

# Environmentally Extended Input-Output for Industrial Decarbonization Analysis (EEIO-IDA)

An Excel-based scenario modeling tool for analysis of scope 1, 2, and 3 industrial emissions  
*developed by the U.S. Department of Energy Industrial Efficiency & Decarbonization Office*



# Overview of the EEIO-IDA scenario modeling tool

EEIO-IDA: Environmentally Extended Input-Output for Industrial Decarbonization Analysis

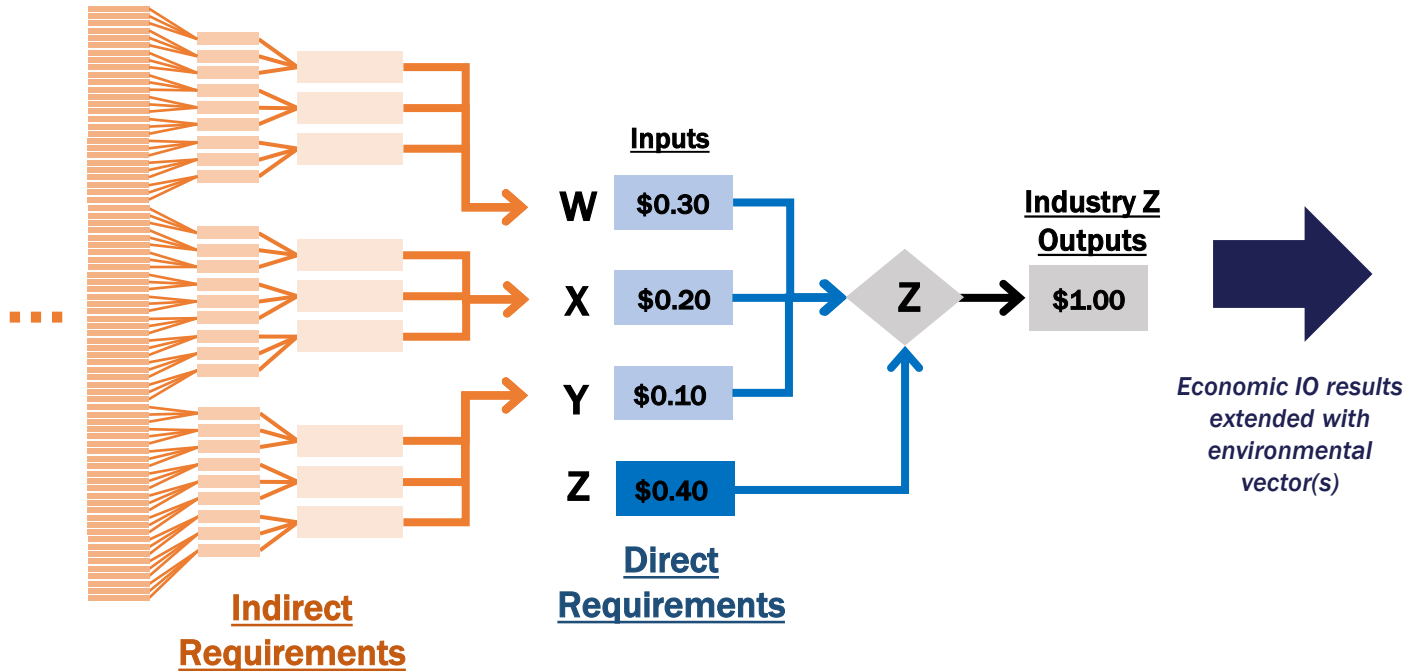
**EEIO-IDA is an Excel-based tool for rapid “what-if” analysis of industrial decarbonization opportunities, leveraging an environmentally extended input/output (EEIO) approach.**

- An Excel-based user interface allows for open-ended adjustment of industrial fuel mix, electric grid generation mix, electrification progress, carbon capture, and other assumptions for 25 different industrial subsectors
- The EEIO-IDA tool automatically calculates scope 1, 2, and upstream Scope 3 emissions based on user assumptions and compares results to a 2018 base case
- This document provides an overview of the EEIO-IDA tool and presents base case (2018) results for the 25 industrial subsectors included in the model

# The environmentally extended input-output (EEIO) method

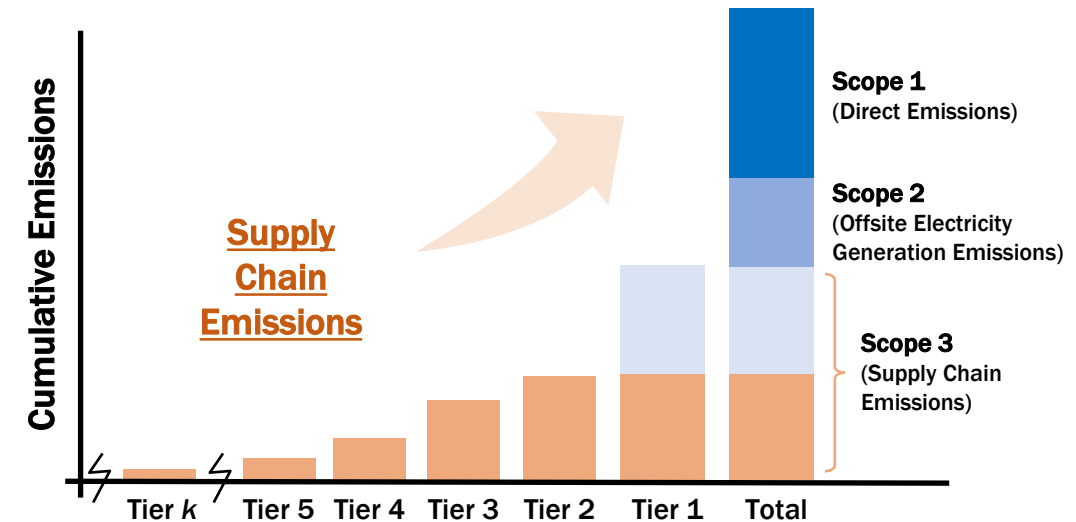
## Total Economic Requirements of Industry Z:

Direct + Indirect



## Environmental Extension

Scope 1, 2, and 3 Greenhouse Gas Emissions



**Environmentally-Extended Input/Output (EEIO)** models leverage economic transaction data to estimate the cumulative (supply-chain) impacts of an industry's products on environmental metrics such as greenhouse gas emissions.

# Advantages & disadvantages of EEIO methods

## Advantages of EEIO Modeling

- **Economy-wide:** Macroeconomic EEIO models represent entire economies; they can account for all industrial products and emissions.
- **Holistic (scope 1, 2, and 3):** EEIO techniques enable assessment of total life cycle emissions for industrial products, including emissions accrual in the upstream supply chain.
- **Supply chain perspective:** Since EEIO models track resource flows through economies, they can be used for hotspot detection and supply chain risk assessment.

## Limitations of Existing EEIO Models

- **Recency:** Many existing EEIO models are based on datasets that are 10-20 years old
- **Adjustability:** Existing U.S. EEIO models do not allow for user adjustment of energy efficiency, grid mix, or industrial fuel use
- **Subsector Homogeneity:** All EEIO models assume subsector homogeneity (e.g., same energy or emissions intensity for a whole subsector). Models with more granular subsector definitions are more accurate, but data availability can become a limitation.

**The EEIO-IDA tool is designed to leverage the holistic scope of an EEIO approach while enhancing recency and adjustability.**

**The EEIO-IDA tool:**

- reflects a 2018 base year (aligns with 2018 MECS\*)
- includes capabilities for adjusting key assumptions in each industry.
- is purpose-built for industrial decarbonization scenario modeling

**CURRENT**

**ADJUSTABLE**

**SPECIALIZED**

\*EIA [Manufacturing Energy Consumption Survey](#) (MECS)



# Foundational datasets and methods for EEIO-IDA

- The underlying economic IO dataset is BEA's Input-Output Accounts for 2018 (71 subsectors, 25 of which are industrial subsectors).
- Foundational environmental vectors quantify consumption of major fuels, electricity, and non-energy-related emissions for each subsector.
- Greenhouse gas emissions are calculated dynamically in the model based on foundational data and user-input assumptions.
- Decarbonization “pillars” from the Department of Energy's (DOE's) **Industrial Decarbonization Roadmap** are emphasized in the user interface, and the user can independently adjust assumptions for each pillar.
- For a complete summary of datasets and methods in EEIO-IDA, see the tool documentation & user guide.

## Key Data Sources for EEIO-IDA Model

### Fuel Use by Subsector

- EIA Manufacturing Energy Consumption Survey (MECS) 2018
- USDA Census of Agriculture 2017
- IEA Annual Energy Outlook for 2018
- U.S. Economic Census 2017
- EIA Electric Power Annual 2018
- ORNL Transportation Energy Data Book for 2018
- EIA Commercial Buildings Energy Consumption Survey (CBECS) 2018
- BEA IO Use Tables 2018 (used for disaggregation)
- DOE Comprehensive Annual Energy Data and Sustainability Performance (for federal facilities) 2018

### Non-Energy Emissions

- EPA Inventory of Greenhouse Gas (GHG) Emissions and Sinks for 2018

### Emissions Factors and Global Warming Potential (GWP)

- GHG Emissions Factors by Fuel: 2006 IPCC Guidelines for National Greenhouse Gas Inventories
- GWP by Emission (for CO<sub>2</sub>-eq calcs): IPCC AR5 values for 100-Year GWP

### IO Economic Input-Output Dataset

- BEA Input Output Accounts 2018

[DOE Industrial Decarbonization Roadmap, DOE Report No. EE-2635 \(2022\)](#)

# Scenario modeling interface in EEIO-IDA

DOE's [Industrial Decarbonization Roadmap](#) decarbonization pillars build the foundation for the user scenario-building interface

## Energy Efficiency

- User can modify the amount of energy consumed in each industrial subsector to deliver its services and products

## Industrial Electrification

- User can modify the fraction of energy supplied by electricity in each subsector
- User can modify the domestic electricity grid mix for the U.S.

## Low-Carbon Fuels, Feedstocks, and Energy Sources

- User can modify the mixture of fuels for each subsector.

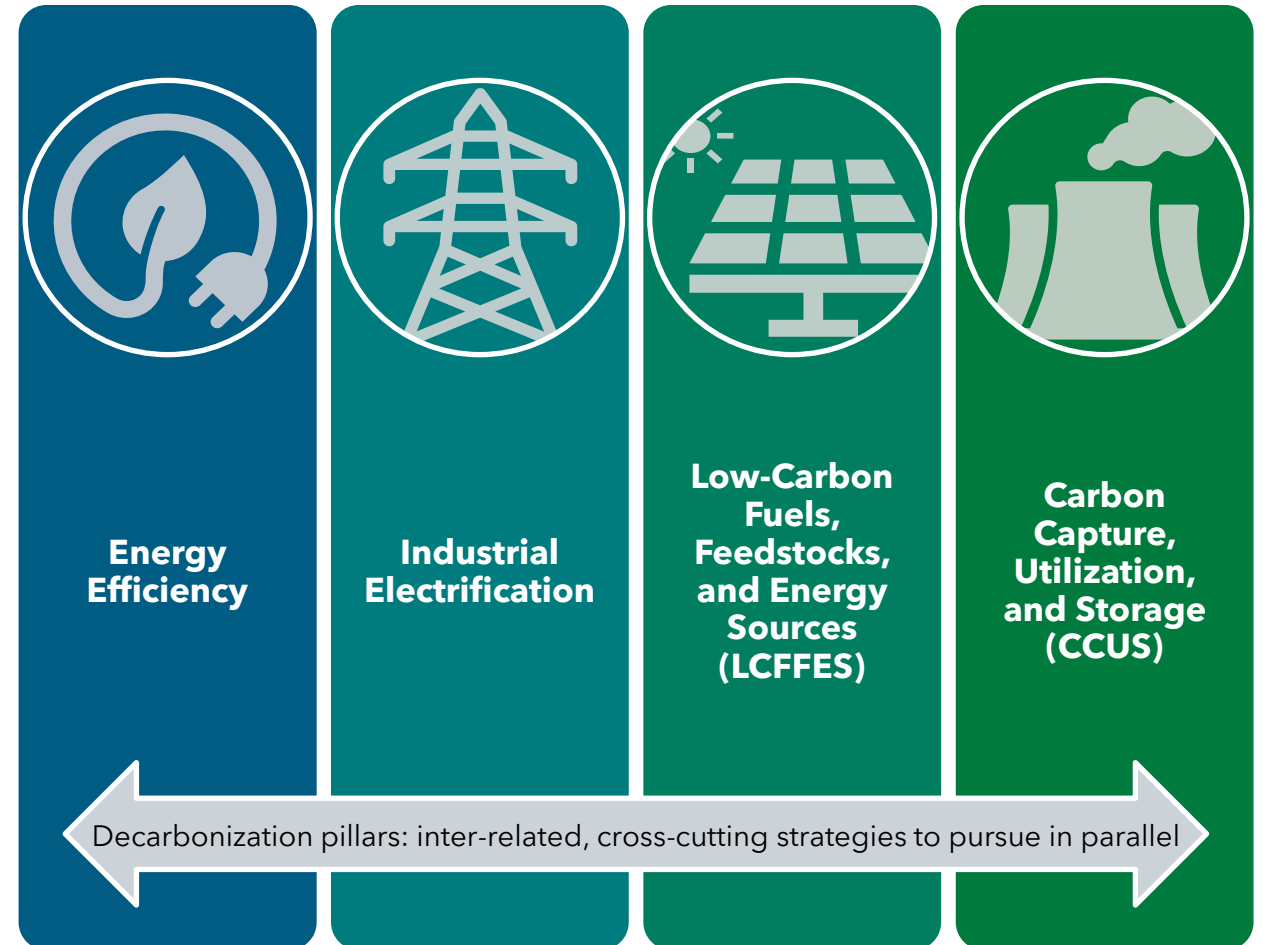
## Carbon Capture, Utilization, and Storage (CCUS)

- User can modify the fraction of combustion and process related CO<sub>2</sub> captured in each subsector.

## Other Decarbonization Approaches

- User can modify the amount of non-energy emissions produced by each subsector (process approaches)
- User can modify the product demand for each subsector

## Industrial Decarbonization Pillars



# EEIO-IDA user interface: representative tool screencap

U.S. DEPARTMENT OF ENERGY (DOE) OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY (EERE)

## Environmentally Extended Input-Output for Industrial Decarbonization Analysis

### EEIO-IDA User Interface

User instructions: modify model assumptions by editing cells with a WHITE background and BLUE text:  <-- User input cells with WHITE background and BLUE numeric values

#### Electric Grid Assumptions (Industrial Electrification Pillar)

Assumed Electric Grid Mix (U.S. Average)	Coal	Natural Gas	Petroleum	Nuclear	Biofuels	Renewables (except bio)	Total (100%)
<b>USER INPUT VALUES (% net electricity generation)</b>	28.4%	34.1%	0.6%	20.1%	0.8%	15.8%	100%
U.S. 2018 (EIA MER)	28.4%	34.1%	0.6%	20.1%	0.8%	15.8%	100%
U.S. 2022 (EIA MER)	20.1%	38.9%	0.5%	18.9%	0.7%	20.9%	100%
U.S. 2030, Base Case Scenario (EIA AEO)	8.4%	22.6%	0.2%	18.4%	0.0%	50.4%	100%
<b>REFERENCE SCENARIOS (% net electricity generation)</b>	5.0%	19.4%	0.1%	12.9%	0.0%	62.6%	100%
U.S. 2030, Low Cost Renewables Scenario (EIA AEO)	7.0%	20.0%	0.2%	18.4%	0.0%	54.5%	100%
U.S. 2050, Low Cost Zero Carbon Tech Scenario (EIA AEO)	0.7%	7.7%	0.1%	14.2%	0.0%	77.3%	100%
World 2030, Net Zero by 2050 Scenario (IEA)	8.9%	16.8%	1.0%	9.9%	4.0%	59.4%	100%
World 2050, Net Zero by 2050 Scenario (IEA)	1.0%	1.0%	0.0%	8.0%	5.0%	85.0%	100%

**Include Biogenic Emissions in Emissions Totals?**

To Include emissions from biofuel combustion in emissions totals, input a "Y" below. Emissions totals will be higher when selecting "Y."

