# ESG Workshop #5:  Scopes 3 & 4

## Supply Chain and Avoided Emissions

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*October 12, 2023*

# Welcome & Introductions

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**Workshop #5 Presenters**

# Poll

## Quiz: Which Scope is not included in a company's emissions inventory?

# Agenda

- **Introductions, Background & Context**
- **Scope 3: Supply Chain Emissions**
  - What are they and what reporting is expected?
  - What should be reported, and how can companies track down data?
- **Scope 4: Avoided Emissions**
  - Explanation of avoided emissions
  - How to use avoided emissions
  - U.S. EPA's WARM Calculator and sample calculation
  - Resources
- **Wrap up and preview for November**

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# Background/Context

The ESG initiative is ISRI's response to a changing world affecting all types and sizes of organizations and companies.

The initiative is being offered to members to help maneuver through the maze of sustainability issues, focusing on creating opportunities to drive business value by shaping resilient and profitable companies for years to come.

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# ISRI's ESG Toolkit

- **Purpose-** simplify & customize ESG for recycling industry
- **Contents**
  - ESG strategy development guidance
  - Reporting education
  - Emissions calculators
  - Sample policies
  - Downloadable data templates
- **Timeline** – Completed by end of 2023
- **Ongoing Support** – Information will continue to be available and updated online for ISRI member reference and use.

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# 2023 Workshop Series

| Month (2023) | Activity |
|---|---|
| **June** | **Overview, Materiality and Governance. These provide an important overlay for ESG strategy.** What do stakeholders think is important, or material, about your company. The role of data, policies and guidance associated with good governance play an important role in the ESG strategy dialogue. |
| **July** | **Strategy, Goals & Community** Descriptions and supporting documents to help develop key topics supporting ESG. Understanding the "S" of Social in ESG. |
| **August** | **GHG Emissions and Carbon Footprint:** A look at GHG emissions, and an introduction to Scopes 1, 2 and 3 emissions. |
| **September** | **Value Creation & The Whole Works Mapping Tool** |
| **October** | **Understanding Scope 3& 4 emissions:** What they include and how they are counted. |
| **November** | **Reporting Frameworks** |
| **December** | **Looking Ahead to 2024:** A review of the toolkit. Taking time to look ahead to future trends and program needs. |

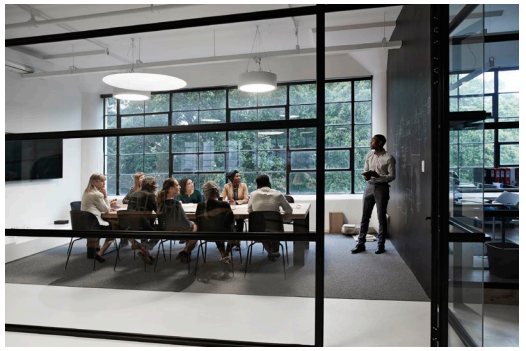
# Overview from Workshops 1, 2, 3 & 4

## Topics Covered Previously:

- **Workshop #1: Materiality and the "G"/Governance in ESG**
  - ESG Overview
  - Materiality & Governance
- **Workshop #2: Strategy and the "S"/Social in ESG**
  - **ESG Goals & Strategy -** Building on Workshop #1, we discussed developing ESG Goals & Strategies.
  - **The "S"/Social in ESG** – including employees, community, Environmental Justice and Human Rights.
- **Workshop #3: The "E"/Environment in ESG**
  - **GHG Emissions** - What are they?
  - **Scopes 1, 2 & 3:** Identifying and reporting GHG emissions
  - **Calculating emissions:** Using existing tools
- **Workshop #4: Creating Value from ESG**
  - WholeWorks Sustainability map connects ESG Initiatives to Impact and Value Creation, creating a tool to integrate ESG with financial value.
  - **https://www.wholeworks.com/esg-program.**

# Workshop #1: Overview & Governance





## Overview

- Few laws requiring ESG reporting in N. America
- Reporting on Sustainability and ESG is continually evolving.
- ESG" was coined by the finance industry
- Investors and other stakeholders expect publicly owned companies to report on key ESG topics.

## Materiality

- Materiality is determining which ESG impacts (or issues) matter to an organization's stakeholders.
- Materiality can't be determined by a company on its own. Companies must enlist stakeholder input.
- A Materiality Assessment prioritizes issues and links the business of the company to its significant ESG impacts

## Governance - The "G" of ESG

- Good governance is the foundation for a company's health.
- Includes corporate structure, financial reporting, policies, stakeholder engagement, compliance and strategy.
- Putting policies in place is critical, as well as annual reporting – and progress towards reported ESG goals.

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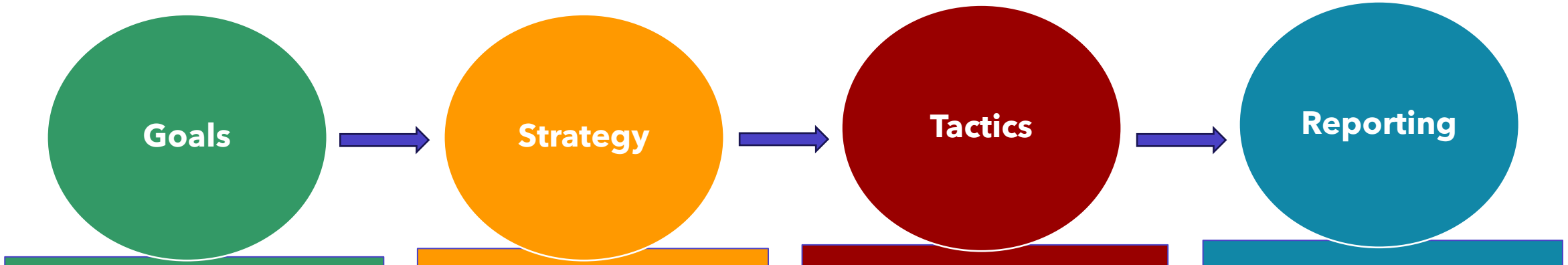
# Workshop #2: ESG Goals & Strategy




1. Conduct a materiality assessment
2. Establish your baseline
3. Set ESG Goals
4. Analyze Performance Gaps and revise goals as necessary

Create Strategy Statements for each Goals

Develop tactics for achieving your goals

Track goals quarterly and report annually

**Goals + Strategy for Each Goal + Tactics + Reporting**

**=**

## ESG Strategic Planning

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# Workshop #2: The "S"/Social in ESG

**The "S" in ESG is more than just doing good for your surroundings.**

It includes all the topics connected to how a company relates to people within and outside its walls. It examines the company's relationships with the other businesses and communities, as well as how the companies treat their employees.

**During Workshop #2, we covered:**

- Employee Relations
- Community Relations
- Environmental Justice
- Human Rights

The financial world defines the "S/Social" in ESG as ***how a company manages its relationships with its workforce, the societies in which it operates, and the political environment.***

**Companies are being held accountable for all aspects of their business:** Corporate governance, policies, goals, transparent reporting and community relations

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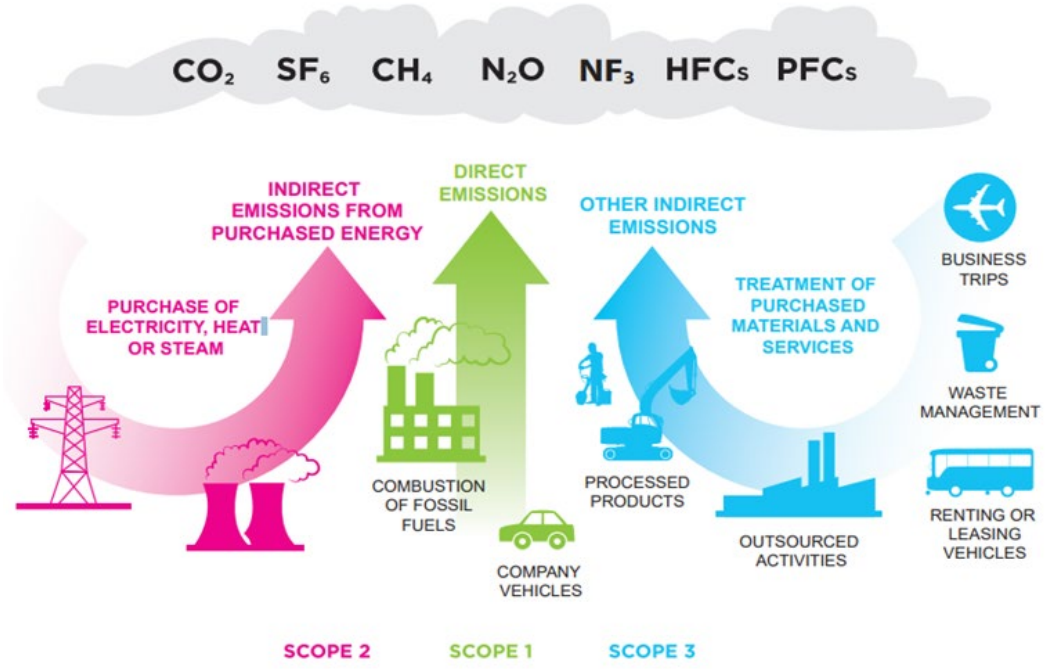
# Workshop #3: The "E"/Environmental in ESG & GHG Calculations

- **What Are GHGs?** Gases that trap heat in the atmosphere are called greenhouse gases.
- **Reporting Emissions:** Three categories, or "Scopes" of GHG Emissions are used for accounting and reporting.
  - **Scopes 1 –** Direct emissions from operations.
  - **Scope 2 -** Indirect emissions from electricity use.
  - **Scope 3** - Indirect emissions that are part of a company's supply chain.
- **Avoided Emissions, or Scope 4 emissions are reported separately from GHG emissions. Offsets & credits.** These should be considered after all possible GHG reductions have been made.




- **Calculating GHG emissions.** US EPA's simple emissions calculator identifies is designed to help small businesses calculate their GHG emissions.

**The "E" in ESG considers how a company performs as a steward of the natural or physical environment. It takes into account a company's utilization of natural resources and the effect of its operations on the environment, both in its direct operations and across its supply chains.**

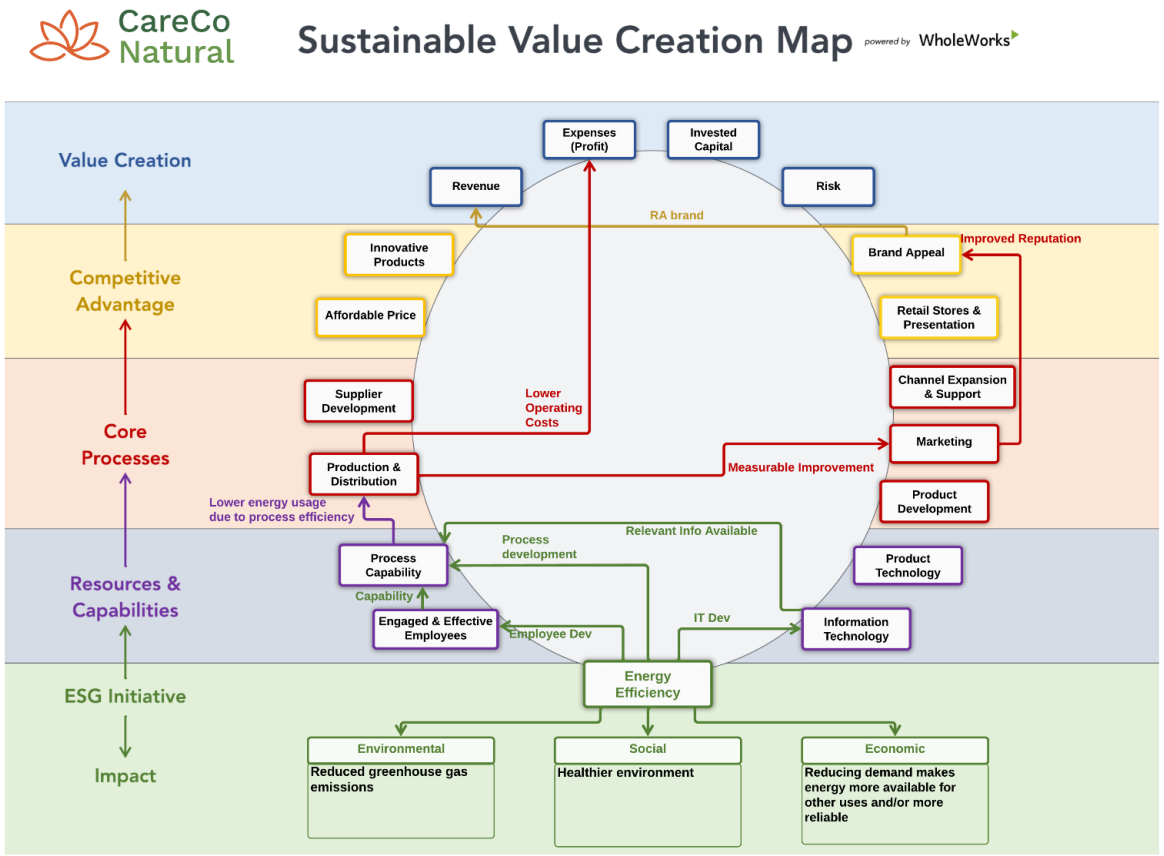
# Workshop #4: Value Creation from ESG

**Laura Asiala, from WholeWorks, led a workshop to understand how Sustainability Value Creation can strengthen a company's competitive strategy to create financial value.**

