BUSCH® SYSTEMS

Let's Recycle Better, Together.

SCOPE 3 INVENTORY:
WHEN ASSUMPTIONS MEET DATA

TUESDAY APRIL 23RD 1:00 PM ET.

1-800-565-9931   buschsystems.com   81 Rawson Avenue, Barrie, Ontario, Canada L4N 6E5
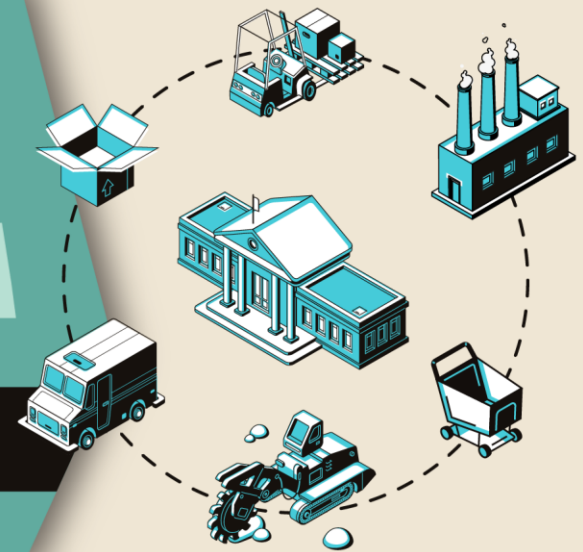
Today's Panelists

Brandie Sebastian
*Technical Director &
Senior LCA Strategist*

John Beath Environmental

Patrick Cigana
Senior Sustainability Advisor

Polytechnique Montréal

Karen Cook
*Sustainability Project
Manager*

Alameda County, CA

Andrew Sheahan
*Director of Sales &
Marketing*

CarbonGraph

Mackenzie Bradbury
*Sustainability & Eco-
Impact Coordinator*

Busch Systems

BUSCH® SYSTEMS

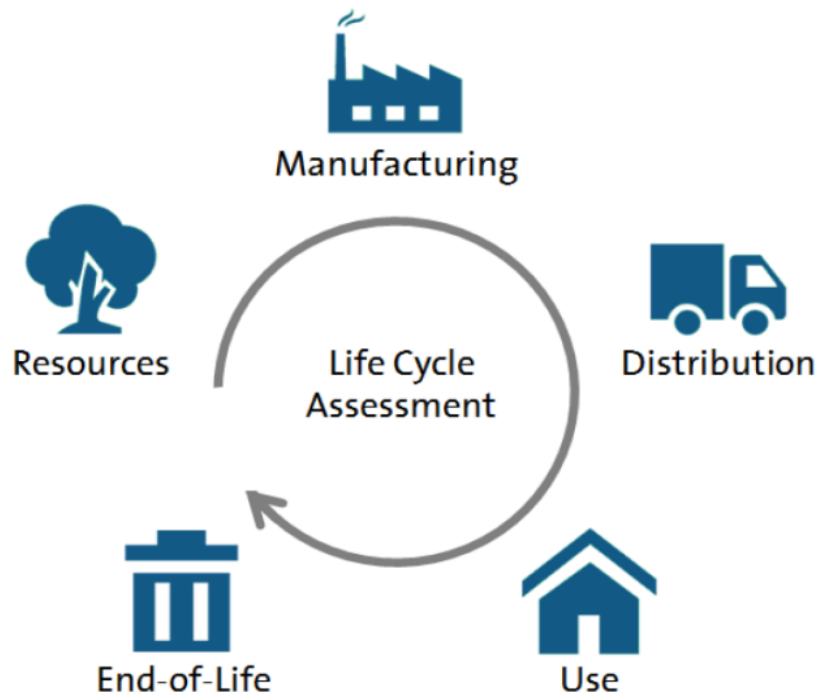*Let's Recycle Better, Together.*

Certified B Corporation

Our vision is to help clients enhance their operational and environmental performance to manage risks, ensure environmental compliance, and design more sustainable products and services
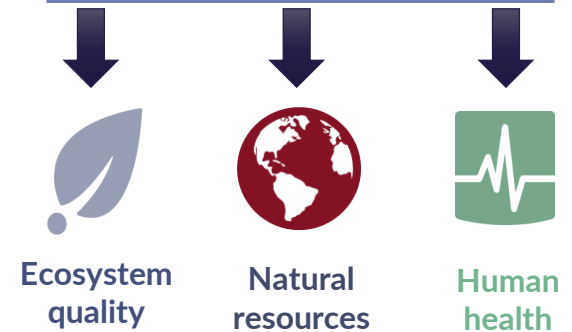
JBE seeks to impact the global environment in a positive, resource efficient way while exceeding client expectations and leaving the situation better than we found it

What is an LCA?

A standardized, comprehensive method to evaluate potential environmental and human health impacts of a product, material, or process, throughout its life cycle.

More than just carbon footprint

resources acidification heavy metals
minerals energy
water waste
climate change
VOCs ozone depletion
NOx land use
particulates
ecotoxicity human toxicity smog
SOx eutrophication biodiversity
respiratory material scarcity

Ecosystem quality   Natural resources   Human health

Areas of protection (damage categories)

Sources: ACLCA, 2017; Greendelta GmbH.

ISO Framework for Conducting an LCA
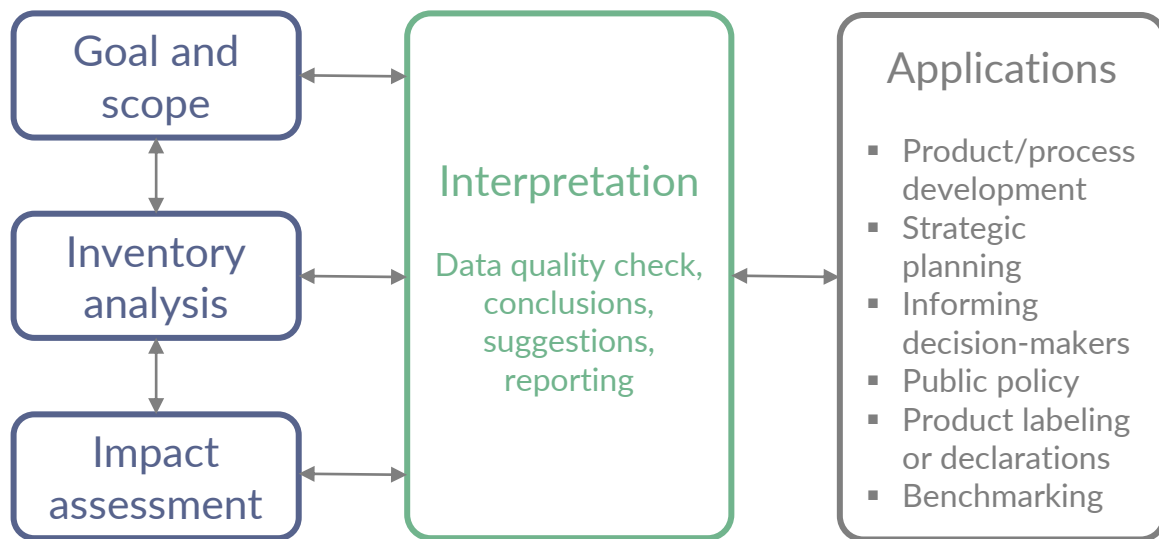
Includes decisions such as:
- ❑ Corporate/institution, product, or service
- ❑ GHG only or broader impacts
- ❑ Complete life cycle or materials production only

Goal & Scope Definition
- **Identifies the study subject and intended use**
- **Sets system boundary and level of detail**

Goal and scope

Inventory analysis

Impact assessment

Interpretation

Data quality check, conclusions, suggestions, reporting

Applications

- Product/process development
- Strategic planning
- Informing decision-makers
- Public policy
- Product labeling or declarations
- Benchmarking

Life Cycle Inventory Analysis
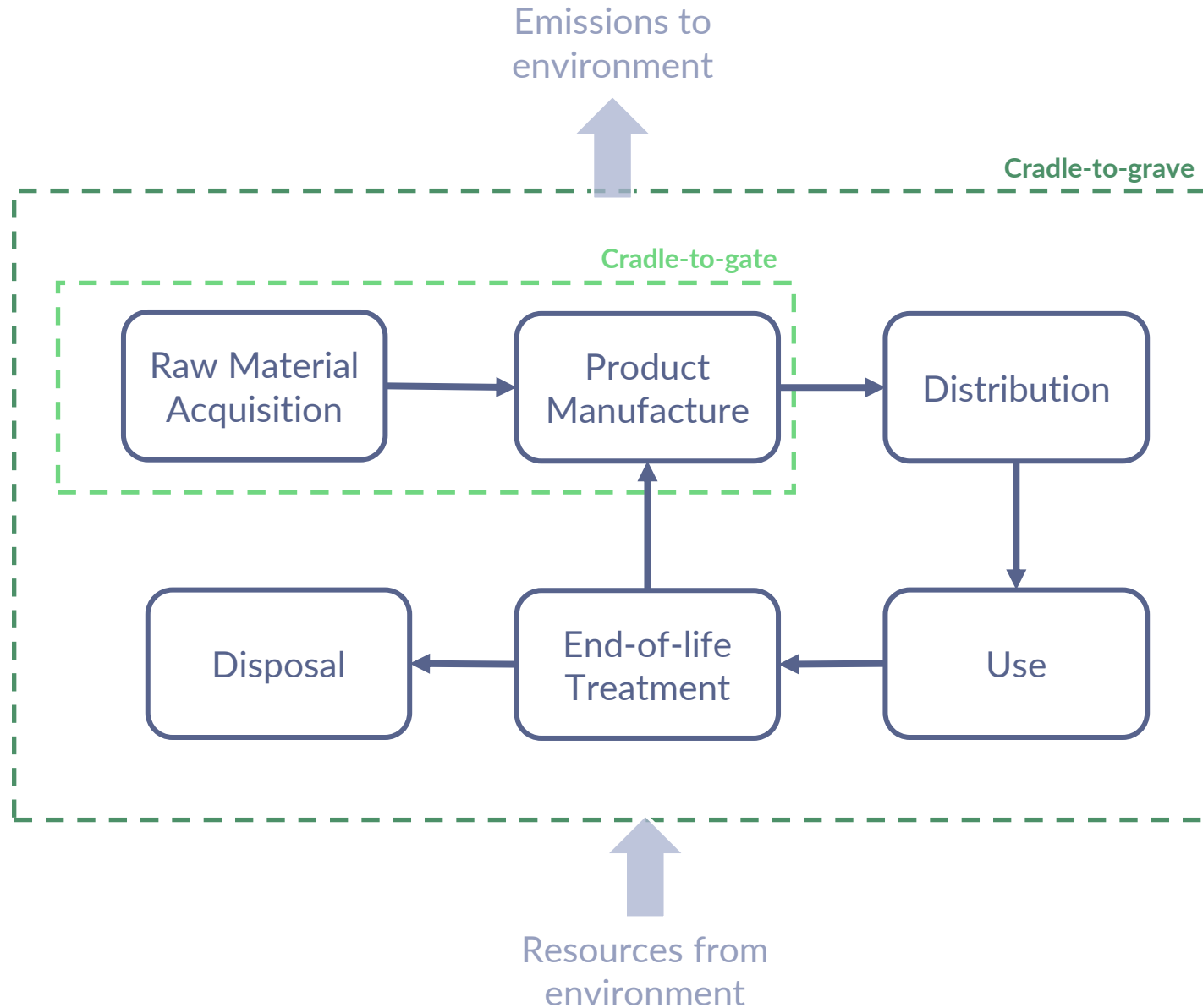- Data collection, modeling & analysis

