE DEVICES	0.002%
CELLULAR PHONES	0.001%
	100.00%

All results are calculated in CO_2e value in metric tons.

Gasoline & Kerosene	4,350,000 Mt CO_2e
Electronics	200,000 Mt CO_2e
Total	**4,550,000 Mt CO_2e**

Discussion and Limitations

The major limitation in this category was estimating the total lifetime expected uses for each product category. To calculate the total lifetime expected uses of the product, the average lifetime of the most sold product within each product category was used as the basis for the calculations. The average lifetime was based on the number of times a particular product was used annually multiplied by the number of years it was used until it was discarded or replaced. This method has been used since there is a lack of reliable public data sources that provide this information. To calculate the electricity consumed per use of each product the research team used the wattage and converted it to kWh based on how long the product would be used per use.

Considering the above challenges and assumptions, the final emissions value reported should be considered as a rough estimate of the total emissions from the use of all sold electronics products by Meijer. However, around 95% of the emissions in this category are from the gasoline sold, hence making the assumptions in electronics sold insignificant.

Furthermore, the Use of Sold Products Category, materially contributes to Meijer's total Scope 3 emissions yet requires significant changes in consumer behavior which can be more challenging for a retailer like Meijer to influence, especially considering the sale and use of gasoline is ingrained in the global economy and large-scale decarbonization is outside of Meijer's purview.

3.12 Category 12 - End-of-Life Treatment of Sold Products

Introduction and Methodology

Category 12 includes emissions from the waste disposal and treatment of products sold by Meijer at the end of their life. End-of-life treatment methods like landfilling, incineration, and recycling are described in Category 5 (Waste Generated in Operations) and apply to both Category 5 and Category 12. Calculating emissions from Category 12 requires assumptions about the end-of-life treatment methods used by consumers from disposing of the product at the end of its life, not the final product. It is difficult to obtain accurate data on consumer behavior, hence a number of assumptions are made in order to leverage the available data. The waste-type-specific method of calculation used for this category.

The data used to calculate the emissions from this category are the list of relevant products that are highest in sales ($ amount), the quantity sold of each product, weight of product sold, the end-of-life treatment breakdown for each product material, and percent of total waste being treated by each waste treatment method. The total dollar amount of sales was obtained from Meijer's internal sales database. The U.S. Environmental Protection Agency and Center for Sustainable Systems fact sheets publish data on waste generation, recycling, and disposal statistics and emission factors for each disposal method. The excel sheet "UofM L5 Pids" that calculated the emissions for this category took into account that the percent of waste from each waste treatment method was the same for all products of a certain material. For example, the

percent waste for all aluminum products was a constant 18% for recycling, 68% landfill, 14% combustion, etc.

Results

All results are calculated in CO_2e value in metric tons.

Grocery DSD	103,000 Mt CO_2e
Dairy	75,000 Mt CO_2e
Produce	31,500 Mt CO_2e
Meat	17,800 Mt CO_2e
Remaining	42,700 Mt CO_2e
Total	**270,000 Mt CO_2e**

Discussion and Limitations

The biggest limitation for this category was that it was challenging to pick the final waste materials for each product. Most products have more than one waste material including the packaging and the product itself. To simplify this, calculations were made assuming only the packaging waste was treated and all the food products had been completely consumed before being disposed of. Typically, food waste constitutes 21.8% of total municipal solid waste according to the EPA.[15] Hence, not including this amount of data in our calculations means this reported value is a rough estimate of emissions. Most general wastes were categorized as mixed municipal solid waste and all electronics have been assumed to be mixed electronics for simplicity.[30]

3.13 Category 13 - Downstream Leased Assets

Category 13 is not relevant to the Meijer business model, as a grocery retailer supercenter. There are no material downstream leased assets.

3.14 Category 14 - Franchises

Category 14 is not relevant to Meijer. Meijer does not own franchises or have franchise agreements. All retail locations are operated by the Meijer corporation.