**Creating Sustainable Value requires creating BOTH creating societal value (Triple Bottom Line) AND shareholder value.**

**Key take-aways:**

1. Convey the value of an ESG Strategy: value creation in addition to risk reduction
2. Starts with completing a materiality review
3. Creating Sustainable Value requires creating both shareholder and societal value
4. Make sure that your house is in order




**Using an ESG strategy to create value at your company requires that you are walking the talk.**

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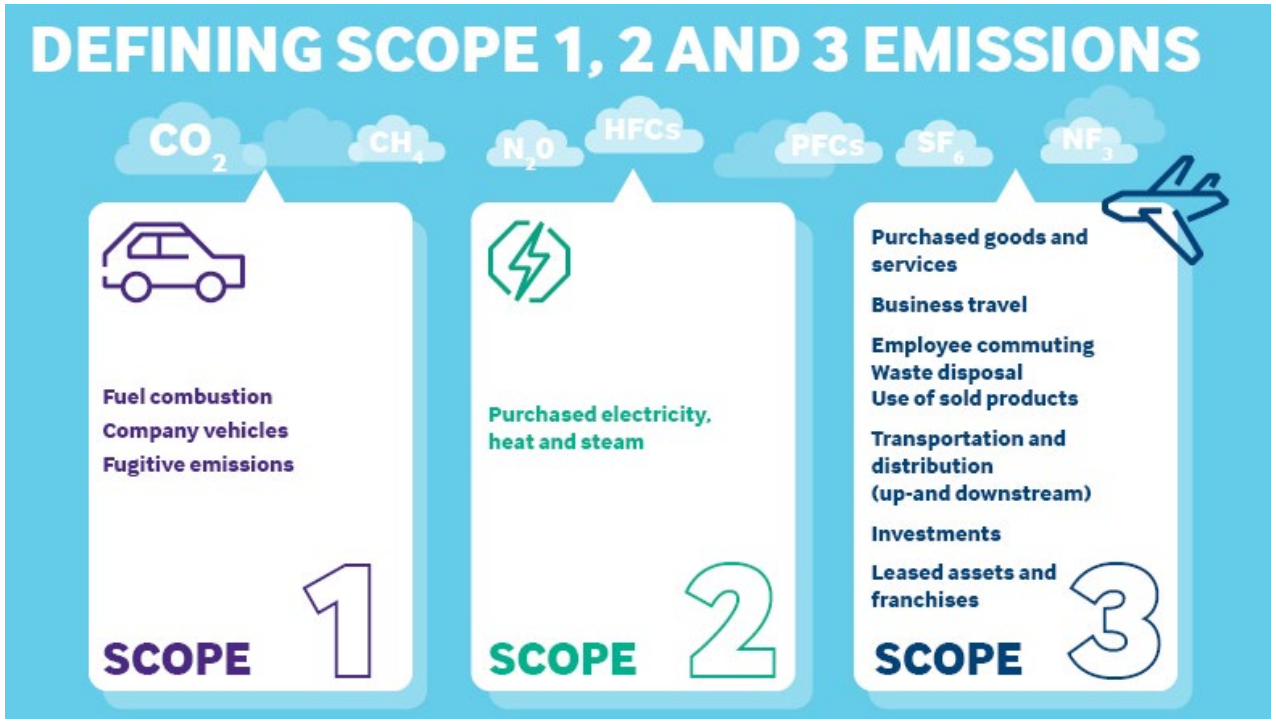
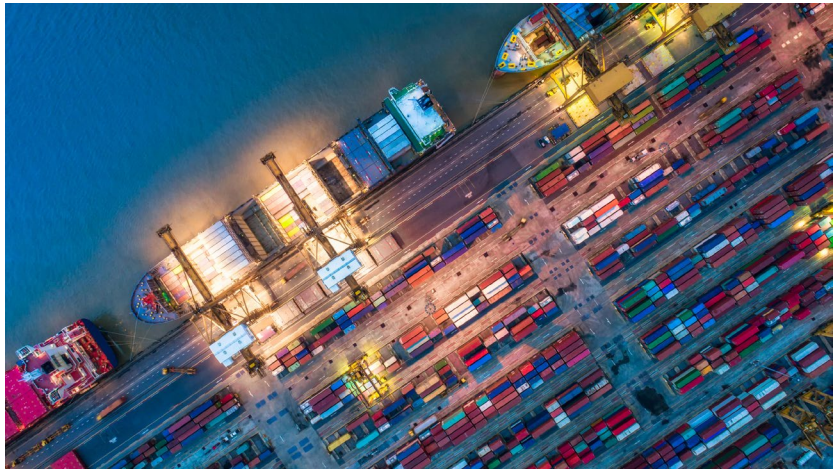
# Scope 3 Emissions




rpsgroup.com

**Scope 3 emissions are indirect supply chain emissions (other than electricity) that are the consequence of the activities of the company but occur from sources not owned or controlled by the company.**

# Scope 3: Supply Chain/Other Indirect Emissions



Scope 3 emissions are called **Supply Chain Emissions** because the emissions are associated with a company's supply chain but are from sources not owned or controlled by the company.

**The Role of Scope 3 Emissions for Recyclers:**

1. **As a Vendor.** The recycling industry is part of our customers' Scope 3 emissions; and
2. **As a Reporting Company.** Our vendors are the recycling industry's Scope 3 emissions

**Example: DHL Nordic Express: Accounting for outsourced transportation services**

DHL provides transport and worldwide express package and document deliveries.

While accounting for their emissions, they discover that 98% of their emission are from 3rd party transportation partners.

They began working with these partners to account for their emissions, and now use this information to evaluate and reduce their emissions.

By including Scope 3 and promoting reduction throughout their value chain they have been able to reduce their emissions footprint.

| Scope | Emissions (CO2) |
|---|---|
| Scope 1 | 7,265 (2.%) |
| Scope 2 | 52 (0.015%) |
| Scope 3 | 327,634 (97.9%) |
| **Total** | **334,951** |

# What are Scope 3 Emissions?

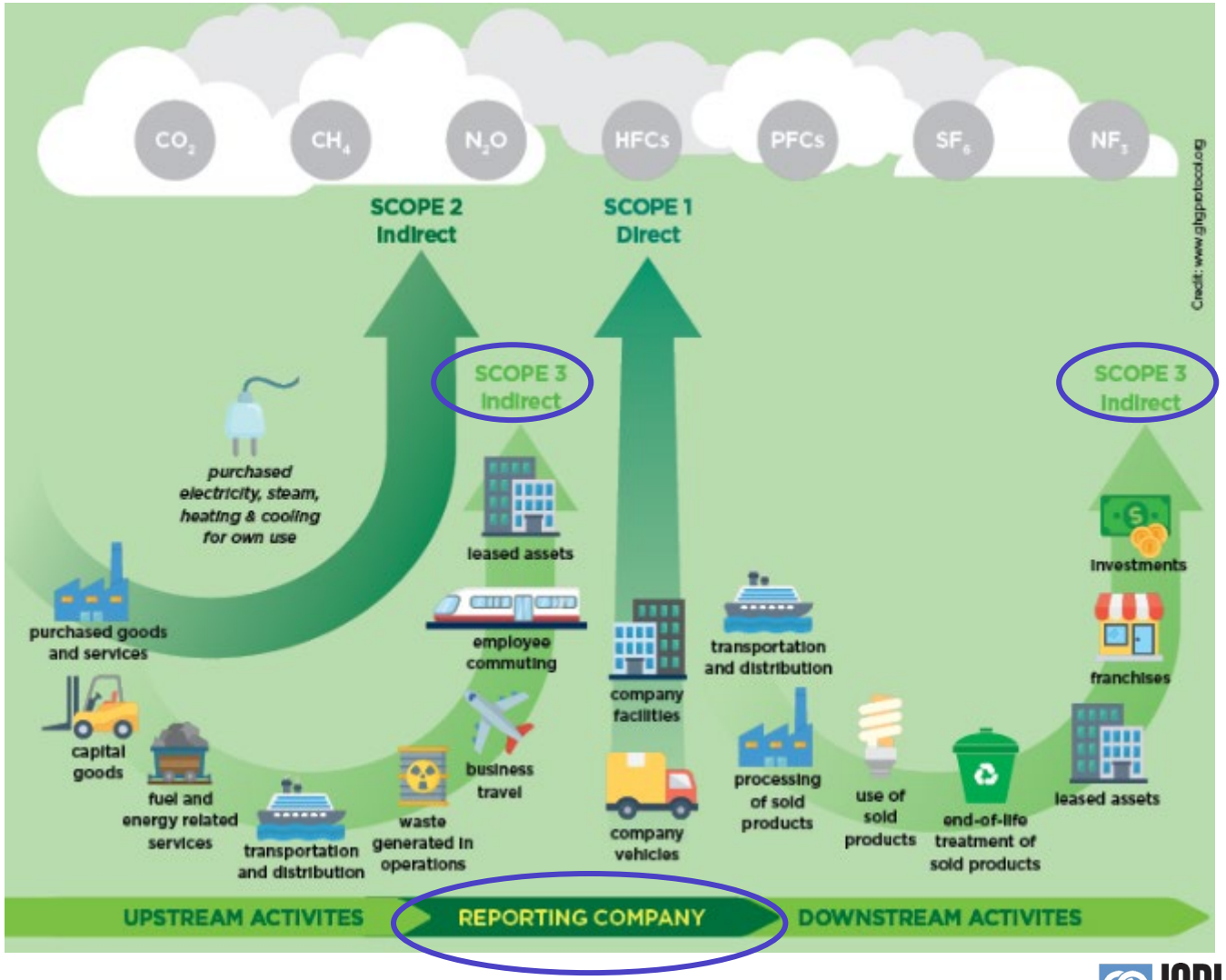
A company's environmental impacts related to GHG emissions depends on both its upstream **and** downstream impacts, not only its direct operations:

**Scope 1 =** Emissions from fuel from a company's fleet and combustion from its manufacturing processes.

**Scope 2 =** Purchased Electricity

**Scope 3 =** Everything thing else. These can be both upstream (purchased services and goods) and downstream (sold products)

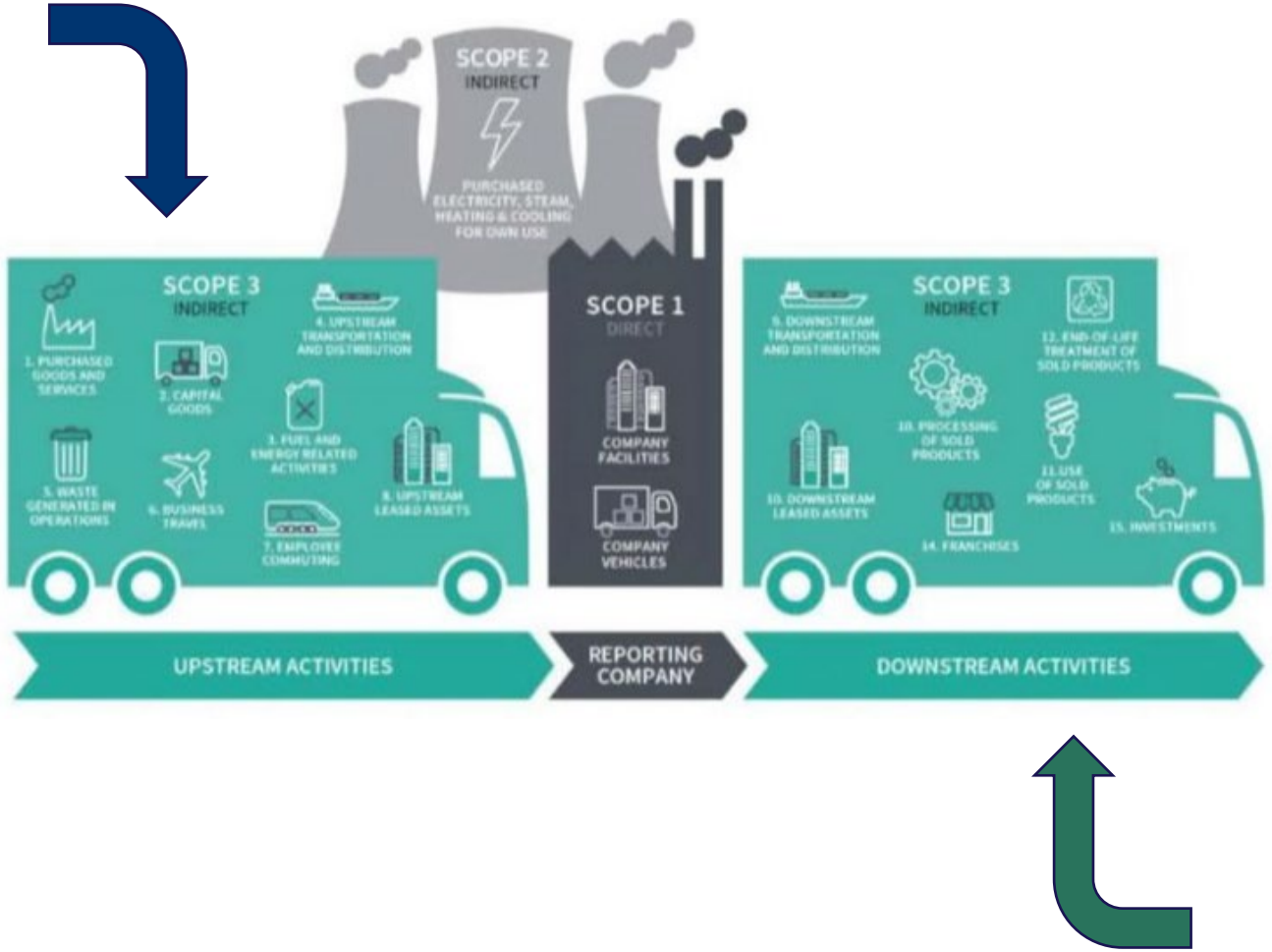
**Every company is part of another company's supply chain**



