Better Plants
U.S. DEPARTMENT OF ENERGY

Implementing a Waste Diversion Program

Virtual INPLT Training

Session 8

Tuesday – April 8, 2025

10:00 am – 12:30 pm EDT

U.S. DEPARTMENT OF ENERGY

Waste Virtual INPLT Agenda

- **Week 1 (February 18th) – Introduction: Waste Diversion and Reduction 101**
- **Week 2 (February 25th) – How to Effectively Track and Measure Your Waste**
- **Week 3 (March 4th) – Source Reduction and Waste Minimization Techniques**
- **Week 4 (March 11th) – Finding Outlets for Hard to Manage Waste Streams**
- **Week 5 (March 18th) – Construction Waste Management and Green Building Certifications**
- **Week 6 (March 25th) – Scope 3 Emission Considerations**
- **Week 7 (April 1st) – Implementation of a Waste Diversion Program – Developing a Roadmap to Zero Waste**
- **Week 8 (April 8th) – Conclusions, Summaries, and Wrap up Presentations**

Plan of Action

Today, we will:

- Discuss the homework
- Conduct a review of sessions 1-7
- Listen to attendee presentations
- Conduct a Q&A session

Presenters from Sustainable Solutions Corporation

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Operations Manager
Sustainable Solutions Corporation

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Homework Discussion

Homework Takeaways

Overview

- Identify key areas of improvement that would be on a roadmap to zero waste to landfill for your site. State action items needed to achieve the steps called out, and who needs to be involved to execute them. Determine who would need to be on the site Green Team if one is not already instituted.

Takeaways

- Waste segregation was called out as a key area of improvement
  - Signage, labeling, and location noted as needing addressed
- Employee training and communication is required to implement strategies onsite
- First steps towards zero waste to varied by company
  - Some needed to conduct internal review of policies and procedures while others were focused on employee training and onsite waste segregation
- Multiple companies had Green Teams with representation from various departments including, EHS, engineering, operations, and more

Today's Topic:

Review of Sessions 1-7 & Attendee Presentations

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Review of Sessions 1-7

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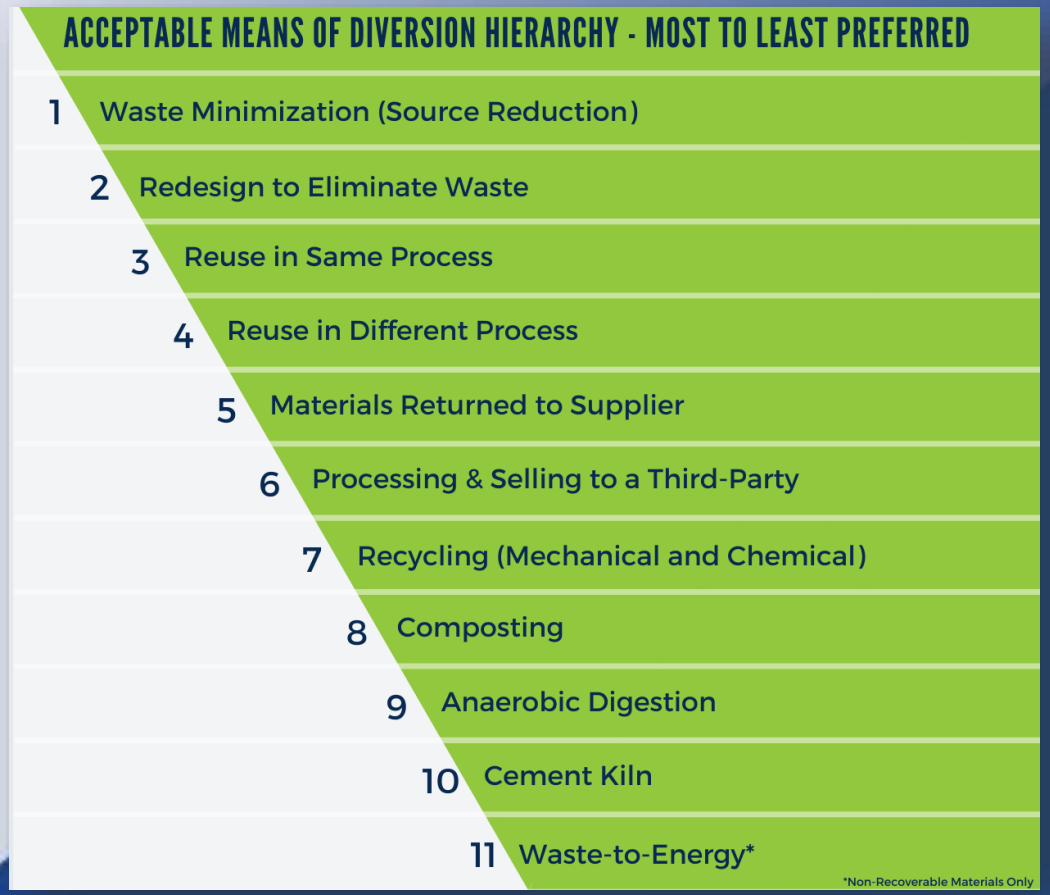

Session 1

- **Waste Diversion and Reduction 101**
  - Topics:
    - Overview of waste
    - Waste diversion hierarchy and general strategies
    - Key waste legislation

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U.S. Solid Waste Infrastructure

U.S. Solid Waste Infrastructure

Infrastructure	Number
Curbside Recycling Programs	9,000+
Material Recovery Facilities (MRF)	586
Transfer Stations	3,350
Compost Sites	2,300
Mixed Waste Processing Facilities & Hybrid MRFs	70*
Anaerobic Digestion (Stand-alone)	25
Waste-to-Energy	76
Landfills	1,908

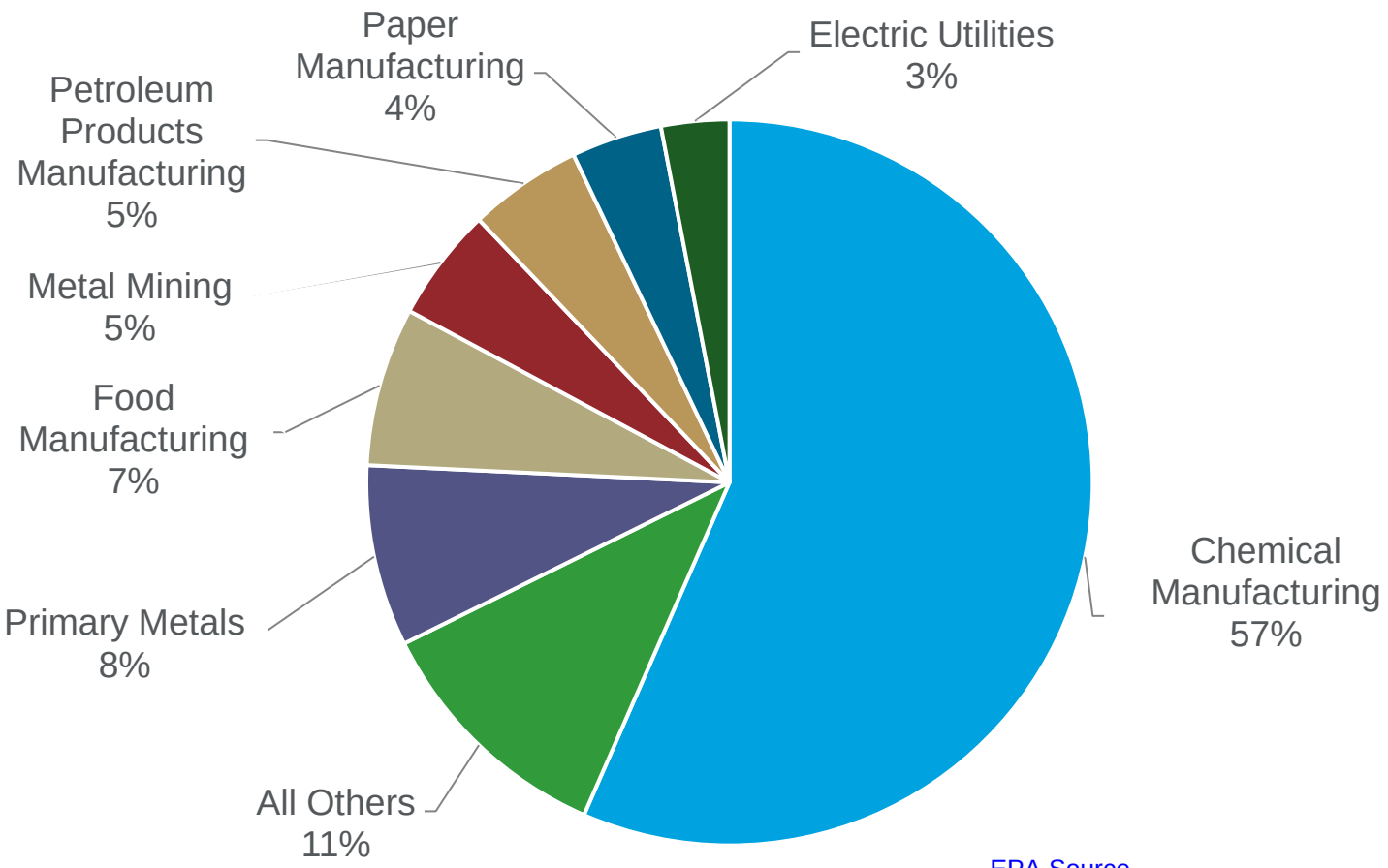
*Excludes facilities that solely produce refuse-derived fuel
Source: GBB, 2017 from various.