Impact Assessment
- Characterization & assigning impact

Interpretation
- Completeness checks
- Sensitivity and uncertainty analyses
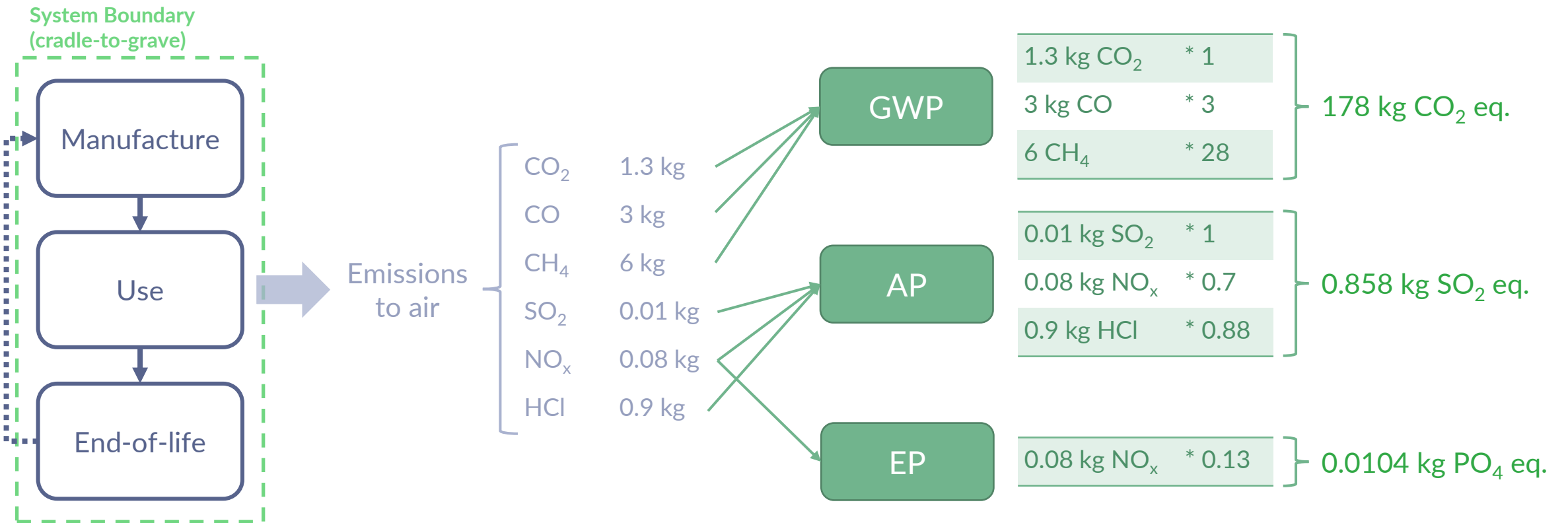- Results and recommendations
- Implications and limitations

Source: ISO 14040:2006 (en) – Environmental management – Life Cycle Assessment – Principles and Framework

System Boundary Concept

LCA – from Process Data to Results

| Life Cycle Inventory | Classification | Characterization | LCIA Results |

System Boundary (cradle-to-grave)

Manufacture → Use → End-of-life

Emissions to air:

CO_2	1.3 kg
CO	3 kg
CH_4	6 kg
SO_2	0.01 kg
NO_x	0.08 kg
HCl	0.9 kg

GWP

1.3 kg CO_2	* 1
3 kg CO	* 3
6 CH_4	* 28

178 kg CO_2 eq.

AP

0.01 kg SO_2	* 1
0.08 kg NO_x	* 0.7
0.9 kg HCl	* 0.88

0.858 kg SO_2 eq.

EP

0.08 kg NO_x	* 0.13

0.0104 kg PO_4 eq.

An LCA focused only on carbon at the corporate/institutional level is a GHG inventory

"Carbon" (GHG) Accounting: The What and the Why

CO_2 CH_4 N_2O HFCs PFCs SF_6
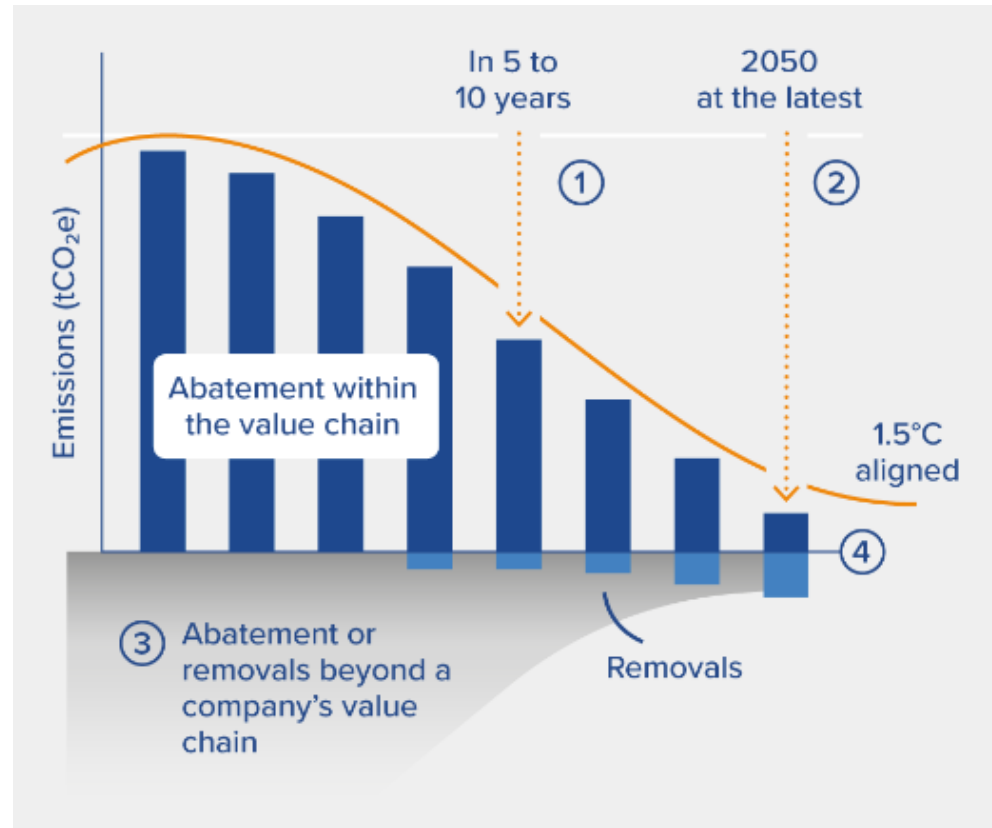
Aggregated and expressed in CO_2-equivalents

Carbon Accounting:

A framework of methods to measure and track how much greenhouse gases (GHGs) are emitted by an organization and its value chain.

Why Quantify Emissions?

- Identify GHG hotspots to inform impactful emissions reduction efforts

- Track and back-up efficiency or reduction measure statements

- Respond to customer/investor data requests

- Annually quantifying emissions allows for tracking progress against climate targets - which is especially important for attracting and retaining investors and employees

In 5 to 10 years ①

2050 at the latest ②

Emissions (tCO₂e)

Abatement within the value chain

1.5°C aligned

④

③ Abatement or removals beyond a company's value chain

Removals

Sources: Greenhouse Gas Protocol, Corporate Standard; Science-Based Targets Initiative (SBTi)

Science-Based Targets Initiative (SBTi) Net-Zero Standard

1. Near-term targets
2. Long-term targets
3. Neutralize residual emissions
4. Beyond Value Chain Mitigation

Scope 3: Value Chain GHG Emissions Sources

SCOPE 1
DIRECT EMISSIONS

Company Facilities

Company Vehicles

REPORTING COMPANY

SCOPE 2
INDIRECT EMISSIONS

Purchased Electricity, Steam, Heating & Cooling for Own Use

SCOPE 3
INDIRECT EMISSIONS

Purchased Good & Services

Capital Goods

Fuel & Energy Related

Transportation & Distribution

Waste From Operations

Business Travel

Employee Commute

Leased Assets

UPSTREAM ACTIVITIES

SCOPE 3
INDIRECT EMISSIONS

Investments

Franchises

Leased Assets

End-of-Life Treatment of Sold Products

Use of Sold Products

Processing of Sold Products

Transportation & Distribution

DOWNSTREAM ACTIVITIES

13

LCA vs. GHG Inventory

It all depends on how you define your scope!
- Product vs. company/institution
- GHG only vs. broader impacts and inventory metrics

Methodology and calculations are similar
- May follow different standards → GHG Protocol or ISO 14064 for company/institution-level vs. ISO 14040/14044 or 14067 for products

GHG inventories often rely on spend data for some Scope 3 categories
- Efficient, but can create challenges in achieving granularity of information needed to create impact reduction plans

LCAs can make GHG inventories more precise, particularly for Scope 3 procurement categories
- Trends in all market sectors for increasing specificity of data (manufacturer-specific, facility-specific, supply chain-specific, etc.)

Compare Emissions Across Scenarios with an Easy-to-Use LCA Tool

Challenge

Meet Aggressive Sustainability Goals By Reducing Emissions in Products

- A global manufacturer of consumer and professional products is striving to reduce the GHG emissions of its products and packaging to meet its corporate carbon reduction targets.

- In order to redesign existing products to use less emissions, they first need to know the carbon hotspots of the products' life cycles.

- A traditional case-by-case LCA approach is too slow and costly to allow real-time design decisions, but simple screening tools do not provide robust enough data to enable good decision-making.

Solution

Excel-based Tool Evaluates Multiple Scenarios

- JBE developed a user-friendly, transparent tool to simultaneously compare product and packaging designs.

- The model allows the client to change design scenarios so they can evaluate future options in-house.

- The tool also identifies carbon hotspots across the various stages of a product's life cycle to inform the design team.

Impact

Faster Results for Better Design Decisions

- Our tool identified a large potential for carbon reductions if the company were to prioritize selling their "concentrated refill" product offerings.

- Our tool provides the ability to simultaneously compare different product offerings and can be used early in the R&D process to design more sustainable products and packaging.

- Design decisions now being made in real time, enabling the company to achieve its corporate targets.
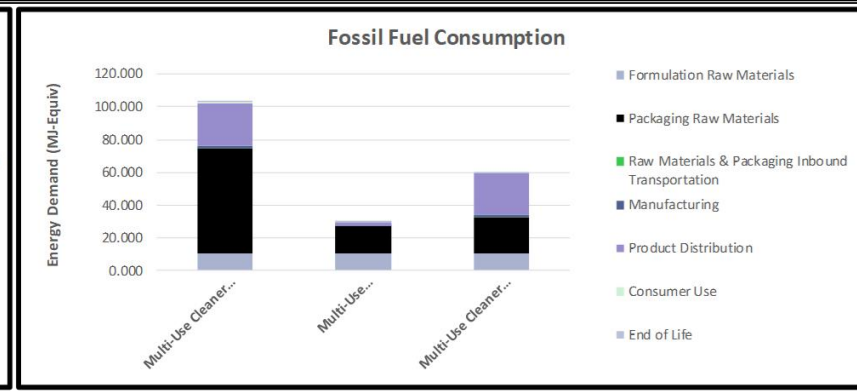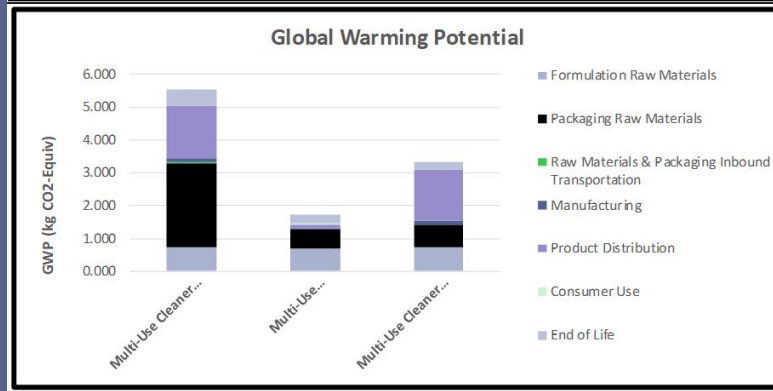
JBE CASE STUDY