# Fifteen Categories of Scope 3 Emissions

## Upstream Scope 3 Emissions

1. Purchased goods & services
2. Capital good
3. Fuels-and-energy- related activities (not included in scope 1 or scope 2)
4. Upstream transportation and distribution
5. Waste generated in operations
6. Business travel
7. Employee commuting
8. Upstream leased assets




## Downstream Scope 3 Emissions

1. Transportation and distribution of sold goods
2. Processing of sold products
3. Use of sold products
4. End-of-life treatment of sold products
5. Downstream leased assets
6. Franchises
7. Investments

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# Why are Scope 3 Emissions Important?

- Enables the understanding of a company's impact across its value chain.
- Knowing where your emissions are (and the volume) allows for focus on the greatest impact.
- Scope 3 often represents the largest source of emissions for companies. **With an inventory of all 3 scopes, a company can take action to optimize its emissions reduction impact.**
- As more reporting companies follow the same reporting standards and categories, global emissions will be reported accurately – including reductions and additions.

**Including Scope 3 emissions in a company's GHG inventory presents a complete assessment of the opportunity for that company to influence its supply chain to reduce global GHG emission.**

# Scope 3 Reporting Requirements

**In the past, reporting on Scopes 1 & 2 emissions was sufficient for many companies.** Globally accepted guidance in the GHG Protocol Guidance does not require reporting or goal setting on Scope 3 emissions if they are less than 40% of a company's overall emissions inventory.

## * That is changing *

**California's SB 253 passed on 9/14/2023**

It requires GHG emission reporting for companies with over $1million in revenue:
Bill Text - SB-253 Climate Corporate Data Accountability Act. (ca.gov)

**What this means for ISRI members:**

- If you are a company with over $1 billion of revenue in California, you will be required to report your Scope 1, 2 and 3 emission by January 2027.*
- If your company does business with a company with California operations, you will be required to provide your customers with information on your GHG emissions so they can meet their regulatory requirements.

**Scope 3 reporting is required in the EU and in California for companies with >$1M revenue**

*Although Gov Newsom signed SB 253, he stated that he expect a delay in the reporting requirement dates.

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# Scope 3 Reporting Realities

**Scope 3 reporting is not easy and is likely to take multiple years to evolve into a complete report.**

## So – why bother at all?

| Upstream Pressure from Stakeholders | Downstream Opportunities |
| --- | --- |
| • Scope 3 is increasingly expected from stakeholders<br>• There is a trickle down from customers' upstream requirements<br>• Getting ahead of the curve may provide a competitive edge | • Attention on suppliers/vendors emissions data can reduce own emissions<br>• Gain insight into vendors' processes and materials.<br>• Potentially reduce supply chain costs. |

# Getting Started

## Identify Risk

- **Reputational risk**
- **Regulatory risk**
- **Supply chain cost & reliability**
- **Evolution of products & technology** *(e.g., increasing demand for low-emitting products & services)*

## Identify Opportunities

- **Efficiency**
- **Innovative products & services**
- **Increase sales and customer loyalty**
- **Improved stakeholder relations**
- **Customer loyalty**

## Engage the Value Chain

- **Work with suppliers for data**
- **Identify highest emitting partners**
- **Create supplier tiers to prioritize efforts**
- **Gather data**
- **Fill gaps over time**

## Report

- **Begin to add Scope 3 information to annual reports**
- **Add information over time**
- **Work with suppliers for improved performance**

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# Prioritize Activities & Suppliers

**Prioritizing suppliers and activities requires making estimates.**

## Prioritize Based on GHG estimates

**Use GHG emissions calculation estimates to determine which suppliers may have significant Scope 3 emissions.**

- A quantitative approach provides relative magnitudes of various scope 3 activities
- Rank all Scope 3 activities from largest to smallest according to their estimated GHG emissions.

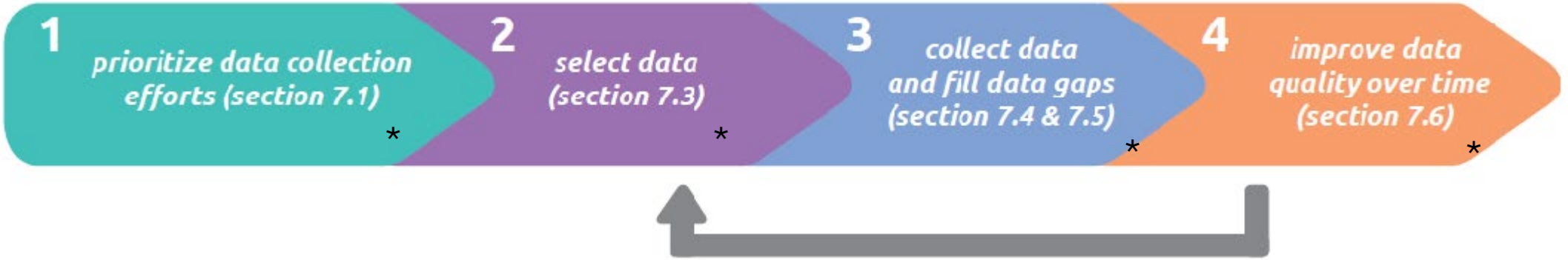
## Prioritize based on Financial Impact

**Prioritize based on a financial spend analysis to rank purchased and sold products.**

- Include activities with a high market value but low emissions.
- Include activities with a low market value but high emissions.

**This includes activities that may have a high GHG impact, even if financial spend is low.**

# Collecting Data: Engage the Supply Chain




**Prioritize data collection efforts on the Scope 3 activities that:**

- Are expected to have the most significant GHG emissions
- Offer the most significant GHG reduction opportunities
- Are most relevant to the company's business goals.

**Collecting higher quality data for priority activities allows companies to focus resources on:**

- The areas with the greatest GHG emissions
- Setting reduction targets; and
- Tracking and demonstrating GHG reductions over time.

* Sections referenced are from the GHG Protocol Scope 3 Standard: https://ghgprotocol.org/corporate-value-chain-scope-3-standard

# Types of Data to Use

| Primary Data: Supplier Specific | Secondary Data: Industry Specific |
|---|---|
| • Meter readings<br>• Purchase records<br>• Utility bills,<br>• Engineering models<br>• Direct monitoring<br>• Mass balance<br>• Stoichiometry<br>• Other methods for obtaining data from specific activities in the company's value chain | **Secondary data can be used to fill data gaps.**<br>• Use industry specific averages.<br>• Select secondary data that are the most representative to the company's activities in terms of technology, time, and geography, and that are the most complete and reliable.<br>• Secondary data sources is available at https://ghgprotocol.org/life-cycle-databases. |

**Scope 3 data depends on the quality of data used to calculate emissions**

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# Discussion

**Customer Questions:**

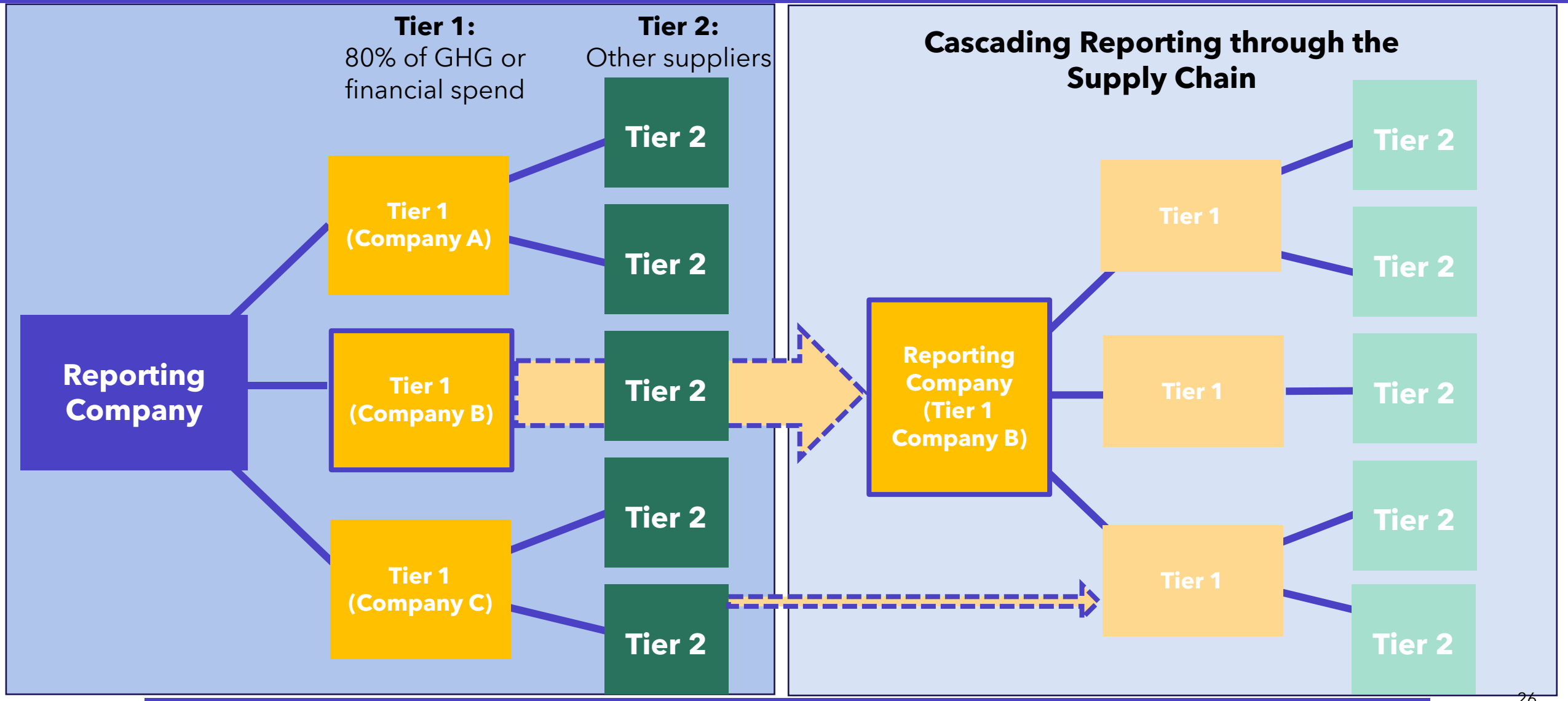
- What questions are you asked most often from your customers about your emissions?

**Vendor Questions:**

- If you ask your vendors for information on their emissions, what questions are you asking them?

What sorts of response do you get from them?

# Create Supplier Tiers: Cascading Reporting




As companies cascade reporting requirements to their supply chain, a global inventory develops

# Reporting: Putting the Pieces Together

**More reporting means that more companies will be accountable for their emissions.** Accounting of Scope 3 emissions recognizes that a broad range of actions impact emissions and play a role in reducing global emissions reporting over time.

- **Customers, policy makers and regulators are calling for increased efforts around Scope 3 reporting.** Scope 3 data can be tricky to obtain – especially for large complex companies. However, companies are expected to start this process with an understanding that the quantity and quality of the data will improve over time.
- **Companies may need to start with low quality data due to limited data availability In the initial years of Scope 3 data collection**.
  Work to improve the data quality of their Scope 3 inventory each year by filling data gaps, and replacing lower quality data with higher quality data as it becomes available.
- **Collecting data, assessing data quality, and improving data quality is an iterative process**.
  Quality will improve over time.