Solid Waste Management Options

- Solid waste collection
- Recycling
- Organics
- Waste conversion
- Landfilling

Waste by Industry per EPA

Production-Related Waste Managed by Industry, 2020
28.3 billion pounds



EPA Source

Chemical industry includes:

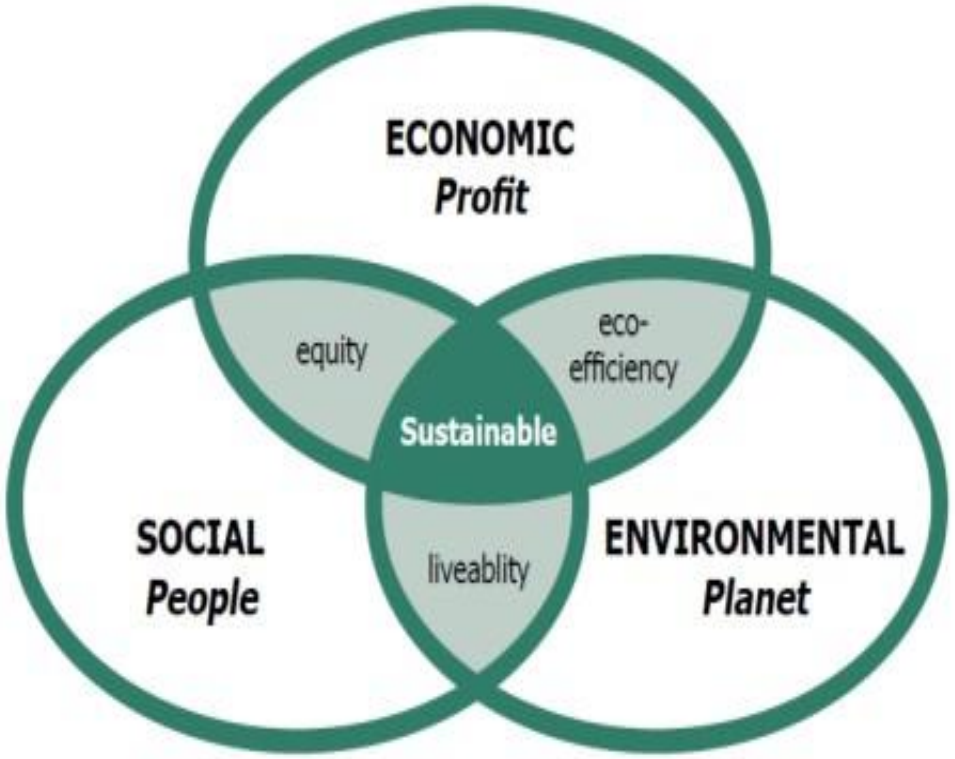
- Pharmaceuticals
- Cleaning and personal care
- Coatings and adhesives
- Basic chemicals
- Resins and synthetic rubber

Sustainability

Economic Performance
Sustained profits, increased market share, shareholder value, innovation

Environmental Performance
Reduced waste, resource and energy consumption equals significant cost savings

Equity/Social Performance
Customers, employees, community connections



What is the Circular Economy?

LINEAR

CIRCULAR

Evolution from a linear system to a circular approach

- Change does not occur only through recycling – it requires life cycle thinking and multiple strategies and approaches

Key Legislation

- Resource Conservation and Recovery Act (RCRA)
- State-level
  - Diversion requirements
    - Organic waste as a focus
    - Prohibiting certain material's being sent to landfill
  - Sustainability reporting
  - Extended producer responsibility
- Europe
  - European Green Deal
  - Landfill Directive
  - Packaging waste focus

Session 2

- **How to Effectively Track and Manage Your Waste**
  - Topics:
    - Waste tracking methodology
      - Data gathering and review
      - Onsite assessment and waste characterization
    - Onsite waste collection strategies

Waste Tracking Methodology

Waste tracking can be broken into the following steps:

1. Select a system
2. Delegate responsibility and accountability
3. Gather and input data
4. Validate data
5. Process and review results
6. Conduct an onsite assessment
7. Conduct a waste characterization (recommended)
8. Set realistic goals
9. Review on recurring basis

Waste Tracking Methodology Review

You can't manage what you don't measure

- Develop consistent system that addresses:
  - Who will be involved and what will they do?
  - What data needs to be gathered and from where?
    - Where should this data be housed?
  - How should the data be reviewed and what metrics matter most?
    - Is a tool necessary to assist with this?

Image Source

Correlating Procurement and Waste Information

What is bought vs. what becomes waste

- Review production waste totals and compare to raw material procurement costs
  - Hauler information may not be detailed enough to show correlation
    - To get more detailed data:
      - Investigate waste streams/collection and estimate waste
      - Increase segregation
      - Conduct a waste characterization

Onsite Assessment

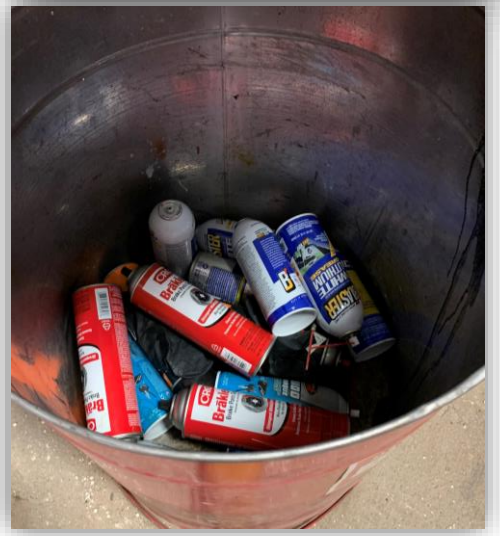
- Do not limit focus to where the waste is and what to do with it
  - Learn how and why waste is generated
- Walk through all areas onsite, from manufacturing to office spaces
- Understand manufacturing process and decision-making to assist in discovering opportunities for improvement
  - Follow the flow of raw materials
  - Talk to site personnel to understand pain points

Waste Characterization - Procedure

- Conduct a waste characterization as part of or after an onsite assessment
- Determine areas or waste streams to evaluate
- Obtain waste from this location
  - Sort through enough waste to obtain an understanding of typical waste in the area
  - Know the timeframe for waste generated onsite to allow for scaling data
- Empty out waste and sort it into separate streams
  - Plastic bottles, aluminum cans, cardboard, paper, PPE, trash, etc.
  - Can group streams if they would normally be hauled away together, such as in single-stream recycling
- Record the weight of the groups of waste

Waste Collection

- Evaluate bin consistency
  - Availability and location
  - Labels
  - Color
  - Size
  - Lid vs. no lid
    - It is recommended that lids have slots for specific waste streams
- Segregate hazardous and non-hazardous wastes
  - Look for opportunities to minimize hazardous waste
- Consider centralized collection areas