Compare Emissions Across Scenarios with an Easy-to-Use LCA Tool: Example Results

Streamlined LCA Design Tool
Multi-Use Cleaning Product
Results per 1000 Cleaning Events

	Design Scenario #1			Design Scenario #2			Design Scenario #3		
RED DENOTES LARGEST IMPACT							*INCLUDE CONSUMER USE LIFE CYCLE STAGE IMPACTS?*		*Yes*
GREEN DENOTES SMALLEST IMPACT									
Design Scenario Name:	Multi-Use Cleaner in Traditional Spray Bottle			Multi-Use Concentrate with Starter Kit and Concentrated Formula in Refill Pods			Multi-Use Cleaner with Reusable Bottle/Trigger and Ready-to-Use Formula Refill Jugs		
Life Cycle Stage	**Global Warming Potential**	**Fossil Fuel Consumption**	**Water Use**	**Global Warming Potential**	**Fossil Fuel Consumption**	**Water Use**	**Global Warming Potential**	**Fossil Fuel Consumption**	**Water Use**
	(kg CO$_2$-equiv)	**(MJ-Equiv)**	**(m^3)**	**(kg CO$_2$-equiv)**	**(MJ-Equiv)**	**(m^3)**	**(kg CO$_2$-equiv)**	**(MJ-Equiv)**	**(m^3)**
Formulation Raw Materials	0.716	10.659	0.065	0.702	10.324	0.067	0.716	10.659	0.065
Packaging Raw Materials	2.581	64.047	0.026	0.566	16.751	0.009	0.700	21.917	0.007
Raw Materials & Packaging Inbound Transportation	0.022	0.346	0.000	0.019	0.288	0.000	0.020	0.302	0.000
Manufacturing	0.115	1.429	0.011	0.006	0.078	0.000	0.115	1.429	0.011
Product Distribution	1.604	26.096	0.003	0.134	2.188	0.000	1.541	25.084	0.003
Consumer Use	0.005	0.058	0.005	0.015	0.177	0.014	0.005	0.058	0.005
End of Life	0.489	1.023	0.000	0.298	0.421	0.000	0.243	0.481	0.000
Total Impacts:	**5.53**	**103.66**	**0.11**	**1.74**	**30.23**	**0.09**	**3.34**	**59.93**	**0.09**
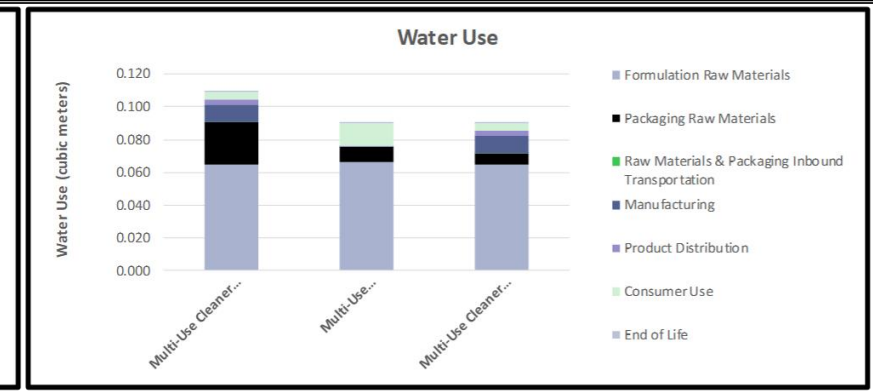
JBE CASE STUDY

Aligning Scope 3 Emissions with Broader Climate Strategy

Challenge

Lack of Scope 3 Emissions Insight

- Food service industry client's scope 3 emissions accounted for majority of emissions but were not in line with corporate climate strategy.
- Broader food service industry facing customer and investor demands for more transparency surrounding climate emissions.
- Client could lose access to investor capital as well as market share if scope 3 emissions were not addressed.

Solution

Implement Thorough Reporting Process

- JBE helped implement a process for measuring and reporting Scope 3 emissions.

- Alignment of climate approach to the Task Force on Climate-related Financial Disclosures (TCFD) by creating a framework that covers Governance, Strategy, Risk Management, and Metrics & Targets.

Impact

Strong Baseline and Insights to Lead Reductions

- The scope 3 measurement allowed client to quickly identify largest sources of emissions and set baselines to report against.

- Emissions data collection served as foundation for setting SBT for scope 3 emissions.

- Exceeded customer and investor requirements with industry leading reporting and target setting.

Thank you!

🌐 www.beath.us

📞 +888.777.4310

✉ jbe@beath.us
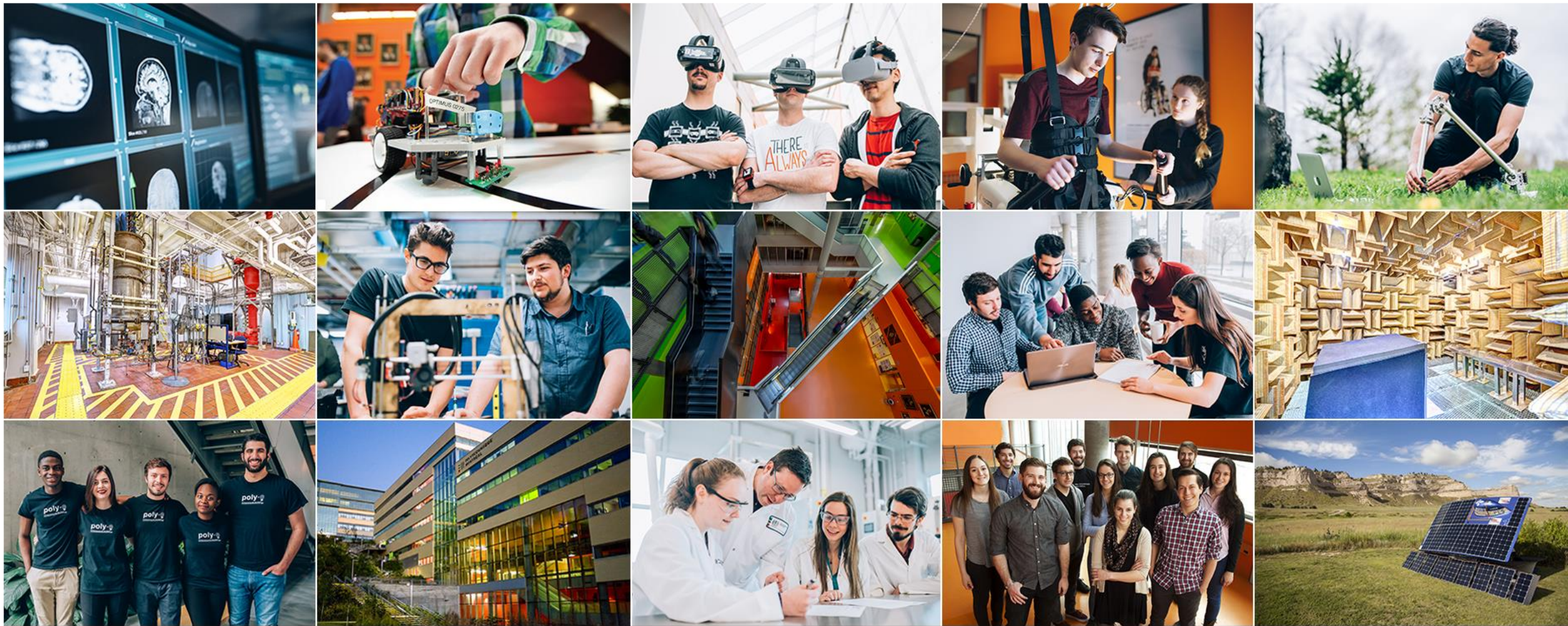
INSITUTIONAL CARBON FOOTPRINT IN A HEI

Patrick Cigana

Senior Sustainability Advisor

2024-04-23

ABOUT US

Polytechnique Montréal

- Engineering school located on the University of Montreal campus

- 12 undergraduate programs, about 10000 students (7500 full time)

- 2500 post-graduate students

- Faculty & staff – approximately 1600 FTE

POLYTECHNIQUE MONTRÉAL
TECHNOLOGICAL UNIVERSITY

PRESENTATION OUTLINE

1. Project Background
2. Institutional Carbon Footprint
3. Methodology
4. Results
5. Discussion

POLYTECHNIQUE MONTRÉAL

TECHNOLOGICAL UNIVERSITY
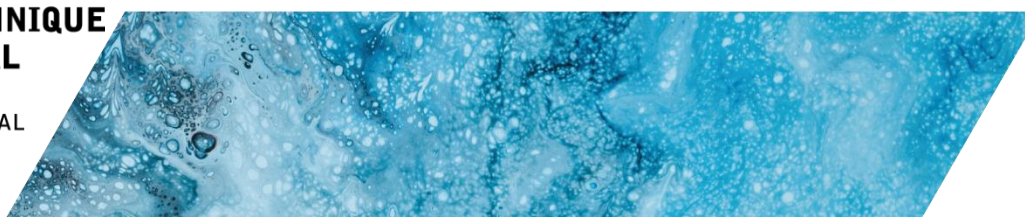
WHY ESTIMATE OUR CARBON FOOTPRINT?

Universities and colleges "Race to Zero" campaign joined by over 700 universities around the world

Polytechnique Montréal is committed to achieving net zero carbon by

2050

INSITUTIONAL CARBON FOOTPRINT

Objectives

1. Obtain a complete carbon footprint of our operations

2. Determine the main sources of emissions

3. Evaluate the impact of our targets

4. Follow the evolution of our footprint in time

For Polytechnique

✓ **build our future on a solid basis**
✓ **prioritize our actions**
✓ **maximize their impact**
✓ **protect our environment**

HYBRID LIFE CYCLE APPROACH

A variety of approaches

A hybrid LCA approach, viz. a combination of:
- Process database (*ecoinvent)* for physical data
- Input-Output database for financial data

Open I-O Canada (developed by CIRAIG)
- uses a top-down approach, based on national and industry inventories
- emissions reported for 238 industries

GHG Emission Factors

INPUT-OUTPUT VS PROCESS DATABASE

Process database
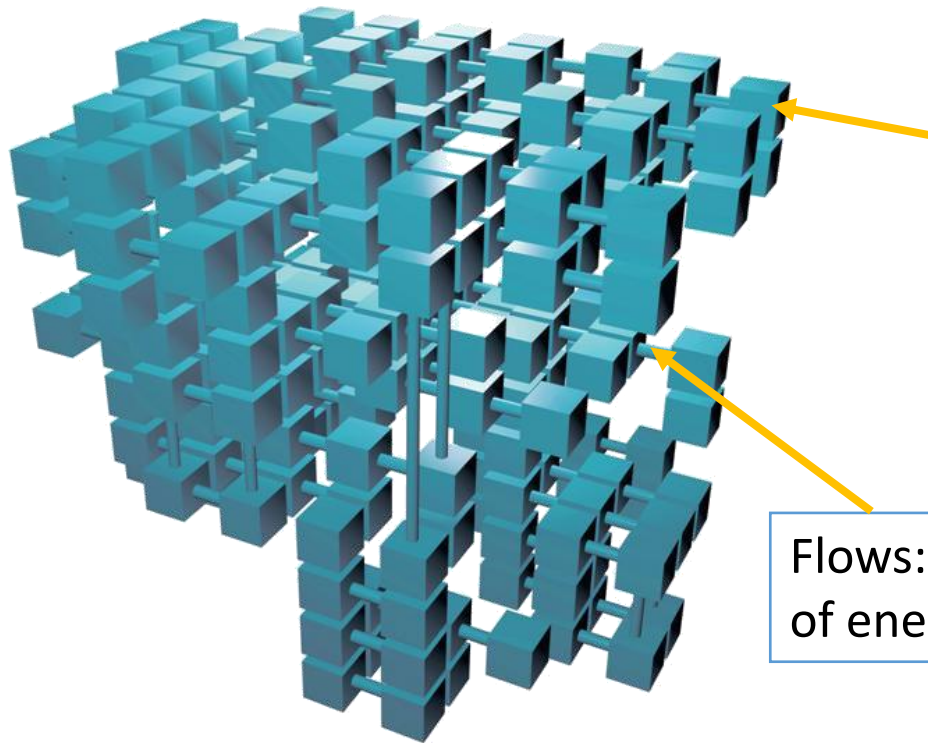
Activities: Processes, factories, consumptions, energy…