3.15 Category 15 - Investments

[30] "National Overview: Facts and Figures on Materials Wastes & Recycling" 3 Dec. 2022. https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials. Accessed 15 Mar 2023

Category 15 is not relevant to Meijer. There are no investments at this time that are significant and material to Scope 3 emissions.

4.0 Results

The total emissions for the baseline year of 2021 is 19,200,000 Mt CO_2e and the emissions contribution by Scope 3 category is indicated in Table 9. The top three most contributing categories to this overall figure are Purchased Goods (65%), Use of Sold Products (24%), and Downstream Transportation and Distribution (5%).

Table 9. Summary of Scope 3 Emissions per Category, Respective Percentages of Total Emissions and Estimated Level of Certainty Table

Scope 3 Category	**Category Emissions ($MtCO_2e$)**	**Percentage of Total Scope 3 Emissions (%)**	**Estimated Level of Certainty**
Category 1 - Purchased Goods and Services	12,300,00	65%	High
Category 2 - Capital Goods	252,000	1%	Medium
Category 3 - Fuel-and Energy-Related Activities	639,000	3%	High
Category 4 - Upstream Transportation and Distribution*	-	-	
Category 5 - Waste Generated in Operations	66,800	<1%	Low
Category 6 - Business Travel	1,100	<1%	High
Category 7 - Employee Commuting	109,000	1%	Medium
Category 8 - Upstream Leased Assets	83	<1%	High
Category 9 - Downstream Transportation and Distribution	1,030,000	5%	Low
Category 10 - Processing of Sold Products**	-	-	
Category 11 - Use of Sold Products	4,550,000	24%	Low
Category 12 - End-of-Life Treatment of Sold Products	270,000	1%	Low

Category 13 - Downstream Leased Assets**	-	-	
Category 14 - Franchises**	-	-	
Category 15 - Investments**	-	-	
TOTAL	**19,200,000**	**100%**	