Session 3

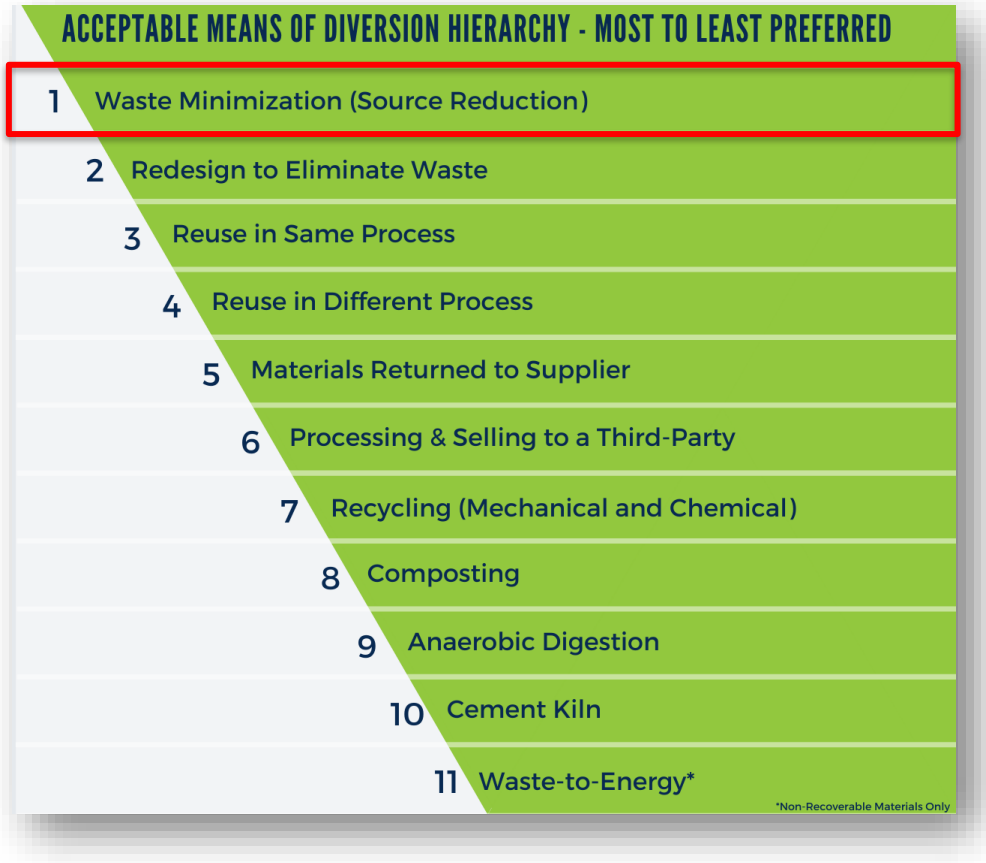
- **Source Reduction and Waste Minimization Techniques**
  - Topics:
    - Techniques for source reduction
    - Identifying source reduction opportunities
    - Benefits of waste reduction and minimization

Source Reduction Techniques

Source reduction is the elimination of waste before it is created

Techniques for source reduction include:

- Supplier takeback programs
- Product enhancement
- Process efficiency improvements
- Material substitution
- Inventory control
- Industrial hygiene
- Preventative maintenance
- In-process recycling



Process Efficiency Improvements: Industry Example

- A food manufacturer was disposing of over 100 lb. of product per batch due to issues with consistency
- This waste was equal to over $150,000 annually in final product
- Installing a valve at the packaging line to remove water from the product prior to packaging eliminated this waste stream

Identifying Waste Reduction Opportunities

Identify reduction opportunities:

- Reviewing available data
  - Benchmarking
  - Correlating procurement to waste
  - Identifying hotspots due to production processes
- Conducting a site assessment and waste characterization

Evaluating opportunities identified:

- Conduct cost analysis
- Undergo Stage Gate Process
  - Work for sustainable product innovation

Benefits to Waste Minimization

- Reduce disposal and management costs
- Improve worker health and safety
- Reduce impacts of regulatory requirements
- Minimize potential environmental liability
- Reduce company emissions
- Demonstrate environmental leadership to stakeholders
- Improve public image

Session 4

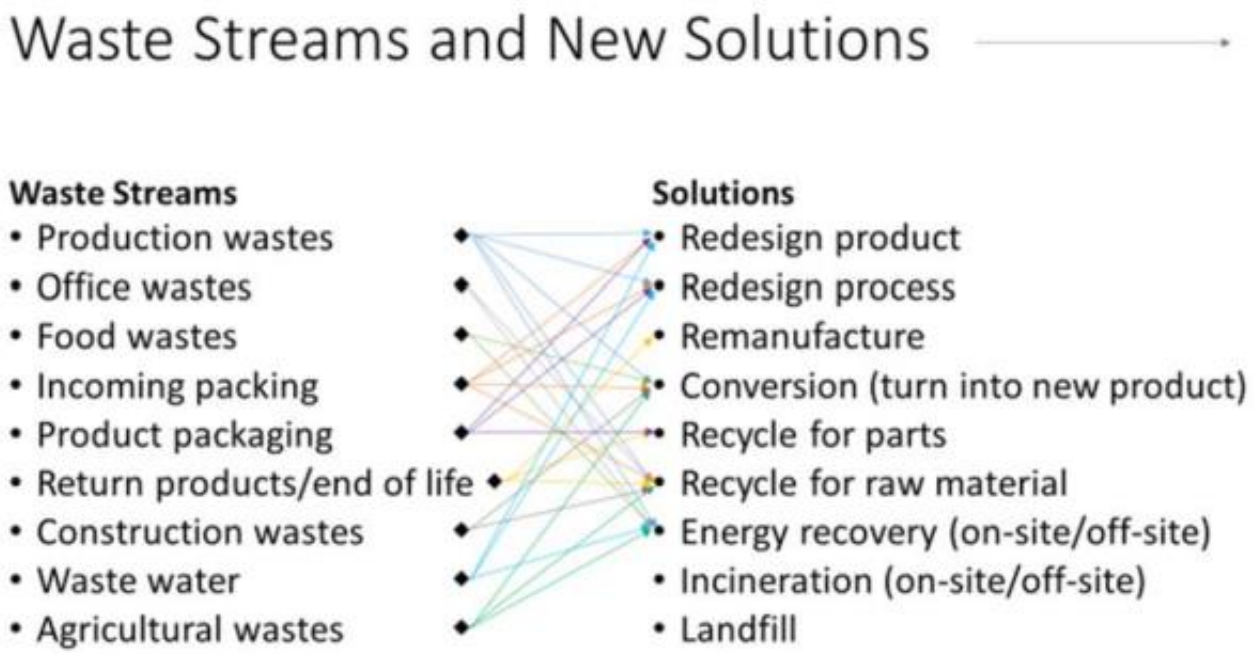
- **Finding Outlets for Hard to Manage Waste Streams**
  - Topics:
    - Hard to manage waste and feasible outlets
    - Recommendations for identifying outlets

What is a Hard to Manage Waste Stream?

- A hard to manage waste stream is different for every company and can be dictated by:
  - Waste stream
    - Volume or frequency of generation
    - Shape or state of waste
  - Industry
    - Required processes
    - Products produced
  - Ability to handle waste
    - Facility/site size or layout
    - Available personnel
  - Regional outlets
  - Regulatory requirements

Outlets for Waste Streams

Many waste streams have various outlets available as solutions for waste diversion



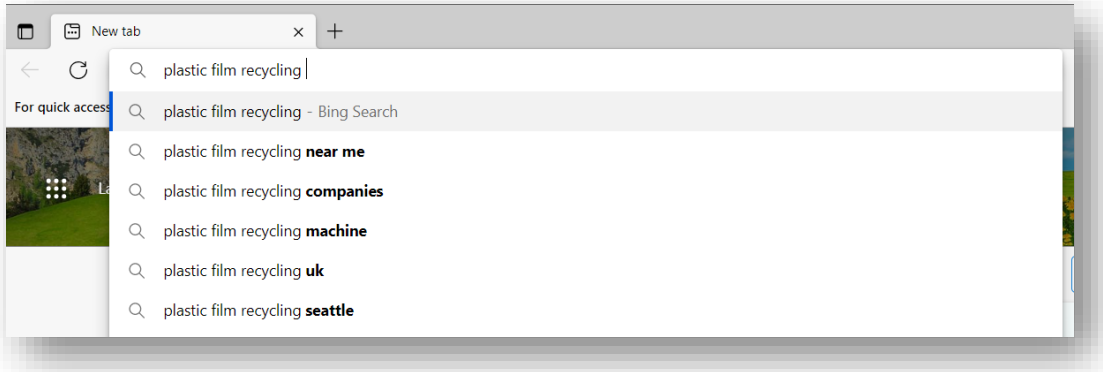
Better Buildings Taxonomy of Wastes

Hard to Manage Wastes

Waste stream(s)	Why is it hard to manage?	Potential outlets	Key strategies
Foam packaging	Not acceptable in general recycling	• Specialty recycling • Waste-to-energy	Seek specific outlets and do not rely on municipalities
Pallet wrap and films	• Not acceptable in general recycling • Difficult to handle and store	• Specialty recycling • Waste-to-energy	Bale the material to increase its desirability
Sludges and swarf	• Can be large volumes • Minimal local outlets • Possibility of high moisture content	• Metal recovery • Raw material for aggregate products • Agricultural land application • Cement kiln • Waste-to-energy	• Dry before shipping • Conduct laboratory testing
Metal turnings, chips, dust, and shavings	May not be reusable in current form	• Remelt • Recycling	Compress into briquette to make the material reusable
Expired products and materials	• Infrequently generated • Combination of waste streams in one item (packaging and product)	• Supplier return • Recycling • Waste-to-energy	De-package and separate waste streams • Some companies can do this for you

Finding an Outlet

- Do not only rely solely on local municipalities!
- There are outlets available for many waste streams
  - Internet searches will yield fruitful results
    - Utilize outlet databases such as Earth911 as part of search efforts
  - Do not limit searches to just the city your site is in
    - Could you combine waste with another site, one that is closer to a waste outlet?
  - Sometimes suppliers will know of outlets that handle their products
- Now more than ever companies are working to utilize waste streams to create products, and they need waste!