**As more companies take inventory and report on emissions, they are more likely to implement efforts to reduce them, leading to a reduction in global emissions.**

# Q&A

## Do you have questions about Scope 3 Emissions?

# Break Time!

**5 Minute Break**

Stretch

Meditate

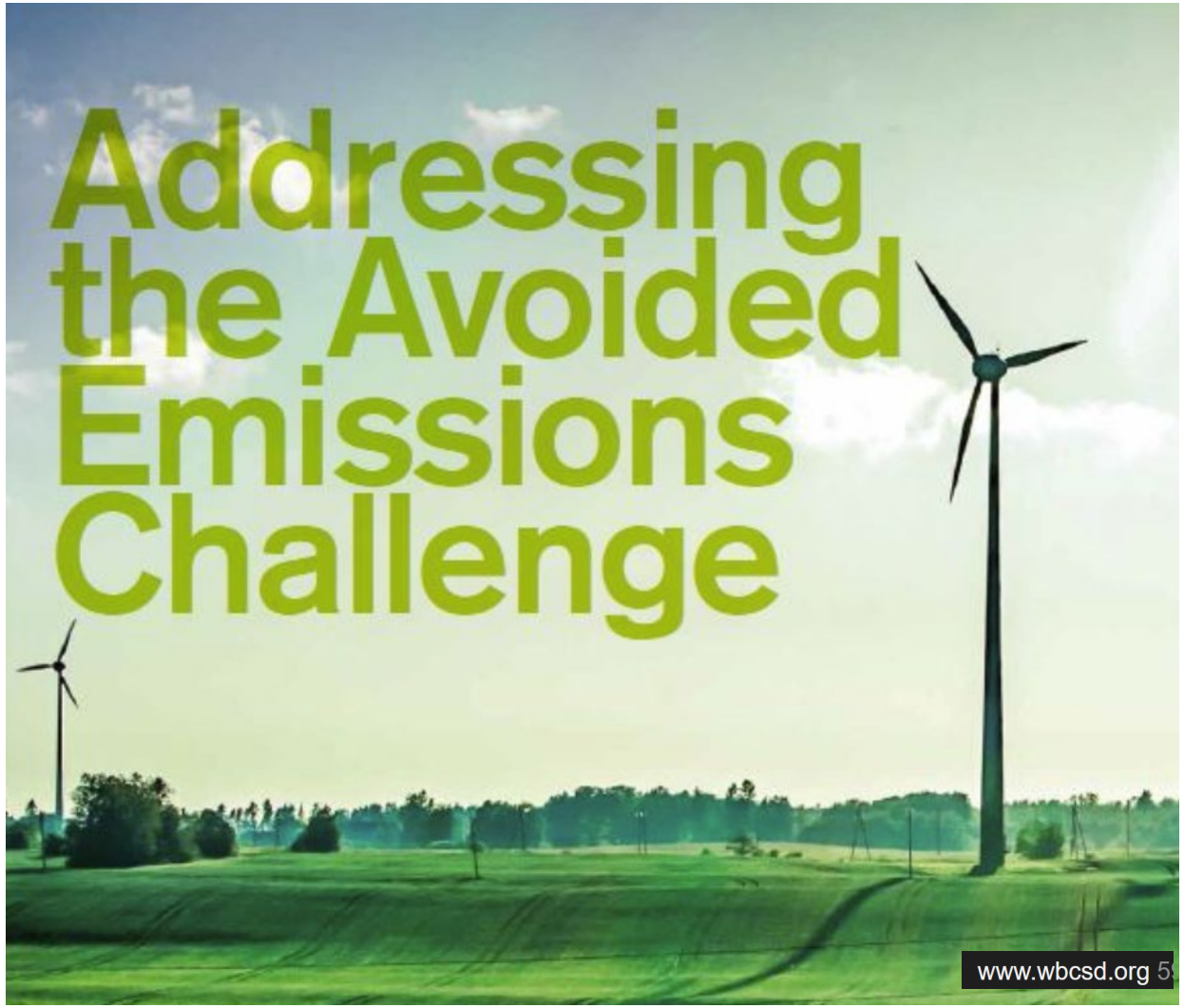
Hydrate

Get a Snack

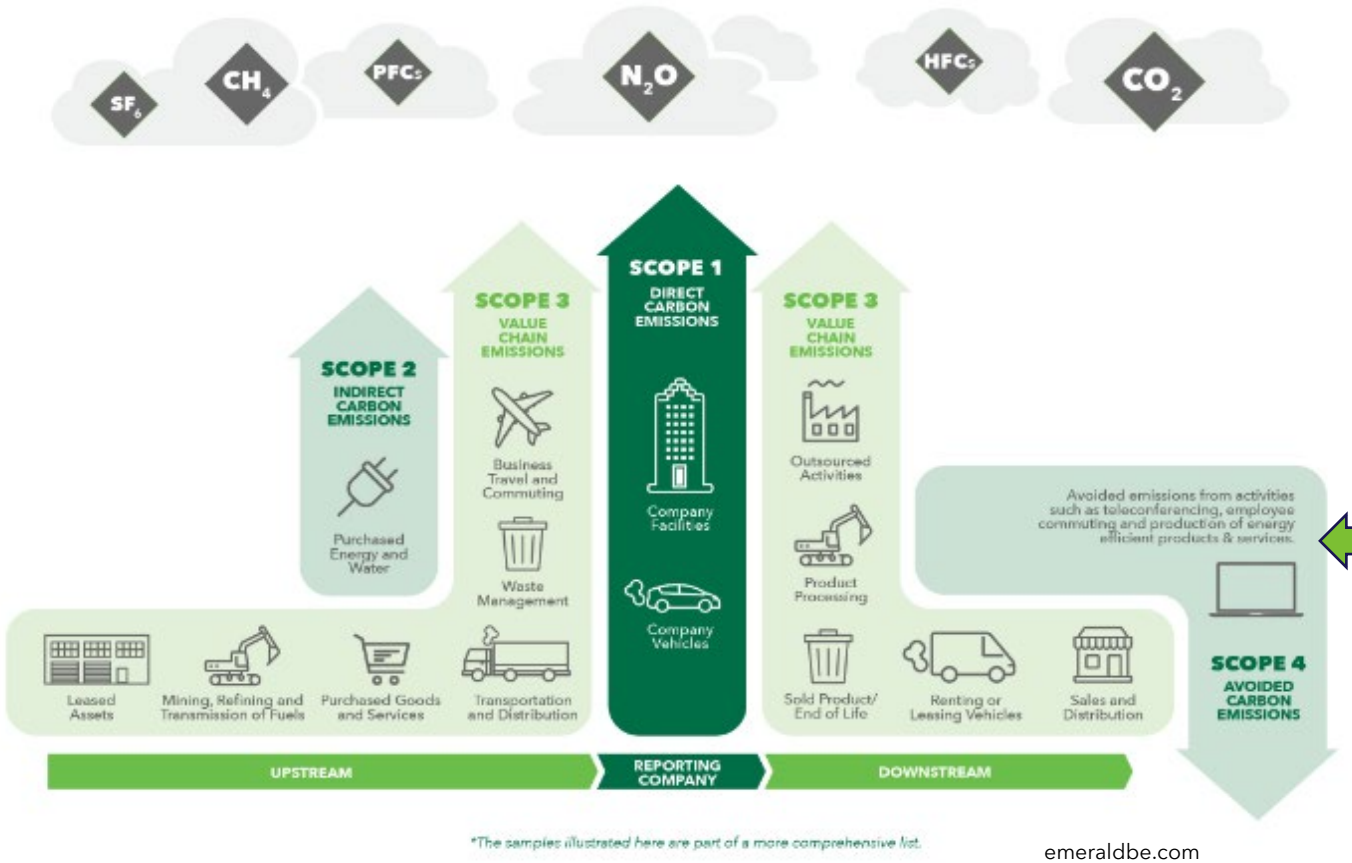
Eye Strain Break

Play Wordle

# Avoided Emission (Scope 4)



# What are Avoided Emissions (Scope 4)



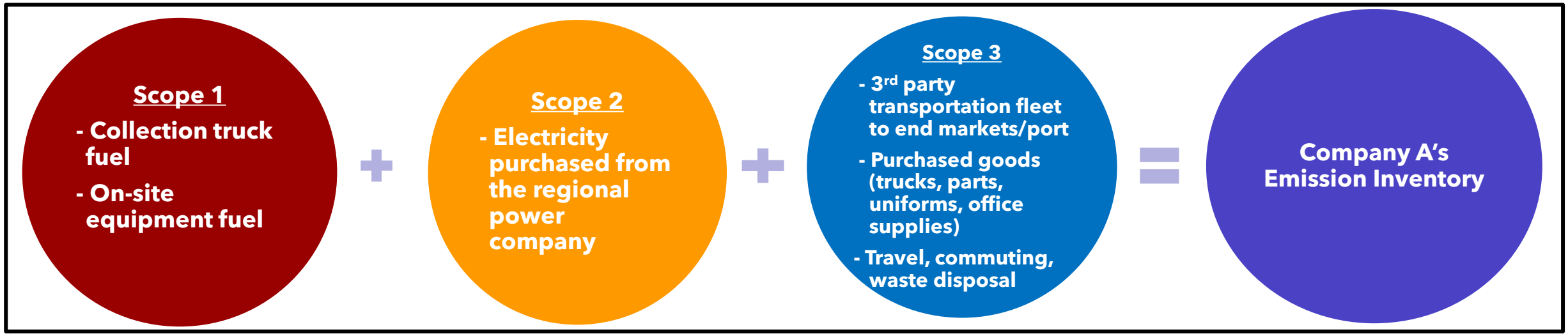

emeraldbe.com

**Scope 4 emissions are not included as emissions by a reporting company. They are outside of Scopes 1-3 emissions.**

**Avoided emissions are emissions that didn't get generated.**
The GHG protocol reports emissions, not avoided emissions.

# Example: Recycling Emissions Inventory

**Recycling Company A provides recycling collection and sorting services.**
Through their GHG emissions inventory process, the company identified the following primary emissions:




**Avoided Emissions (Scope 4):**
Reported separately as part of this company's Sustainability Report

- **Company A's emission inventory includes emissions only.** It does not include the environmental benefits associated with the tons they recycle.
- **Avoided Emissions.** The benefits of recycling are called Avoided Emissions since they reduce emissions outside of the boundary of this company. Other companies in the supply chain will report the benefits of recycling as part of their emission inventory.
- **If Recycling Company A incorporated these benefits, this would result in double counting of emissions benefits.**

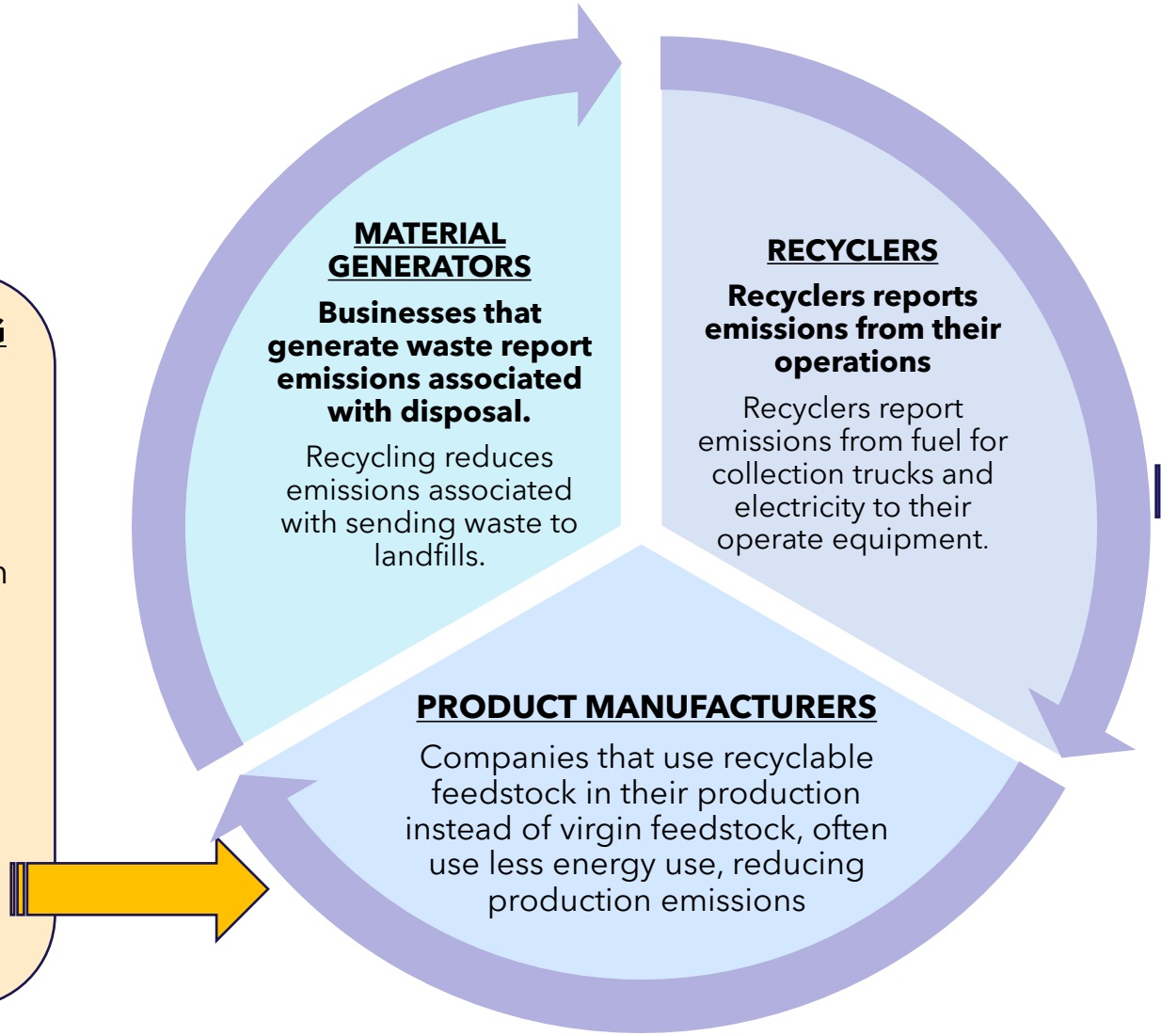
# Counting Emissions from Recycling

## Who Counts Which Emissions?

**VIRGIN MATERIAL MINING COMPANIES**

**The mining industry reports emissions from their mining operations.**

- Most emissions occur from the fuel and electricity used to mine virgin resources.
- Recyclables sold to product manufactures reduce demand for virgin material, so mining company report fewer emissions.