** This category was not able to be calculated, insufficient data were available*

*** This category was not calculated due to insignificant materiality to Meijer*

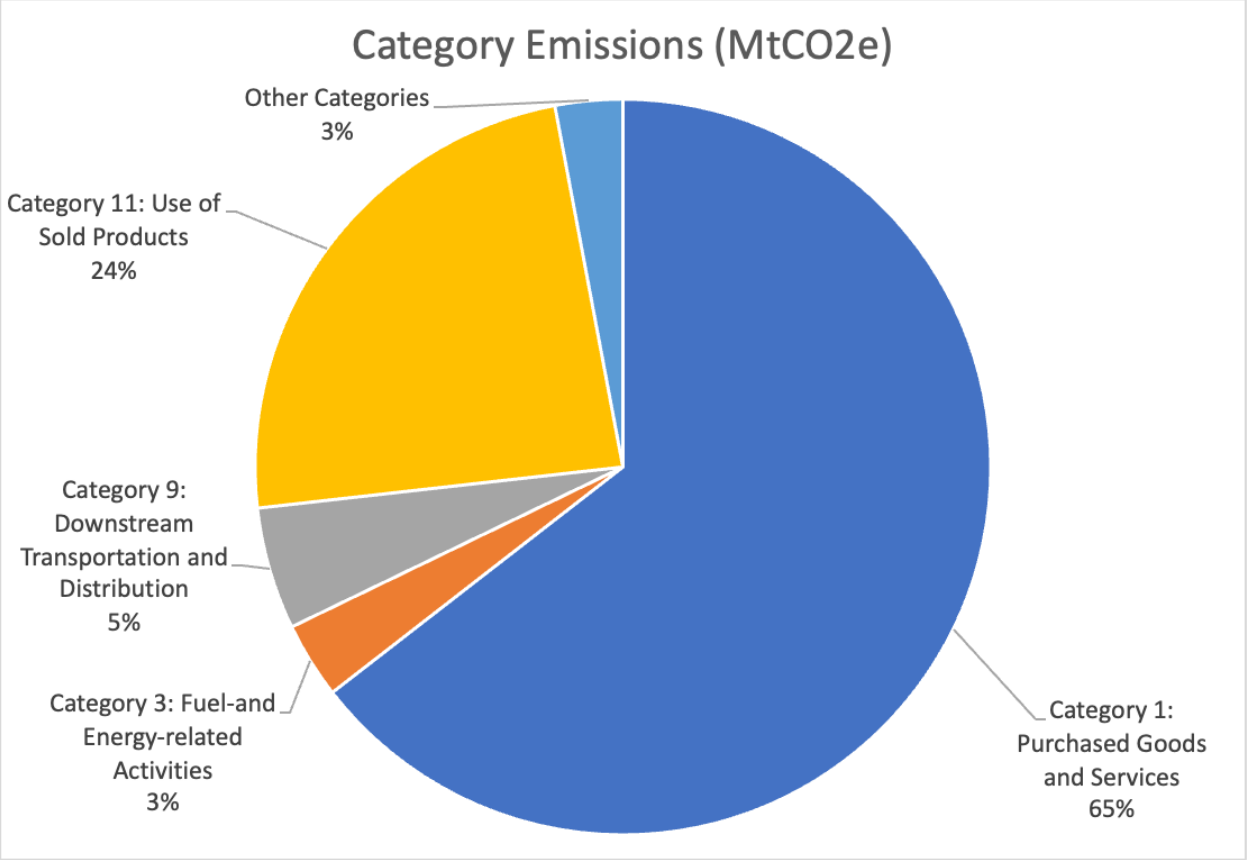

Figure 6: Emissions breakdown for each category

For a point of comparison, the global retailer Walmart reported Scope 3 emissions of 242,835,480 Mt CO_2e in FY 2021 per their CDP report.[31] Similarly, the retailer Target reported Scope 3 emissions of 40,524,000 Mt CO_2e in FY 2021 per their CDP report.[32] Both retailers are sizable, operating nationally or internationally, and have large retail footprints. Additionally both

[31] *Welcome to your CDP Climate Change Questionnaire 2020 C0. Introduction*. (2020, September 30). Walmart Corporate. Retrieved March 20, 2023, from https://corporate.walmart.com/esgreport/media-library/document/walmart-inc-cdp-climate-change-questionnaire-2020-wednesday-september-30-2020/_proxyDocument?id=0000017a-5896-de8c-a17a-7ab7a1b40000

[32] Welcome to your CDP Climate Change Questionnaire 2021 C0. Introduction. (2021, September 21). Target Corporate. Retrieved March 20, 2023, from https://corporate.target.com/_media/TargetCorp/Sustainability-ESG/PDF/2021-CDP-Climate-Response.pdf

retailers sell more hardlines (e.g., household goods, appliances, etc.) than Meijer, who sells more groceries. Thus the product mix of these retailers is different, making it hard to have a direct comparison of emission totals. These values should serve as a point of reference for the Meijer team to better understand the Meijer Scope 3 emissions of 19,200,00 Mt CO_2e in the baseline year.

4.1 Observed Challenges with Data Availability and Collection

There are three main challenges the research team observed during data collection :

- **Lack of data availability:** For the first two categories, Purchased Goods and Services and Capital Goods, Meijer hasn't implemented a system to collect emissions data from suppliers. It is expected that many suppliers have not conducted GHG inventories for their products. This limitation led us to apply the spend base method for these categories. Additional categories faced similar challenges.

- **Data quality issues:** Even when data is accessible, it may not be consistent or dependable. Suppliers' methodology and units of measurement may vary, making it difficult to compare data between vendors or follow development over time.

- **Complex supply chains:** All retail stores, including Meijer, have complex and extensive supply chains that involve multiple tiers of suppliers, making it challenging to trace emissions back to their original source. This can lead to gaps in data and difficulty in identifying emissions hotspots.