Finding an Outlet

How can I identify an outlet if I do not know who or what can use this kind of material?

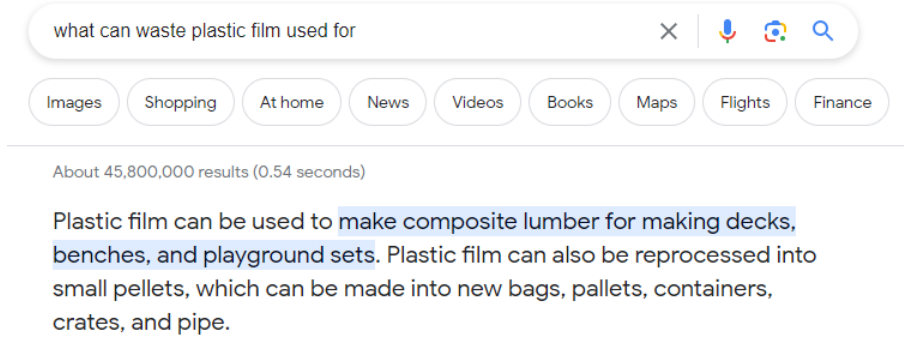
- Identify what is in the waste
  - Conduct chemical analysis
  - Ask supplier for spec sheet
    - Example: films are widely variable, but a supplier should be able to tell you exactly what it is
- Adjust the search criteria
  - Research other industries and the raw materials they use and compare it to the waste
  - Rather than search “what is film used for”, you can search what is polyethylene used in

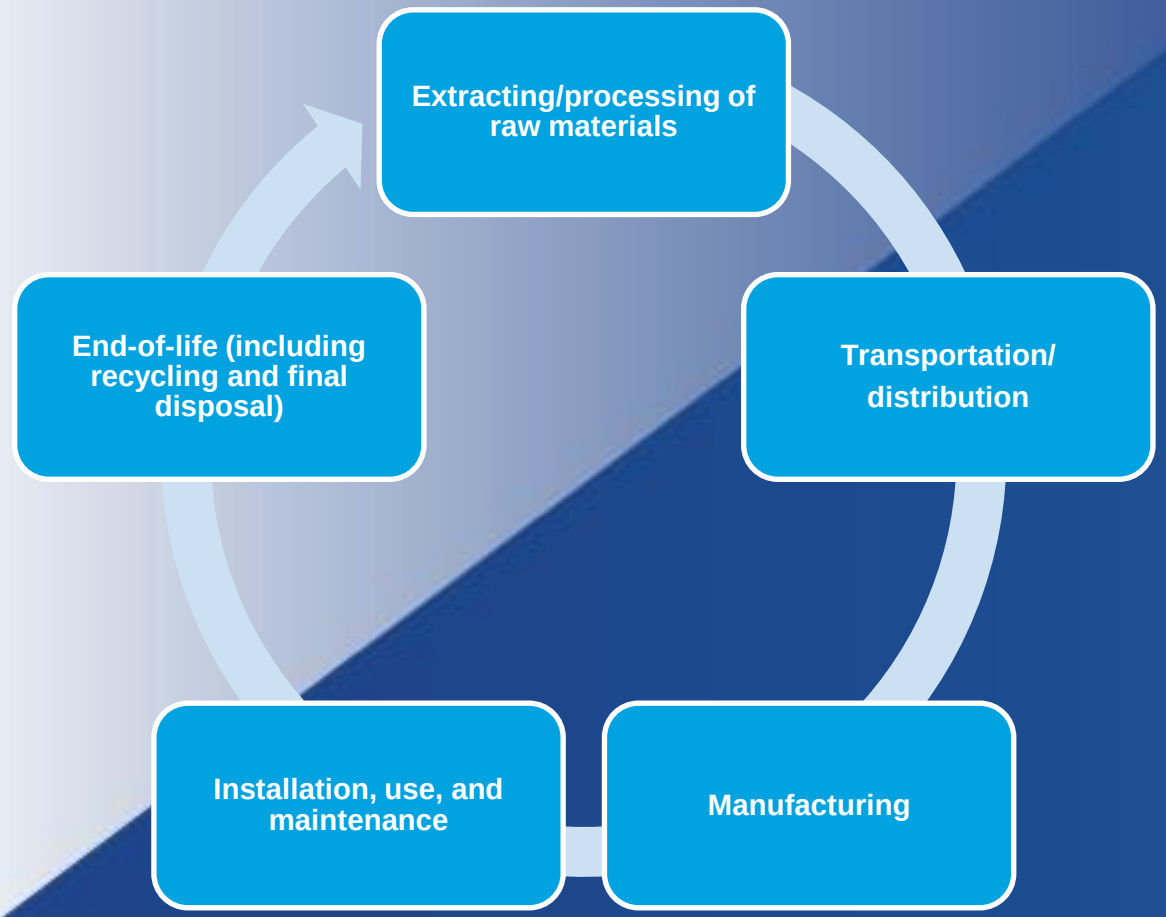
What common products are made of polyethylene?

1 – Polyethylene Terephthalate (PET or PETE)

- Soft drink bottles.
- Juice bottles.
- Water bottles.
- Shampoo/conditioner bottles.
- Liquid hand soap bottles.
- Carry-home food containers.

Do any companies that make these products have recycled content?





Waste and LCA

- What impacts waste's contribution to emissions?
  - Transportation distance
  - End-of-life scenario
  - Does it displace raw materials elsewhere?
- How can my company reduce impacts?
  - Can waste be reused in-house?
  - Is there a more appropriate outlet for waste?
  - Is there a closer outlet than the one currently used?

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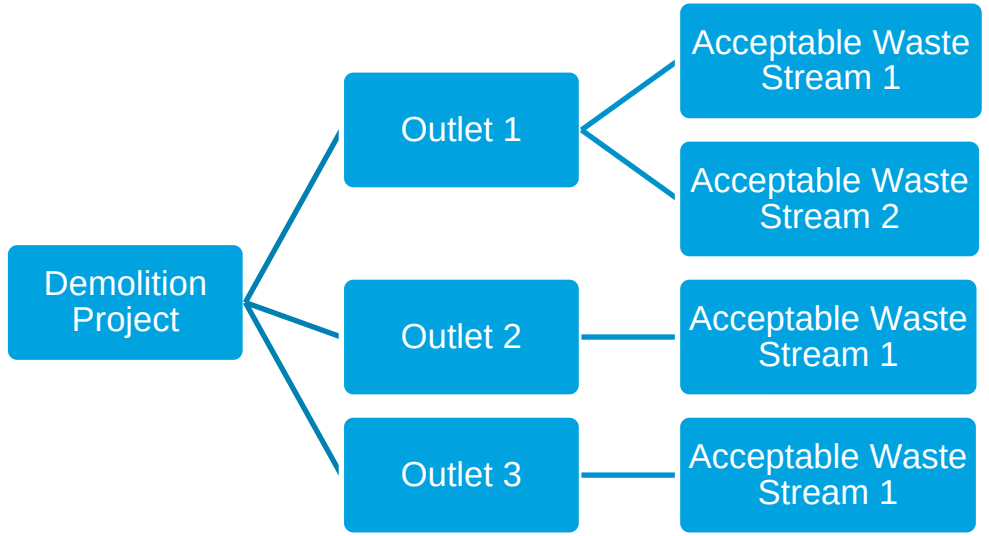
Session 5

- **Construction Waste Management and Green Building Certification**
  - Topics:
    - Construction and demolition waste minimization and diversion
      - Designing out waste
      - Managing waste at the site
    - Construction waste management and green building certifications

Creating a C&D Waste Management Plan

- A C&D waste management plan must be project specific
- The waste management plan should reflect the builder's expectations for waste management and diversion including:
  - Anticipated waste streams
  - Waste diversion targets
  - Acceptable waste handling and diversion strategies
  - Acceptable end-of-life scenarios for various materials
  - Reporting criteria and frequency
  - Identification of MMOs
  - Contractor training and communication with subcontractors



Onsite C&D Waste Management Planning

Consider the following prior to starting construction:

- Anticipate waste streams
  - When a stream will be generated
  - Estimated volume
  - Condition of the waste
- Contact material management organizations (MMOs)
  - Determine what waste streams each outlet will take
- Plan for waste collection area(s)
  - Generate signage
- Train and establish expectations for contractors
- Establish diversion rate goal