Flows: kg of production, kWh of energy, m^2 of area…

Easy for:
- Energy
- Food
- Water
- Waste management

Feasible for:
- Staff & student commuting
- Business travel

INPUT-OUTPUT VS PROCESS DATABASE

Input output database
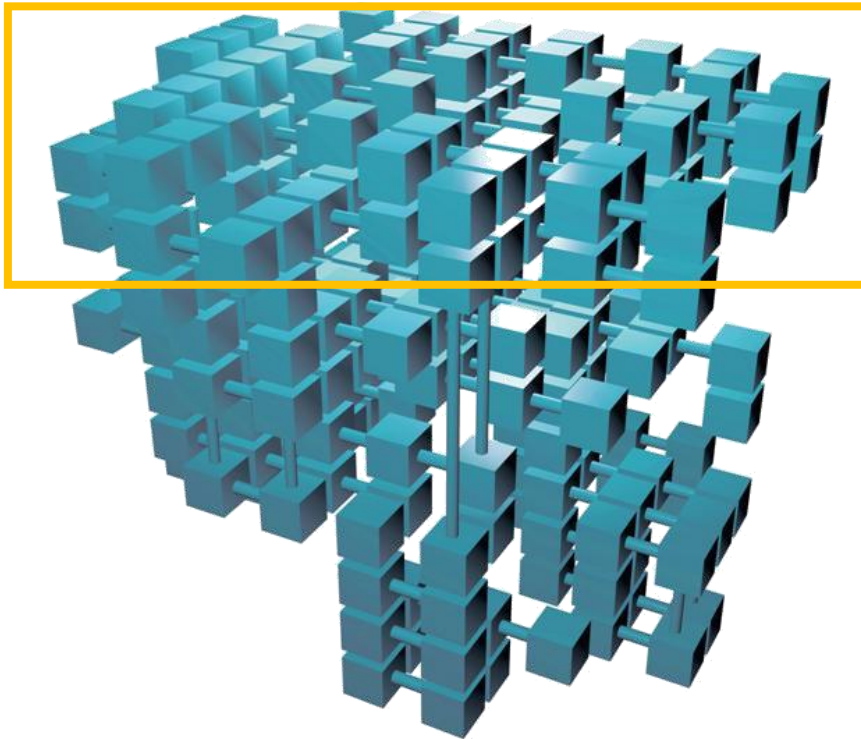
Industry A yields:
- Amount of GHG
- Amount of GDP

CO_2eq / $

Based on national emissions inventory (Canada)

Easy for:
- Nearly everything

Not ideal for:
- Fossil fuel combustion

Misses:
- Whatever isn't in your books!

SYSTEM BOUNDARIES

Object:
Polytechnique's operations during FY 2022-2023

Scope 1	Scope 2	Scope 3

Scope 1
- Fossil fuel combustion
  - Gas
  - Heating Oil
  - Vehicle Fleet

Scope 2
- Electricity

Scope 3
- 3.1 Purchased G&S (Polytechnique + Food Services)
- 3.2 Capital Goods (major building works)
- 3.3 Fuel and Energy Indirect Emissions
- 3.5 Waste & Wastewater
- 3.6 Business Travel
- 3.7 Staff & Student Commuting
- 3.8 Leased Assets
- 3.15 Financial

SYSTEM BOUNDARIES

Object:
Polytechnique's operations during FY 2022-2023

Scope 1	Scope 2	Scope 3

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  - Gas
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- 3.8 Leased Assets
- 3.15 Financial

Financial data
Physical data

DATA SOURCES

PHYSICAL / COMPLETE *Food Services,* *Fossil Fuels*	FINANCIAL / COMPLETE *Most Procurement*
PHYSICAL / STATISTICAL *Commuting*	FINANCIAL / STATISTICAL ?

SAMPLE CALCULATIONS

Using Input-Output Approach

GL Code	GL Desc	IO Code	IO Desc	GL $ (infl.adj)	t CO$_2$ eq
40316	Lab Supplies	MPG339100	Medical, Dental and Personal Safety Supplies, Instruments and Equipment	$ 3 148 476	293
50203	Insurance - Goods	MPG524200	Insurance Brokerage and Other Services Related to Insurance	$ 511 464	37

SAMPLE CALCULATIONS

Using ecoinvent DB for Physical Data

Source	LCA Emission Factor	NIR Emission Factor for Quebec	LCA footprint (t CO_2 eq)	Scope 1/2 (t CO_2 eq)	Scope 3.3 (t CO_2 eq)
Electricity 23.6031 (GWh)	21 t/GWh (entire life cycle)	1.5 t/GWh	496	35	460
Natural Gas 1 499 208 (m³)	860.5 g/m³ (production and distribution)	1937.4 g/m³	4195	2905	1290

RESULTS

Emissions by Scope
FY 2022-2023

20792 t CO_2 eq

- Scope 1 (2976)
- Scope 2 (35)
- Scope 3 (17781)

Legend: ■ Scope 1 ■ Scope 2 ■ Scope 3
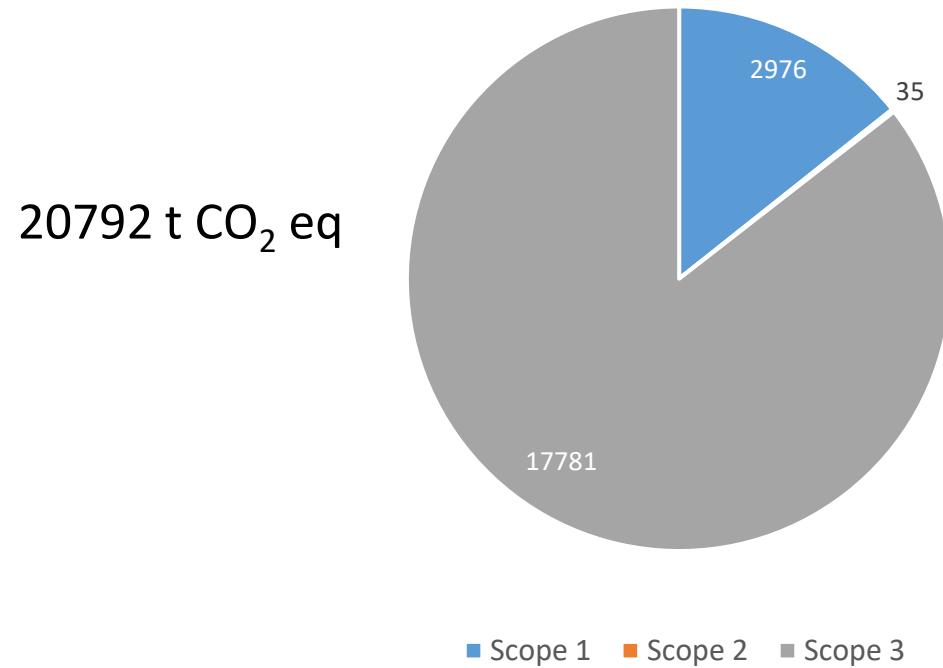
Observations

Scope 2 = almost negligible – typical for Quebec (hydro)

Scope 3 = lion's share of emissions – typical of HEI's (especially with low scope 2)
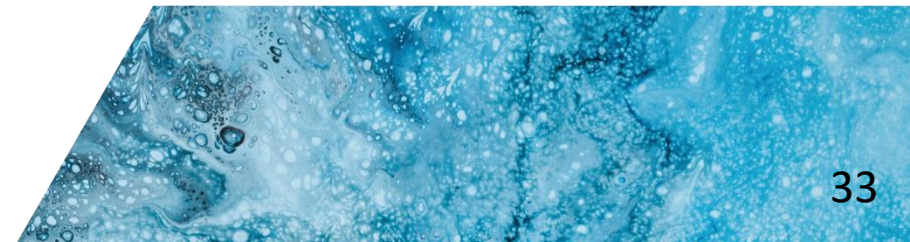
RESULTS

Emissions by activity
FY 2022-2023

Activity	t CO_2 eq
Procurement	9401
Natural Gas	4195
Commuting	3275
Business Travel	2564
Food Services	581
Energy - Other	553
Misc.	222

t CO_2 eq
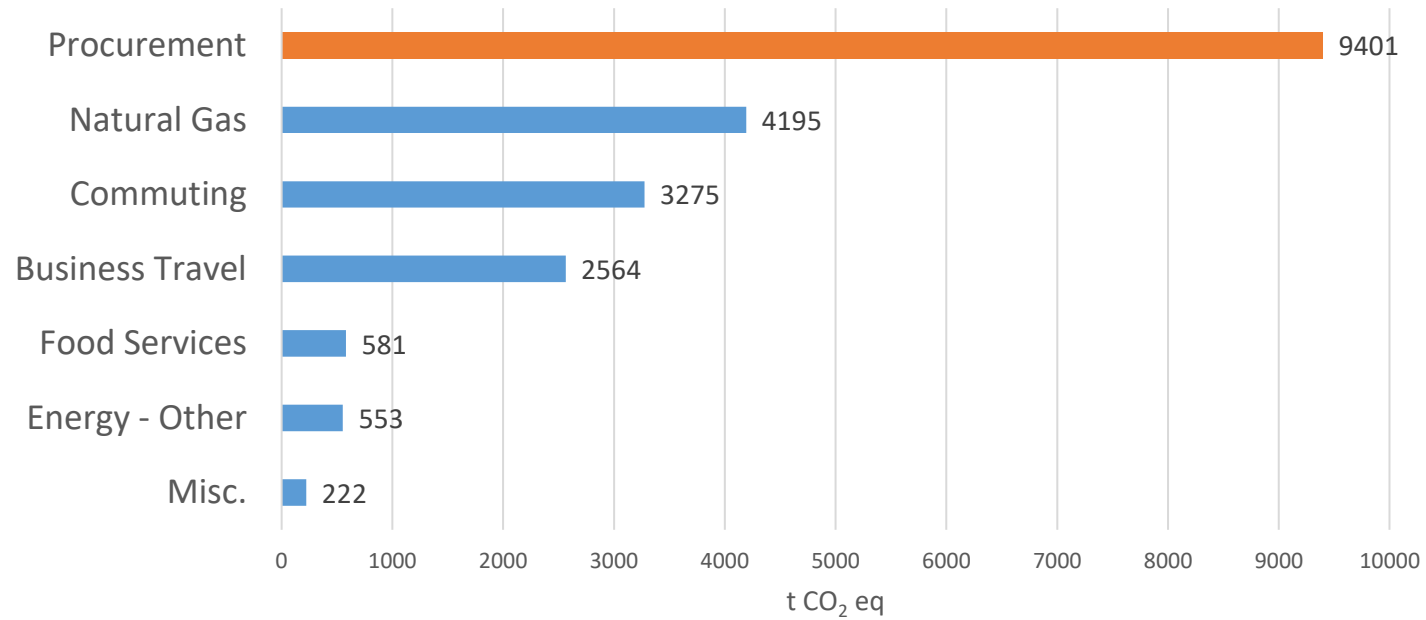
Procurement excluding energy, business travel and food services