**THE BOTTOM LINE**

- Recyclers generate emissions.
- Our customers' recycling programs create recyclables that reduce landfill emissions.
- Recyclables replace virgin material, which results in reduced production energy and reduced mining emissions (the largest impact).

**Overall fewer global emissions are generated and reported as a result of recycling.**

# Avoided Emissions in Other Industries

**Avoided emissions is not unique to the recycling industry.** Many companies manufacture products that result in an overall reduction of GHG emissions in society.
The **renewable energy field** offers several examples of products and solutions that reduce emissions versus alternatives energy solutions:

| | |
|---|---|
| Wind turbines or solar panels, compared to fossil fuel power plants | Triple-pane windows, compared to double- or single-pane windows |
| LED bulbs, compared to incandescent bulbs | Insulation in a building, compared to no insulation |
| Online meeting software, compared to business travel | |

Similar to the recycling industry, a renewable energy company's **customers** benefit from reporting fewer emissions associated with more efficient use-phase energy use. Their customers report the emissions associated with their manufacturing process.

**The net benefits of the entire system leads to avoided emissions, which are captured by tracked by comparing a company's emissions inventory over time**

**Energy efficiency reduces renewable energy customers' emissions**
(no emissions credit to renewable energy company)

**+**

**Product Manufacturers (Customer) has reduced emissions due to renewable energy company products.**

**=**

**Product manufacturer benefits by reporting fewer emissions.**
These are Avoided Emissions from energy efficiency products.

# Risks of Improper Scope 4 Reporting

**In an article for Eco-Business, author Ng Wai Mun** cautions against inaccurate reporting of Avoided Emissions.

- Avoided emissions claims are often unverifiable or inaccurate.
- Most companies that report Avoided Emissions cherry-pick and publicly report the positive impacts of their products.

  Citing a paper by the World Resources Institute, "*companies tend to only focused on positive impacts in public reporting, ignoring the fact that negative impacts of products are equally common.*"
- Companies risk tarnishing their brand if they are called out for greenwashing or overstating claims on emissions avoided.

**Mun offers the following advice for Reporting Avoided Emissions:**

1. **Avoid Cherry Picking.** Include negative and positive impacts of products and services.
2. **Be transparent about assumptions.** State assumptions up front.
3. **Consider spillover impact or change in consumer behavior.** The use of a product may create ripple effects that increase or reduce emissions outside of the product's life cycle. Report complete value chain emissions inventory information.

News • Eco-Business explains

## Explainer: Avoided emissions and how not to overclaim them

Businesses routinely report their carbon emissions in three categories. There is now growing interest in the potential of a fourth 'scope'. However, experts are wary that companies are using problematic methods to account for these so-called 'avoided emissions'.

https://www.eco-business.com/news/explainer-avoided-emissions-and-how-not-to-overclaim-them/

# How to Calculate & Use Avoided Emissions

- **Report Avoided Emissions outside of Scopes 1-3 Emissions.**
- **Use US EPA's WARM tool.**
  - It is an accepted  calculator for the emissions avoided because of recycling.
  - The tool provides GHG emissions reduction calculations, charts and LCA information for a wide range of materials
  - EPA's WARM tool and Recycling Equivalency tool can play an important role in communicating the benefits of recycling to ISRI members customers
  - Understand the inputs to ensure accurate analysis
- **Recycling equivalencies are a good way to present avoided emissions from recycling.** These can be presented by company, by material or by customer.

# U.S. EPA's Avoided Emission Calculator

**EPA developed its WARM tool over 25 years ago to help businesses calculate emissions.**

- It estimates the potential GHG emissions, energy savings and economic impacts of baseline and alternative waste management practices
- WARM is updated regularly--Version 17 was completed in 2023
- GHG savings are calculated by comparing the emissions associated with managing materials under an alternative scenario with the emissions associated with the user's baseline scenario (i.e., current practices)

**WARM Calculation Example**:

The GHG savings of recycling one (1) short ton (standard U.S. ton) of aluminum cans instead of landfilling them (requiring more virgin production) would be calculated as follows:

**(1 short ton × -9.13 MTCO2E/short ton) - (1 short ton × 0.02 MTCO2E/short ton) = -9.15 MTCO2E***

**Emissions from manufacturing aluminum**

**Emissions from recycling aluminum**

**Emissions avoided by recycling aluminum**

*** Avoided emissions are expressed as a negative, since they are a reduction in emissions**

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# Calculating Avoided Emissions

## US EPA's WARM* tool: Calculating Avoided Emissions

CONTACT US

### Waste Reduction Model (WARM)

EPA created the Waste Reduction Model (WARM) to provide high-level estimates of potential greenhouse gas (GHG) emissions reductions, energy savings, and economic impacts from several different waste management practices. WARM estimates these impacts from baseline and alternative waste management practices—source reduction, recycling, anaerobic digestion, combustion, composting and landfilling.

#### Basic Information about WARM

- What is WARM?
- WARM Tool
- Versions of WARM
- Frequent Questions about WARM

#### Documentation

- Documentation for Greenhouse Gas Emission, Energy and Economic Factors Used in WARM
- Background Documents

#### Related Tools

- Recycled Content Tool
- Individual Waste Reduction Model (iWARM)
- Greenhouse Gas Equivalency Calculator
- Policy and Program Impact Estimator

#### Relevant Programs

- Sustainable Materials Management
- ENERGY STAR

**https://www.epa.gov/warm**

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October 2023

# WARM User's Guide

## Waste Reduction Model (WARM) Tool

User's Guide

WARM version: 15 (November 2020)
Software version: 1.5
Guide version: November 2020

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warm-users-guide_v15_10-29-2020.pdf

## Documentation for GHG Emission, Energy and Economic Factors Used in WARM

The WARM documentation explains the calculation of emission factors by material type, or group of materials, arranged into individual chapters. EPA also provides chapters addressing each specific materials management practice that is available in WARM, along with a background and overview chapter, a list of definitions and acronyms, user's guides for the different versions of the WARM tool, a summary of recent updates in WARM and additional chapters on special topics like forest carbon sequestration, energy factors and economic impacts.

The WARM documentation chapters are grouped into several files based on the following chapter topics:

- User's Guide WARM Version 15: provides an overview for users who may be new to the tool or need some basic knowledge about downloading and modeling scenarios in WARM version 15
- User's Guide WARM version 15 Excel: provides an overview for users of the Excel-based tool for WARM version 15. This guide is the same as the guide found on the first sheet of the WARM Excel tool
- Background includes chapters covering:
  - WARM Background and Overview
  - Definitions and Acronyms
  - Recent Updates in WARM
  - Forest Carbon Storage
- Management Practices includes chapters covering:
  - Source Reduction
  - Recycling
  - Anaerobic Digestion
  - Composting
  - Combustion
  - Landfilling

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# Behind the Scenes Documentation

**WARM User's Guide.** The guide provides an overview for users who may be new to the tool or need some basic knowledge about downloading and modeling scenarios.

- **Background** - WARM Background and Overview, Definitions and Acronyms, Recent Updates in WARM, Forest Carbon Storage and Transportation Assumptions
- **Management Practices** - Source Reduction, Recycling, Anaerobic Digestion, Composting, Combustion, Landfilling, Energy Impacts and Economic Impacts
- **Containers, Packaging and Non-Durable Goods Materials** - Glass, Metals, Paper Products, Plastics, and Polylactide (PLA) Biopolymer
- **Organic Materials** -Food Waste and Yard Trimmings
- **Electronic**s - Electronics
- **Tires** - Tires
- **Construction Materials** - Asphalt Concrete, Asphalt Shingles, Carpet, Clay Bricks, Concrete, Drywall, Fiberglass Insulation, Fly Ash, Vinyl Flooring, Wood Flooring, and Wood Products.

## Links to Background Documentation

- Waste Reduction Model (WARM) Tool User's Guide (pdf) (1.6 MB)
- Waste Reduction Model (WARM) Excel User's Guide Version 15 (pdf) (615.23 KB)
- Background Chapters (pdf) (934.25 KB)
- Management Practices Chapters (pdf) (2.74 MB)
- Construction Materials Chapters (pdf) (2.67 MB)
- Containers, Packaging, and Non-Durable Goods Materials Chapters (pdf) (2.24 MB)
- Electronics Chapter (pdf) (847.95 KB)
- Tires Chapter (pdf) (599.87 KB)
- Organic Materials Chapters (pdf) (1.45 MB)

# WARM Covers 60 Materials

**WARM covers 60 material types** →

**WARM includes 6 materials management practices:**

- Recycling
- Source Reduction
- Combustion
- Composting
- Anaerobic Digestion
- Landfilling

**WARM calculates emission, energy and economic factors for each material and management practices, including:**

- Units of metric tons of carbon dioxide equivalent (MTCO2E)
- Million BTU
- Labor hours
- Wage dollars
- Tax dollars

## Materials Types Recognized by WARM

| | | | | | |
|---|---|---|---|---|---|
| Aluminum can | Aluminum Ingot | Asphalt Concrete | Asphalt Shingles | Beef | Branches |
| Bread | Carpet | Clay Bricks | Concrete | Copper Wire | Corrugated Cardboard |
| Cathode Ray Tube (CRT) Displays | Dairy Products | Desktop Central Processing Units (CPUs) | Dimensional Lumber | Drywall | Electronic Peripherals |
| Fiberglass Insulation | Flat-Panel Displays | Fly Ash | Food Waste | Food Waste (mean only) | Food Waste (non-meat) |
| Fruits and Vegetables | Glass | Grains | Grass | Hard-copy Devices | HDPE (high-density polyethylene) |
| LDPE (low-density polyethylene) | Leaves | LLDPE (linear low-density polyethylene) | Magazines/ Third-Class Mail | Medium Density Fiberboard | Mixed Electronics |
| Mixed Metals | Mixed MSW (municipal solid waste) | Mixed Organics | Mixed Paper (general) | Mixed Paper (primarily from offices) | Mixed Paper (primarily residential) |
| Mixed Plastics | Mixed Recyclables | Newspaper | Office Paper | PET (polyethylene terephthalate) | Phonebooks |
| PLA (polylactic acid) | Portable Electronic Devices | Poultry | PP (Polypropylene) | PS (polystyrene) | PVC (polyvinyl chloride) |
| Steel cans | Textbooks | Tires | Vinyl Flooring | Wood Flooring | Yard Trimmings |

# Getting Started: Accessing WARM

## The download requires time (and patience).

**1. Identifying which version to download**

### Current WARM Tool – Version 15

WARM version 15 was originally released in May 2019 and was updated in November 2020 and September 2022. WARM is now available as a tool based on a database developed in openLCA software, with versions available for both Windows and Macintosh users (zip). The openLCA database for WARM Version 15 (zip) is also available. Users are still able to access the Excel-Based Tool (xls) (3.43 MB).

**2. Installation**

There are versions of the WARM Tool available for Windows (64 bit and 32 bit upon request) and Mac (64 bit and 32 bit upon request). In all cases, the tool is provided in a compressed file (*.zip, *.gz), which should be first downloaded and then its content extracted (i.e., right click on the file → Extract…).

A folder "WARM" will be then generated. The file "WARM.exe" contained in it should be run to get the application started.