C&D Waste Best Practices

Source Reduction

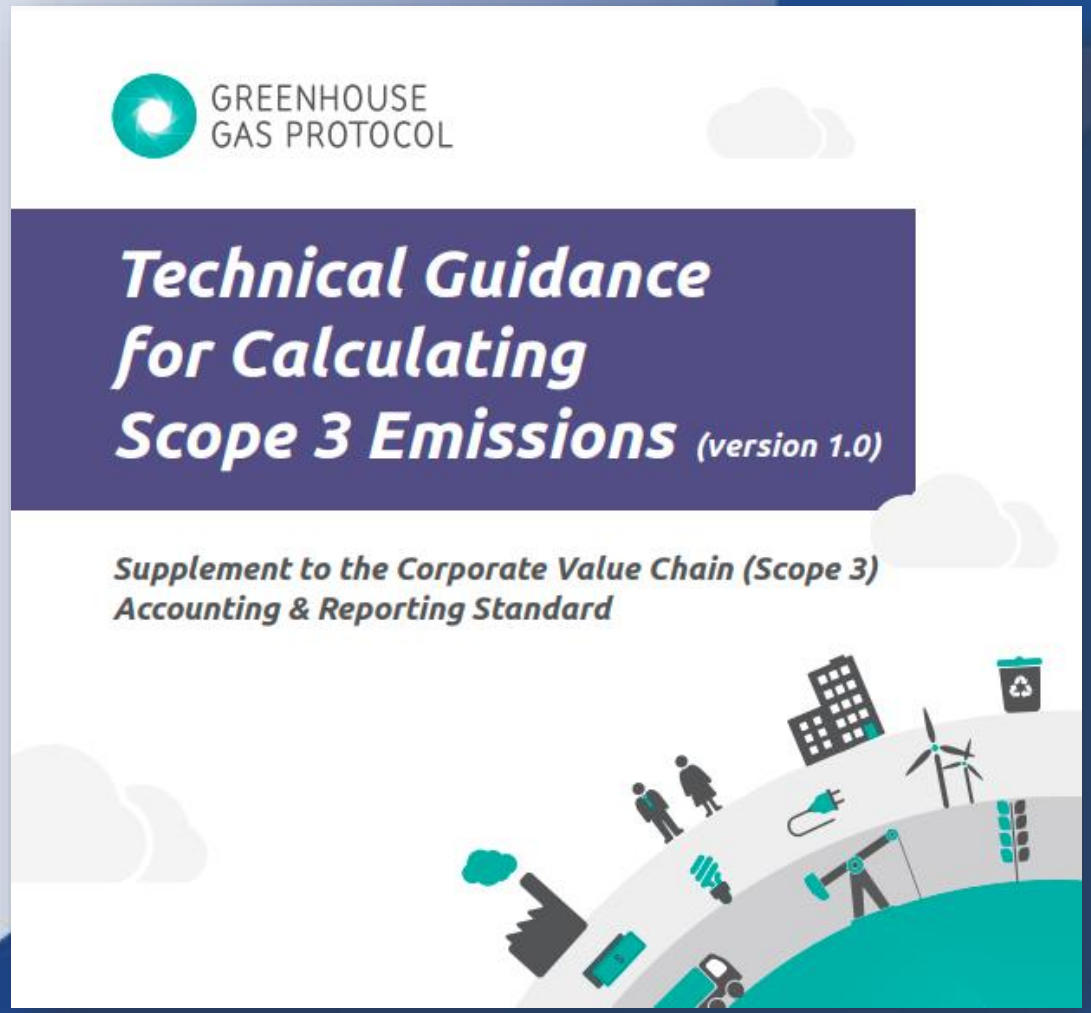
- Preserving existing buildings
- Optimizing the size of new buildings
- Designing new buildings for adaptability to prolong useful lives
- Using construction methods that allow disassembly and reuse

Divert Materials from Landfill

- Reusing materials
- Recycling materials
- Establishing circularity
  - Using recycled materials

Green Building Standards

- Many companies are using green building standards to assist with meeting carbon reduction goals and science-based targets
- All major green building standards have considerations related to waste either for construction sites or within facilities

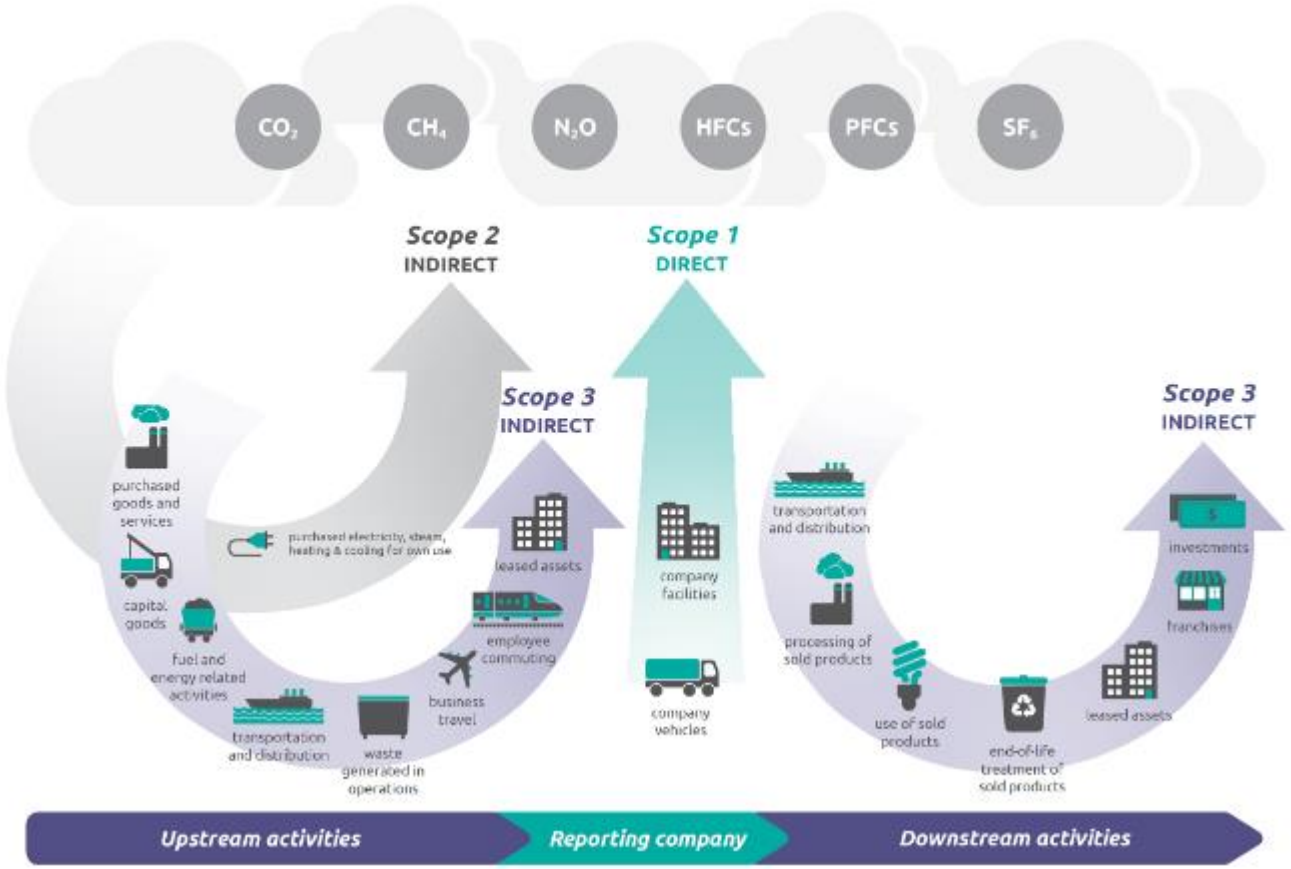


Session 6

- **Scope 3 Emission Considerations**
  - Topics:
    - Scope 3 emissions and their contribution to total company carbon footprint
    - Relevant legislation focused on methane reduction
    - ESG reporting frameworks
    - Scope 3 emissions calculation methodology
    - Sustainable sourcing and procurement