(Y/N)

#### Energy Mix Adjustments by Subsector (Low-Carbon Fuels and Industrial Electrification Pillars)

NAICS Code(s)	Nonmanufacturing Industries	USER INPUT VALUES (%)						Total (100%)
		Electricity	Coal	Natural Gas	Petroleum	Biofuels	Renewables (except bio)	
111, 112	Farms	24%	0%	18%	58%	0%	0%	100%
113, 114, 115	Forestry, fishing, and related activities	6%	1%	13%	79%	0%	0%	100%
211	Oil and gas extraction	0%	0%	81%	19%	0%	0%	100%
212	Mining, except oil and gas	0%	2%	41%	57%	0%	0%	100%
213	Support activities for mining	0%	0%	16%	84%	0%	0%	100%
23	Construction	10%	0%	1%	89%	0%	0%	100%

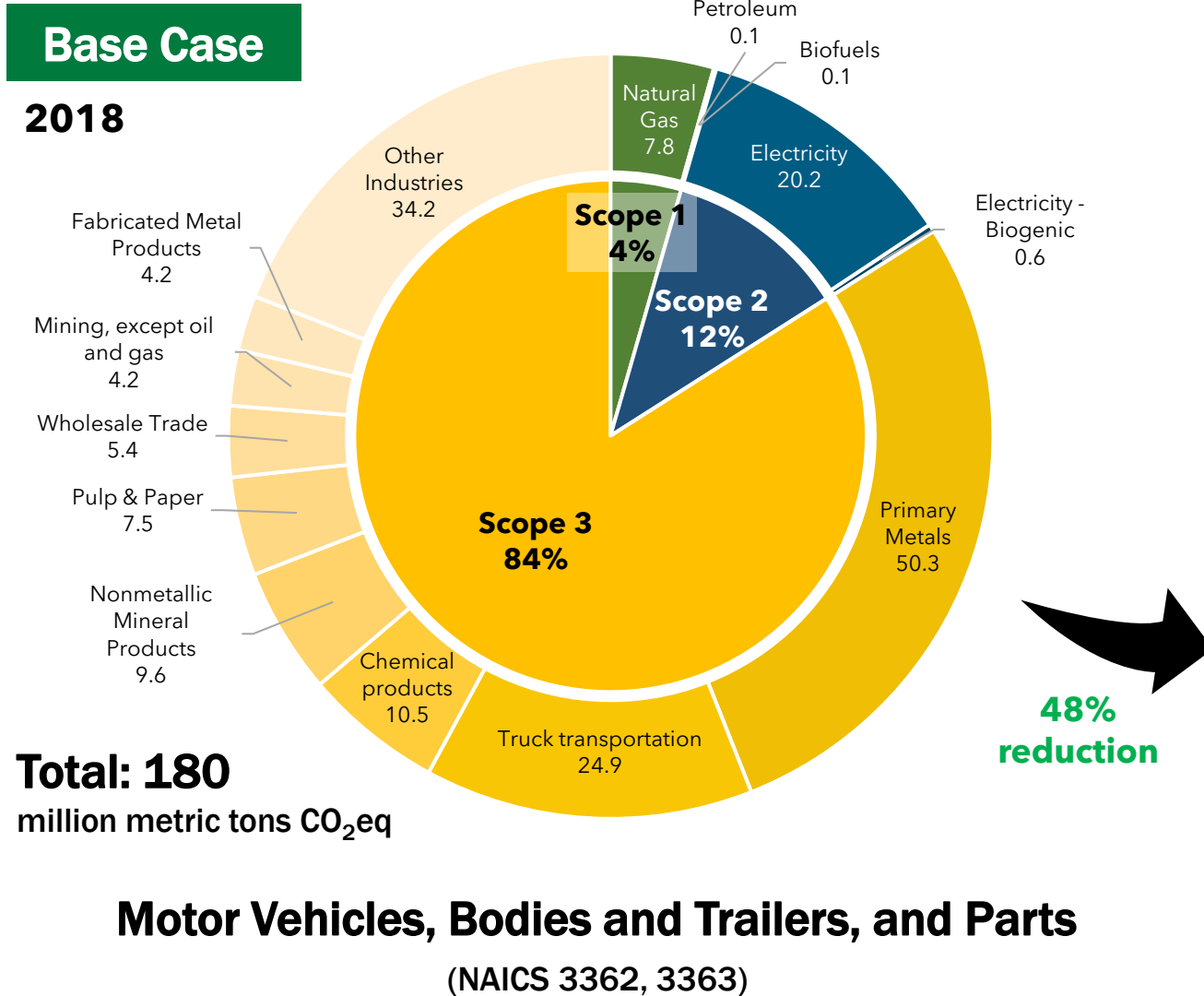
REFERENCE VALUES (2018, %)							
Electricity	Coal	Natural Gas	Petroleum	Biofuels	Renewables (except bio)	Total (100%)	
24%	0%	18%	58%	0%	0%	100%	100%
6%	1%	13%	79%	0%	0%	100%	100%
0%	0%	81%	19%	0%	0%	100%	100%
0%	2%	41%	57%	0%	0%	100%	100%
0%	0%	16%	84%	0%	0%	100%	100%
10%	0%	1%	89%	0%	0%	100%	100%

NAICS Code(s)	Manufacturing Industries	USER INPUT VALUES (%)						Total (100%)
		Electricity	Coal	Natural Gas	Petroleum	Biofuels	Renewables (except bio)	
321	Wood products	18%	0%	17%	4%	60%	0%	100%
327	Nonmetallic mineral products	16%	23%	43%	17%	1%	0%	100%
331	Primary metals	31%	2%	51%	12%	4%	0%	100%
332	Fabricated metal products	49%	0%	49%	2%	0%	0%	100%

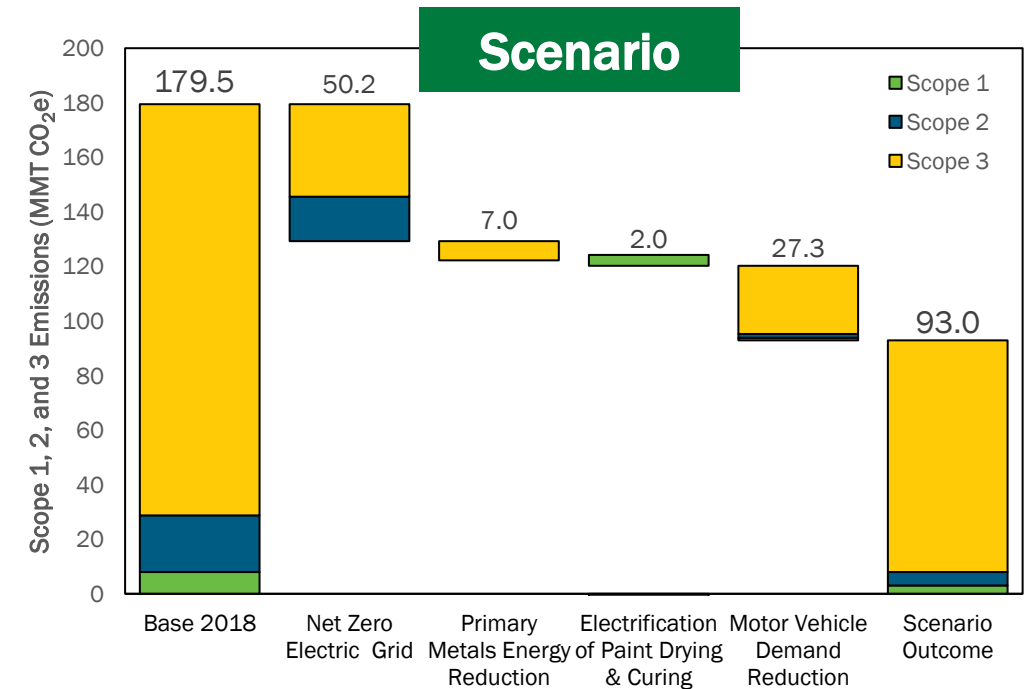
REFERENCE VALUES (2018, %)							
Electricity	Coal	Natural Gas	Petroleum	Biofuels	Renewables (except bio)	Total (100%)	
18%	0%	17%	4%	60%	0%	100%	100%
16%	23%	43%	17%	1%	0%	100%	100%
31%	2%	51%	12%	4%	0%	100%	100%
49%	0%	49%	2%	0%	0%	100%	100%

# A representative industrial decarbonization scenario in EEIO-IDA



## Scenario Assumptions:

- Clean Grid (IEA “Net Zero by 2050” for 2050)
- 33% reduction in energy demand for primary metals (aluminum and steel)
- 50% electrification of steam & paint curing
- 25% reduction in demand for new motor vehicles





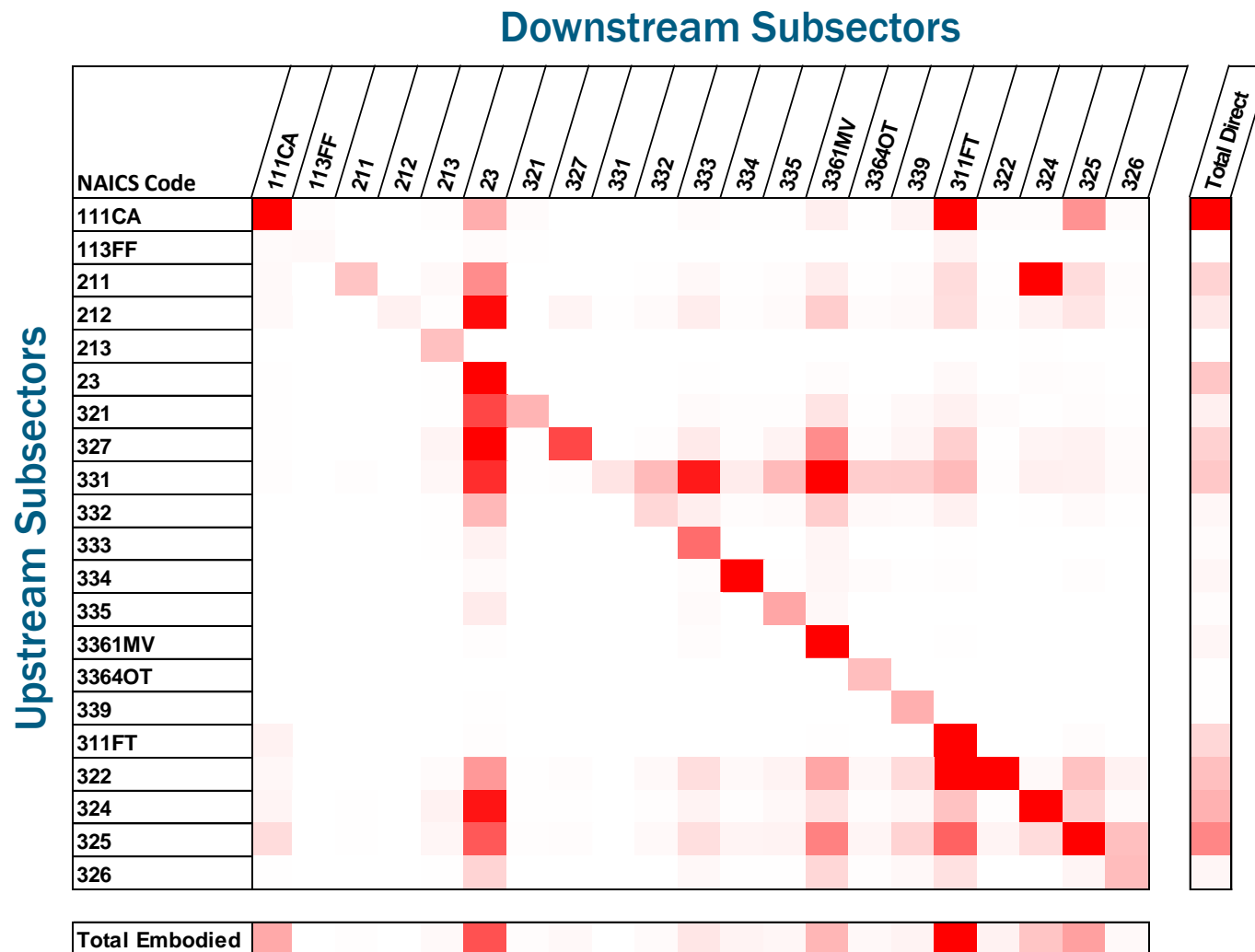
# Expected use cases for the EEIO-IDA tool

The EEIO-IDA tool can be used for:

- carbon hotspot analysis
- economy-level technology impact assessment
- strategic planning

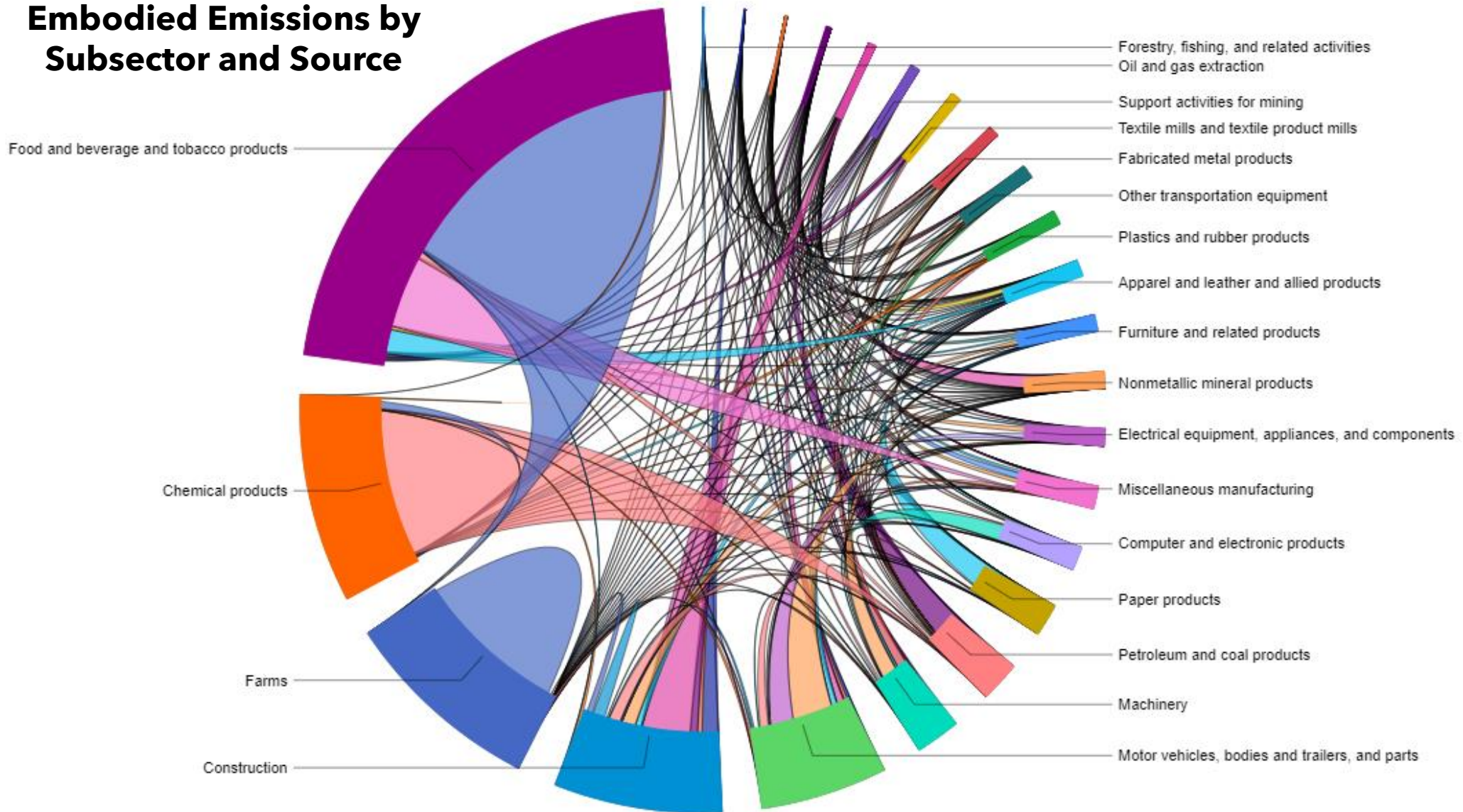
Scenario modeling with EEIO-IDA can be used to answer questions like:

- Where are the largest opportunities for decarbonization (in the industrial sector overall, or in an individual industry)?
- How can strategies can be combined to reach net-zero emissions overall?