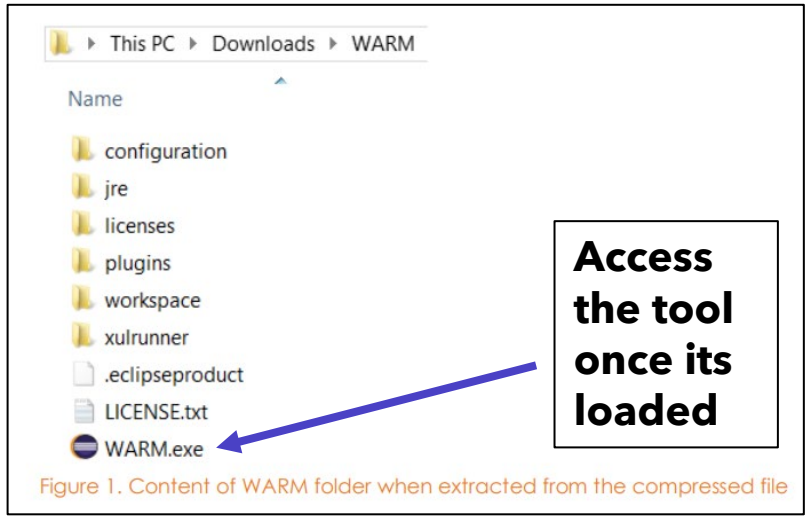



Figure 1. Content of WARM folder when extracted from the compressed file

**2.1 Hardware and software requirements**

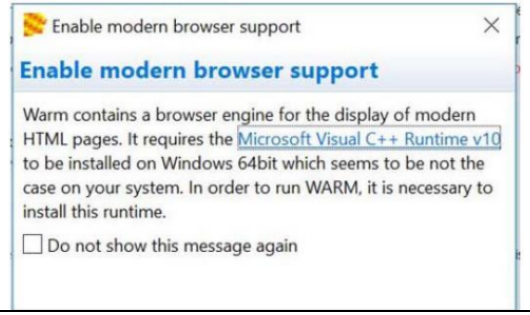
Hardware:

- 1 GB RAM
- 140 MB (Windows), 64 MB (Mac) free hard disk space

Software:

- For MacOS users, Java version 8 is required to run the WARM tool. The official Oracle release of Java 8 may require a separate license agreement with Oracle. More details can be found here. The WARM tool may also be compatible with OpenJDK versions of Java 8. MacOS users may install OpenJDK free of charge by using the SDK command line tool. More information on SDK can be found here.

- Microsoft Visual C++ Runtime v10 needs to be installed on Windows 64 bit because the WARM Tool contains a browser engine for the display of modern HTML pages that requires this runtime. If you have not installed it before running the tool, a message like in Figure 2 would be shown. You can download this runtime here.

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# Calculator Overview

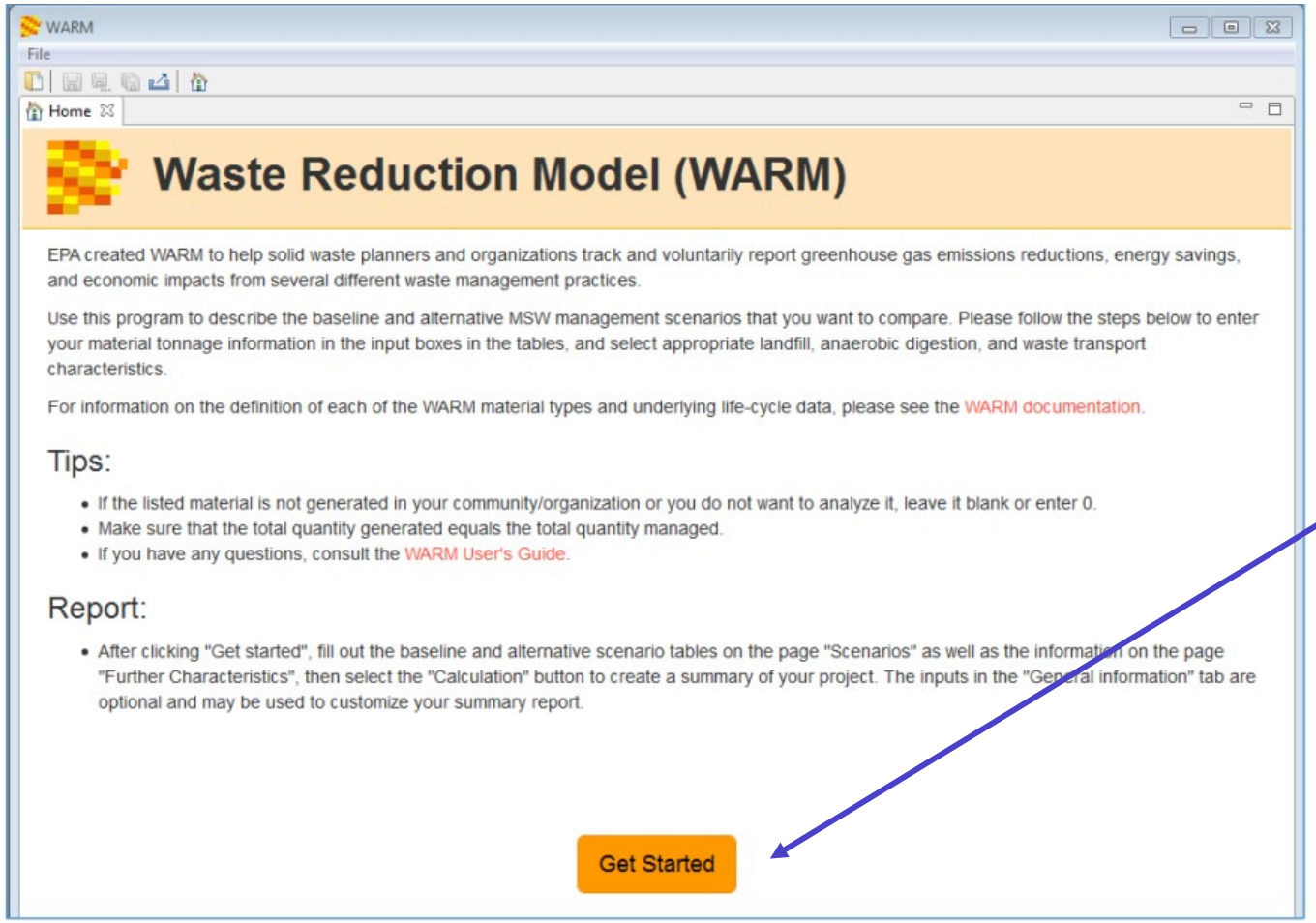



Figure 3. Home tab

If you click the button "Get Started", a new tab "Data Entry" appears, where the data for the analysis should be entered by the user. This tab consists of four steps: Scenarios, Further Characteristics, General Information and Calculation. You can navigate through them by clicking on the buttons on the top of the tab or on the "Back"/ "Next" buttons on the bottom of the page. You can also use the scrollbar in the right of the window to see the full content of each page. Detailed information about the "Data Entry" tab is provided in section 4 of this guide.

# Data Entry Table

## Waste Reduction Model (WARM)

1 Scenarios | 2 Further Characteristics | 3 General Information | 4 Calculation

Please enter data in short tons (1 short ton = 2,000 lbs.) and refer to the User's Guide if you need assistance.

**Baseline Scenario:** Describe the baseline generation and management for the MSW materials listed below. If the material is not generated in your community or you do not want to analyze it, leave it as 0.

**Alternative Scenario:** Describe the alternative management scenario for the MSW materials generated in the baseline.

**Each input row will be validated to sum up correctly. The tons generated in the baseline scenario must match the tons generated in the alternative scenario.**

A row is valid if the sum of tons entered in the Baseline Scenario columns, as shown in the Tons Generated column, is equal to the sum of tons entered in the Alternative Scenario columns. For example, if the Baseline Scenario assumes that 100 tons of aluminum cans are landfilled, this is the Tons Generated value. To generate valid results, all values entered in the Alternative Scenarios columns must add up to 100 tons to equal the Tons Generated value.

| | Baseline Scenario | | | | | | Alternative Scenario | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Material | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Tons Anaerobically Digested | Tons Generated | Tons Source Reduced | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Tons Anaerobically Digested |
| Corrugated Containers | 0 | 0 | 0 | N/A | N/A | 0 | 0 | 0 | 0 | 0 | N/A | N/A |
| Magazines/Third-class Mail | 0 | 0 | 0 | N/A | N/A | 0 | 0 | 0 | 0 | 0 | N/A | N/A |
| Newspaper | 0 | 0 | 0 | N/A | N/A | 0 | 0 | 0 | 0 | 0 | N/A | N/A |
| Office Paper | 0 | 0 | 0 | N/A | N/A | 0 | 0 | 0 | 0 | 0 | N/A | N/A |
| Phonebooks | 0 | 0 | 0 | N/A | N/A | 0 | 0 | 0 | 0 | 0 | N/A | N/A |
| Textbooks | 0 | 0 | 0 | N/A | N/A | 0 | 0 | 0 | 0 | 0 | N/A | N/A |
| Mixed Paper (general) | 0 | 0 | 0 | N/A | N/A | 0 | 0 | 0 | 0 | 0 | N/A | N/A |
| Mixed Paper (primarily residential) | 0 | 0 | 0 | N/A | N/A | 0 | 0 | 0 | 0 | 0 | N/A | N/A |
| Mixed Paper (primarily from offices) | 0 | 0 | 0 | N/A | N/A | 0 | 0 | 0 | 0 | 0 | N/A | N/A |
| Food Waste | N/A | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 |

Next

# Example: Cardboard Recycling

1 Scenarios | 2 Further Characteristics | 3 General Information | 4 Calculation

Please enter data in short tons (1 short ton = 2,000 lbs.) and refer to the User's Guide if you need assistance.

**Baseline Scenario:** Describe the baseline generation and management for the MSW materials listed below. If the material is not generated in your community or you do not want to analyze it, leave it as 0.

**Alternative Scenario:** Describe the alternative management scenario for the MSW materials generated in the baseline.

**Each input row will be validated to sum up correctly. The tons generated in the baseline scenario must match the tons generated in the alternative scenario.**

A row is valid if the sum of tons entered in the Baseline Scenario columns, as shown in the Tons Generated column, is equal to the sum of tons entered in the Alternative Scenario columns. For example, if the Baseline Scenario assumes that 100 tons of aluminum cans are landfilled, this is the Tons Generated value. To generate valid results, all values entered in the Alternative Scenarios columns must add up to 100 tons to equal the Tons Generated value.

| | Baseline Scenario | | | | | | Alternative Scenario | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Material | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Tons Anaerobically Digested | Tons Generated | Tons Source Reduced | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Tons Anaerobically Digested |
| Corrugated Containers | 0 | 100 | 0 | N/A | N/A | 100 | 0 | | 0 | 0 | N/A | N/A |

**WARM requires entering the "Base Scenario" tons recycled and/or landfill first**

# Adding Recycling

1 Scenarios | 2 Further Characteristics | 3 General Information | 4 Calculation

Please enter data in short tons (1 short ton = 2,000 lbs.) and refer to the User's Guide if you need assistance.

**Baseline Scenario:** Describe the baseline generation and management for the MSW materials listed below. If the material is not generated in your community or you do not want to analyze it, leave it as 0.

**Alternative Scenario:** Describe the alternative management scenario for the MSW materials generated in the baseline.

**Each input row will be validated to sum up correctly. The tons generated in the baseline scenario must match the tons generated in the alternative scenario.**

A row is valid if the sum of tons entered in the Baseline Scenario columns, as shown in the Tons Generated column, is equal to the sum of tons entered in the Alternative Scenario columns. For example, if the Baseline Scenario assumes that 100 tons of aluminum cans are landfilled, this is the Tons Generated value. To generate valid results, all values entered in the Alternative Scenarios columns must add up to 100 tons to equal the Tons Generated value.

| | Baseline Scenario | | | | | | Alternative Scenario | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Material | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Tons Anaerobically Digested | Tons Generated | Tons Source Reduced | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Tons Anaerobically Digested |
| Corrugated Containers | 0 | 100 | 0 | N/A | N/A | 100 | 0 | 100 | 0 | 0 | N/A | N/A |