RESULTS

Procurement emissions by item
FY 2022-2023
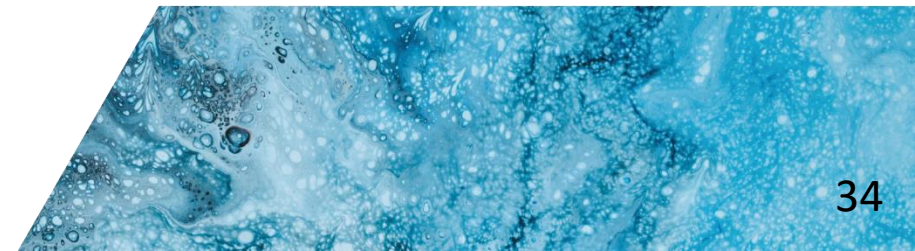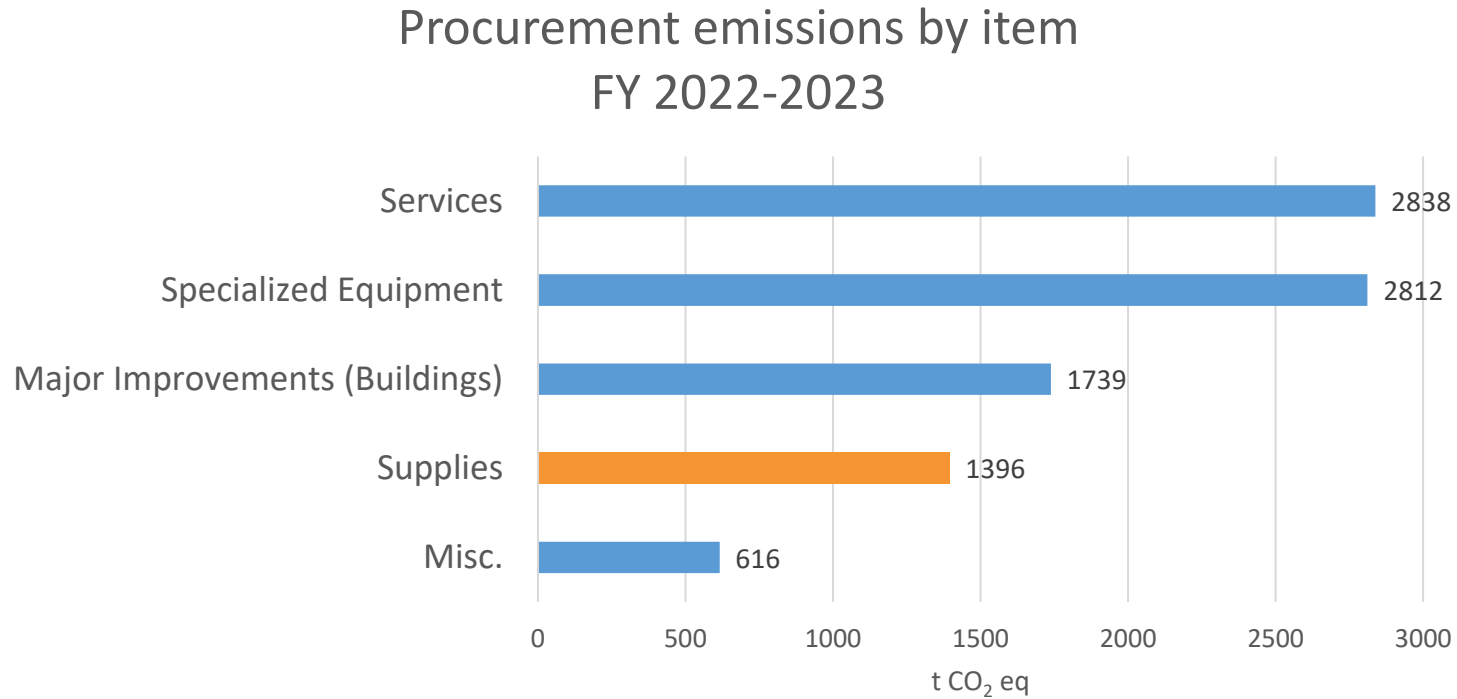
Procurement excluding energy, business travel and food services
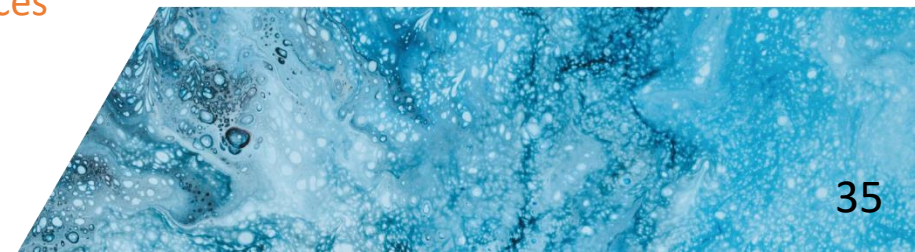
RESULTS

Service related emissions
FY 2022-2023

Fees & Training — 1444
Services related to goods — 797
Other — 597

t CO_2 eq
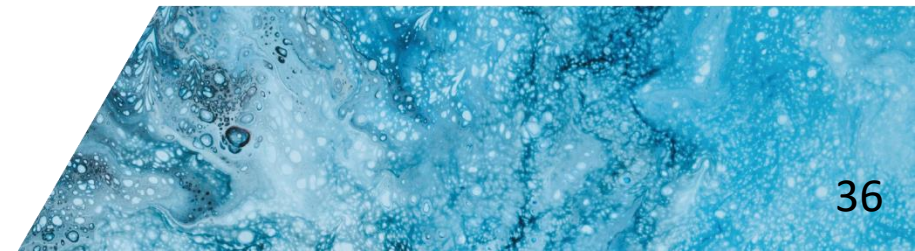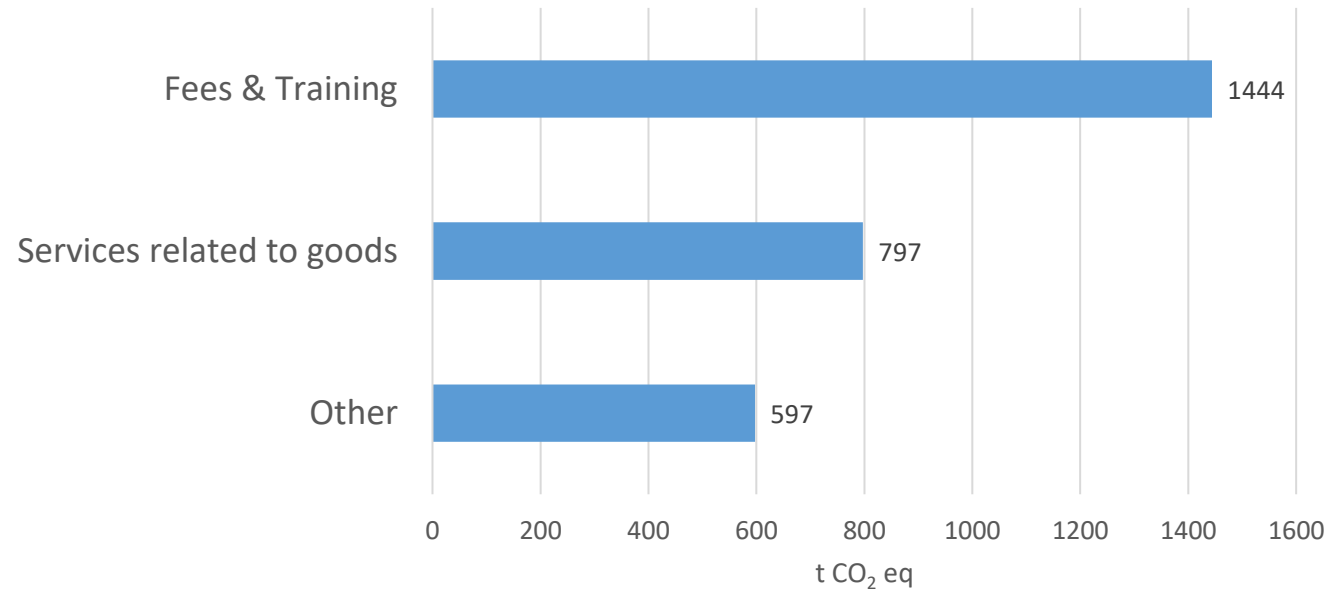
THOUGHTS

Limits of GHG Protocol Scopes

There's scope 3 hidden in scopes 1 & 2

Breakdown by activity

Follow the money!

More likely to capture everything

Where you spend most is (probably) where you emit most

Dematerialized ≠ non-material

Our Motivation

- Ready to move beyond "low-hanging fruit" initiatives
- Scale of opportunity is significant
- Desire to strategically target biggest sources of impact

Alameda County
SUSTAINABILITY
Local Action, Global Impact.

Sustainable Supply Chain Analysis

ANALYSIS OF SUSTAINABILITY IMPACTS OF
Alameda County Supply Chain Expenditures

Technical Report

Alameda County
SUSTAINABILITY
Local Action, Global Impact.

Prepared by Good Company
April 2019
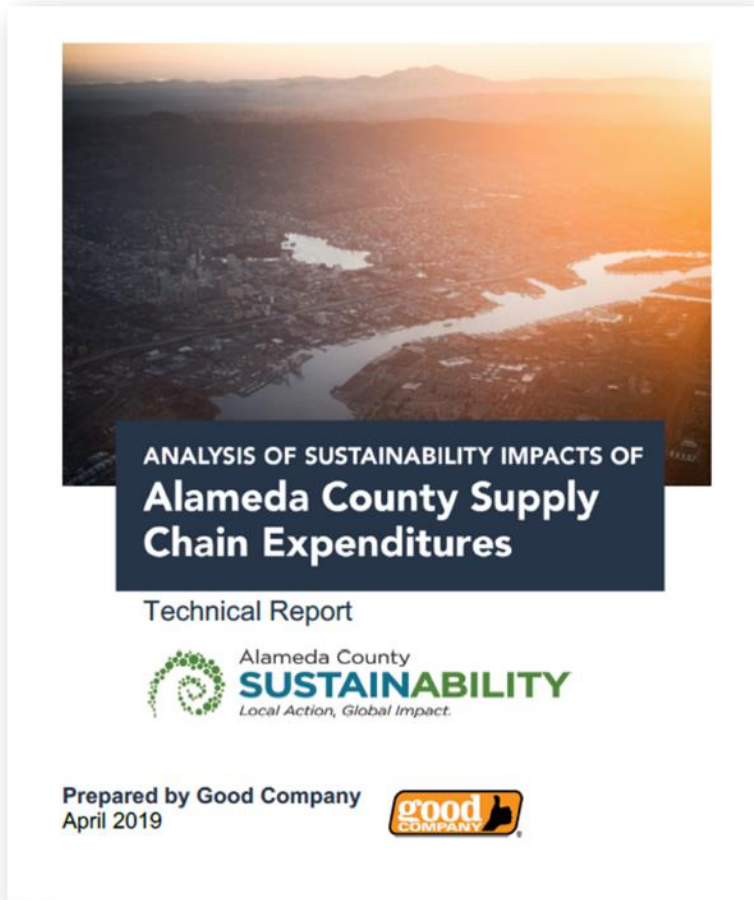
- Inventory for Countywide expenditures in 2015 & 2019
- Includes six impact categories:
  - GHG, PM2.5, human toxicity, water use, smog, and acid rain
- Completed analysis of the sources of impact for 13 purchasing categories

Alameda County
SUSTAINABILITY
Local Action, Global Impact.