# Using EEIO to identify sources of upstream emissions

## Embodied Emissions by Subsector and Source

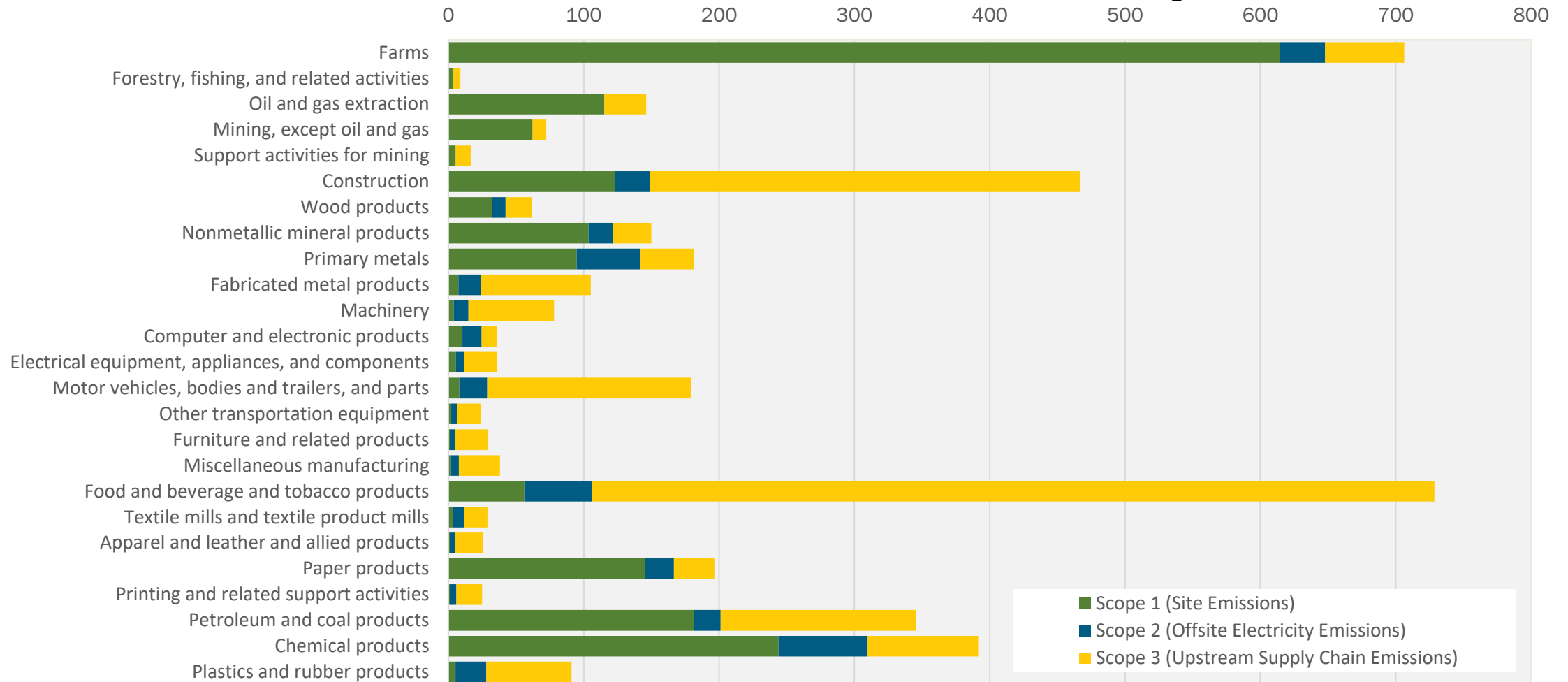


# Summary level base case results for all industrial subsectors

EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

2018

## U.S. Greenhouse Gas Emissions in 2018 (million metric tons CO<sub>2</sub>eq)



# Detailed base case results for all industrial subsectors

EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

The slides that follow present detailed base case results for each of the 25 industrial subsectors (6 non-manufacturing industrial subsectors and 19 manufacturing subsectors) in the EEIO-IDA model, listed and hyperlinked below:





# Farms



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

648

706

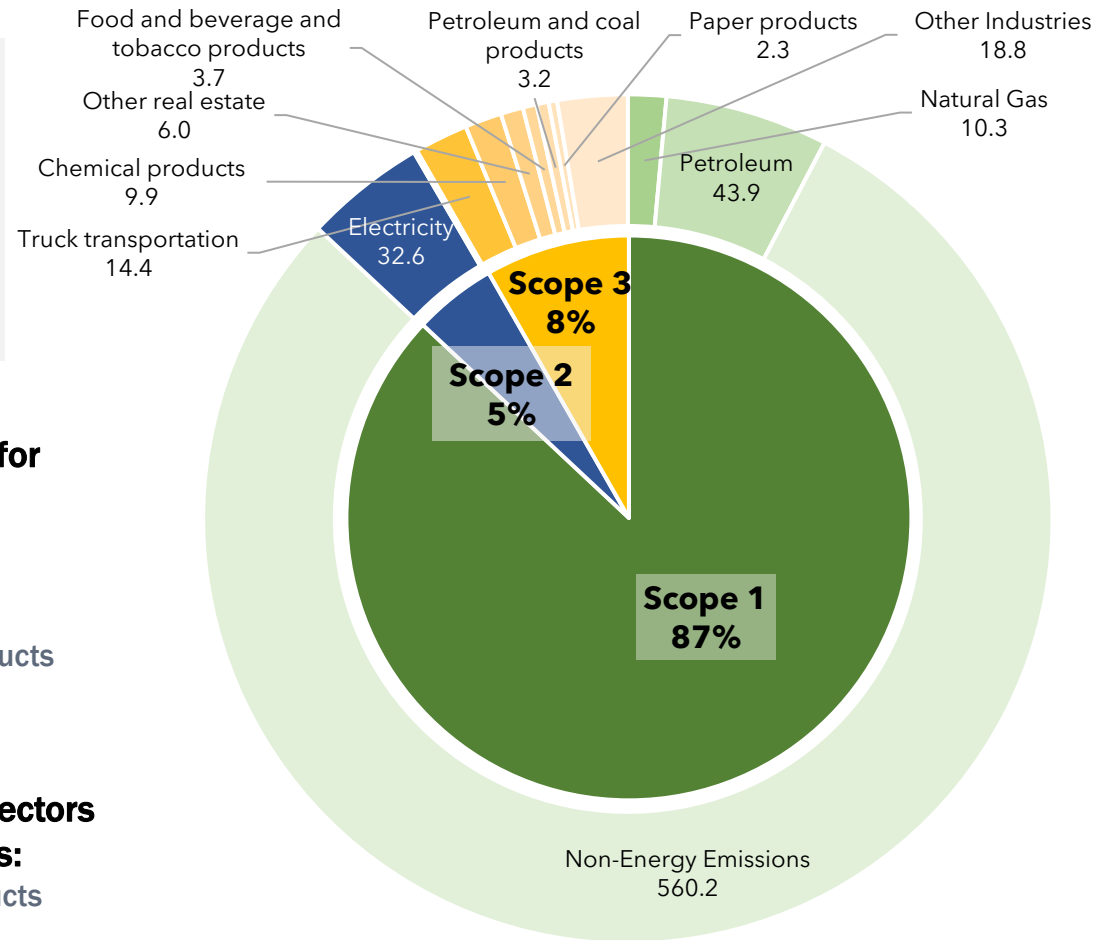
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Truck transportation
- Chemical products
- Other real estate
- Food and beverage and tobacco products
- Petroleum and coal products

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Food and beverage and tobacco products
- Farms
- State and local general government
- Food services and drinking places
- Chemical products



**Farms**  
(NAICS 111, 112)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Farms Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

**Scope 1** (onsite combustion) emissions represent 87% of the embodied emissions of this subsector's products

**Scope 2** (offsite electricity generation) emissions represent 5% of the embodied emissions of this subsector's products

The remaining 8% of embodied emissions are **Scope 3** (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Forestry, fishing, and related activities



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

4

9

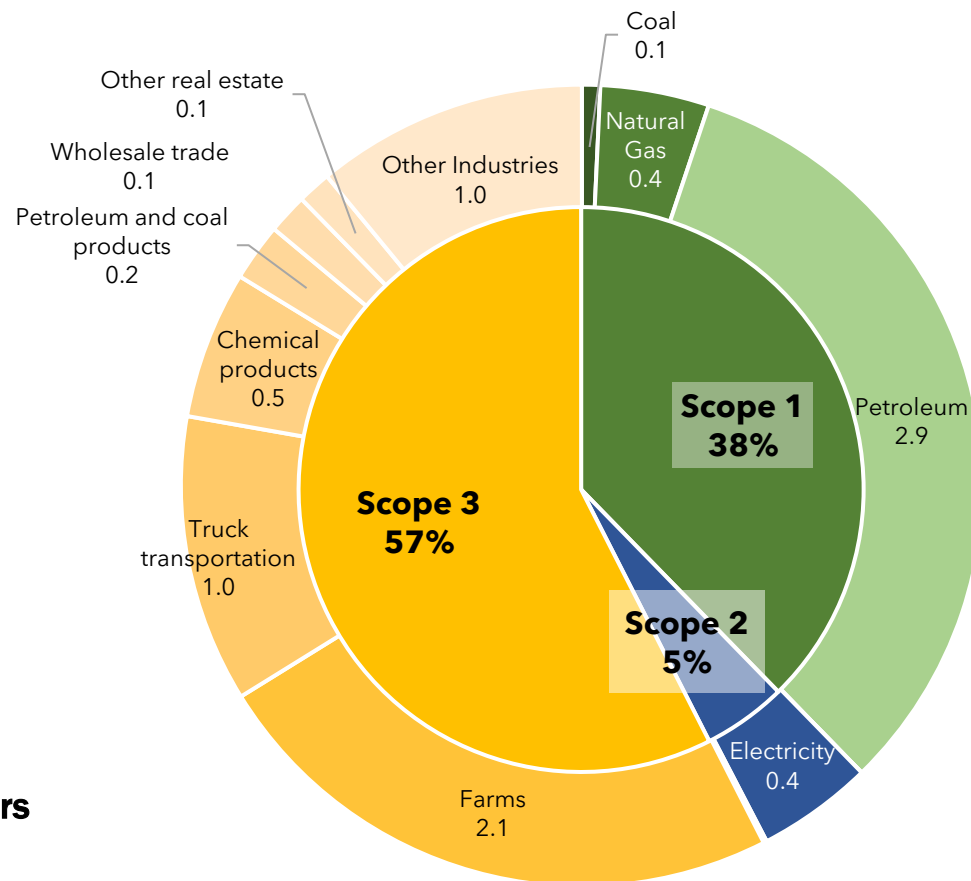
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Farms
- Truck transportation
- Chemical products
- Petroleum and coal products
- Wholesale trade

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Food and beverage and tobacco products
- Forestry, fishing, and related activities
- Farms
- State and local general government
- Construction



## Forestry, fishing, and related activities

(NAICS 113, 114, 115)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Forestry, Fishing, and Related Activities Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 38% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 5% of the embodied emissions of this subsector's products

The remaining 57% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Oil and gas extraction



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

115

146

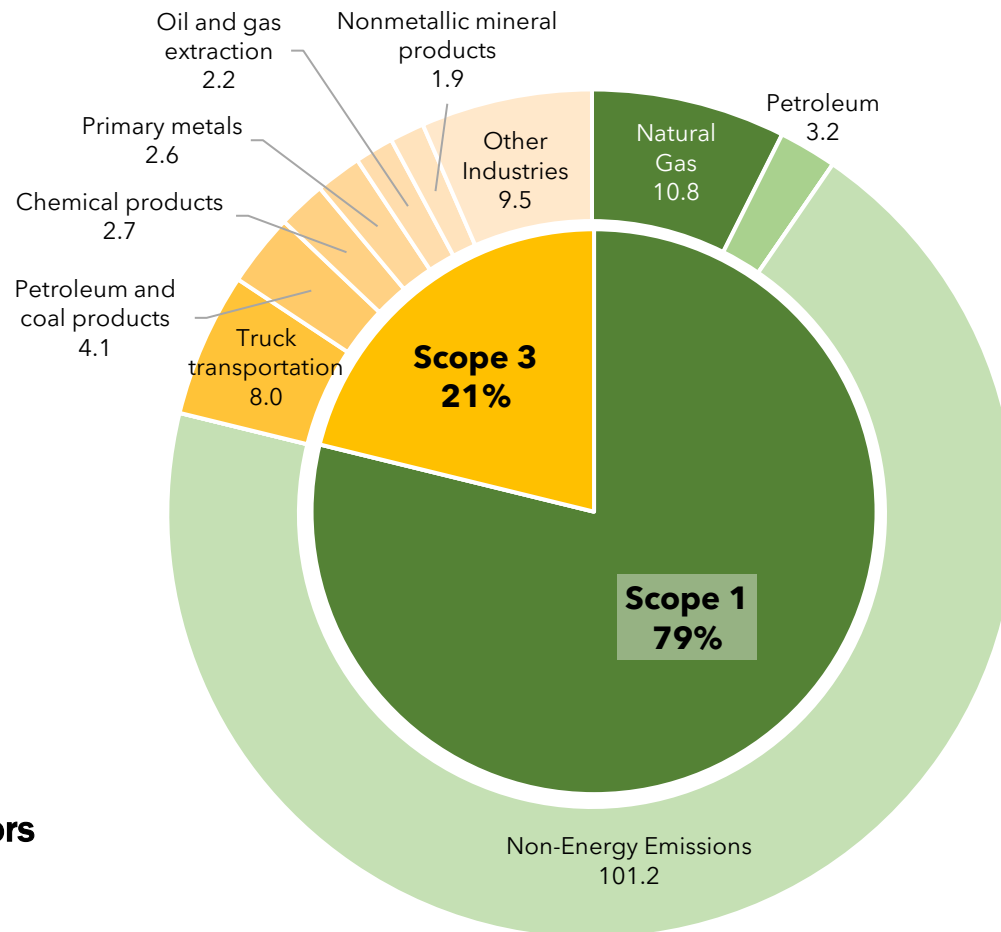
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Pipeline transportation
- Primary metals
- Truck transportation
- Chemical products
- Petroleum and coal products