Scope Emissions

Overview of GHG Protocol scopes and emissions across the value chain

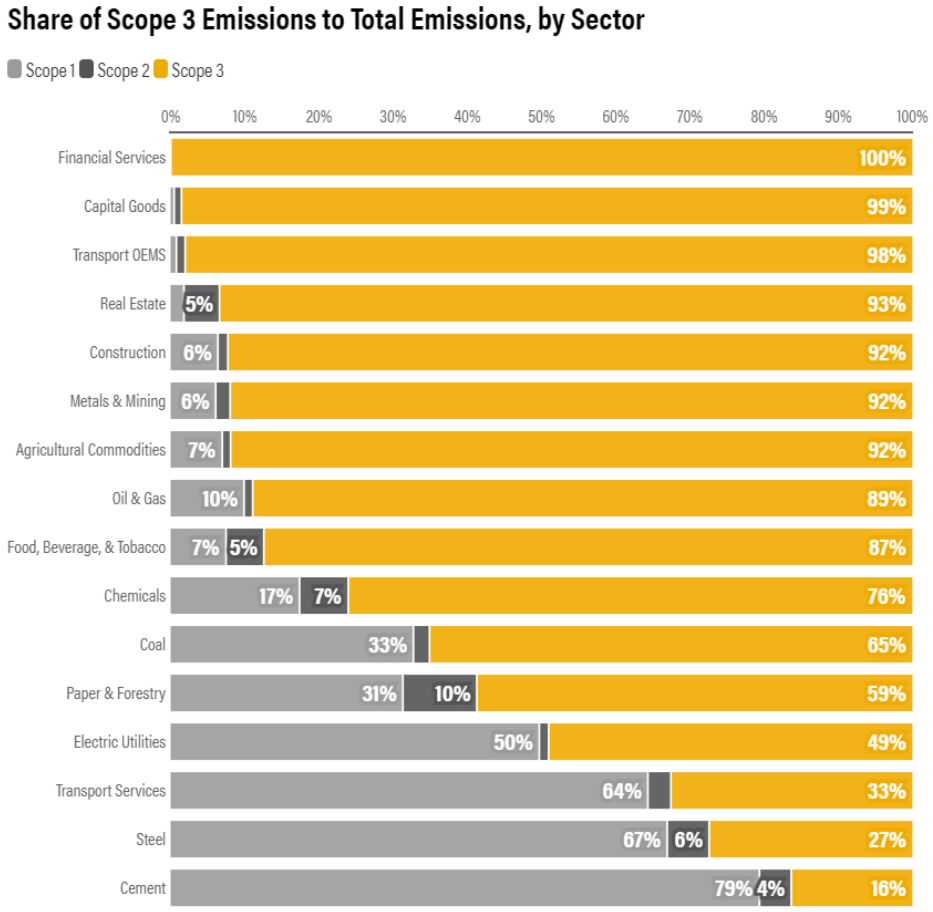


GHG Protocol

	Scope 3 category
Upstream	1. Purchased goods and services
	2. Capital goods
	3. Fuel- 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	9. Downstream transportation and distribution
	10. Processing of sold products
	11. Use of sold products
	12. End-of-life treatment of sold products
	13. Downstream leased assets
	14. Franchises
	15. Investments

Scope 3 Emissions by Sector

How large are Scope 3 emissions?



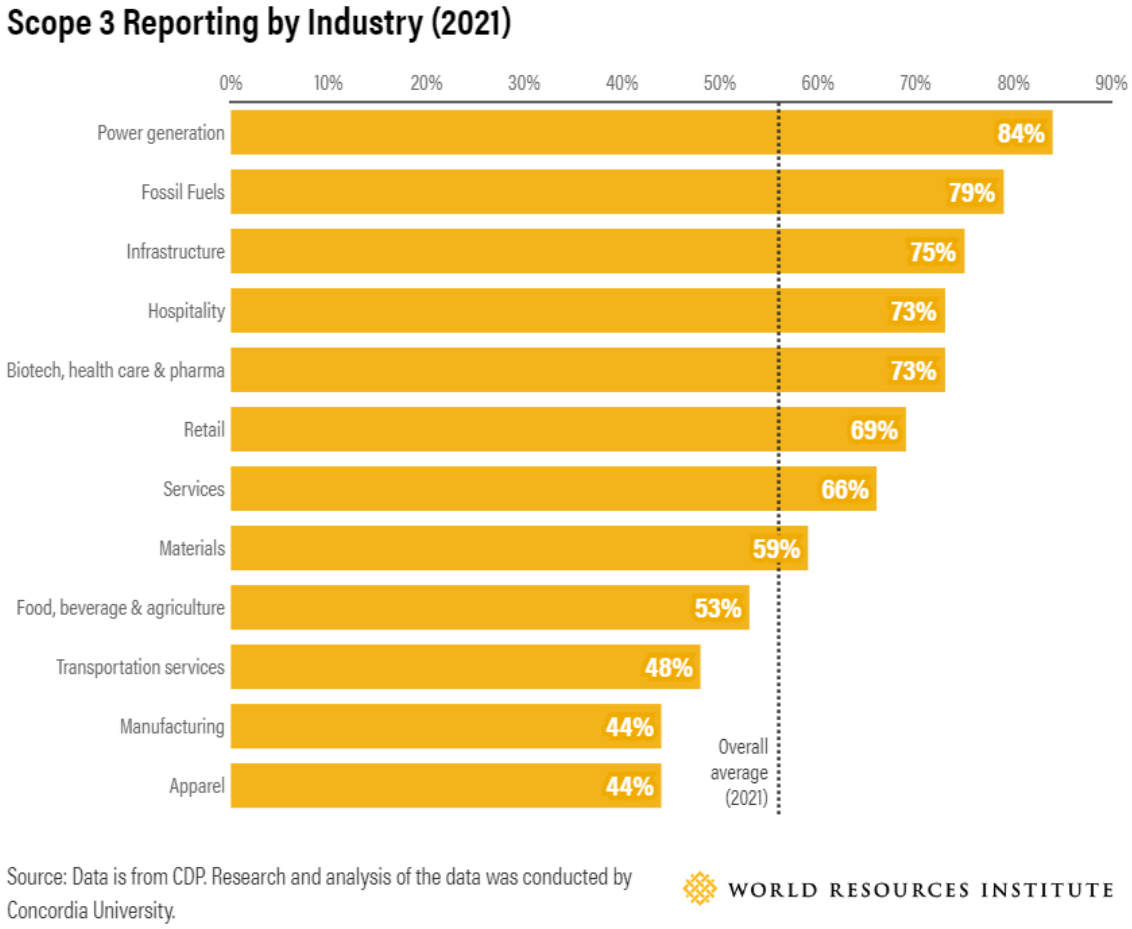
Source: Data is from CDP. Research and analysis of the data was conducted by Concordia University.

WORLD RESOURCES INSTITUTE

[World Research Institute Scope 3 Disclosure Trends]

Status of Disclosure and Reporting Frameworks

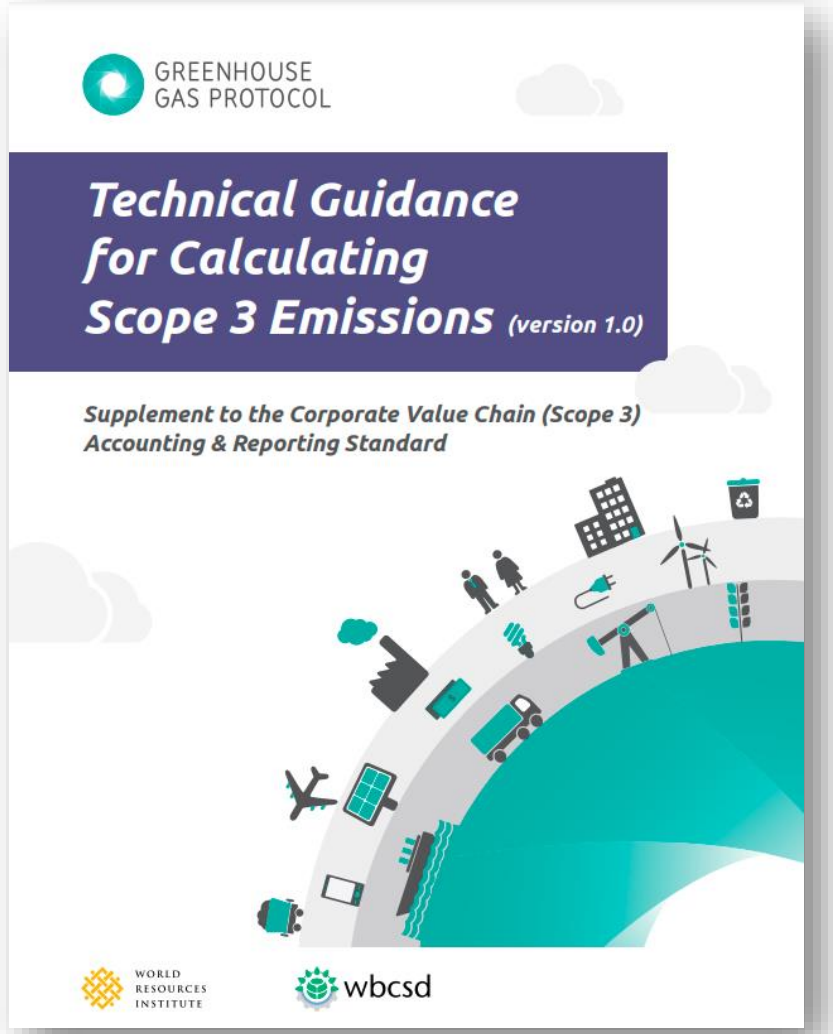
- There is increasing pressure and expectation for companies to disclose sustainability-related information
- Various platforms and frameworks exist to assist companies in disclosing correct and relevant information:
  - Global Reporting Index (GRI)
  - CDP
  - Science Based Target Initiative (SBTi)
  - Sustainability Accounting Standards Board (SASB)
  - Securities and Exchange Commission (SEC)