Figure A.3: Comparison of 2019 and 2015 GHG emissions by purchasing category
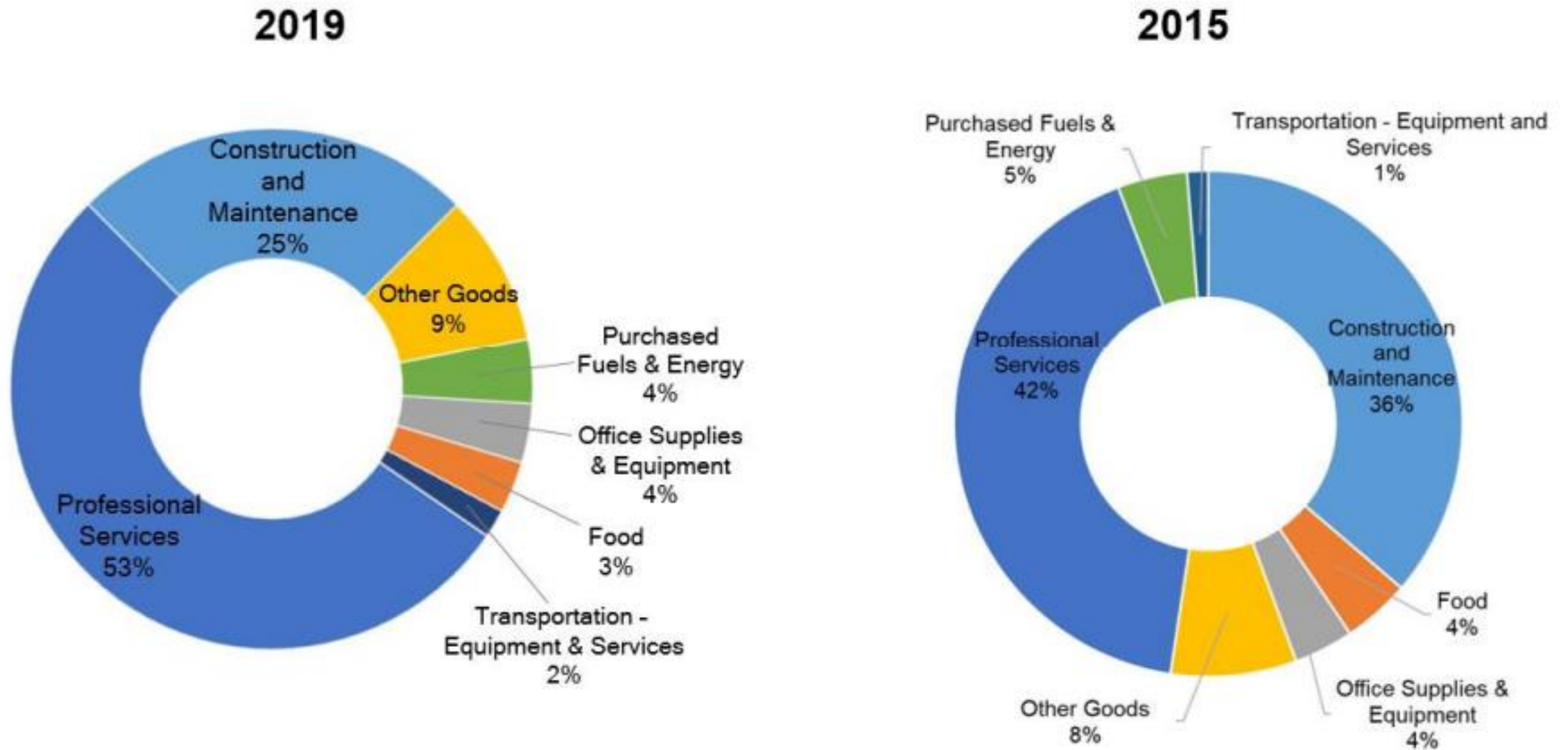
Big Opportunities in Supply Chain
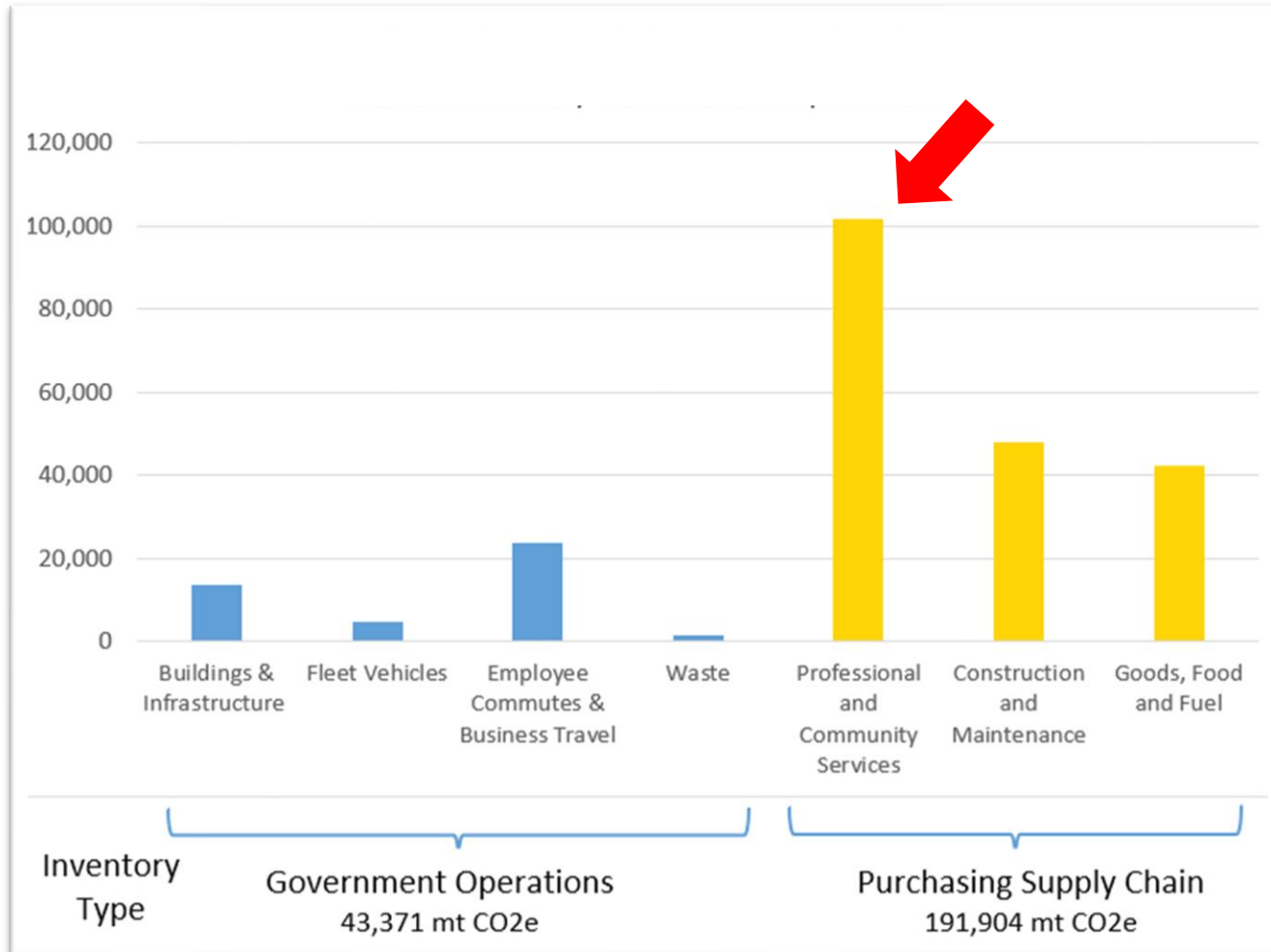
- Supply chain emissions are **4x bigger** than government operations
- **~50%** of supply chain emissions are from **contracted services,** primarily serving our most vulnerable citizens

Analyze Hotspots

- Identify actions we can take to address major causes of impact in the supply chain

- Identify actions that will reduce local health impacts, especially PM$_{2.5}$

Source: https://www.acgov.org/sustain/documents/2015SupplyChainReport-Technical.pdf

Figure 14: Percentage of total life-cycle impact, by supply chain activities for four impact metrics (%).
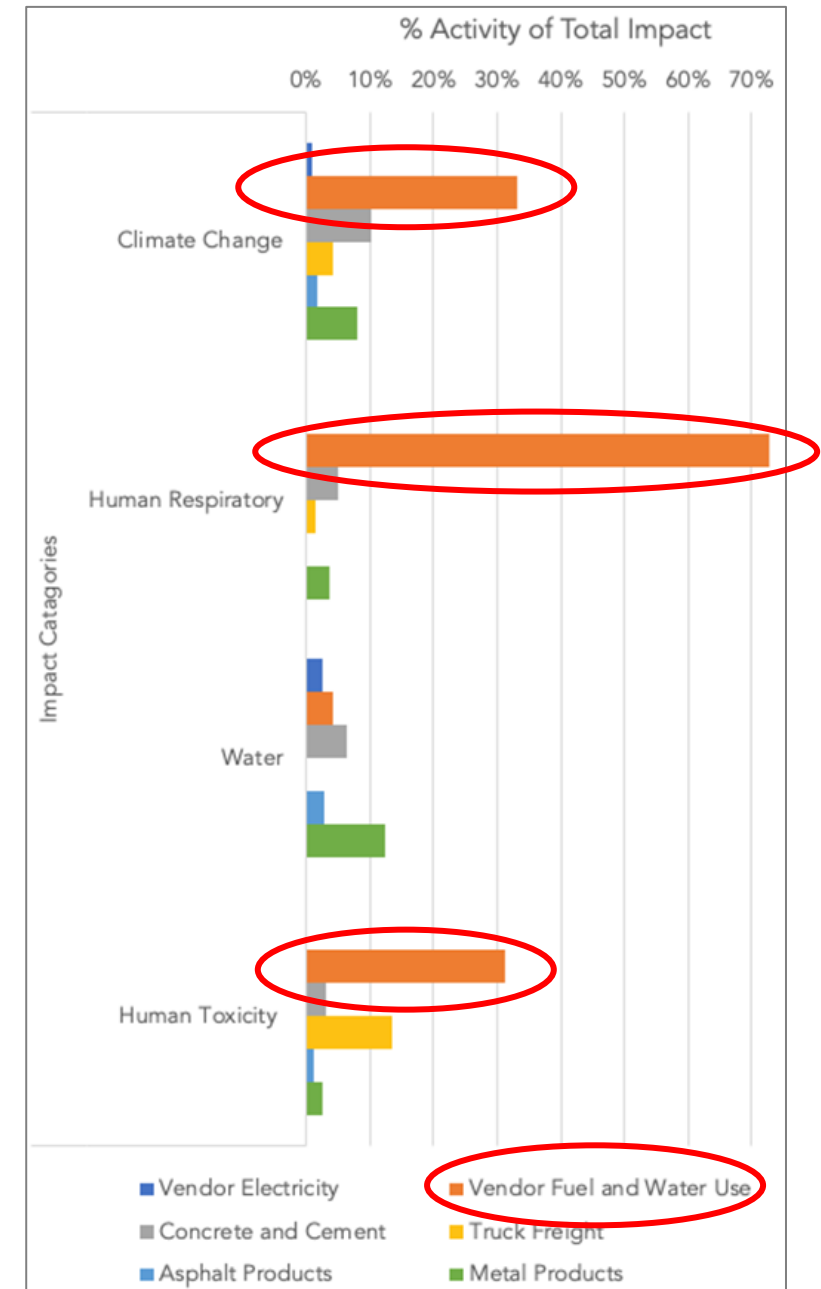
Targeting Efforts by Purchasing Category