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Petroleum and coal products
- State and local general government
- Construction
- Utilities
- State and local government enterprises



## Oil and gas extraction

(NAICS 211)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Oil and Gas Extraction Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 79% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 0% of the embodied emissions of this subsector's products

The remaining 21% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Mining, except oil and gas



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

62

72

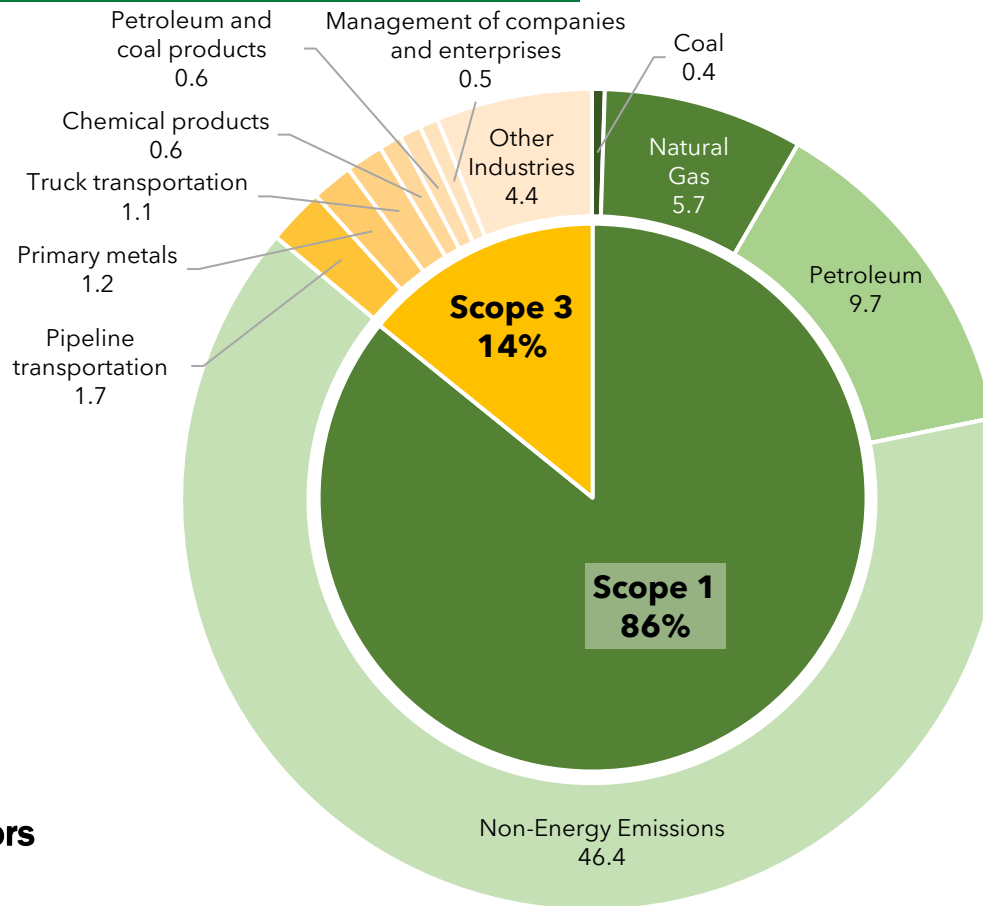
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Truck transportation
- Petroleum and coal products
- Chemical products
- Primary metals
- Oil and gas extraction

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Construction
- Utilities
- Motor vehicles, bodies and trailers, and parts
- State and local general government
- State and local government enterprises



## Mining, except oil and gas (NAICS 212)

### Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Mining, Except Oil and Gas Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 86% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 0% of the embodied emissions of this subsector's products

The remaining 14% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use





# Support activities for mining



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

5

million metric tons CO<sub>2</sub>eq

Scope 1, 2 & 3

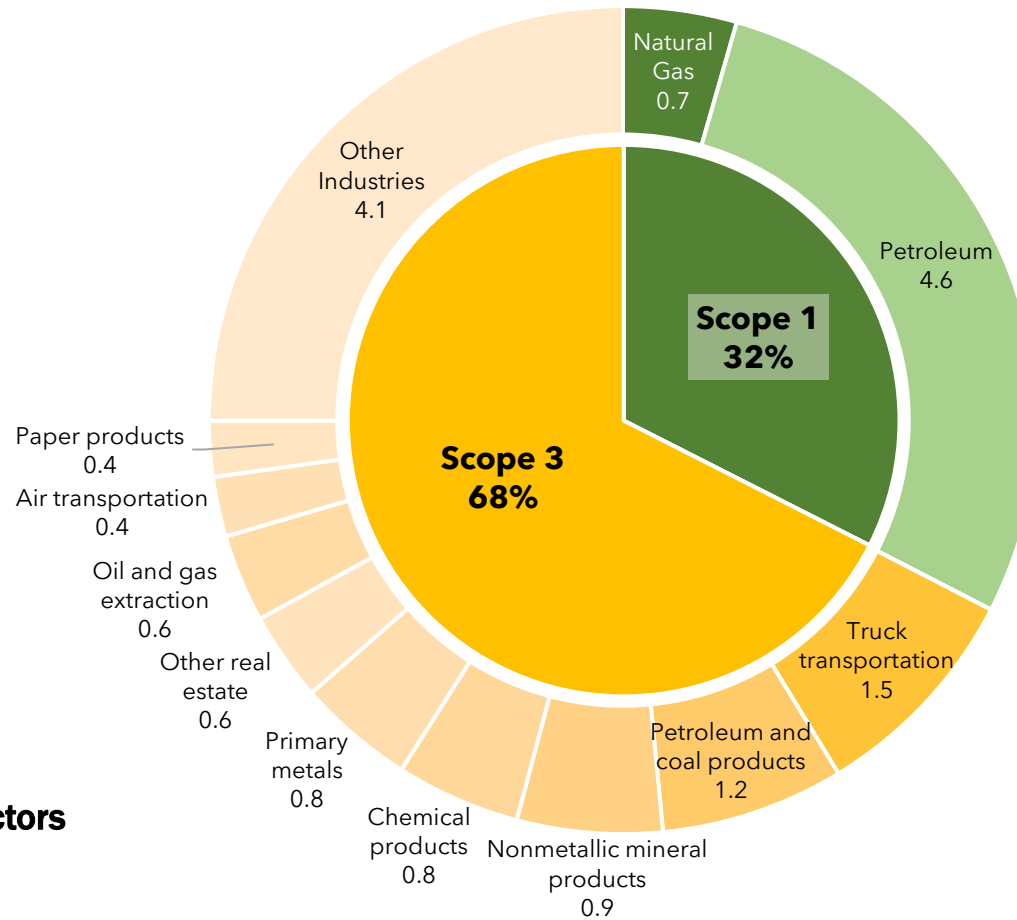
17

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Truck transportation
- Petroleum and coal products
- Nonmetallic mineral products
- Chemical products
- Primary metals

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Support activities for mining
- Petroleum and coal products
- Construction
- State and local general government
- Utilities



## Support activities for mining

(NAICS 213)

### Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Support Activities for Mining Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 32% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 0% of the embodied emissions of this subsector's products

The remaining 68% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Construction



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

149

Scope 1, 2 & 3

467

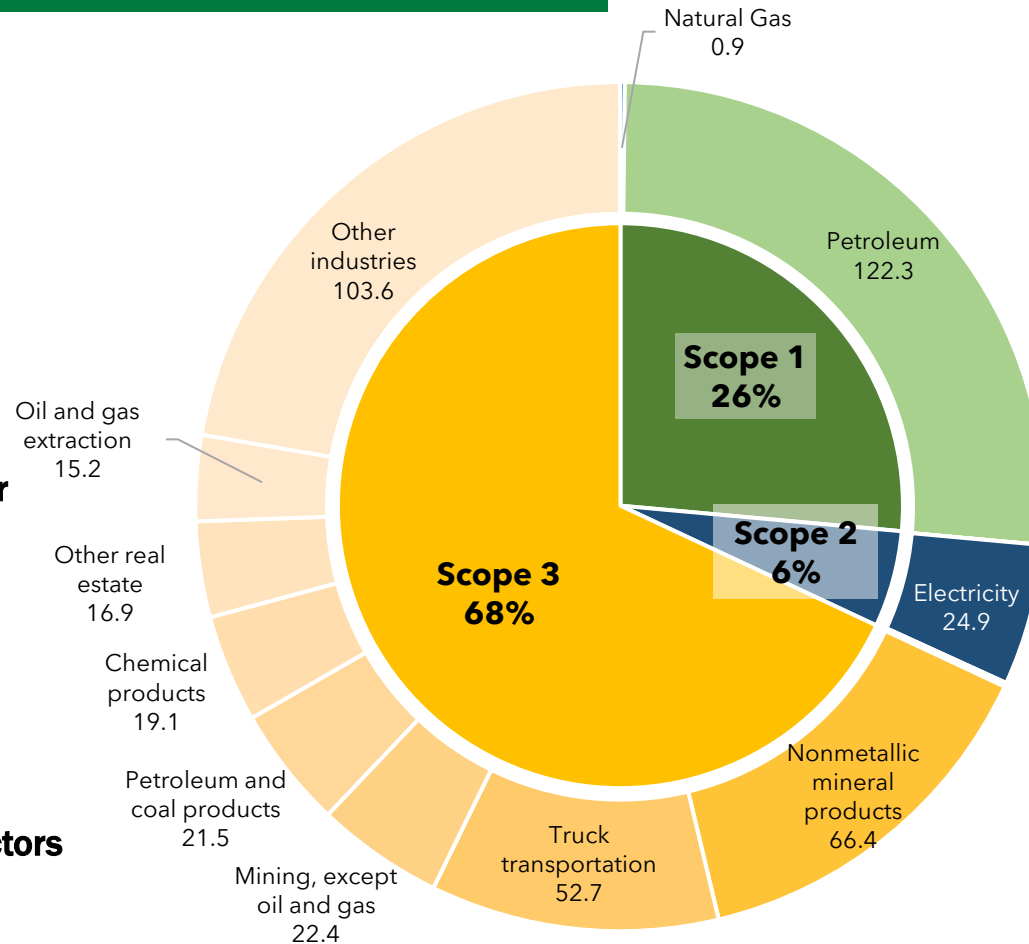
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Nonmetallic mineral products
- Truck transportation
- Mining, except oil and gas
- Petroleum and coal products
- Primary metals

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Construction
- Housing
- State and local general government
- State and local government enterprises
- Other retail



## Construction

(NAICS 23)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Construction Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

**Scope 1** (onsite combustion) emissions represent 26% of the embodied emissions of this subsector's products

**Scope 2** (offsite electricity generation) emissions represent 6% of the embodied emissions of this subsector's products

The remaining 68% of embodied emissions are **Scope 3** (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Wood products



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

42

62

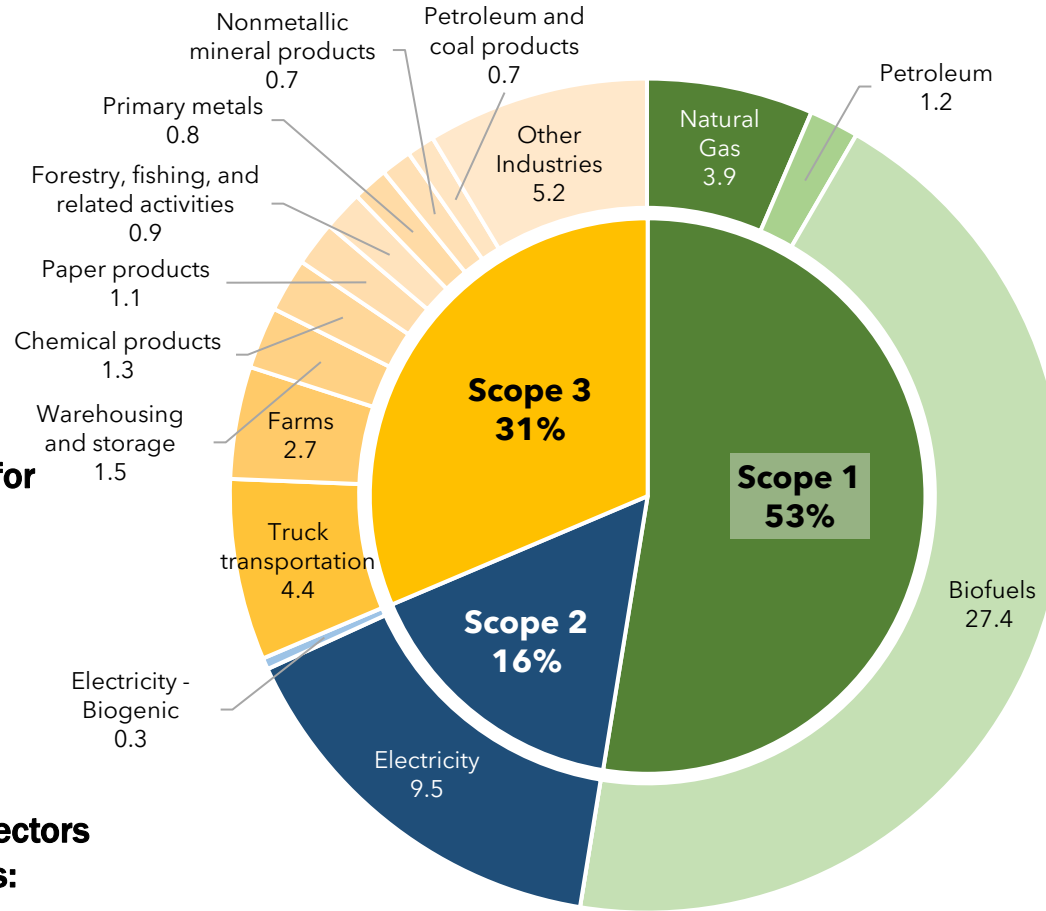
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Truck transportation
- Farms
- Warehousing and storage
- Chemical products
- Paper products

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Construction
- Wood products
- Furniture and related products
- State and local general government
- Motor vehicles, bodies and trailers, and parts



## Wood products

(NAICS 321)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Wood Products Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 53% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 16% of the embodied emissions of this subsector's products

The remaining 31% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Nonmetallic mineral products