[World Research Institute Scope 3 Disclosure Trends]

How to Calculate Scope 3 Emissions

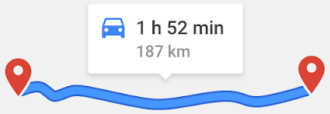
- Follow established guidelines for calculating Scope 3 emissions
  - What data is needed, how to use the data, what the thresholds are, where assumptions can be made
- A significant amount of data will be required
  - Utilize averages to estimate key impact categories then work to replace estimates with real data
  - Coordination with suppliers is likely for some categories



Integrating Responsible Sourcing and Procurement

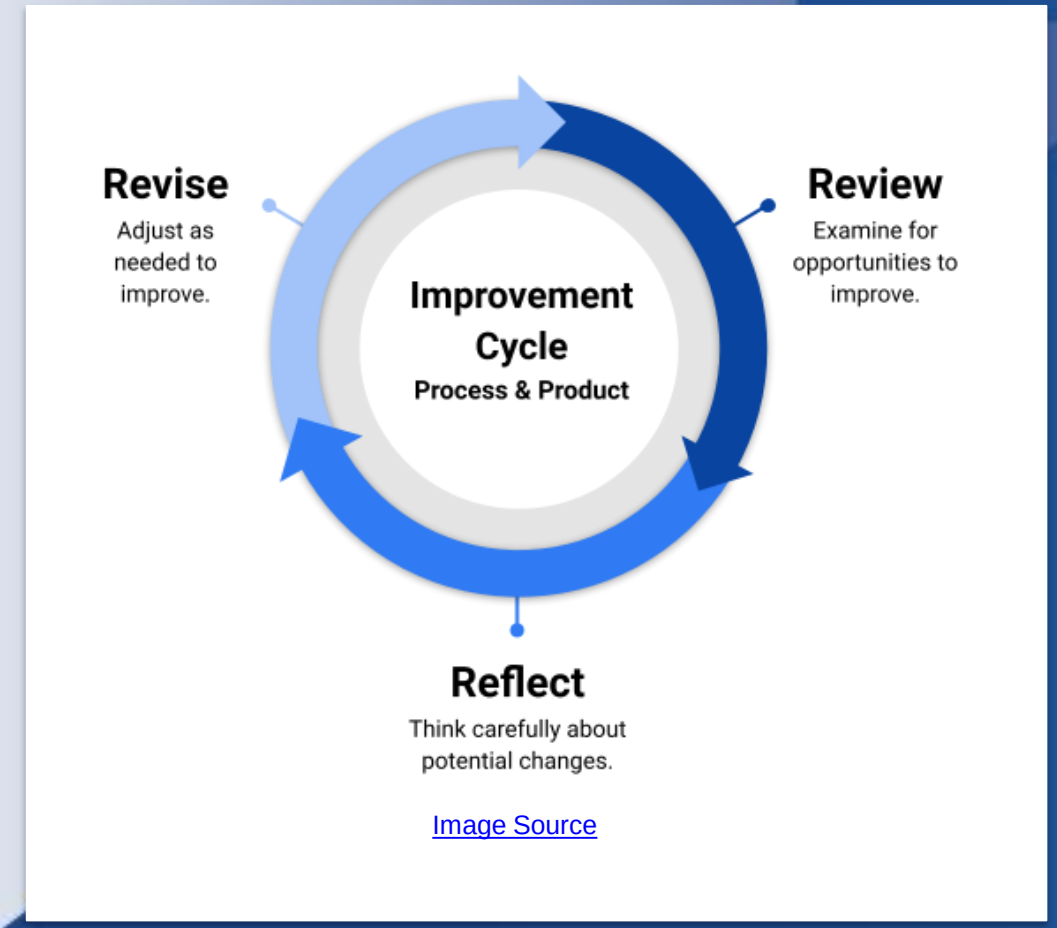
What could sustainable sourcing include?

- Criteria within contractual agreements related to:
  - Data disclosure and information sharing
    - Include information requirements and frequency of reporting
  - Agreement to assist with sustainability initiatives
  - Sharing codes of conduct, ethics, or practices
    - Increasing number of companies have these available
- Internal parameters for evaluating suppliers and services such as:
  - Prioritizing products which are made more sustainably or made by companies with sustainability initiatives in place
  - Requiring emissions data disclosure
  - Prioritizing companies with third-party verification



Benefits of Responsible Sourcing and Procurement

- Assist with risk-management against:
  - Scarcity of supply
    - Lower impact products and companies who focus on sustainability will be in larger demand
  - Increased demand in emerging markets
    - Establish connections with sustainability focused companies
  - Stakeholder pressure to reduce emissions
    - Being proactive will mitigate pressure
  - Protection of brand reputation
    - Companies in supply chain who are not focused on ESG could represent larger risks
    - Stakeholders want to see transparency



Session 7

- **Implementation of a Waste Diversion Program – Developing a Roadmap to Zero Waste**
  - Topics:
    - Prioritizing reduction opportunities
    - Developing a waste diversion program
    - Establishing a zero waste to landfill roadmap
    - Greenwashing
    - Third-party verification

OPERATION ZERO WASTE

8-Step Process to Achieve Zero Waste to Landfill

1

UNDERSTAND THE WASTE

Conduct site visit to characterize and measure all material flows and waste streams.

2

DEVELOP WASTE DIVERSION ROAD MAP

Develop comprehensive waste minimization and diversion strategy.

3

FIND NEW OUTLETS FOR MATERIALS

Identify new outlets for difficult to manage waste streams to divert from landfill.

4

REPORT OUT MEETING WITH CLIENT

Share the road map and areas for improvement.

5

PROCEDURE DEVELOPMENT

Create policies for employees to assist with correct waste handling practices.

6

EMPLOYEE TRAINING

Educate employees and assist in road map implementation.

Third-party Verification

7

CERTIFY IMPROVEMENTS

Audit and certify waste minimization and diversion achievements.

Third-party Verification

8

MARKET ACHIEVEMENTS

Utilize various social media platforms to market client achievements.

Waste Diversion Program Overview

What should the program include?

1. Establish a Green Team
2. Gather and review data
3. Determine your areas of focus
4. Establish policies and procedures
5. Prioritize opportunities
6. Develop a Zero Waste to Landfill Roadmap
7. Review program regularly

Developing a Zero-Waste to Landfill Roadmap

Where to begin?

- Determine what your company currently does well and what it needs improvement on

Continue with site or company-specific needs

- Determine areas of improvement and identify key steps in addressing them

Ask questions

- Is waste segregated well enough to divert?
- How can we optimize the space onsite to assist with our waste diversion efforts?
- How can we reduce raw material waste from our process?

Recommendations

How to prioritize reduction opportunities?

- Begin with a review of:
  - Data, waste segregation onsite, manufacturing process, and policies and procedures
- Identify low or no cost opportunities then move onto low hanging fruit or easy wins
  - Training, takeback programs, outlet identification, and diversion
- Move onto more detailed strategies requiring longer planning and capital investment
  - Redesigning products, processes, or purchasing of equipment

Zero-Waste to Landfill Roadmap Example

Track Waste Data and Material Efficiency

☑ Improve waste tracking

- Increase consistency and detail
- Improve verification process

Create a Green Team

☑ Empower employees to participate in waste diversion efforts

☑ Create clear organizational chart with defined responsibilities

Onsite Waste Diversion Evaluation

☑ Conduct an onsite review of current waste handling, sorting, and diversion

☑ Determine key areas of improvement

Process Evaluation

☑ Evaluate processes to determine improvements to reduce waste generated

☑ Install new equipment to reduce waste, where feasible

Waste Collection

☑ Evaluate buildings individually for divertible streams

☑ Establish collection for divertible materials

☑ Ensure appropriate bins are available for streams generated in an area

Waste Segregation

☑ Utilize contestant bin colors and sizes for waste streams

☑ Ensure clear labeling on waste containers

☑ Place bins in consistent locations

Recycling Program

☑ Contract with a waste hauler

☑ Segregate recyclable materials

☑ Purchase compactor for cardboard

Source Reduction

☑ Encourage employees to bring reusable containers

☑ Implement reusable/recyclable materials in lieu of single-use materials

☑ Purchase materials in bulk

Employee Training

☑ Communicate onsite changes with employees

☑ Establish expectations

☑ Be transparent with company goals and progress

Contractor Training

☑ Include waste diversion best practices and expectations

☑ Implement visuals of waste collections signage, bins, and collection areas

☑ Have contractors provide a list of anticipated waste streams ahead of arrival onsite