**Next, enter tons recycled in the Alternative Scenario Section.**
**The total tons managed must be reconciled.**

# Error Alert

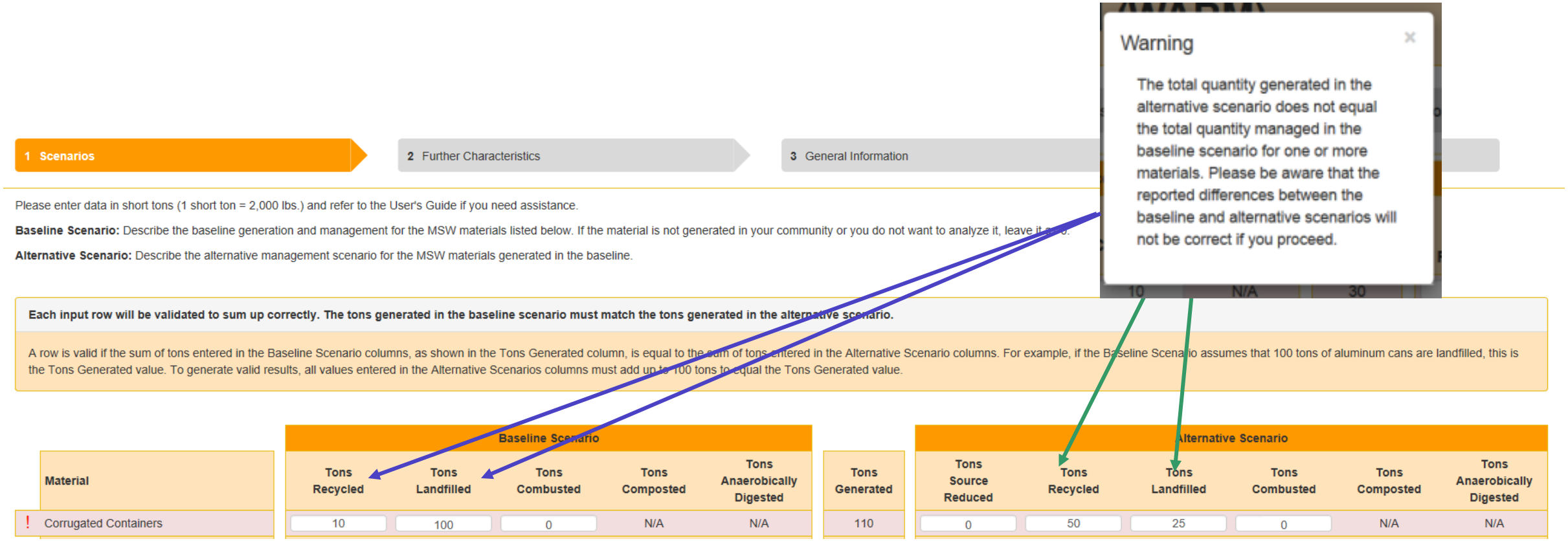


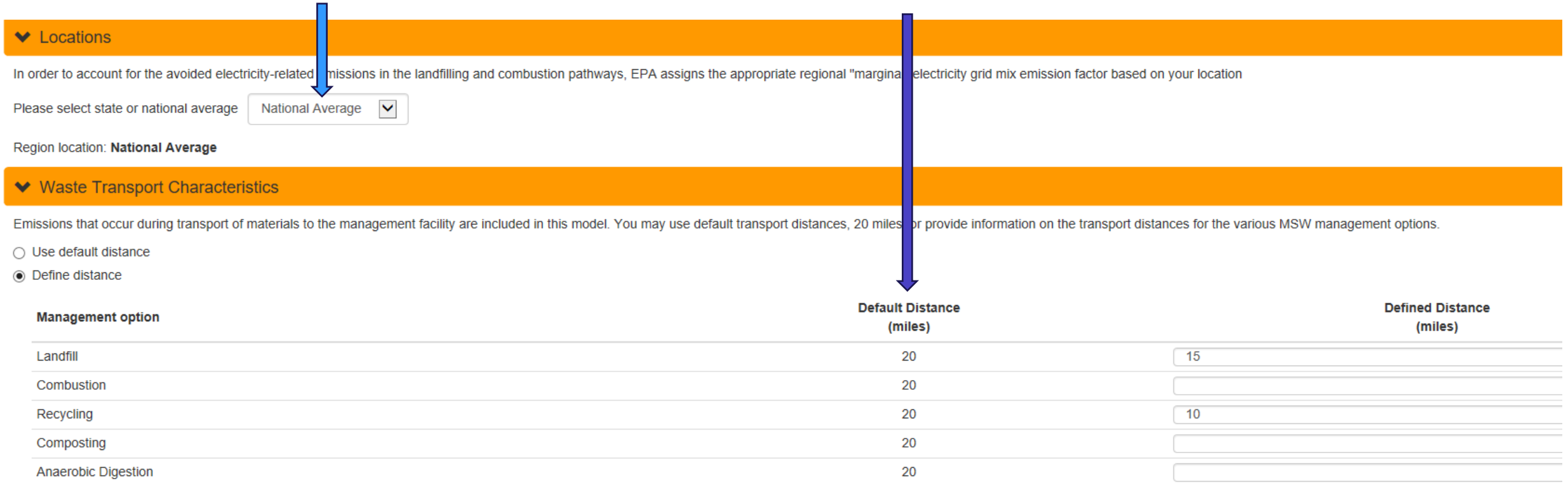

Figure 6. Error of validation for several materials in the "Scenarios" step (i.e., baseline total amount ≠ alternative total amount)

# Electricity and Mileage

## Input Characteristics: Electricity and Distances

- Locations: they affect the emission factors for those management practices consuming/avoiding electricity. The specific regional grid mix is used depending on the state selected by the user in the drop-down menu. The value by default is "National Average".

- Waste Transport Characteristics: the distances covered between the location where the waste was collected and the correspondent management facility can also be modified. The value by default is 20 miles. You can select the option "Define distance" to enter new values (also in miles).



▼ Locations

In order to account for the avoided electricity-related emissions in the landfilling and combustion pathways, EPA assigns the appropriate regional "marginal" electricity grid mix emission factor based on your location

Please select state or national average: National Average

Region location: **National Average**

▼ Waste Transport Characteristics

Emissions that occur during transport of materials to the management facility are included in this model. You may use default transport distances, 20 miles, or provide information on the transport distances for the various MSW management options.

○ Use default distance

◉ Define distance

| Management option | Default Distance (miles) | Defined Distance (miles) |
|---|---|---|
| Landfill | 20 | 15 |
| Combustion | 20 | |
| Recycling | 20 | 10 |
| Composting | 20 | |
| Anaerobic Digestion | 20 | |

# Calculating Output Properties

1 Scenarios | 2 Further Characteristics | 3 General Information | 4 Calculation

## Calculation Properties

Please select the result output unit:

- (•) Metric Tons of Carbon Dioxide Equivalent (MTCO2E)
- ( ) Metric Tons of Carbon Equivalent (MTCE)
- ( ) Units of Energy (million BTU)
- ( ) Labor Hours - employment supported by materials management
- ( ) Wages ($) - all forms of employment income from materials management
- ( ) Taxes ($) - taxes collected by the federal, state and local government from materials management

You can return to this screen to generate results with another output unit once the initial report has been generated.

Calculate

Then - hit the "calculate" button on the tool.

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October 2023

# Output: Avoided Emissions

**Waste Reduction Model (WARM)**

**Summary Report (MTCO2E)**

## GHG Emissions Analysis - Summary Report

GHG Emissions Waste Management Analysis for **{organization}**
Prepared by: **{name}**
Project Period for this Analysis: **{from}** to **{to}**

**Landfilling less and recycling more reduced emissions by 226.12 MTCO2E**

| Material | Baseline Scenario | | | | | | Alternative Scenario | | | | | | | Change (Alt-Base) MTCO2E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Tons Anaerobically Digested | Total MTCO2E | Tons Source Reduced | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Tons Anaerobically Digested | Total MTCO2E | |
| Corrugated Containers | 0.00 | 100.00 | 0.00 | N/A | N/A | 18.16 | 0.00 | 100.00 | 0.00 | 0.00 | N/A | N/A | -313.53 | -331.69 |
| | | | | | | 18.16 | | | | | | | -313.53 | |

**BEFORE RECYCLING**

**AFTER RECYCLING**

**Negative # = Reduced/avoided emissions**

# Going Deeper

## Waste Reduction Model (WARM)
### Summary Report (MTCO2E)

### GHG Emissions Analysis - Summary Report

GHG Emissions Waste Management Analysis for **{organization}**
Prepared by: **{name}**
Project Period for this Analysis: **{from}** to **{to}**

| Material | Baseline Scenario | | | | | | Alternative Scenario | | | | | | | Change (Alt-Base) MTCO2E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Tons Anaerobically Digested | Total MTCO2E | Tons Source Reduced | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Tons Anaerobically Digested | Total MTCO2E | |
| Corrugated Containers | 0.00 | 100.00 | 0.00 | N/A | N/A | 18.16 | 0.00 | 100.00 | 0.00 | 0.00 | N/A | N/A | -313.53 | -331.69 |
| | | | | | | 18.16 | | | | | | | -313.53 | |

a) For explanation of methodology, see the EPA WARM Documentation

b) Emissions estimates provided by this model are intended to support voluntary GHG measurement and reporting initiatives.

c) The GHG emissions results estimated in WARM indicate the full life-cycle benefits waste management alternatives. Due to the timing of the GHG emissions from the waste management pathways, (e.g., avoided landfilling and increased recycling), the actual GHG implications may accrue over the long-term. Therefore, one should not interpret the GHG emissions implications as occurring all in one year, but rather through time.

d) The equivalency values included in the box to the right were developed based on the EPA Greenhouse Gas Equivalencies Calculator and are presented as an example of potential equivalencies. Additional equivalencies can be calculated using WARM results at the Greenhouse Gas Equivalencies Calculator website or using alternative data sources.

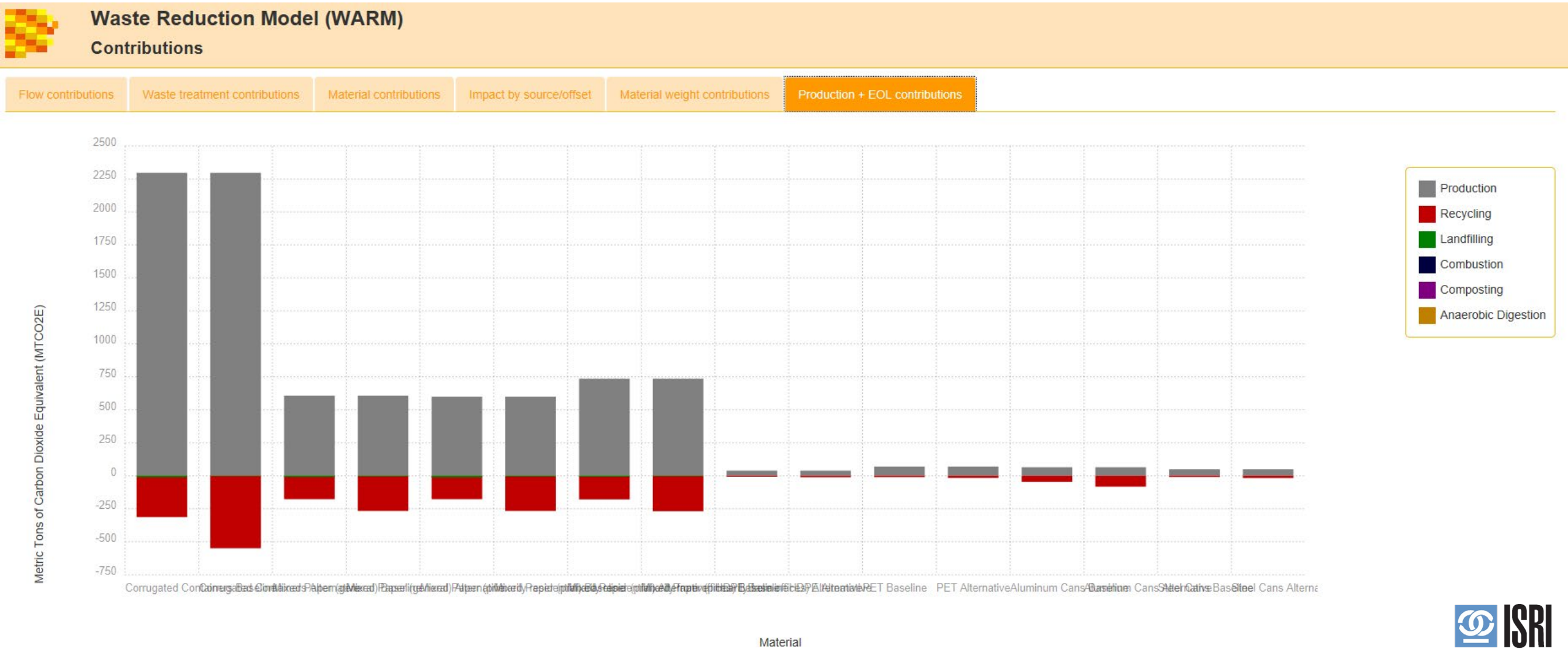
Total Change in GHG Emissions (MTCO2E): **-331.69**

This is equivalent to...
Removing annual emissions from **70** Passenger Vehicles
Conserving **37323** Gallons of Gasoline
Conserving **13820** Cylinders of Propane Used for Home Barbeques

Summary | Analysis | Production + EOL | Charts

**Tabs w/additional Information**

# Charts

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# Modeling Reuse

**Reuse of materials or products is a form of source reduction that can be modeled in WARM with a few additional steps.**.