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

121

150

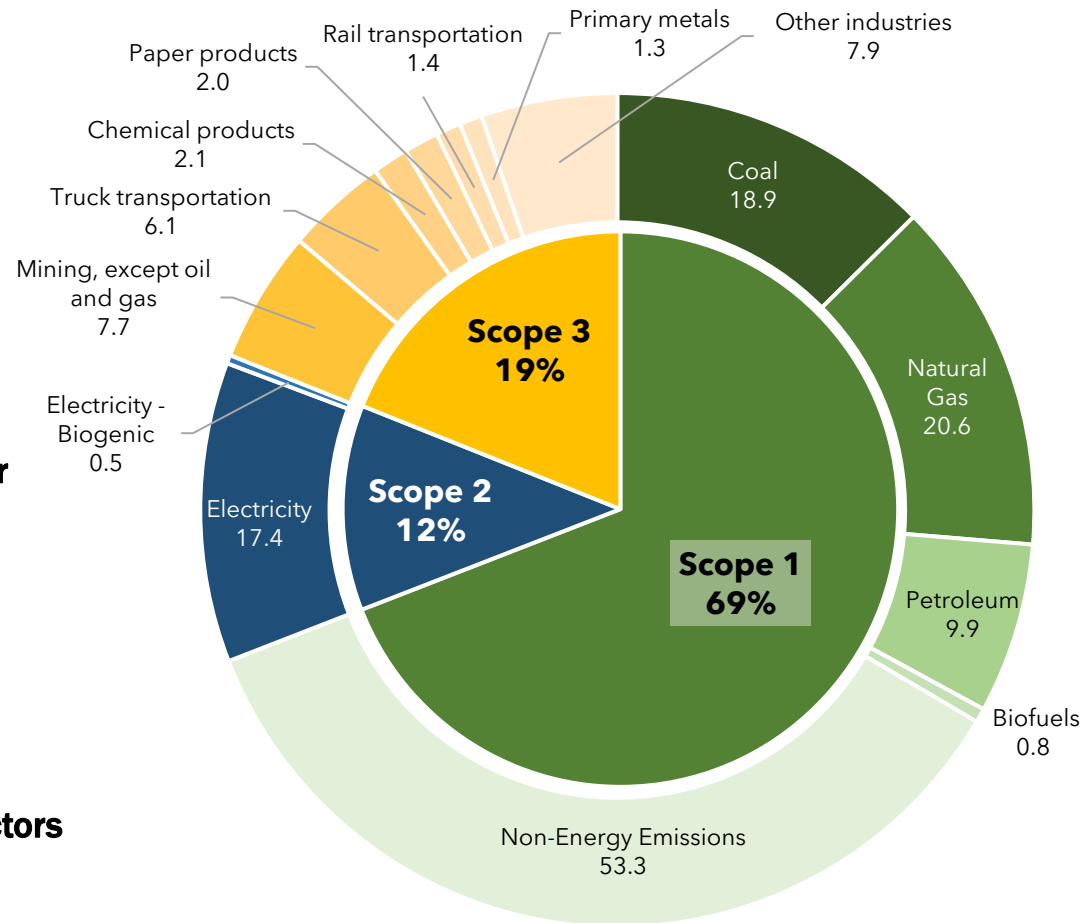
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Mining, except oil and gas
- Truck transportation
- Chemical products
- Paper products
- Rail transportation

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Construction
- Nonmetallic mineral products
- Motor vehicles, bodies and trailers, and parts
- State and local general government
- Food and beverage and tobacco products



## Nonmetallic mineral products (NAICS 327)

### Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Nonmetallic Mineral Products Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 69% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 12% of the embodied emissions of this subsector's products

The remaining 19% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use





# Primary metals



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

142

181

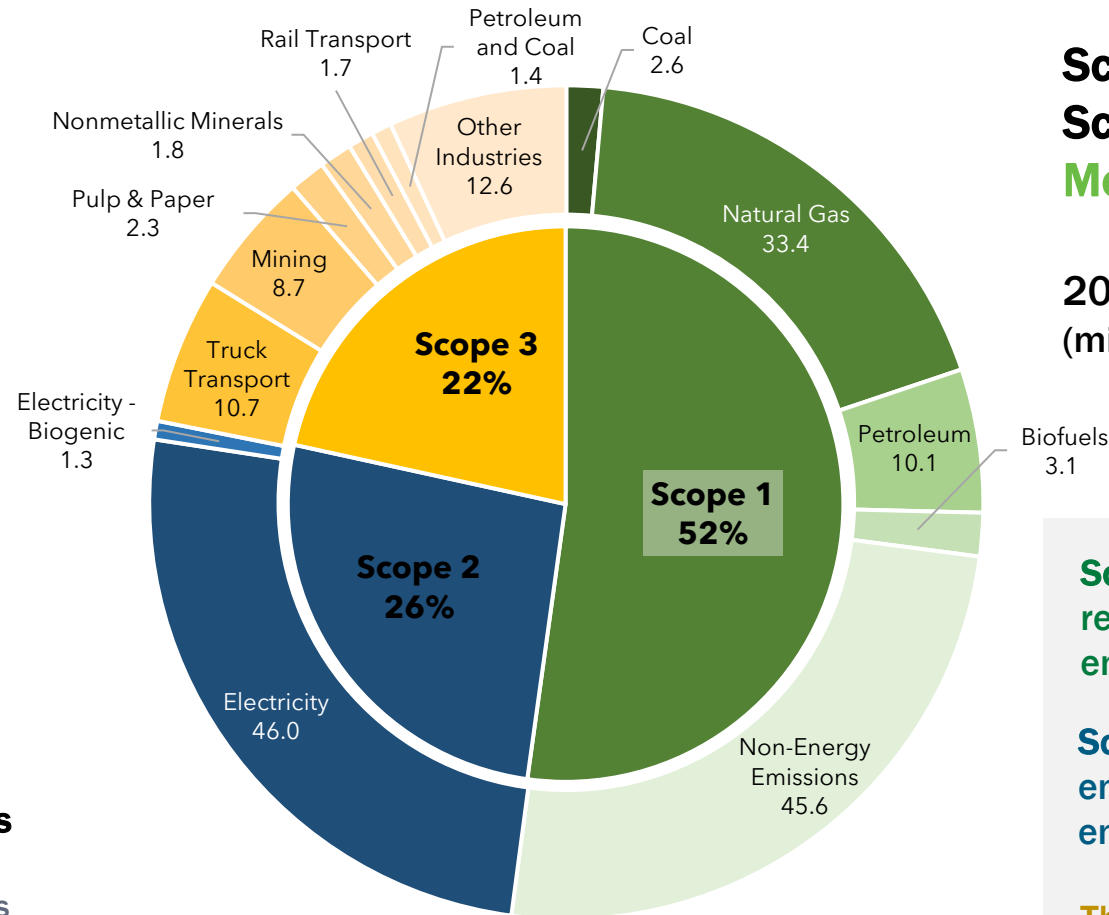
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Truck transportation
- Mining, except oil and gas
- Paper products
- Nonmetallic mineral products
- Rail transportation

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Motor vehicles, bodies and trailers, and parts
- Machinery
- Construction
- Food and beverage and tobacco products
- Fabricated metal products



## Primary metals

(NAICS 331)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Primary Metals Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

**Scope 1** (onsite combustion) emissions represent 52% of the embodied emissions of this subsector's products

**Scope 2** (offsite electricity generation) emissions represent 26% of the embodied emissions of this subsector's products

The remaining 22% of embodied emissions are **Scope 3** (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Fabricated metal products



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

24

105

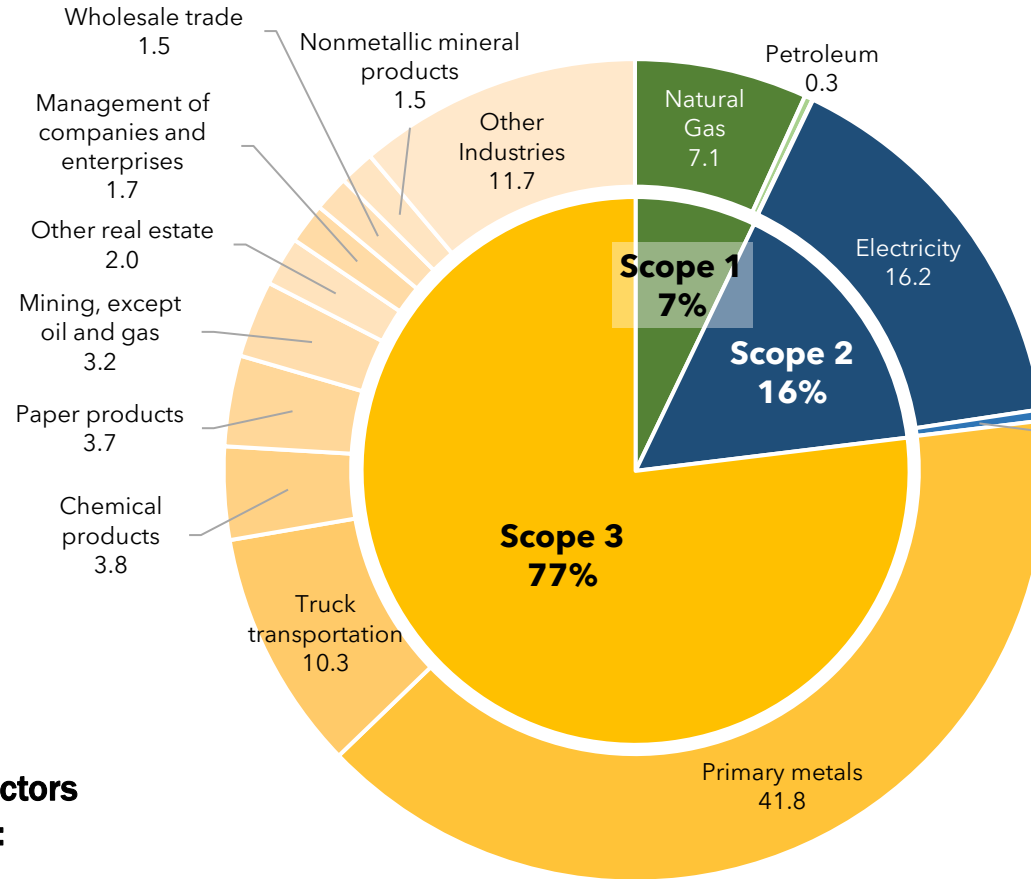
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Primary metals
- Truck transportation
- Chemical products
- Paper products
- Mining, except oil and gas

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Construction
- Motor vehicles, bodies and trailers, and parts
- Fabricated metal products
- Machinery
- Food and beverage and tobacco products



## Fabricated metal products (NAICS 332)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Fabricated Metal Products Industry

2018 Base Case (million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 7% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 16% of the embodied emissions of this subsector's products

The remaining 77% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Machinery



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

15

78

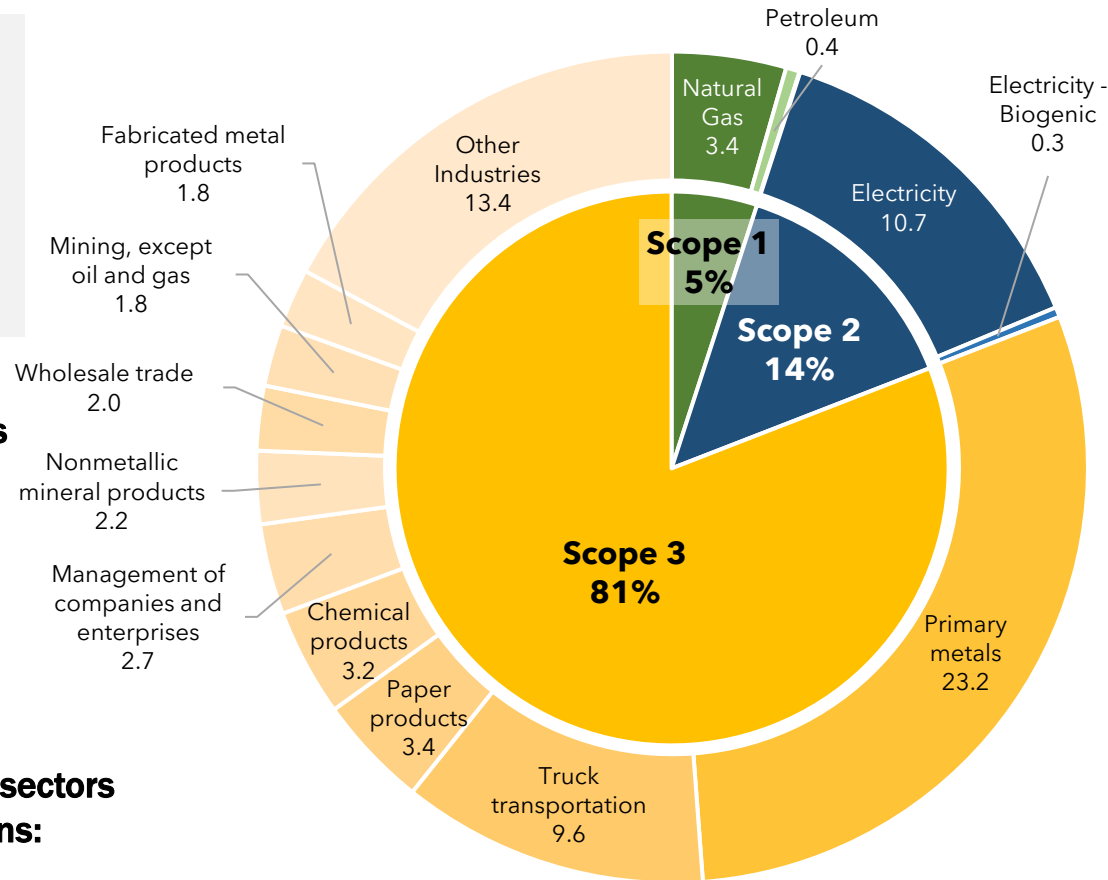
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Primary metals
- Truck transportation
- Paper products
- Chemical products
- Management of companies and enterprises

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Machinery
- Construction
- Motor vehicles, bodies and trailer, and parts
- State and local general government
- Support activities for mining



## Machinery

(NAICS 333)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Machinery Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 5% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 14% of the embodied emissions of this subsector's products

The remaining 81% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Computer and electronic products



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

25

36

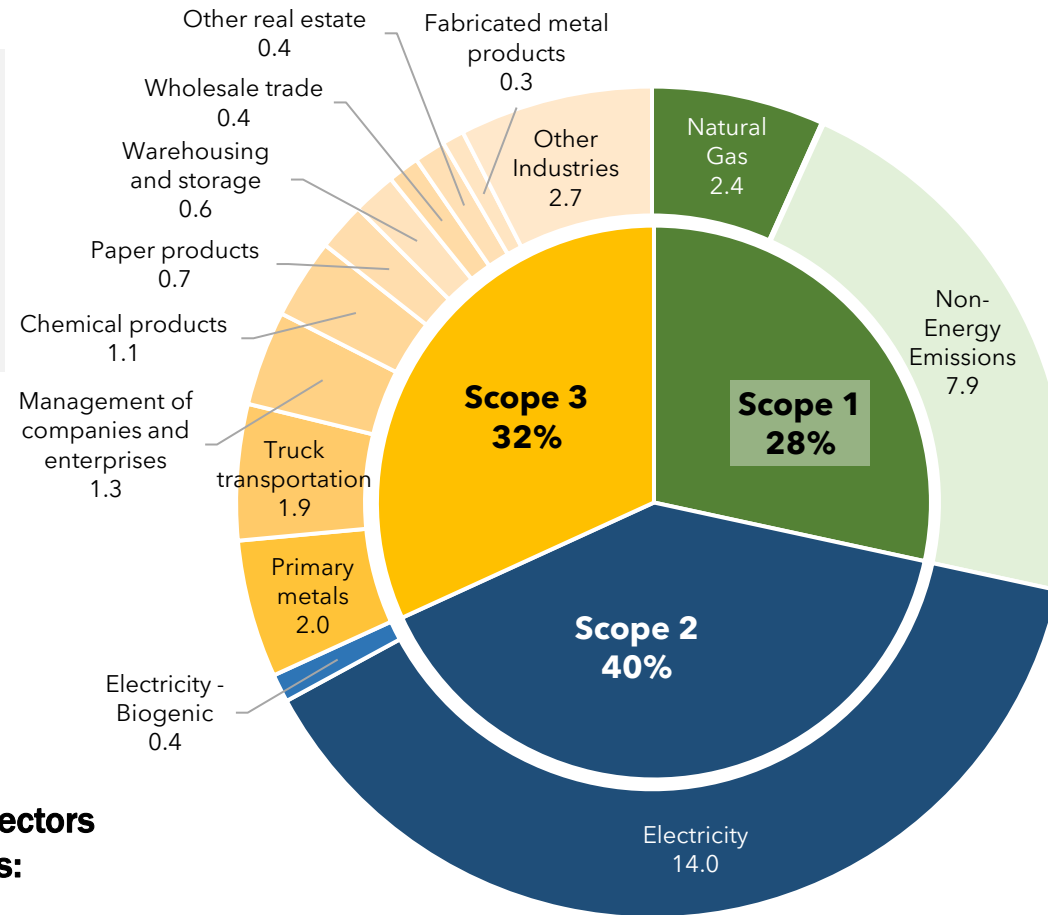
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Primary metals
- Truck transportation
- Management of companies and enterprises
- Chemical products
- Paper products