Our Vendors'
Operational Emissions

- Electricity and natural gas used to power the vendors' facility
- Fuel used to travel to serve clients
- Embodied carbon in food served to clients

Construction and Maintenance
25%

Other Goods
9%

Purchased Fuels & Energy
4%

Office Supplies & Equipment
4%

Food
3%

Transportation – Equipment & Services
2%

Professional and Community Services
53%

Alameda County
SUSTAINABILITY
Local Action, Global Impact.
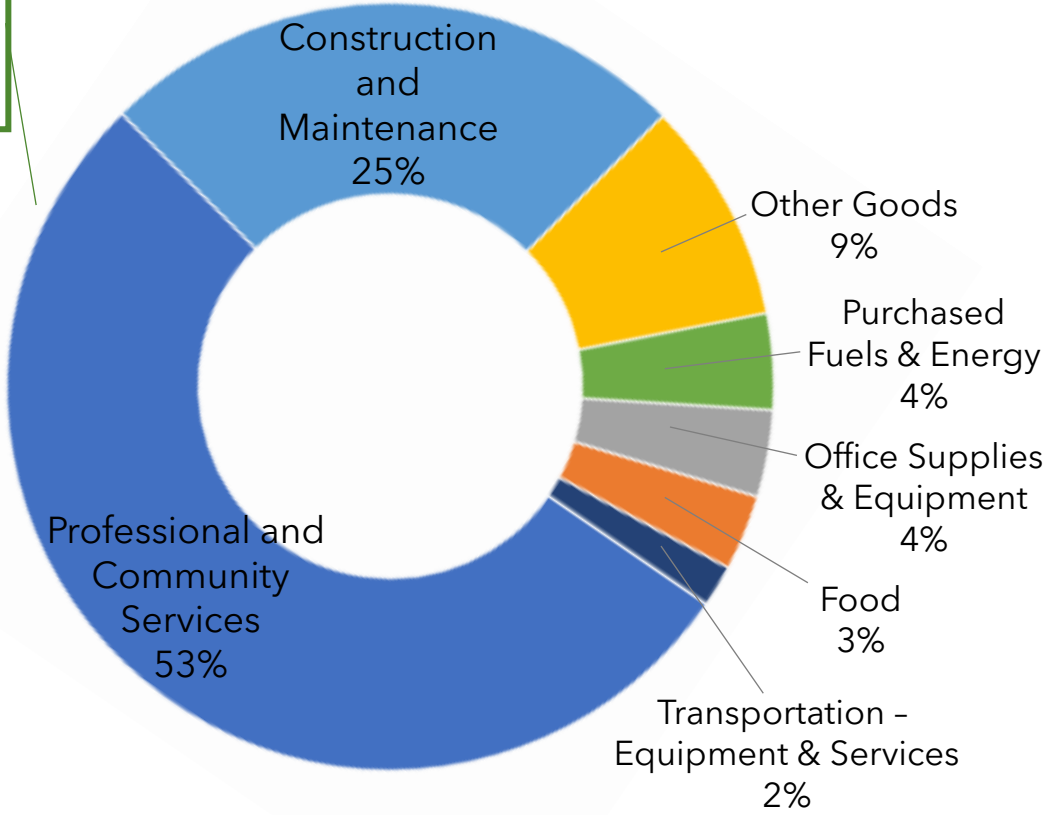
New Initiatives: Vendor Sustainability

SUSTAINABILITY RESOURCES
FOR CHILDCARE CENTERS

Switching to more sustainable practices with these programs can help you save money, reduce waste, create a healthier environment, and make your in-home childcare center or childcare facility safer and healthier for children and providers!

SAVE ENERGY
Reducing your energy use can create savings on your bills and for the environment

- "Opt Up" to 100% renewable energy and receive rebates and incentives to save money and energy with Alameda County's electricity provider, Ava Community Energy
- Explore flexible financing for energy projects with GoGreen Financing
- Buy Energy Star products when it's time to replace appliances to earn rebates and save money and energy. View Energy Star's energy saving tips

REDUCE FOOD WASTE
Reducing your food waste decreases carbon emissions and saves you money

- Explore the EPA's tips to reduce food waste
- View the Children's Environmental Health Network's tips for reducing and reusing

CLEAN WITH GREEN PRODUCTS
Look for products with trusted ecolabels

- For cleaning, use Safer Choice or Green Seal products
- For sanitizers or disinfectants, use Design for the Environment products
- View UCSF's informational posters on safer cleaning, sanitizing, and disinfecting

CERTIFY YOUR CENTER
Get credit for making your childcare center more sustainable, safe, and healthy

- Get certified and receive incentives and assistance from The Green Business Program for conserving energy and water, minimizing waste, preventing pollution, and reducing emissions

Questions? Email: acsustain@acgov.org

Alameda County
SUSTAINABILITY
Local Action, Global Impact.

EMERGENCY PREPAREDNESS RESOURCES
FOR CHILDCARE CENTERS

Being prepared for an emergency or natural disaster is critical for your in-home childcare center or childcare facility to resume operations. Don't be caught off guard- plan ahead with these tools!

MAKE A PLAN
Create a plan to help your center recover and resume operations after a disaster

- Explore the California Department of Social Services' Childcare Disaster Resources
- View UCSF's Childcare Disaster Preparedness Guide

STAY INFORMED
Sign up for Alameda County's AC Alert to receive emergency notifications

- Sign up for alerts from PG&E to be notified of public safety power shutoffs
- Identify your evacuation zone in advance using genasys Protect

KNOW THE RISKS
Discover what hazards, such as floods or fires, that may affect your business

- Review Alameda County's interactive hazard maps
- Learn more about how to be prepared in Alameda County at ready.acgov.org

ALWAYS HAVE RELIABLE POWER
Invest in a backup power source to ensure service during a power outage

- Explore the California Air Resources Board's Zero Emissions Backup Power Tool for residential or commercial buildings

PREPARE AN EMERGENCY KIT
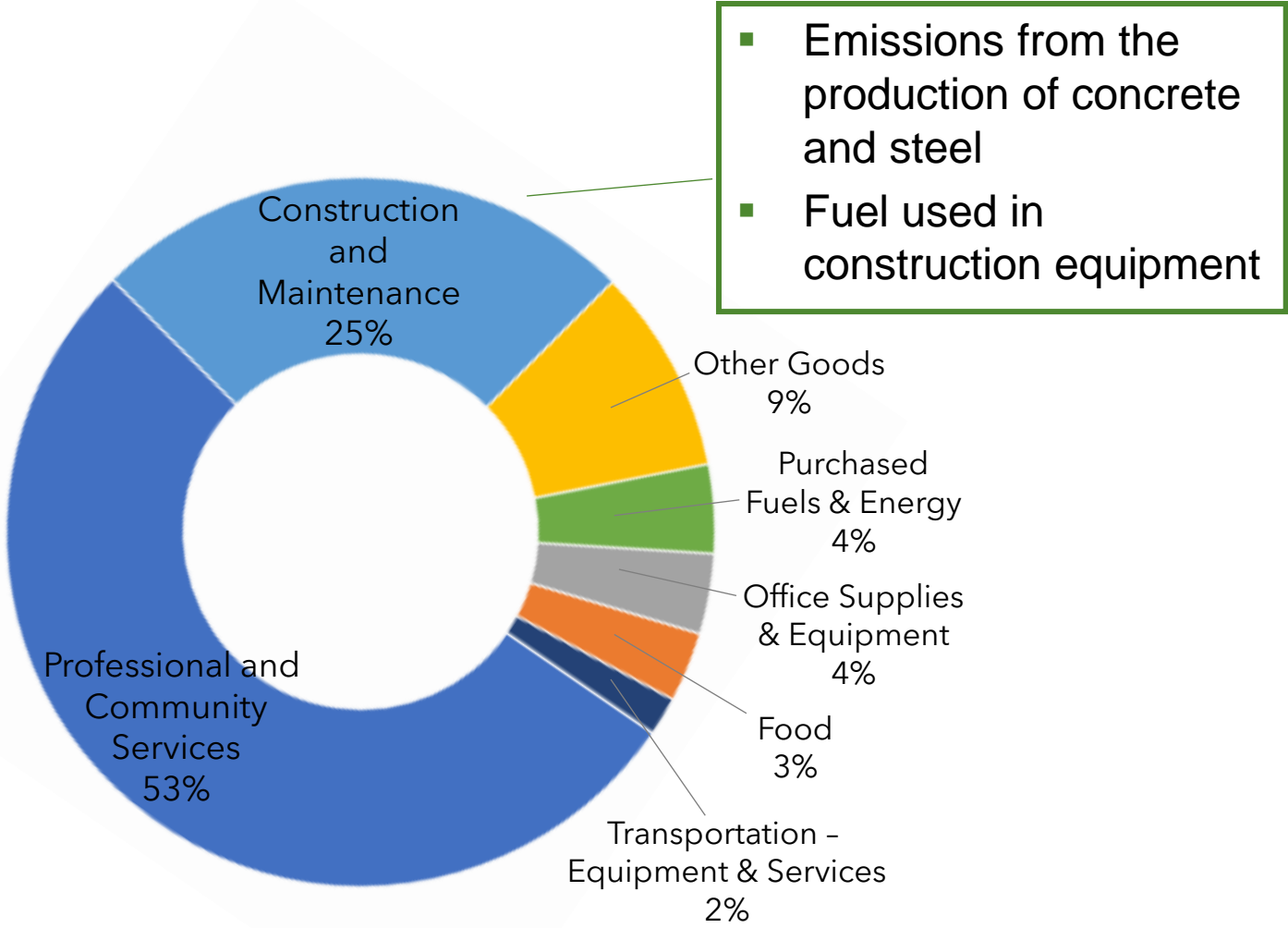Learn what needs to be included in an emergency kit and how to stay safe

- Use UCSF's Emergency Supply Kit Checklist

Questions? Email: acsustain@acgov.org

Alameda County
SUSTAINABILITY
Local Action, Global Impact.

Alameda County
SUSTAINABILITY
Local Action, Global Impact.

Targeting Efforts by Purchasing Category

- Emissions from the production of concrete and steel
- Fuel used in construction equipment

Construction and Maintenance
25%

Other Goods
9%

Purchased Fuels & Energy
4%

Office Supplies & Equipment
4%

Food
3%

Transportation – Equipment & Services
2%

Professional and Community Services
53%

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New Initiatives: Low-Carbon Concrete

- Participated in Marin County code project to set locally relevant GWP limits

- Incorporated limits into performance specification for construction contracts

- Resources:
  - Low Carbon Concrete Code | StopWaste: (www.stopwaste.org/concrete)
  - County Performance Specification: (https://www.acgov.org/sustain/what/greenbuilding/susdesign.htm)

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Targeting Efforts by Purchasing Category