4.2 Observed Challenges with Data Systems

The research team noted several challenges with data systems during this calculation process:

- **Mapping Data:** To identify the business area in both sales and spend data, Meijer uses UNSPSC ID codes. It is difficult to map these codes to theEPA's EFs (which use NAICS codes), as there are not always direct matches. This may cause some inaccuracy in the emissions estimates. To address this challenge and increase accuracy, switching to NAICS codes in Meijer's data management system is suggested.

- **Lack of universal standardization:** There is currently no standardized method for measuring Scope 3 emissions. Based on data availability, different methodologies may be applied, making it difficult for retail stores to compare their emissions with other organizations or track progress against industry benchmarks. For example, comparing Scope 3 emissions of Meijer with other retail stores with mainly the same supplier list is not accurate since they may have applied different methodologies.

- **EPA emission factors**: The last version of the EPA EF is from 2016 in the EEIO methodology, and is not updated frequently enough to reflect changes in technology or other factors that can affect emissions. This can lead to outdated emission estimates and inaccurate reporting.

- **EEIO Methodologies**: The EEIO estimate is the average throughout the country, and the Meijer supplier chains may differ from the average. This implies that the models may need to properly account for the variations in environmental effects over time or across different regions. For instance, a certain economic activity may have a greater environmental impact in a highly populated metropolitan region than in a rural area with a lower population density.

- **GREET model**: Like all models, GREET relies on a series of assumptions and simplifications about the real-world systems it is modeling. These assumptions may not always accurately reflect the complexity and variability of real-world conditions, which can lead to inaccuracies in the model's results. This was especially apparent when the team looked at the well-to-pump GHG upstream emissions for electricity and only a U.S. mix data point was available, while the energy production profile for eGRID region can vary greatly.

5.0 Recommendations

As Meijer works to reduce its Scope 3 emissions, it is necessary to assess each of the calculated categories to better understand where improvements and innovations can be made to reduce emissions. Listed below are potential ideas and solutions to decrease emissions.

Category 1 - Purchased Goods and Services	Meijer's top three emitting categories within purchased goods and services are Dairy & Frozen, Meat & Seafood, and Direct Store Delivery (DSD). This covers about 32% of the Scope 3 emissions for this category. Some possible ideas to reduce emissions: ● Within the top three categories it is important to understand the most contributing subcategories: ○ Within the Dairy & Frozen category, the most carbon-intense subcategories are Eggs and Milk, Ice Cream, and Frozen Vegetables. ○ In the Meat & Seafood Category, Beef and Packed Meat are the most carbon-intense subcategories ● Identify the main supplier(s) in these subcategories and design a supplier engagement strategy based on their business practice. For example, the engagement strategy for farmers may be different than manufacturers. ● Support development of a platform for suppliers to enter their Scope 1 and Scope 2 emissions data. This platform could be designed by the

	retail industry, enabling suppliers to enter their emissions data once and automatically share it with all the retailers they work with. ● Particularly for animal-based products (Dairy, Meat, Seafood) consider suppliers that are working on scope 1 & 2 reductions within their own value chain. ○ Encourage suppliers to reduce emissions from animal feed: A significant portion of the emissions associated with meat and dairy production come from the production of animal feed. ○ Encourage suppliers to adopt regenerative farming practices, such as rotating crops, reducing tillage, and incorporating cover crops. ○ Encourage suppliers to reduce food waste: Food waste is a significant contributor to greenhouse gas emissions. ○ Encouraging suppliers to reduce emissions from transportation and logistics ○ Encourage suppliers to adopt renewable energy sources, such as solar or wind power. This could include options like renewable energy credits and on-site renewables. ○ Encourage suppliers to report their emissions and set targets for emissions reductions ● Establish a supplier recognition program to incentivize and reward suppliers for making sustainable improvements. Incentives could involve participation in on-site audits, training sessions, and performance improvement plans.
Category 2 - Capital Goods	Business areas within Meijer use cost codes to show expenses; however the usage of these cost codes is non-uniform across its 12 business areas. This creates difficulties with data management and therefore impacts the matching process of spend data with emissions factors. The research team had to use average emissions factors for expenses with inadequate or unknown cost code numbers, reducing the accuracy of the calculation. Hence, a uniform reporting standard amongst different business areas would substantially improve the emissions reporting process. Hence, we recommend: ● Fully defining activity identifiers of Cost code numbers to 5 digits for every budgeted purchase. This will allow better alignment of emission factors to each line item rather than using average emissions. ● Each line item should also include purchase order text which would allow the sustainability team to accurately match Cost code numbers with EPA NAICS commodity codes for the matching process. Property Development and IT Services are the highest spending business areas for Category 2 emissions and cause more than 66% of the total Category 2 emissions. These two business areas also seem to have the lowest emissions per dollar spent as they tend to be high volume. The suppliers of these business areas are large in size and usually well placed to reduce their own Scope 1 and 2 emissions due to economies of scale without having a large impact on their costs. As a large consumer, Meijer is well placed to engage these suppliers in

