ecoCity Footprint Tool

Pilot Project Results Webinar

Presented by:
Dr. Jennie Moore
Cora Hallsworth

January 26, 2018 10:30-11:30 am Pacific

Cora Hallsworth Consulting

BCIT

Objectives

- Review and discuss results of the pilot project
- Review next steps

Agenda

1. ecoCity Footprint Tool & Pilot Project Background
2. Results
   - Lessons Learned
   - ecological footprint and consumption based emission inventories
3. Next Steps
4. Discussion & Questions

ecoCity Footprint Tool & Pilot

Background

Cora Hallsworth Consulting

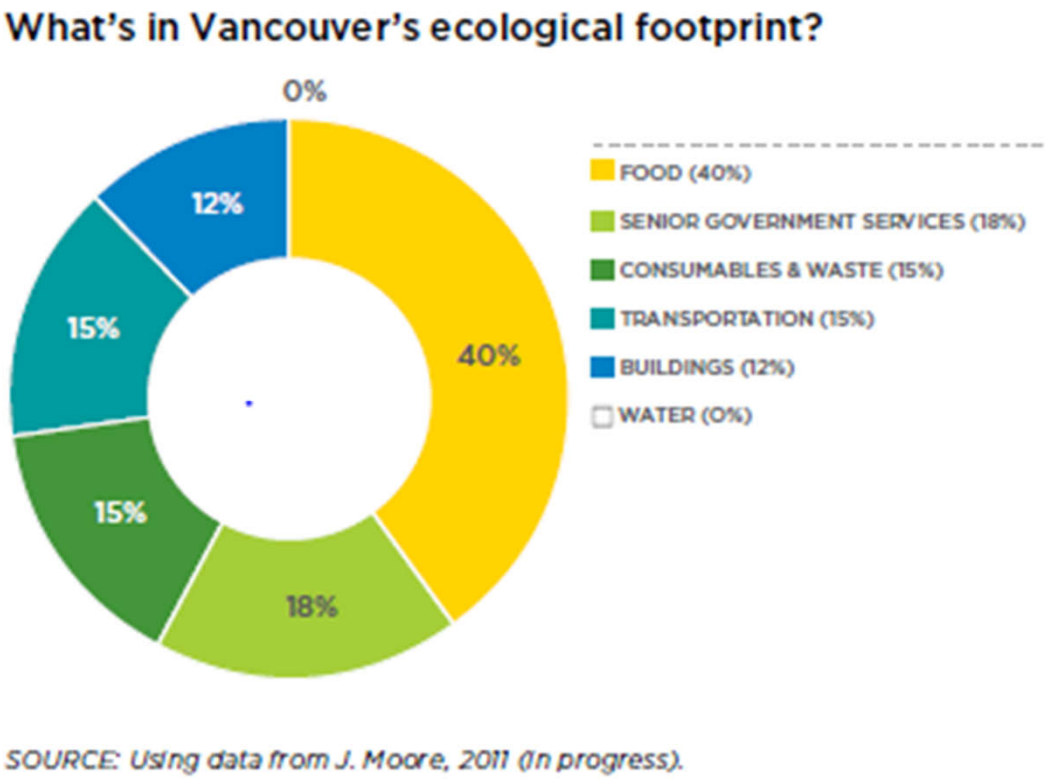
BCIT

ecoCity Footprint Tool: **Background**

Prototype in 2006:

- Research Thesis
  by Dr. Jennie Moore

- Developed for communities
  to estimate their ecological
  footprints



ecoCity Footprint Tool: **Background**

2012 Greenest City Action Plan

Goal:

Achieve a “one planet” ecological footprint

Target for 2020:

Reduce 2006 footprint by 33%

2017 Pilot Project

Funded by the Urban Sustainability Director's Network (USDN)

Objectives

1. Enhancing, refining, and testing the prototype ecoCity Footprint Tool:
   - Aligning with the GPC
     (Global Protocol for Community Scale GHG Emission Inventories)
   - Testing in U.S context
2. Creating consumption based emission inventories and ecological footprints for five pilot communities
3. Scoping on-line format of Tool