- Construction and Maintenance 25%
- Other Goods 9%
- Purchased Fuels & Energy 4%
- Office Supplies & Equipment 4%
- Food 3%
- Transportation – Equipment & Services 2%
- Professional and Community Services 53%
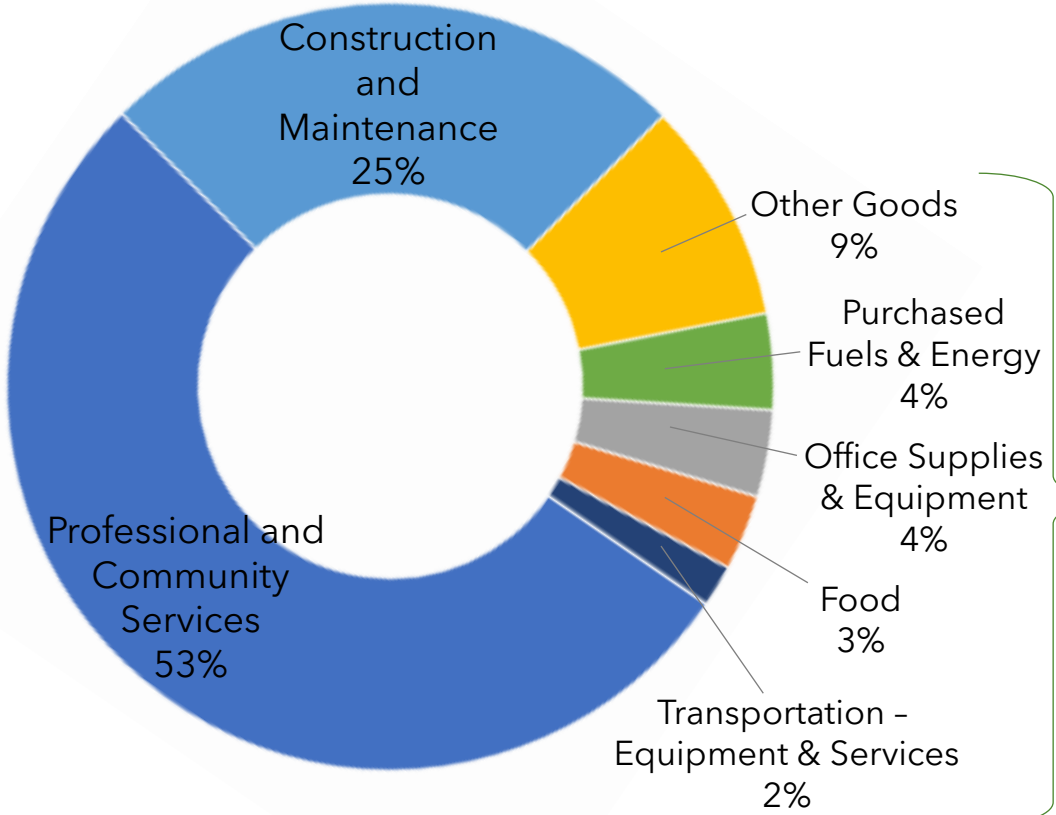
- Emissions from resource extraction, production and transportation of goods, food and fuel

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New Initiatives: ALCO Reuse

- Online marketplace for reused ergonomic equipment
- Increase accessibility for departments

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Resources

- West Coast Climate and Materials Management Forum
  - Trends Analysis Report
  - How-To Guide – (tip: utilize EPA's USEEIO dataset, rather than EIO-LCA)
- Find a comparable organization
  - City – Portland, OR
  - County – Alameda County, CA
- Join others in the journey:

  Sustainable Purchasing Leadership Council

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Thank you!

Karen Cook | 510-208-9754 | Karen.Cook@acgov.org | acsustain.org

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BUSCH® SYSTEMS

CarbonGraph

Unlocking Product Data →

INTELLIGENT LIFE CYCLE ASSESSMENT

Think Big, Start Small, & Scale Fast

Our goal is to understand our products, so that we can optimize our environmental impacts while delivering a much-needed service.

Two key questions we set out to answer:

1. What is the carbon intensity of our products?
2. How do we use this data to start operating more sustainably?

Bringing Data into Focus

A quick summary of our work together:

1. We started small, completing our first product carbon footprint in just 4 weeks
2. Then we quickly scaled to 88 PCFs completed within 6 months, across 37 product families
3. After reviewing our results, we started to share our insights internally and externally

Top Tip: pick a flagship product!
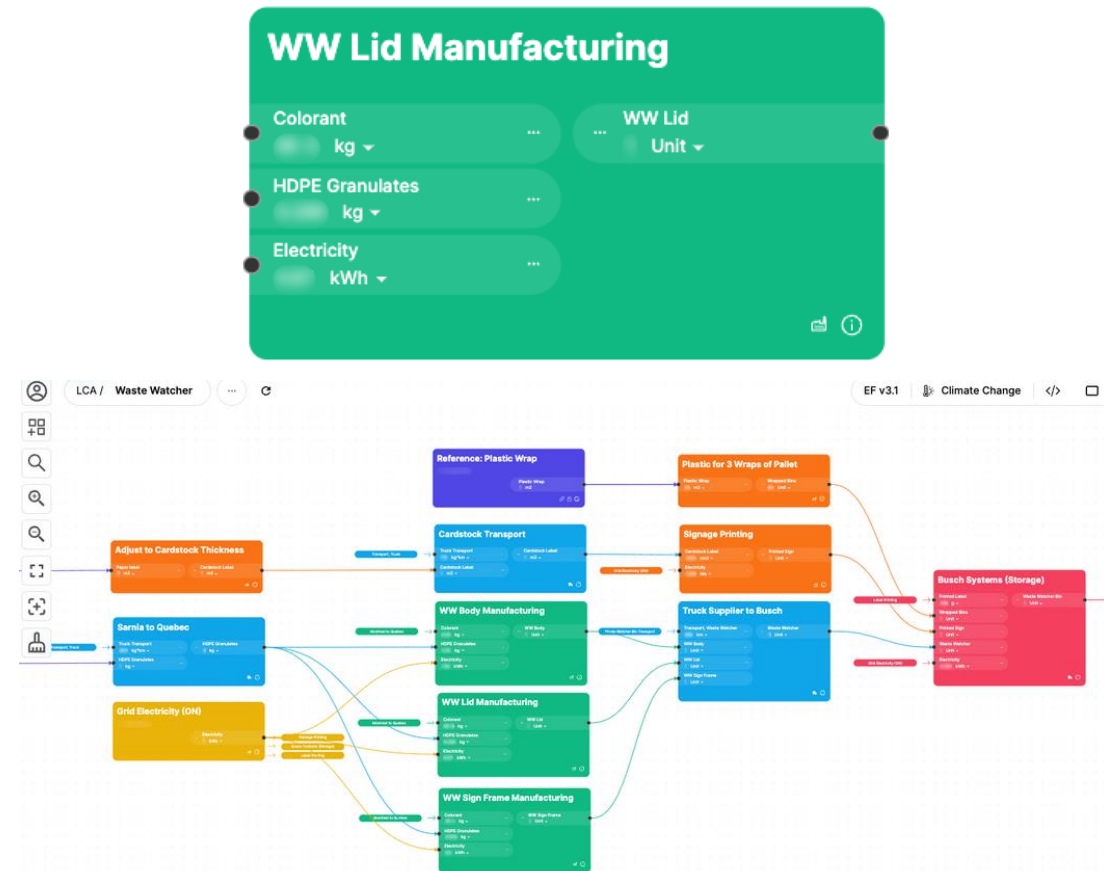
Key Outcomes

With our partnership, we've been able to do two very valuable things:

1. Reduce our greatest impacts
   a. Finding opportunities with PCRC
   b. Life cycling inefficient products
2. Empower our partners and customers with granular data
   a. Sharing our progress
   b. Transparent impact reporting

Transparent & Empowering

For our core catalogue, our partners can now review relevant standards, carbon intensities, and additional data points like life cycle stage contribution and a version history as we make progress towards our reduction goals.

Our partners get to participate in our progress, and make informed program decisions.

Today's Program Online

SCOPE 3 INVENTORY: WHEN ASSUMPTIONS MEET DATA

TUESDAY APRIL 23RD

- Recording

- Presentation slides

Link will be emailed in coming days

Links to Resources:

- From speakers presentations

- NYC guide to do household consumption-based inventories

- Other webinars:
  - West Coast Climate Forum – Consumption-based inventories
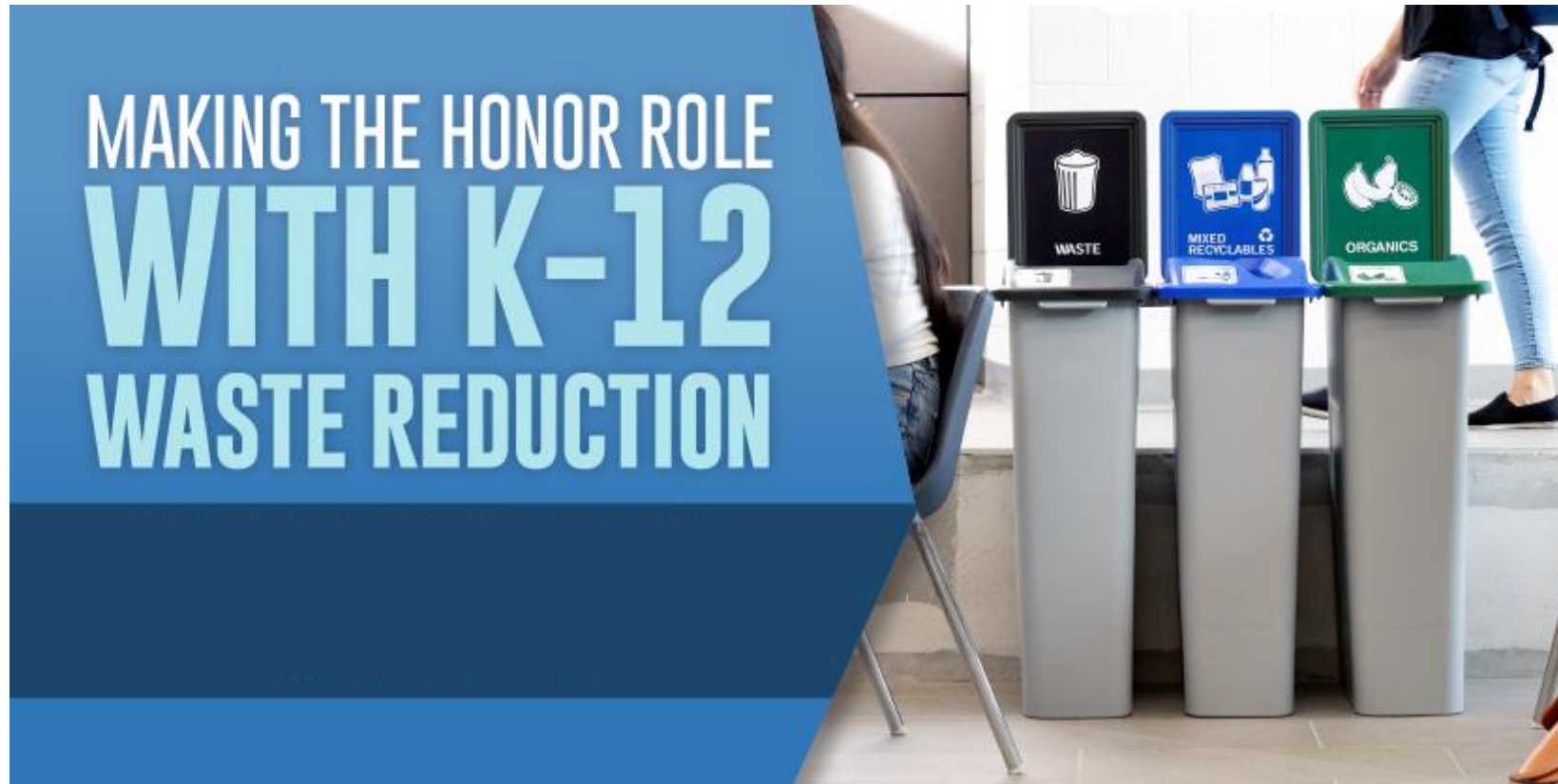 - AASHE – Stanford University

BUSCH® SYSTEMS

Let's Recycle Better, Together.

Certified B Corporation

Coming up in May…

Thank you to our Panelists

Brandie Sebastian
Technical Director & Senior LCA Strategist

John Beath Environmental

Patrick Cigana
Senior Sustainability Advisor

Polytechnique Montréal

Karen Cook
Sustainability Project Manager

Alameda County, CA

Andrew Sheahan
Director of Sales & Marketing

CarbonGraph

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Sustainability & Eco-Impact Coordinator

Busch Systems

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