	tracking and setting their own decarbonization goals. Hence, we recommend that Meijer concentrate its supplier engagement efforts on these two business areas that represent the highest potential emission reductions. Programs within Meijer that make cleaner procurement decisions or engage these business area suppliers would have the lowest impact on the bottom line but the largest impact on category 2 emissions.
Category 3 - Fuel-and Energy-Related Activities	As Meijer looks to decrease its overall fuel and electricity use and change the sources of them (as part of Scope 1 & 2 emissions), these measures will also reduce Category 3 emissions that result from upstream acquisition and delivery of the raw materials needed to create each energy source. For example: ● Bio-based fuels have lower or negative values for upstream emissions factors in GREET compared to traditional fuels ● More fuel efficient vehicles, jets, and appliances will require less fuel and hence less upstream emissions It's important to note that while electrifying vehicles, buildings, and operations will overall lead to fewer CO2e emissions, Category 3 emissions could grow due to how fossil-fuel heavy the U.S. grid still is. Larger reductions in Scope 1 & 2 emissions would offset additions in Scope 3 emissions that result.
Category 4 - Upstream Transportation and Distribution	The research team could not obtain data for Category 4: Upstream Transportation and Distribution, however for future Scope 3 inventories there are a few considerations which could reduce emission impact: ● Work with more local suppliers to reduce the distance of shipments. ● Consolidate shipments to be higher volume to reduce empty trucks. Utilize more truckload (TL) shipments versus less-than-truckload (LTL) when possible. ● Work with third party providers that emphasize environmentally-preferable practices whether that is having a fleet of semi-trucks that are hybrid/electric or incentivizing drivers not to dead-head (drive their truck empty) ● Be mindful of selecting modes of transportation that are more environmentally-preferable as to minimize emission impacts. For example, rail and waterborne modes of transportation emit less GHG emissions than freight-truck or air cargo.[33] This should be considered when partnering with logistic companies, if possible, given if goods are perishable and the transportation transit time.
Category 5 - Waste Generated in Operations	Meijer utilizes recycling and landfilling as primary methods for waste disposal. A few considerations to reduce emissions: ● Streamline processes (sourcing, production, forecasting consumer demand) to limit the amount of waste generated. ● When waste is generated, ensure it is correctly sorted to maximize diversion and reduce waste sent to the landfill.

[33] "Rail and waterborne - best for low carbon motorized transport" 24 Mar. 2021, https://www.eea.europa.eu/publications/rail-and-waterborne-transport. Accessed 19 Mar. 2023