**To estimate the GHG and energy benefits of reuse:**

- Run WARM using a baseline if a material is not reused (e.g., landfill, recycle);
- Run it again using the Source Reduction Alternative
- **Multiply the GHG reduction results by the number of times the material is reused, then apply the following formula**:

***GHG benefits of Reuse =***
***(Number of total uses – 1*) X (GHG benefits of source reduction)*****

**Examples of Reuse include:**

1. *Using a plastic crate 20 times before recycling it*
2. *Donating a computer to a school program or non-profit organization for continued use*
3. *Reusing a cardboard box a second time before recycling it.*

* *Subtracting "1" from the total uses recognized the impacts of the original production.*

** *Total change in GHG emission.*

**This is not a perfect model but can be used to estimate reuse impacts.**

# Reuse Example: Electronics

1

| Material | Baseline Scenario: Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Tons Anaerobically Digested | Tons Generated | Tons Source Reduced |
|---|---|---|---|---|---|---|---|
| Desktop CPUs | 0 | 10 | 0 | N/A | N/A | 10 | 10 |
| Portable Electronic Devices | 0 | 0 | 0 | N/A | N/A | 0 | 0 |
| Flat-panel Displays | 0 | 0 | 0 | N/A | N/A | 0 | 0 |
| CRT Displays | 0 | 0 | 0 | N/A | N/A | 0 | N/A |
| Electronic Peripherals | 0 | 0 | 0 | N/A | N/A | 0 | 0 |
| Hard-copy Devices | 0 | 0 | 0 | N/A | N/A | 0 | 0 |

Select Source Reduction for the Alternative Scenario

2

Locations

In order to account for the avoided electricity-related emissions in the lar

Please select state or national average: National Average

Region location: **National Average**

3

Waste Transport Characteristics

Emissions that occur during transport of materials to the management facility are included in this mode

- (•) Use default distance
- ( ) Define distance

4

| Material | Baseline Scenario: Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Tons Anaerobically Digested | Total MTCO2E | Alternative Scenario: Tons Source Reduced | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Tons Anaerobically Digested | Total MTCO2E | Change (Alt-Base) MTCO2E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Desktop CPUs | 0.00 | 10.00 | 0.00 | N/A | N/A | 0.20 | 10.00 | 0.00 | 0.00 | 0.00 | N/A | N/A | -208.64 | -208.84 |
| | | | | | | 0.20 | | | | | | | -208.64 | |

**GHG benefits of Reuse = (3 times reused -1 [manufacturing] = 2) X (MTCO2e reduced)**

5

**GHG benefits of Reuse of 10 tons of electronics reused 3 times: [3 times reused -1= 2] X 208.6 MTCO2e = 417.8 MTCO2e**

# Creating Recycling Equivalencies

## Waste Reduction Model (WARM)

### Summary Report (MTCO2E)

## GHG Emissions Analysis - Summary Report

GHG Emissions Waste Management Analysis for **{organization}**
Prepared by: **{name}**
Project Period for this Analysis: **{from}** to **{to}**

| | Baseline Scenario | | | | | | Alternative Scenario | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material** | **Tons Recycled** | **Tons Landfilled** | **Tons Combusted** | **Tons Composted** | **Tons Anaerobically Digested** | **Total MTCO2E** | **Tons Source Reduced** | **Tons Recycled** | **Tons Landfilled** | **Tons Combusted** | **Tons Composted** | **Tons Anaerobically Digested** | **Total MTCO2E** | **Change (Alt-Base) MTCO2E** |
| Corrugated Containers | 0.00 | 100.00 | 0.00 | N/A | N/A | 18.16 | 0.00 | 100.00 | 0.00 | 0.00 | N/A | N/A | -313.53 | -331.69 |
| | | | | | | 18.16 | | | | | | | -313.53 | |

a) For explanation of methodology, see the EPA WARM Documentation

b) Emissions estimates provided by this model are intended to support voluntary GHG measurement and reporting initiatives.

c) The GHG emissions results estimated in WARM indicate the full life-cycle benefits waste management alternatives. Due to the timing of the GHG emissions from the waste management pathways, (e.g., avoided landfilling and increased recycling), the actual GHG implications may accrue over the long-term. Therefore, one should not interpret the GHG emissions implications as occurring all in one year, but rather through time.

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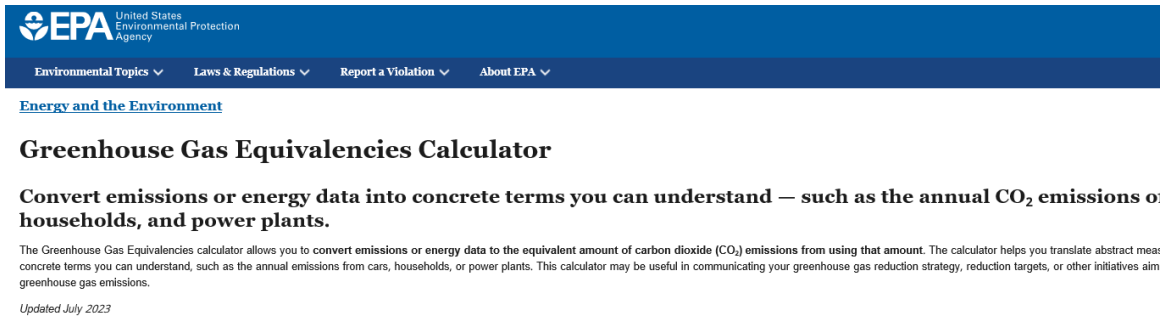
Total Change in GHG Emissions (MTCO2E): **-331.69**

This is equivalent to...
Removing annual emissions from **70** Passenger Vehicles
Conserving **37323** Gallons of Gasoline
Conserving **13820** Cylinders of Propane Used for Home Barbeques



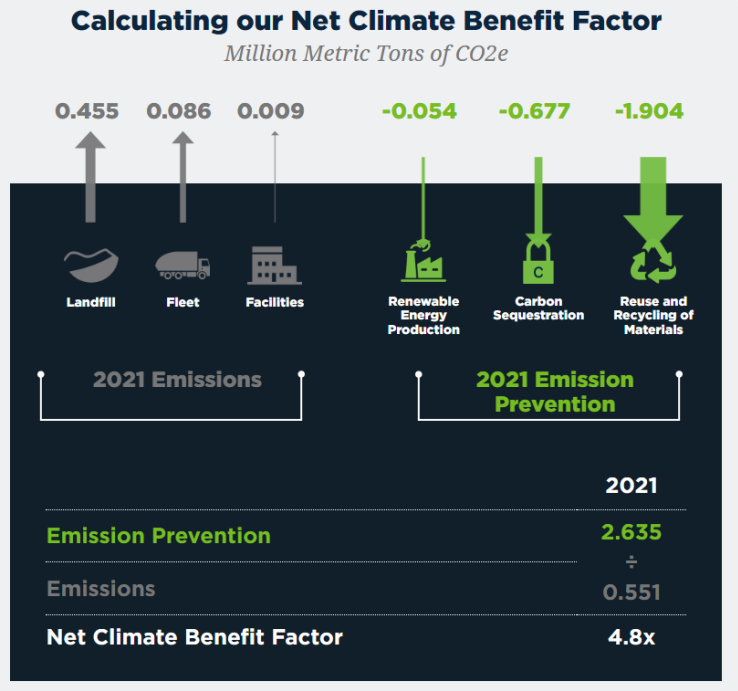

**Get the Widget**

Put the calculator on your website using our widget.

# Using Avoided Emissions & Equivalencies

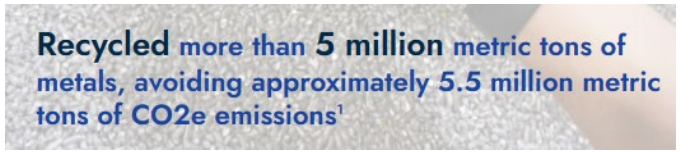
## Company-wide Avoided Emissions equivalencies

### Casella Waste Systems Sustainability Report




## Material Specific Avoided Emissions and Equivalencies

### Radius Recycling
**(formerly Schnitzer Steel) 2022 Recycling Report**



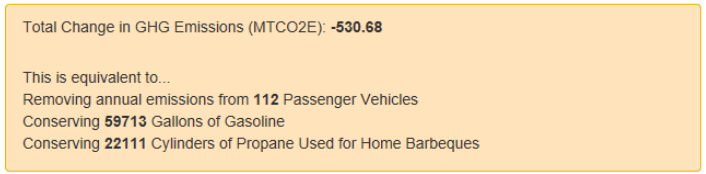

### WM

**14,124,673 tons were recycled/composted in 2015**

**Recycling and composting these materials reduced greenhouse gas (GHG) emissions by more than 33.77 MTCO2e.**

**The GHG reduction is equivalent to removing more than 7.11 million passenger cars from the road each year!**

## Customer Specific Equivalencies




**Example:**
Use EPA's WARM tool to provide your customers with specific information on the emissions their company avoids through the tons they recycle.

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# Customer – Focused Tools

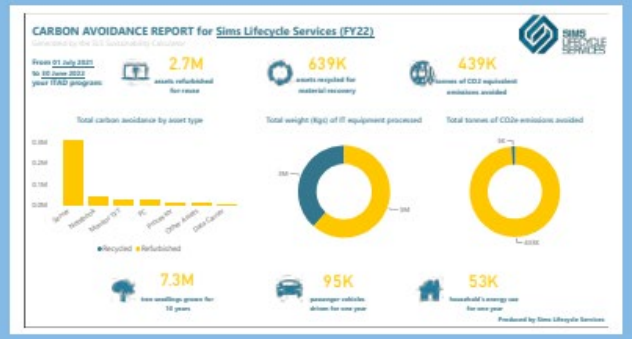
## AN INDUSTRY FIRST – SLS CALCULATES THE IMPACT OF REUSE

Many of our clients have publicly announced their own sustainability goals and carbon reduction programs. Organisations are looking for detailed insights into the carbon impact of their overall operations and technology asset handling. In response, Sims Lifecycle Services launched a sustainability calculator this past fiscal year to provide industry-leading environmental impact reporting to their clients.

The calculator quantifies carbon avoidance from recycling, as well as from the reuse of whole IT assets and components – an important differentiation from most calculators currently available. Incorporating reuse data provides a more accurate and complete overview of carbon savings. Detailed dashboards show volumes of equipment processed, disposition routes and the carbon-equivalent emissions avoided, powered by equipment manufacturing data and our own lab-based asset data.

Using the calculator, we are also able to calculate the total emissions avoided by our customers repurposing and recycling IT assets. For FY22, the total avoided emissions impact was 439 kilotonnes of $CO_2e$ – that's equivalent to taking more than 90,000 cars off the road for one year, or enough electricity to charge a smartphone 53 billion times![14]

The sustainability calculator has been well received by clients who value the increased transparency SLS can offer. We were delighted when the calculator was recognised by the Reverse Logistics Association with the 2022 Green Reverse Logistics Award.




Sims Metals took this to a new level by developing a calculator that enables customers to calculate their own avoided emissions from recycling and reuse.

# GHG Emission versus Lifecycle Accounting

**What is the difference between GHG accounting and Lifecycle Analysis?**

## GHG Accounting

- Is an annual inventory at an **organizational level** (local, state, national, regional or global).
- Quantifies GHG emissions from industrial or economic sectors **on an annual basis**

## Lifecycle Assessment

- Used to evaluate **GHG emissions for a specific material or product**.
- Evaluates the full life-cycle GHG emission associated with the raw materials extraction, manufacturing, transportation, use and end-of-life management of a good or service.

Life-Cycle GHG Accounting Versus GHG Emission Inventories (epa.gov)

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October 2023

# Discussion

**Has your company reported on Avoided Emissions?**

**How did you calculate them? What was the response from stakeholders?**

# Q&A

**What questions do you have about Supply Chain Emissions or Avoided Emission?**

# Next Workshop: September

| Month (2023) | Activity |
|---|---|
| **June 8** | **Overview, Materiality and Governance. These provide an important overlay for ESG strategy.** What do stakeholders think is important, or material, about your company. The role of data, policies and guidance associated with good governance play an important role in the ESG strategy dialogue. |
| **July 20** | **Strategy, Goals & Community** Descriptions and supporting documents to help develop key topics supporting ESG. Understanding the "S" of Social in ESG. |
| **August 10** | **GHG Emissions and Carbon Footprint:** A look at GHG emissions, and an introduction to Scopes 1, 2 and 3 emissions. |
| **September 14** | **Value Creation & The Whole Works Mapping Tool** |
| **October 12** | **Understanding Scopes 3 & 4:** What are they, and how are they counted? |
| **November 9** | **Reporting Frameworks** |
| **December 7** | **Looking Ahead to 2024:** A review of the toolkit. Taking time to look ahead to future trends and program needs. |

# Upcoming ISRI Events

## In-Person:

- **ISRI 2023 Fall Meeting |** Denver, October 16-18
- **Shredder Operations & Safety Forum |** Atlanta, October 25-27

## Virtual Events:

- **ESG Workshop #5 – Reporting Frameworks |** November 9
- **ISRI Safety & Environmental Council Virtual Event |** November 16 & December 14

## Chapter Events:

- **Joint Northern Ohio & Pittsburgh Chapter Vendor Expo** | Warren, OH, October 26
- **Gulf Coast Region Fall Board Meeting** | Tulsa, November 1-2
- **West Coast Chapter Fall Meeting & Dinner** | Long Beach, November 8
- **Southeast Region 2023 Fall Convention** | Savannah, November 8-11
- **Empire Chapter Vendor Expo** | Niagara Falls, November 14

https://www.isri.org/events-training/

**Natalie Messer Betts, ISRI**

**Susan Robinson, Consultant**

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# Thank you