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Computer and electronic products
- Federal general government (defense)
- Motor vehicles, bodies and trailers, and parts
- Ambulatory health care services
- Construction



## Computer and electronic products (NAICS 334)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Computer and Electronic Products Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 28% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 40% of the embodied emissions of this subsector's products

The remaining 32% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Electrical equipment, appliances, and components



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

12

Scope 1, 2 & 3

36

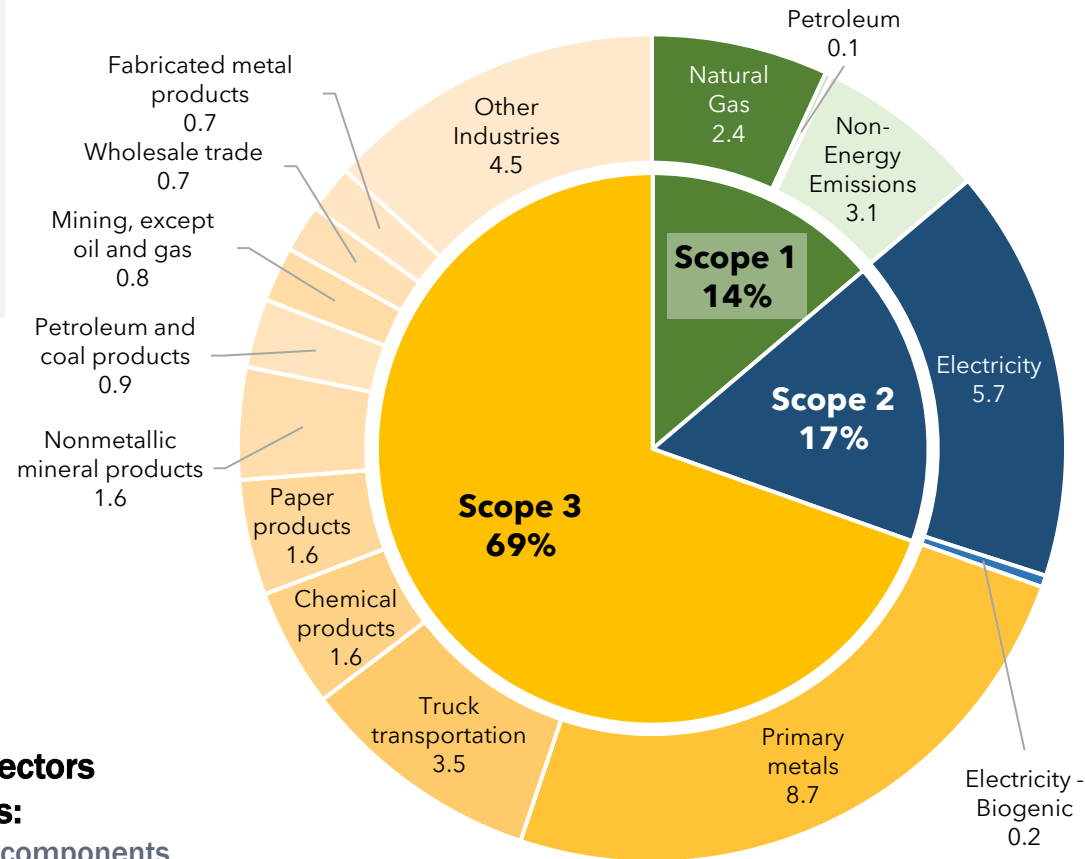
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Primary metals
- Truck transportation
- Chemical products
- Paper products
- Nonmetallic mineral products

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Electrical equipment, appliances, and components
- Construction
- Motor vehicles, bodies and trailers, and parts
- Machinery
- Other services, except government



## Electrical equipment, appliances, and components

(NAICS 335)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Computer and Electronic Products Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 14% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 17% of the embodied emissions of this subsector's products

The remaining 69% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use





# Motor vehicles, bodies and trailers, and parts



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

29

180

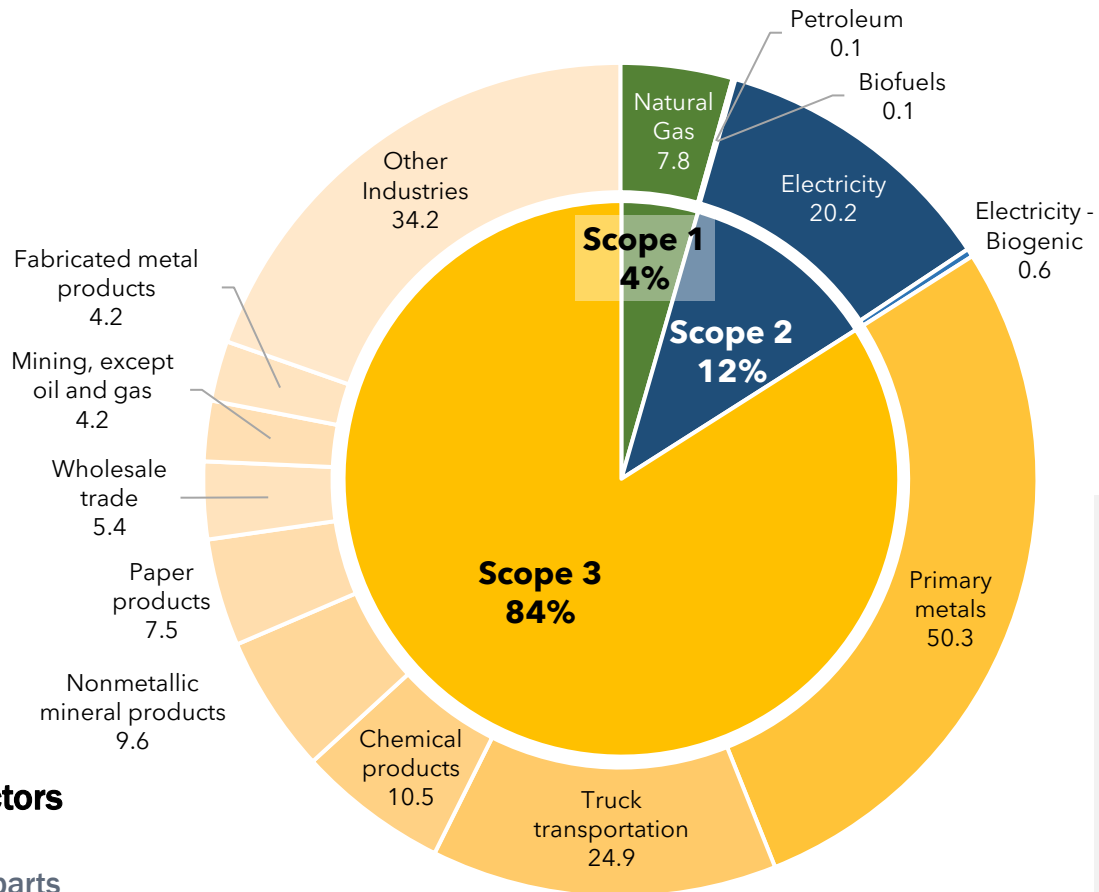
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Primary metals
- Truck transportation
- Chemical products
- Nonmetallic mineral products
- Paper products

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Motor vehicles, bodies and trailers, and parts
- Other services, except government
- State and local general government
- Machinery
- Construction



## Motor vehicles, bodies and trailers, and parts (NAICS 3362, 3363)

### Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Motor Vehicles, Bodies and Trailers, and Parts Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 4% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 12% of the embodied emissions of this subsector's products

The remaining 84% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Other transportation equipment



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

7

24

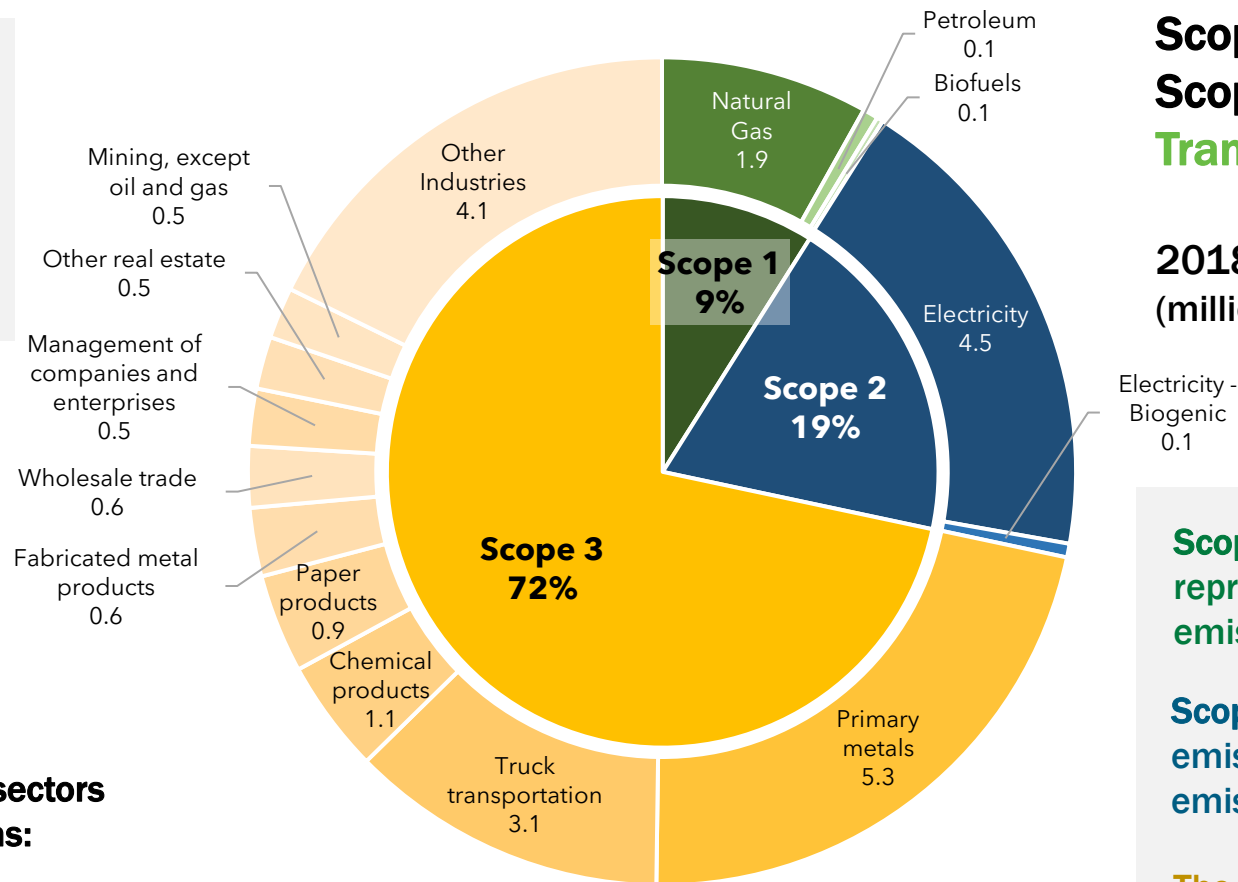
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Primary metals
- Truck transportation
- Chemical products
- Paper products
- Fabricated metal products

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Other transportation equipment
- Federal general government (defense)
- Water transportation
- Motor vehicles, bodies and trailers, and parts
- Federal general government (nondefense)



## Other transportation equipment

(NAICS 3364, 3365, 3366, 3369)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Other Transportation Equipment Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 9% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 19% of the embodied emissions of this subsector's products

The remaining 72% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Furniture and related products



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

5

29

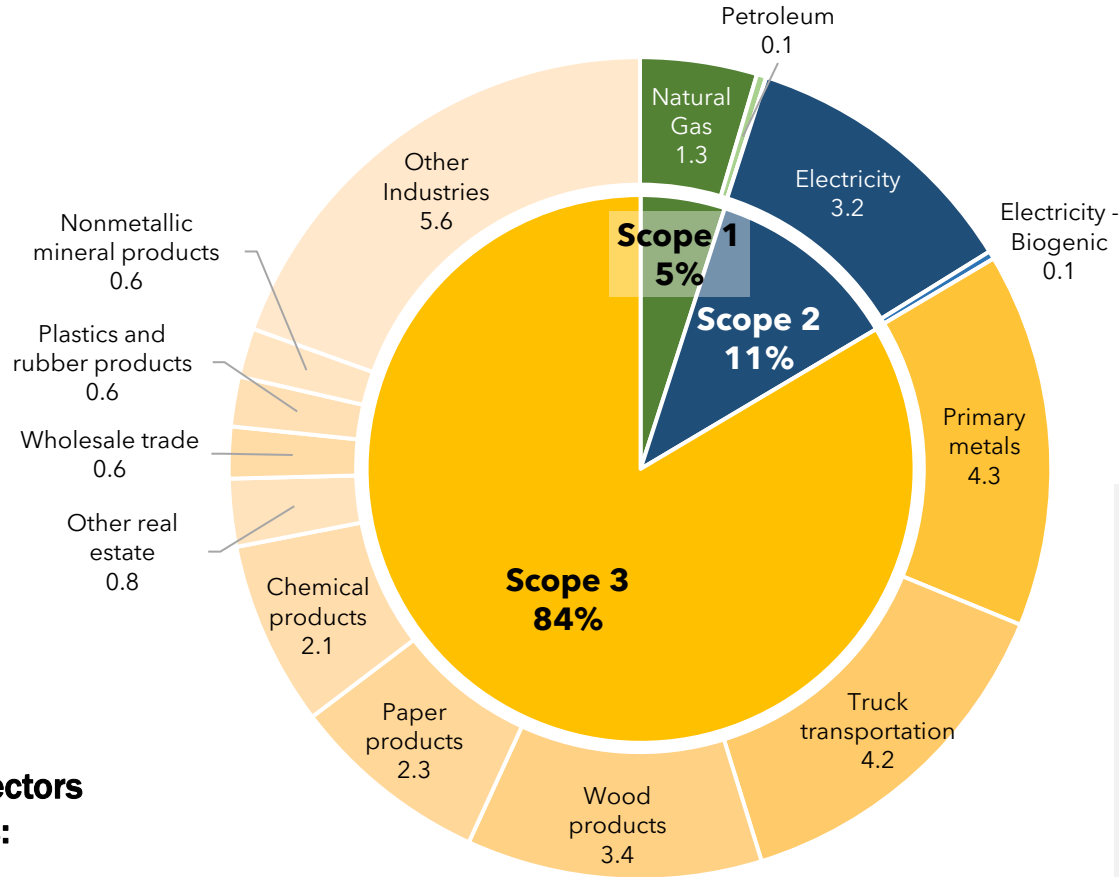
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Primary metals
- Truck transportation
- Wood products
- Paper products
- Chemical products

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Furniture and related products
- Construction
- Housing
- State and local general government
- Other retail



## Furniture and related products (NAICS 337)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Furniture and Related Products Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 5% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 11% of the embodied emissions of this subsector's products

The remaining 84% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Miscellaneous manufacturing