Category 6 - Business Travel	Currently, Meijer uses primarily automobile and airplane travel as the mode of business travel. There are a few ideas to lower the emissions totals in Category 6: ● Create standards/protocols for when meetings and employee travel requires an in-person visit, versus when an employee could use a virtual meeting instead. By encouraging the use of virtual meetings over in-person, this could reduce the emissions in this category. ● Additionally, Meijer could create protocols at specific role levels that allow a certain number of business trips in a year. This would allow a more senior employee more flexibility to decide if in-person over a virtual meeting is the right decision.
Category 7 - Employee Commuting	To improve data quality for future Scope 3 reports, Meijer could look at instituting a few practices: ● For office employees, tracking employee badge scans into and out of the office could provide more accurate totals on commute trips. ● For retail and warehouse employees, start to survey or better understand how many shifts an employee works before returning home, so better estimates on commute trips per shift could be calculated. There are a number of measures Meijer could take to reduce the environmental impact in Category 7: ● Continue to encourage a hybrid working environment to reduce employee commuting to the office. ● Offer incentives for employees to buy/lease a hybrid or electric car and continue to provide charging infrastructure at Meijer facilities to expand the program and increase usage. ● Encourage more walk or bike to work (by providing a stipend or other wellness benefit).
Category 8 - Upstream Leased Assets	Category 8 was a small percentage of Meijer's overall GHG emissions. However, Meijer could continue to reduce its GHG impact in Category 8 by leasing more energy efficient buildings in these countries or utilizing less space.
Category 9 - Downstream Transportation and Distribution	Meijer does not have oversight or authority over this category, since it is based on consumers of their products and how the individual transports their items home. However there are a few behavior change tactics Meijer could employ: ● Expand electric vehicle charger offerings at Meijer stores to encourage drivers of electric vehicles to make Meijer a primary shopping location. ● Promote more shared vehicle/carpooling or bike transportation to Meijer stores. ● Consider more "Meijer Grocery" or "Market" format stores to encourage urban dwellers to walk or bike to stores as opposed to driving long distances. ● Prioritize new store locations based on population densities to reduce the amount of vehicle-miles an individual will drive to buy groceries.

	● Encourage customers to volume buy over several trips of few items, perhaps incentivize consumers with larger discounts based on basket totals. ● Encourage customers to use more digital grocery delivery fulfillment by third parties (like UberEats, Shipt). This can decrease GHG emissions by 22–65%[34] compared to the base case of an individual grocery shopping in a traditional SUV.
Category 10 - Processing of Sold Products	Not Applicable
Category 11 - Use of Sold Products	Category 11 has a significant impact on the overall total GHG emissions. Considering that 95% of this category's emissions are tied to the gasoline that is sold at Meijer Express stations it would be beneficial to think about offsetting the gasoline emissions or reducing the volume of gasoline sold over time. A few ideas for Meijer to pursue: ● Invest in certified carbon reduction projects to offset the emissions generated in the use of gasoline. This could be a partnership with a third party that can help measure the offset needed to be carbon neutral (in this category). ● Encourage consumers to electrify their transportation by continuing to promote EV charging stations at Meijer locations and other electrification behavior changes.
Category 12 - End-of-Life Treatment of Sold Products	Meijer does not have oversight or authority over this category, since it is based on the consumers of their products and how the individual treats their items after using them. However there are a few behavior change tactics Meijer could encourage: ● Promote recycling through recycling centers at all Meijer locations ● Merchandise products that either have less packaging waste or are more recyclable ● Partner with suppliers that have recyclable packaging ● Market products that are "greener" to consumers in store ● Encourage suppliers to incorporate proper disposal instructions on their packaging and products (including adding How2Recycle labels on packaging)
Category 13 - Downstream Leased Assets	Not Applicable
Category 14 - Franchises	Not Applicable
Category 15 - Investments	Not Applicable

[34] Carbon Footprint of Alternative Grocery Shopping and Transportation Options from Retail Distribution Centers to Customer Nicholas J. Kemp, Luyao Li, Gregory A. Keoleian, Hyung Chul Kim, Timothy J. Wallington, and Robert De Kleine Environmental Science & Technology 2022 56 (16), 11798-11806. DOI: 10.1021/acs.est.2c02050

6.0 Next Steps

This document, which serves as a foundational framework for Scope 3 emissions in FY21 (establishing a baseline), is the first component of a GHG Scope 3 Action Plan for Meijer. The research team proposes several next steps in terms of how to utilize this report and reduce Scope 3 GHG emissions going forward. Critical next steps are as follows:

1. Assess the emissions data shared in this report at a more granular level. Review emission "hotspots" and where emissions can be reduced knowing the internal constraints and feasibility of the company. This can help the Meijer sustainability team create a targeted, prioritized list of Scope 3 reduction strategies inclusive of realistic next steps.
2. Set a target goal for Scope 3 emissions reduction (to be decided if this is publicized internally and/or externally).
3. Using the prioritized list of next steps and the target goal, develop a GHG Scope 3 Action Plan with specific sub-goals with comprehensive initiatives, targets and dates aimed to reduce emissions in each of the Scope 3 Categories and related business areas.
4. Engage with key stakeholders, both internally and externally, to share the results of this Scope 3 carbon accounting report and gather feedback on the proposed GHG Scope 3 Action Plan. This may be used to strengthen support for the proposed sustainability strategy and emissions reduction plan.
5. Implement the GHG Scope 3 Action Plan. This may involve changes to business operations, supplier engagement, employee engagement, and other related areas of the business.
6. Regularly monitor and report on progress towards achieving the Scope 3 reduction goals and targets outlined in the GHG Scope 3 Action Plan.

A critical next step will be for Meijer to work closely with its internal stakeholders and suppliers to enact the proposed GHG Scope 3 Action Plan. This partnership with stakeholders and suppliers will enable Meijer to develop strategies towards positive climate action for long-term change. Supply chain emissions are responsible for 95% of Meijer emissions (based on internal calculations of Scope 1 and Scope 2 emission totals). Therefore, engaging Meijer suppliers will be an effective strategy to reduce the overall carbon footprint. The research team recommends Meijer work collaboratively with suppliers to identify opportunities to reduce emissions. These relationships can lead to new opportunities for emissions reductions and cost savings through the creation of low carbon technologies, products, and strategies.

As a starting point, suppliers whose products contribute to the highest emitting category, Purchased Goods & Services, should be prioritized in working to find carbon reduction strategies. A common goal and management strategy should then be established and agreed upon. Companies should submit their progress annually to Meijer so the progress can be

recognized and attributed toward the overall target. Ideally, these targets and goals can be celebrated as wins and shared broadly to drive positive impact.

Key strategy questions for initial supplier engagement:

- Does the supplier have an appetite to lower their carbon emissions and work with a company like Meijer to do so?
- Does the supplier significantly contribute to Meijer's Scope 3 emissions?
- Does the supplier support a carbon reduction goal?
- How willing is the company to openly communicate and share emissions data or other information?
- Does the supplier possess the resources, infrastructure, and company buy-in to support carbon reduction strategies?

Other benefits of collaborating with suppliers include creating innovative new products, improving services, in addition to boosting revenues and profits for both parties. A study conducted by the consulting firm McKinsey found that companies, which regularly collaborated with suppliers, demonstrated higher growth, lower operating costs, and greater profitability than their industry peers.[35] The potential gains earned by Meijer could be impactful, from a sustainability and profitability perspective.

[35] *Taking supplier collaboration to the next level*. (2020, July 7). McKinsey. Retrieved March 20, 2023, from https://www.mckinsey.com/capabilities/operations/our-insights/taking-supplier-collaboration-to-the-next-level

Appendix

Appendix A. Emission Factors for Category 4, Category 7, and Category 9

This table is from the EPA's Emission Factors for Greenhouse Gas Inventories, updated in 2021. It is the GWP factors for vehicle types and utilized in calculating Category 4, 7, and 9.