Waste to Energy

☑ Divert all remaining landfill waste through waste to energy

Certify as

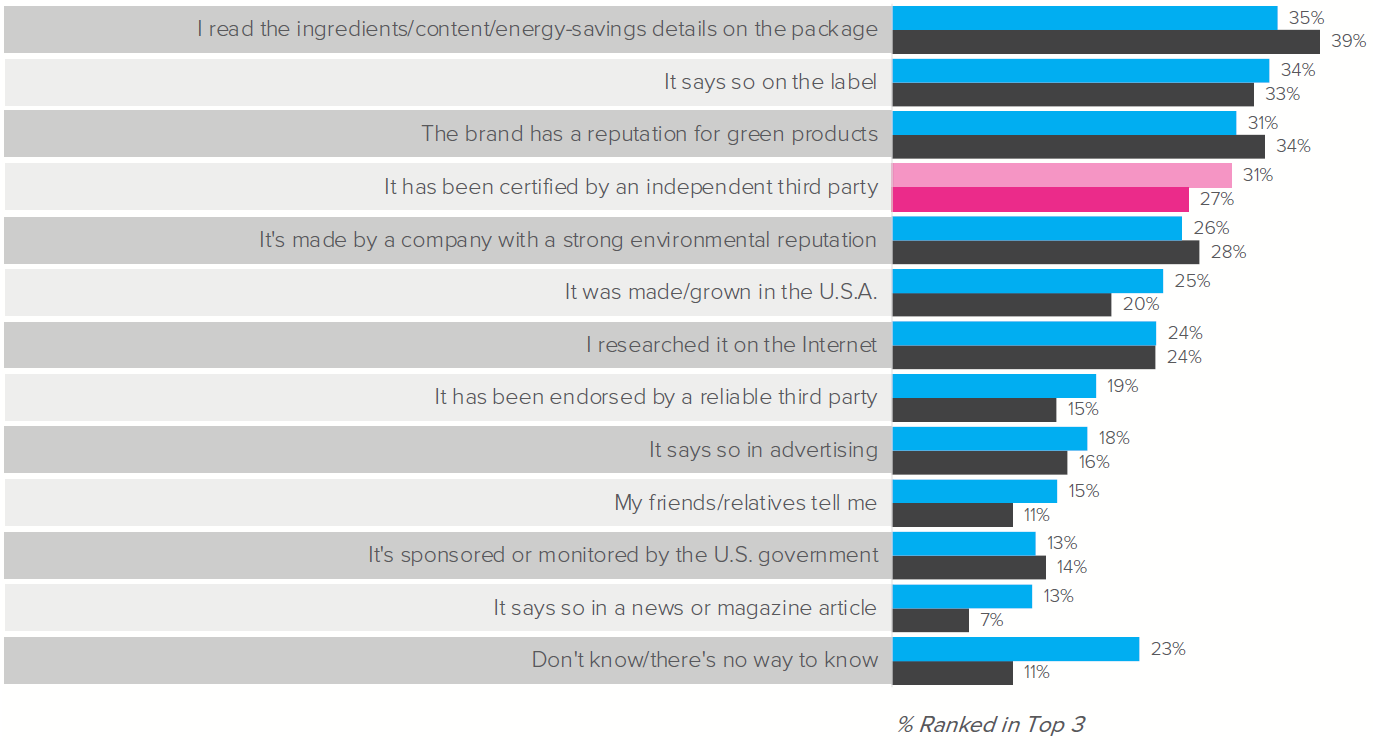
ZERO WASTE TO LANDFILL!

What is Greenwashing?

- **Greenwashing:** a form of misinformation often used to entice a green consumer
- Key greenwashing legislation:
  - California greenwashing policy restricting the use of certain ESG terms on plastic products
  - EU Green Claims Directive
    - Proposed set of rules related to the disclosure of environmental claims
    - Sustainability labels without third-party verification are prohibited

Importance of Third-Party Verification to Consumers

Third-party certifications are rising in importance as a top way consumers discover if a brand is green.



Source

Shelton Grp

Source: Eco Pulse® Wave 12 2020 and Eco Pulse® 2014
How do you know that a product is green? % Ranked in Top Three
2020 n=1,007; 2014 n=2,015

UL Solutions

GreenCircle CERTIFIED — A SUSTAINABLE SOLUTION — ZERO WASTE TO LANDFILL

TRUE

SCS global SERVICES — Setting the standard for sustainability

Closing Remarks

Thank You for:

- Attending
- Participating
- Completing homework
- Collaborating with each other

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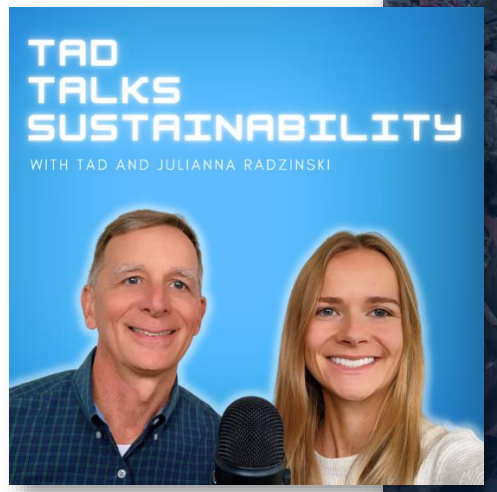
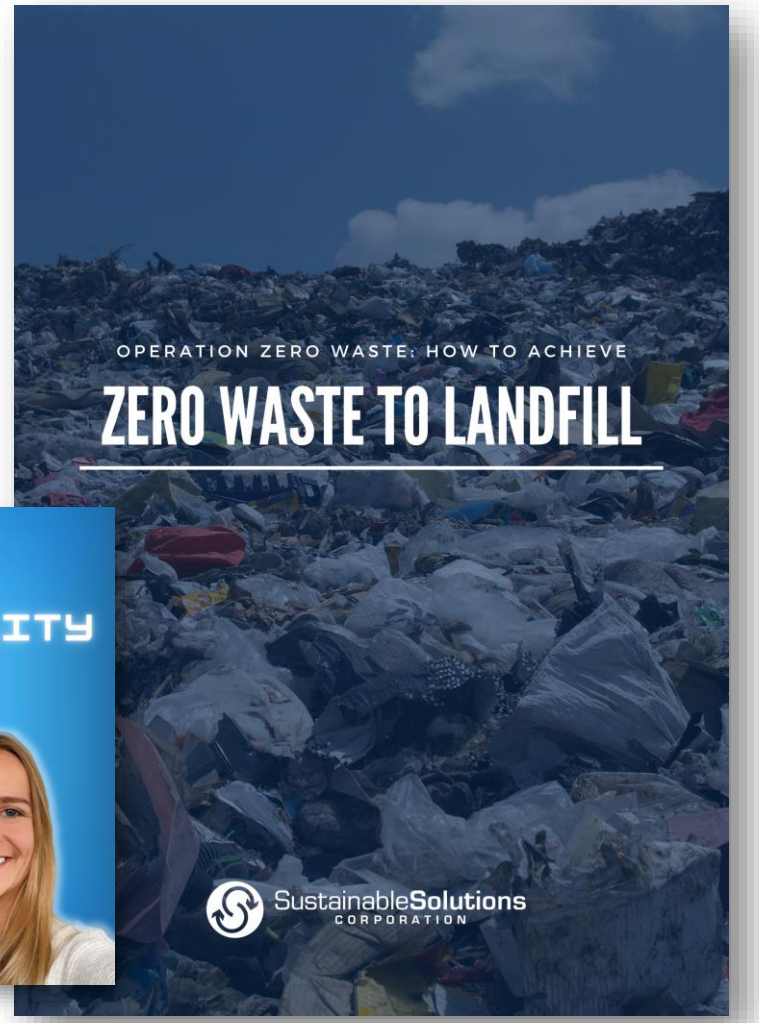
SSC is a Resource for You and Your Company

SSC's Vision: To empower every company to be a driver of positive global change

- Downloadable waste diversion resources on SSC's website
- The Tad Talks Sustainability Podcast
  - Discussions with industry personnel on many topics with episodes on:
    - Multiple waste topics
    - Third-party verification
    - Circular economy
    - Life cycle assessment

Let us help you create and meet your waste diversion goals





Q&A