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

8

Scope 1, 2 & 3

38

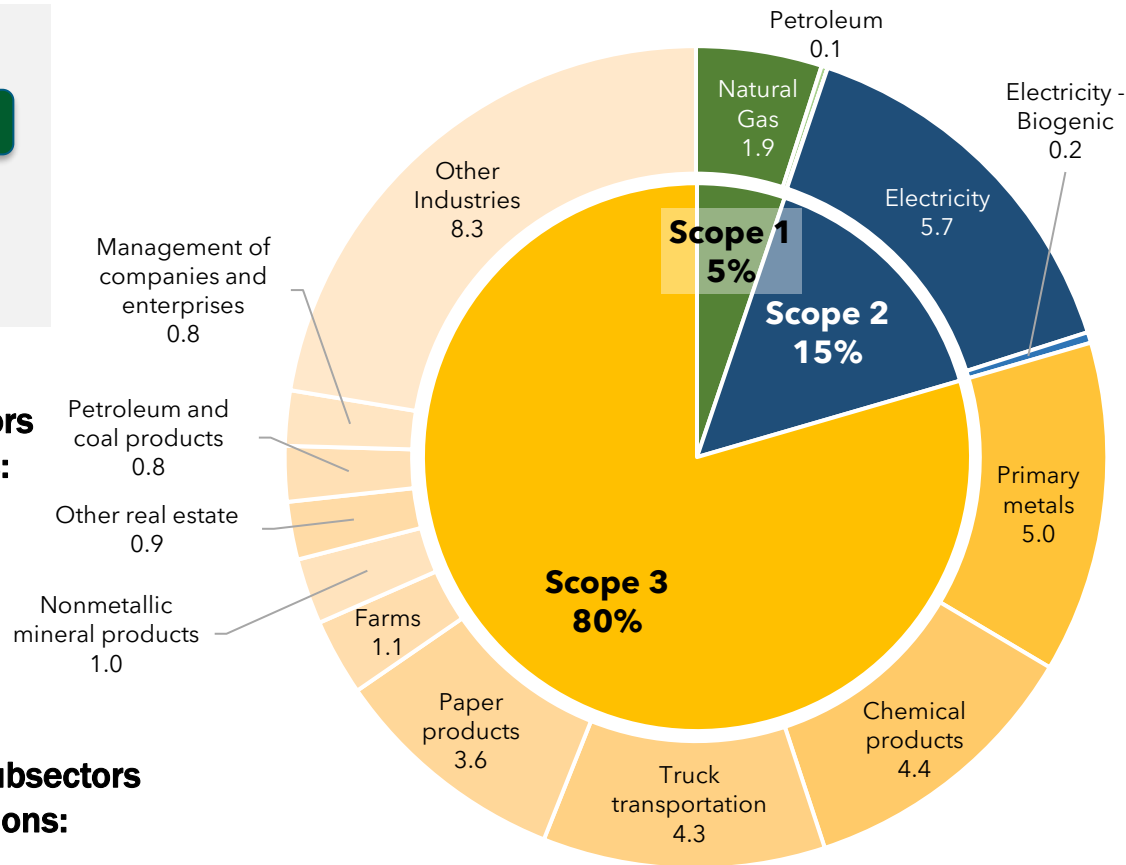
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Primary metals
- Chemical products
- Truck transportation
- Paper products
- Farms

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Miscellaneous manufacturing
- Ambulatory health care services
- Hospitals
- State and local general government
- Construction



## Miscellaneous manufacturing (NAICS 339)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Miscellaneous Manufacturing Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 5% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 15% of the embodied emissions of this subsector's products

The remaining 80% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Food and beverage and tobacco products



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

106

729

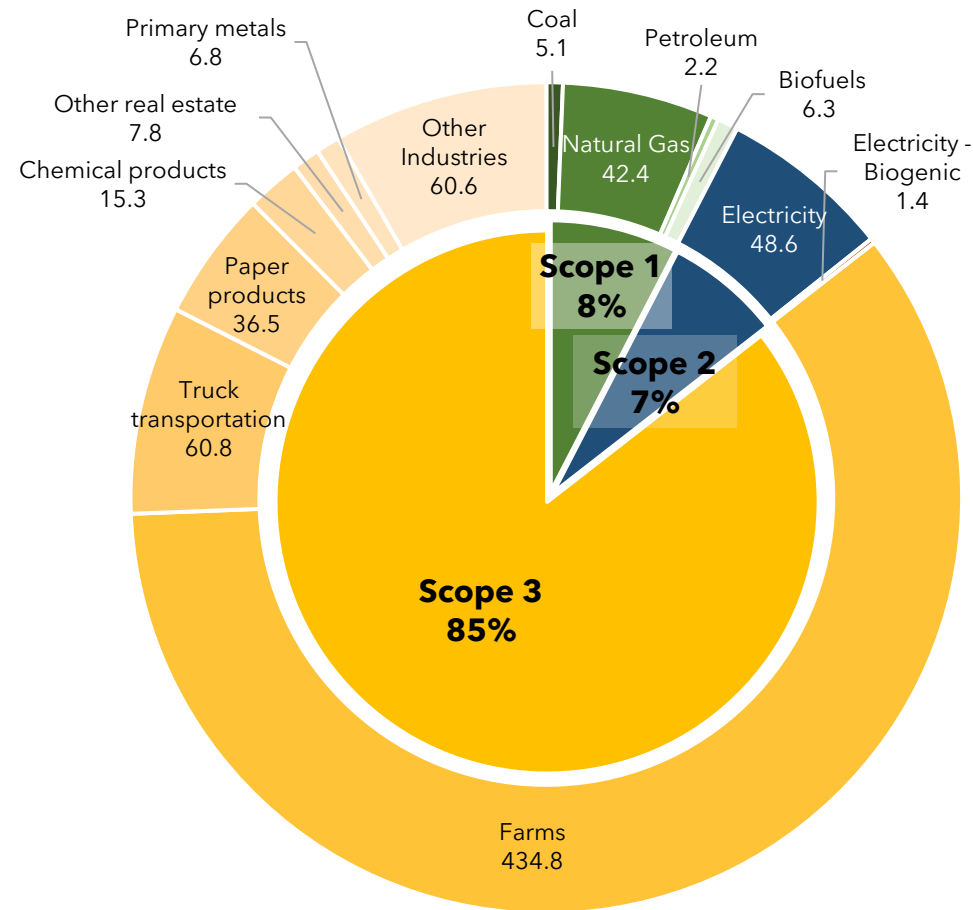
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Farms
- Truck transportation
- Paper products
- Chemical products
- Other real estate

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Food and beverage and tobacco products
- State and local general government
- Food services and drinking places
- Social assistance
- Hospitals



## Food and beverage and tobacco products

(NAICS 311, 312)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Food and Beverage and Tobacco Products Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 8% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 7% of the embodied emissions of this subsector's products

The remaining 85% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use





# Textile mills and textile product mills



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

12

29

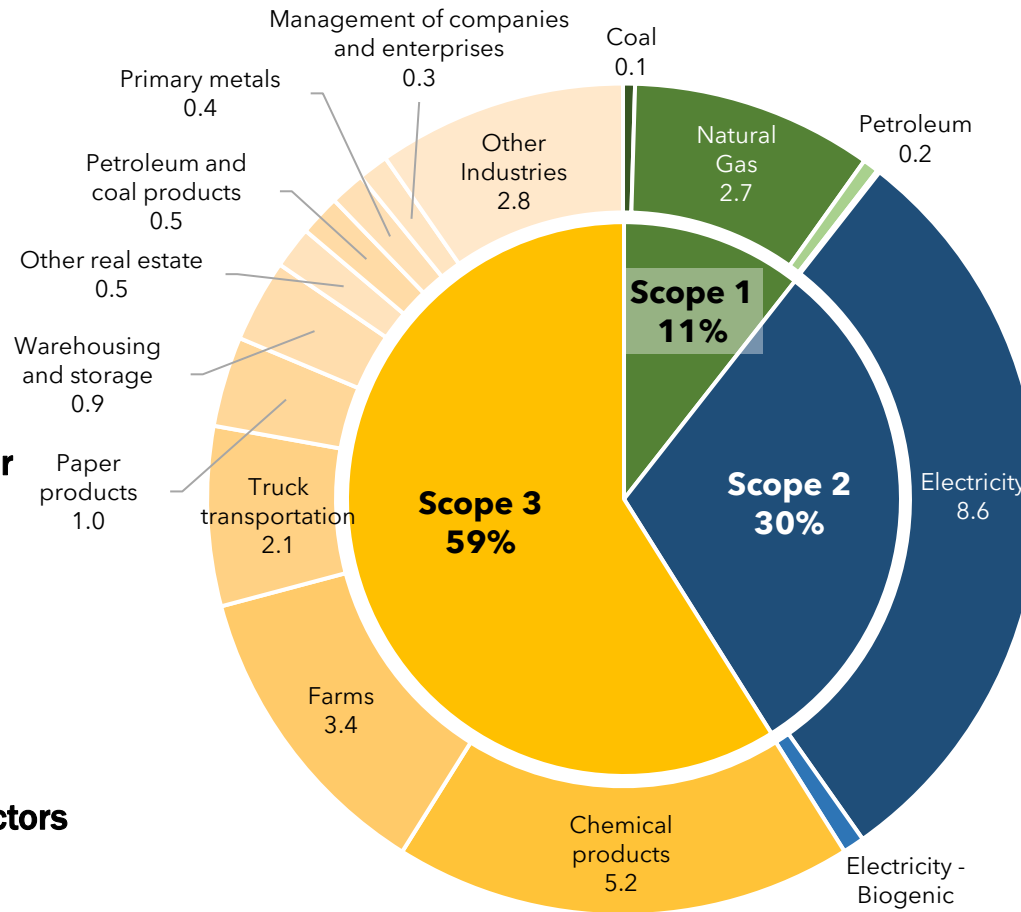
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Chemical products
- Farms
- Truck transportation
- Paper products
- Warehousing and storage

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Textile mills and textile product mills
- Apparel and leather and allied products
- Motor vehicles, bodies and trailers, and parts
- Construction
- Miscellaneous manufacturing



## Textile mills and textile product mills (NAICS 313, 314)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Textile Mills and Textile Product Mills Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 11% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 30% of the embodied emissions of this subsector's products

The remaining 59% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Apparel and leather and allied products



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

5

Scope 1, 2 & 3

26

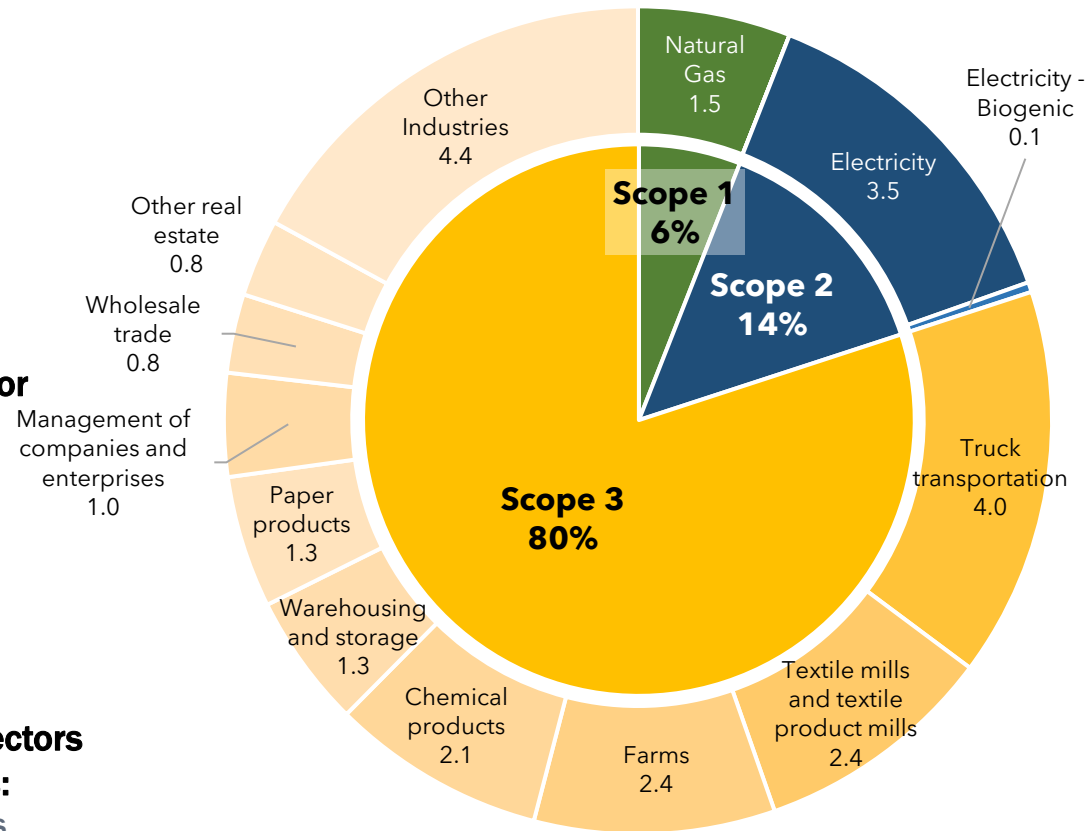
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Truck transportation
- Textile mills and textile product mills
- Farms
- Chemical products
- Warehousing and storage

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Apparel and leather and allied products
- Other services, except government
- State and local general government
- Motor vehicles, bodies and trailers, and parts
- Wholesale trade



## Apparel and leather and allied products

(NAICS 315, 316)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Apparel and Leather and Allied Products Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 6% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 14% of the embodied emissions of this subsector's products

The remaining 80% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Paper products



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

167

197

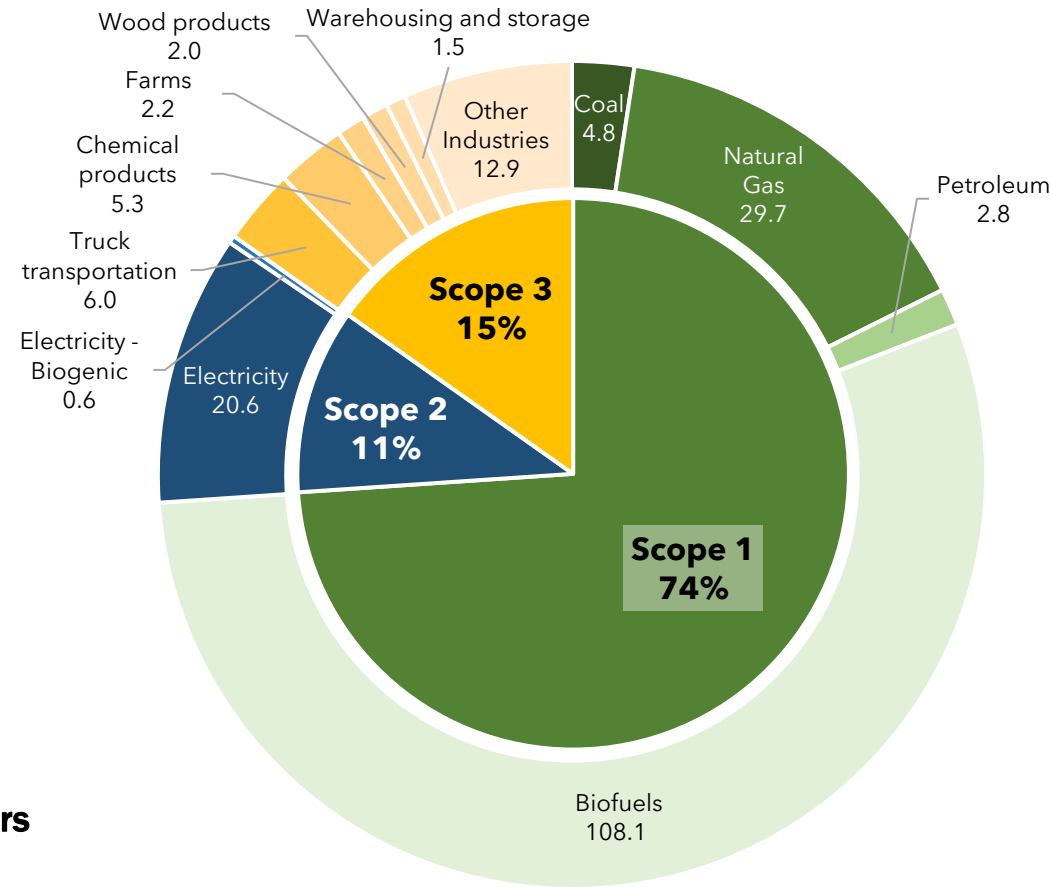
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Truck transportation
- Chemical products
- Farms
- Wood products
- Warehousing and storage