Project Participants & Stakeholders

PROJECT LEADS:

Jennie Moore, BCIT
Cora Hallsworth, CHC

PROJECT ADVISORS:

Allison Ashcroft, USDN
Babe O'Sullivan, USDN

RESEARCH ASSISTANTS:

Emery Hartley
Jennifer Rae Pierce
Jeremy Javier
Paramdeep Natal

CURRENT PILOT CITIES:

City of Victoria BC
City of Vancouver BC
City of North Vancouver BC
District of Saanich BC
Iowa City IA

OBSERVING CITIES:

Cincinnati OH
Cupertino CA
Edmonton AB
Emeryville CA
Fort Collins CO
Flagstaff AZ
Gaithersburg MD
Halifax NS
Kauai OH
Oakland CA
Philadelphia PA
Portland OR
Santa Monica CA
Squamish BC

FUNDING PARTNER:

USDN

STAKEHOLDERS:

Additional USDN members
Additional North American municipalities and regional districts
ICLEI
Federation of Canadian Municipalities
Province of BC

PREVIOUS PILOT CITIES:

Medellin, Columbia
Cusco, Peru

ecoCity Footprint Tool

Functionality

Cora Hallsworth Consulting

BCIT

Tool Functionality

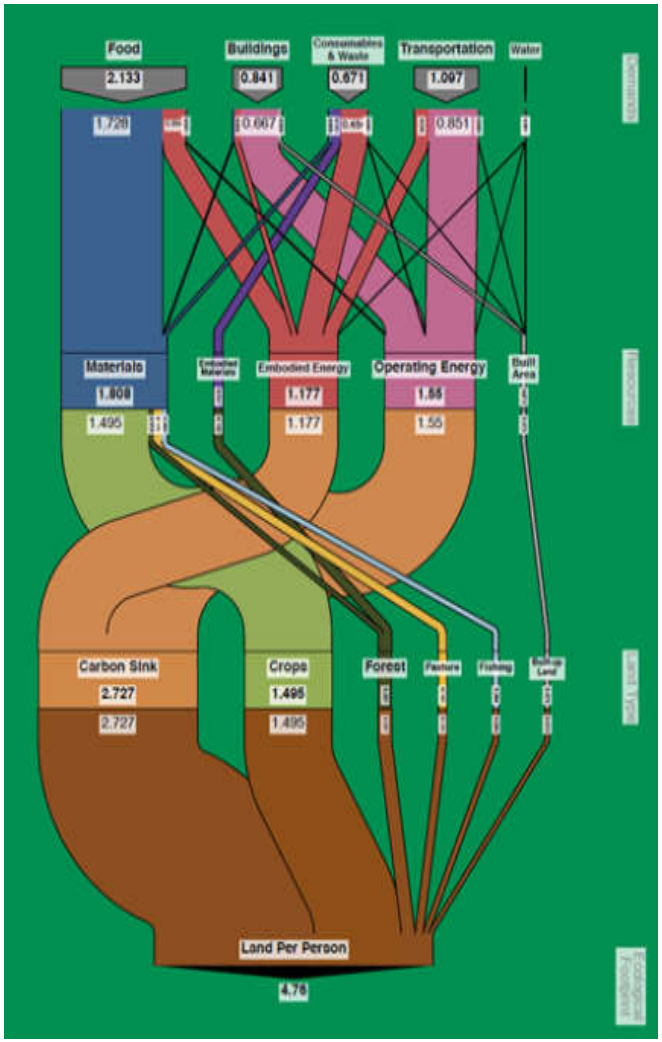
The ecoCity Footprint Tool provides three types of inventories:

Ecological Footprint
(global hectares –gha)

Consumption-Based GHG Emissions
(CO_2e)

Territorial GHG Emissions
(CO_2e)

Bottom-up “Urban Metabolism”