Vehicle Type	CO_2 Factor (kg / unit)	CH_4 Factor (g / unit)	N_2O Factor (g / unit)	Units
Medium- and Heavy-Duty Truck	1.450	0.013	0.034	vehicle-mile
Passenger Car [A]	0.332	0.007	0.007	vehicle-mile
Light-Duty Truck [B]	0.454	0.012	0.009	vehicle-mile
Medium- and Heavy-Duty Truck	0.211	0.0020	0.0049	ton-mile
Rail	0.022	0.0017	0.0006	ton-mile
Waterborne Craft	0.041	0.0183	0.0008	ton-mile
Aircraft[C]	1.165	-	0.0359	ton-mile

Figure 19. Scope 3 Category 4: Upstream Transportation and Distribution and Category 9: Downstream Transportation and Distribution

Appendix B. Category 6

Calculation Process of CWT AnalytIQs

- CO_2e kg values provided by CWT AnalytIQs air and rail reporting are based on guidelines produced by DEFRA's GHG Conversion Factors. The value represents Total Greenhouse Gas (GHG) emissions.
    - This method evaluates flights based on airport locations and calculates emissions based upon the actual distance flown.
    - The total emissions of carbon dioxide equivalent (CO2e kg) includes carbon dioxide plus methane (CH4) and nitrous oxide (N2O), converted to carbon dioxide equivalents.
- Criteria used to determine the factors used in the calculation include:
    - Total distance of a flight segment (coupon), based on origin and destination airports.
        - Note: Trip type is not used in the determination of the factor
    - Class of flight. The available class types are:
        - Economy, premium economy, business, first
        - Note: For shorter flights class is not applicable
- Factors used do not include an "uplift" for Radiative Forcing
    - Radiative Forcing (RF) is a measure of the additional environmental impact of aviation. These include emissions of nitrous oxides and water vapor when emitted at high altitude.
- Factors used to calculate CO_2e kg include:

- Factors are published by DEFRA yearly, typically in the middle of the year. To keep a consistent method, the factors published in 1 year are applied to tickets issued in the subsequent year. For example, DEFRA factors published in summer 2018 are applied to tickets issued beginning January 1, 2019.
- CO2e kg values are calculated at the flight segment (coupon) level and values reported at "higher" levels (subtrip and ticket) are summed based on the associated flight segments (coupons).
- Short haul flights are those less than 785 km.
- Medium haul flights are those greater than 785 km, but less than 3,700km.
- Long haul flights are those greater than 3,700km.

Description of "Commercial Rental Car Data - Meijer Emissions Report Summary TP-Global 202102-202201" provided by Enterprise and National to Meijer:

The methodology for calculating total greenhouse gas (GHG) emissions in metric tons of Carbon Dioxide equivalents (MT CO2e) reporting is summarized as follows – (1) Calculate the average combined fuel economy for each car class driven. (1b) Note: miles per gallon and litres/100km figures provided in this report are an aggregate based the U.S. EPA combined MPG on all makes and models that make up the car classifications as defined by the Association of Car Rental Industry System Standards (ACRISS) within the fleet of vehicles operated by the Enterprise Holdings brands, and may not reflect the exact EPA figures for a particular make and model, the driving conditions encountered during a particular rental, nor the driving style of the renter. (2) Calculate the amount of fuel consumed by dividing the total distance driven in the car class by the average combined fuel economy for that car class. (3a) Calculate total Carbon Dioxide (CO2) by multiplying the quantity of fuel consumed for each vehicle by the EPA emissions factor for each car class (.00878 metric tons CO2 per gallon) (3b) Calculate total Methane (CH4) by multiplying the miles driven by 1.73e-08 metric tons CH4 per mile. The metric tons of CH4 are then converted to MT CO2e by multiplying by 28 - the GWP for CH4. (3c) Calculate total Nitrous (N2O) by multiplying the miles driven by 3.6e-09 metric tons N2O per mile. The metric tons of N2O are then converted to MT CO2e by multiplying by 265 - the GWP for N2O. (4) Total GHG emissions in MT CO2e is the sum of the metrics tonnes of CO2 + metric tons of CO2e for CH4 + metric tons of CO2e for N2O. Add CO2e emissions for each vehicle together to obtain total CO2e emissions. Global Warming Potential (GWP) values as reported within the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report.