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Food and beverage and tobacco products
- Paper products
- State and local general government
- Construction
- Motor vehicles, bodies and trailers, and parts



## Paper products

(NAICS 322)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Paper Products Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

**Scope 1** (onsite combustion) emissions represent **74%** of the embodied emissions of this subsector's products

**Scope 2** (offsite electricity generation) emissions represent **11%** of the embodied emissions of this subsector's products

The remaining **15%** of embodied emissions are **Scope 3** (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Printing and related support activities



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

6

25

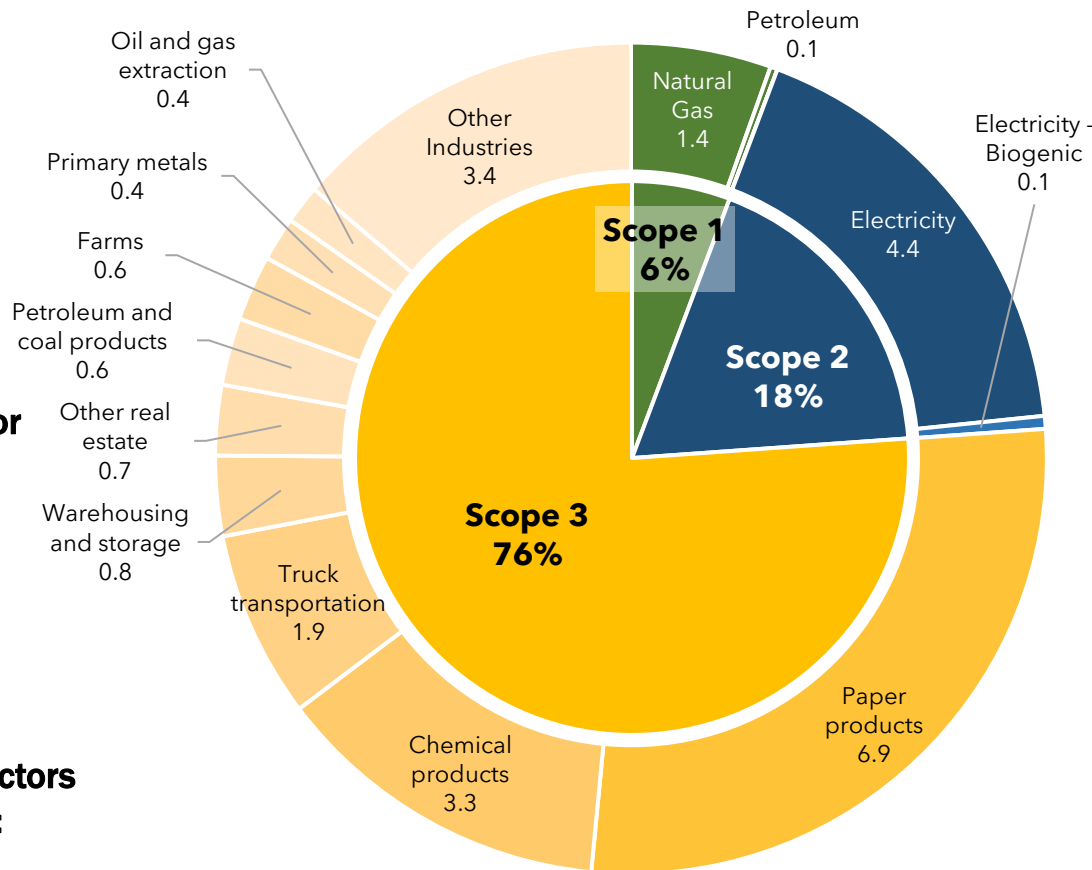
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Paper products
- Chemical products
- Truck transportation
- Warehousing and storage
- Other real estate

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Printing and related support activities
- State and local general government
- Other retail
- Wholesale trade
- Publishing industries, except internet (includes software)



## Printing and related support activities

(NAICS 323)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Printing and Related Support Activities Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 6% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 18% of the embodied emissions of this subsector's products

The remaining 76% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Petroleum and coal products



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

201

346

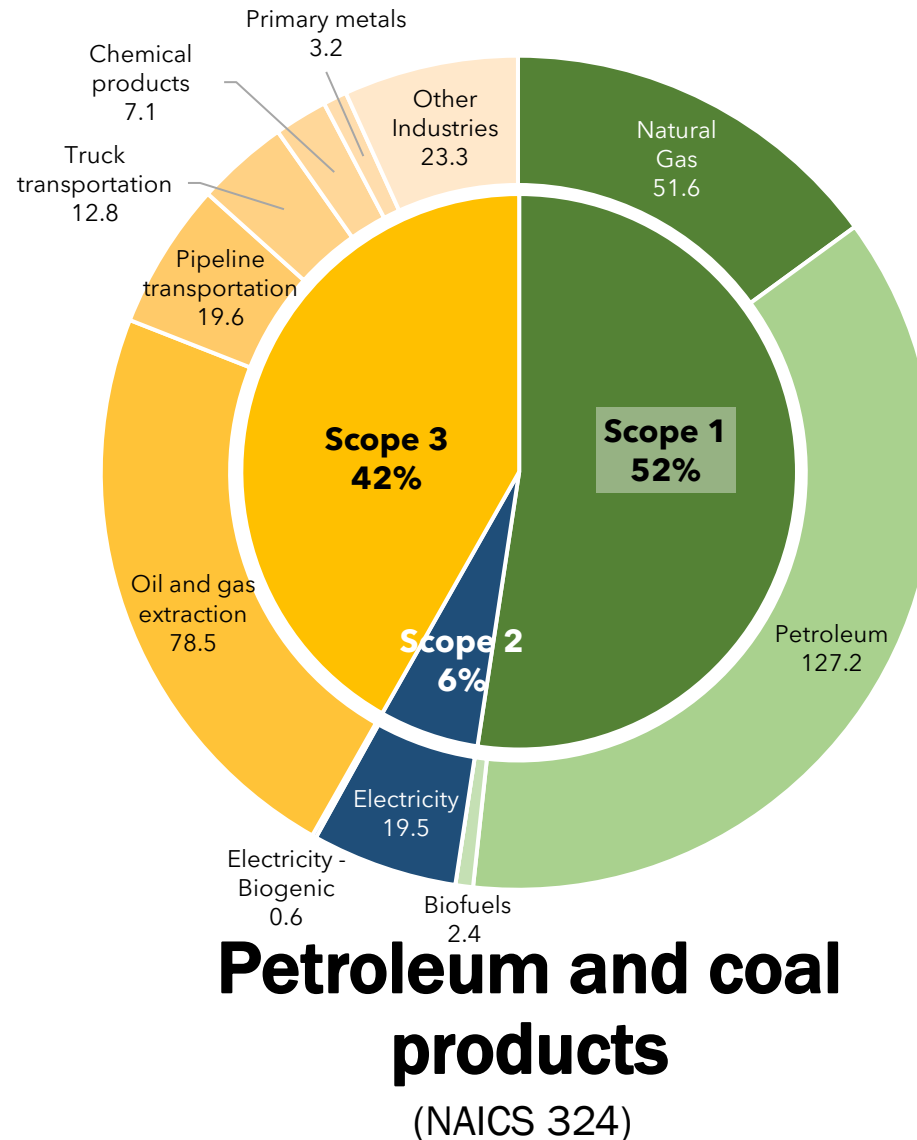
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Oil and gas extraction
- Pipeline transportation
- Truck transportation
- Chemical products
- Primary metals

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Petroleum and coal products
- State and local general government
- Construction
- Federal general government (defense)
- Food and beverage and tobacco products



## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Petroleum and Coal Products Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

**Scope 1 (onsite combustion) emissions represent 52% of the embodied emissions of this subsector's products**

**Scope 2 (offsite electricity generation) emissions represent 6% of the embodied emissions of this subsector's products**

**The remaining 42% of embodied emissions are Scope 3 (upstream supply chain)**

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use





# Chemical products



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

310

392

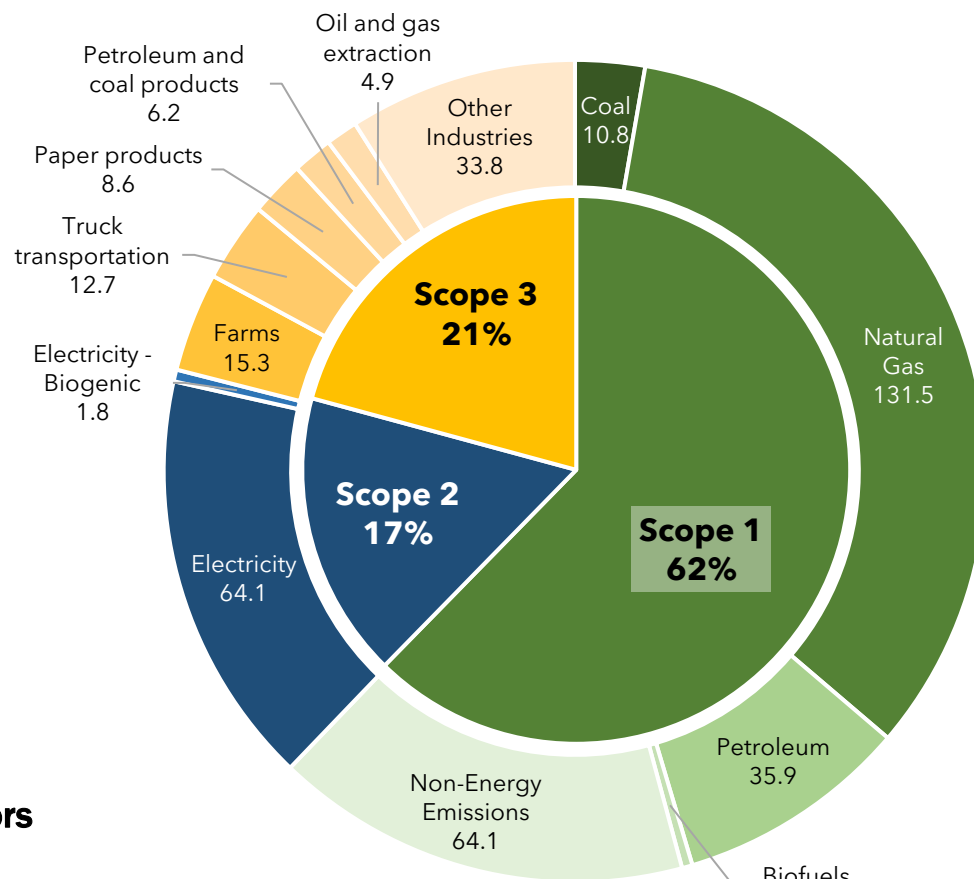
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Farms
- Truck transportation
- Paper products
- Petroleum and coal products
- Oil and gas extraction

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Chemical products
- State and local general government
- Construction
- Food and beverage and tobacco products
- Ambulatory health care services



## Chemical products

(NAICS 325)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Chemical Products Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 62% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 17% of the embodied emissions of this subsector's products

The remaining 21% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use



# Plastics and rubber products



EEIO-IDA United States Base Case Results | version 1.0 (September 2023)

## Total Emissions (2018)

Scope 1 & 2

Scope 1, 2 & 3

28

91

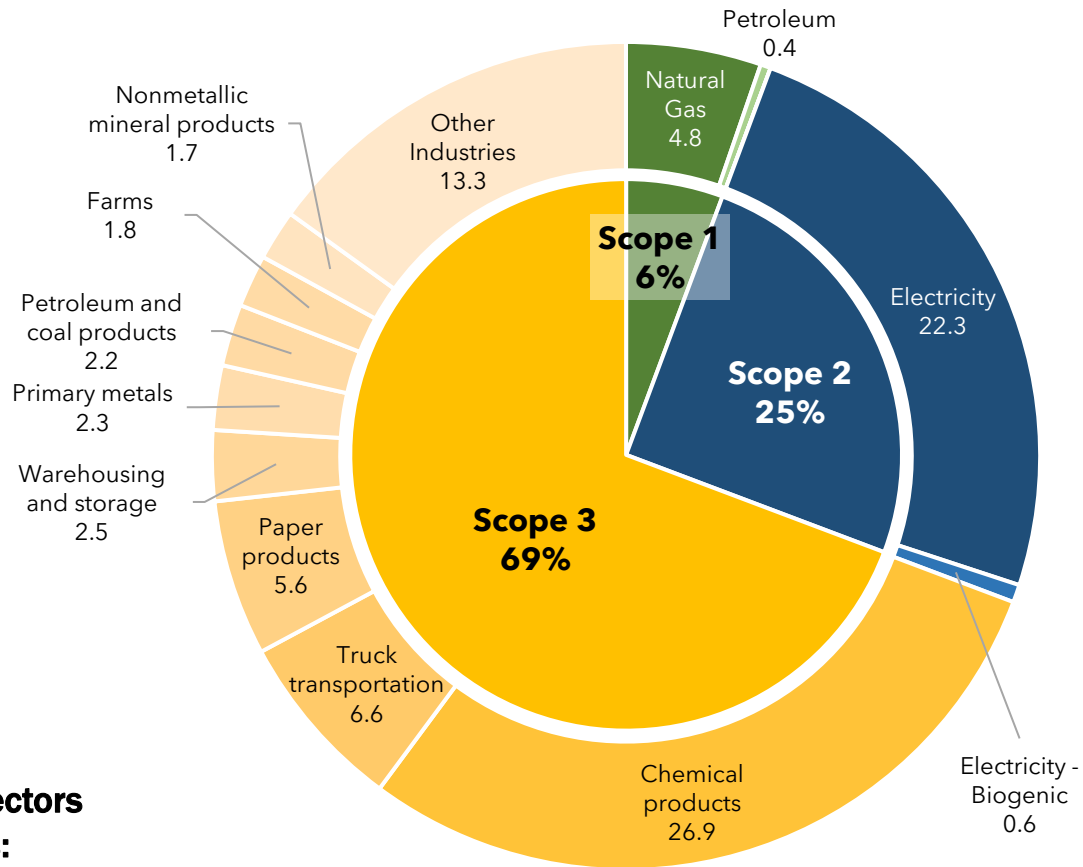
million metric tons CO<sub>2</sub>eq

### Top 5 upstream (source) subsectors for inherited embodied emissions:

- Chemical products
- Truck transportation
- Paper products
- Warehousing and storage
- Primary metals

### Top 5 downstream (destination) subsectors embodying this subsector's emissions:

- Plastics and rubber products
- Construction
- Motor vehicles, bodies and trailers, and parts
- Food and beverage and tobacco products
- State and local general government



## Plastics and rubber products (NAICS 326)

## Scope 1, Scope 2, and Upstream Scope 3 Emissions of the Plastics and Rubber Products Industry

2018 Base Case  
(million metrics tons CO<sub>2</sub>eq)

Scope 1 (onsite combustion) emissions represent 6% of the embodied emissions of this subsector's products

Scope 2 (offsite electricity generation) emissions represent 25% of the embodied emissions of this subsector's products

The remaining 69% of embodied emissions are Scope 3 (upstream supply chain)

All emissions shown are cradle-to-gate and do not include downstream impacts of product distribution or use