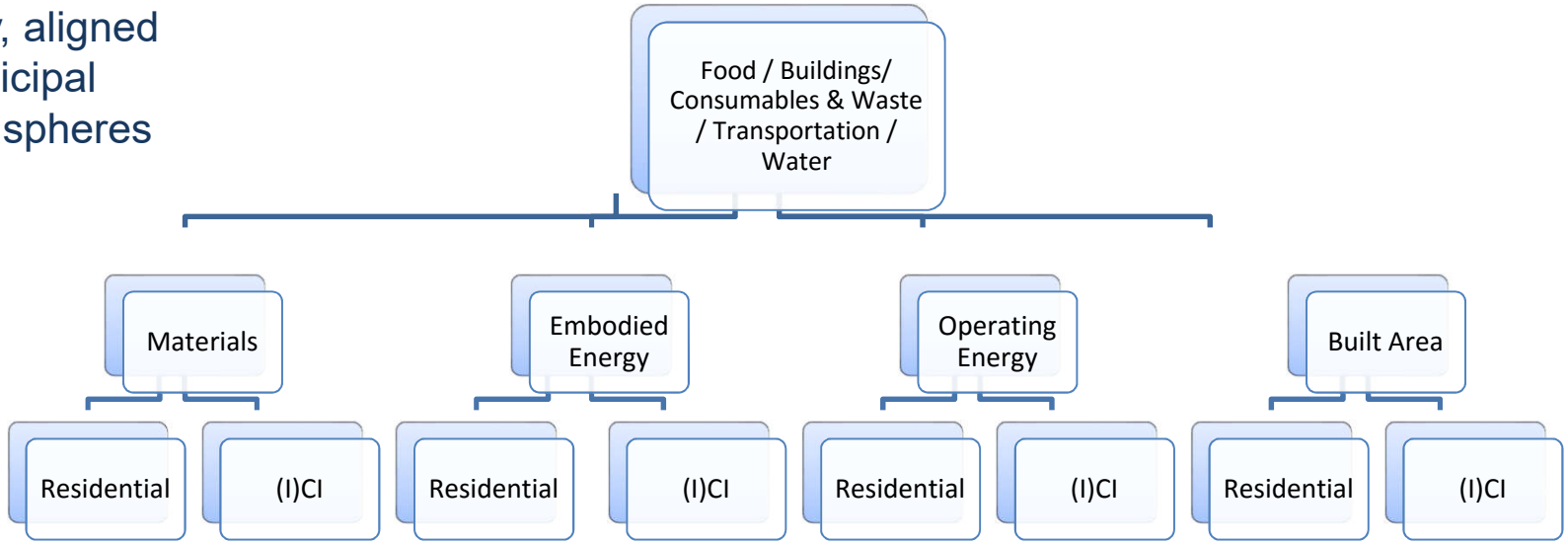
Urban metabolism and **life cycle assessment** are the foundation of the **ecoCity Footprint Tool’s** approach to create a **CBEI** and **EF**

This enables:

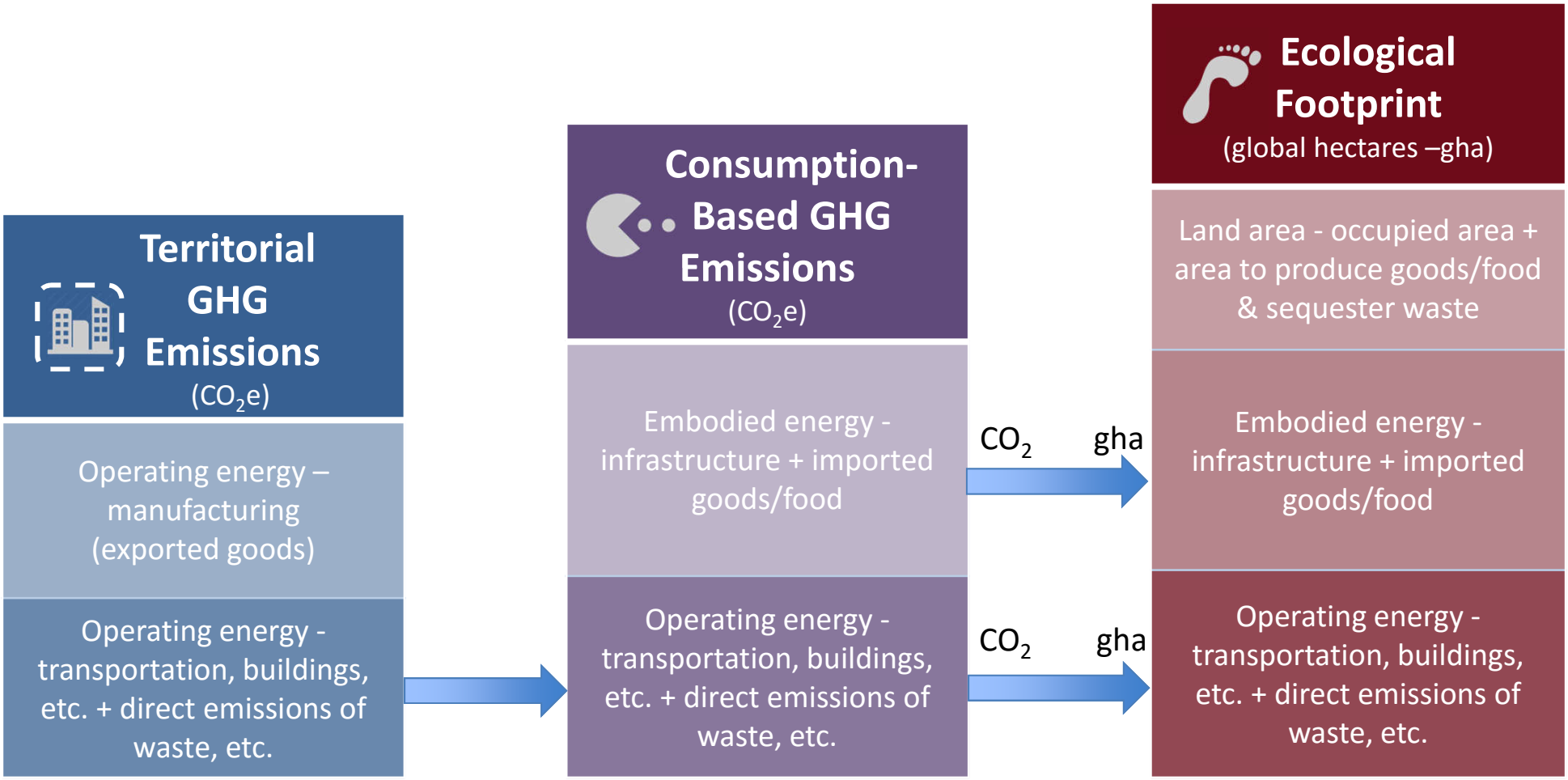
- Identifying consumption hotspots
- Demonstrating progress in closing the loop

Bottom-up “Component Method”

The Tool is a bottom-up inventory, aligned with municipal planning spheres



Components of the Inventories



GHG Inventory Approaches

Territorial GHG Emissions
(CO_2e)

- More common, "traditional" method for GHG emissions inventories
- Based on city ***area***
- Includes GHG emissions from local energy used for buildings, transport and waste management within the community

Consumption-Based GHG Emissions
(CO_2e)

- New, complementary method for GHG emissions
- Based on city ***residents***
- Includes GHG emissions from all ***consumption***, no matter where it was produced or consumed*
- Difficult to accurately account for movement of people (both in and out)

** Based on life cycle assessment of all products and services consumed by local residents, whether produced within the city or outside.*

Bottom-up vs. Top Down Methods

Ecological Footprint
(global hectares –gha)

compound method

- Top-down National data
- Input-Output economic tables (i.e. StatsCan)
- Comparable
- Comprehensive
- Not locally responsive

component method

- Bottom-up
- Local data
- Municipal and Regional reports
- Not comparable (as a rule)
- Significant data gaps
- **Locally responsive/relevant**

ecoCity Footprint Tool

Pilot Project Results

Cora Hallsworth Consulting

BCIT

Pilot Project: **Results**

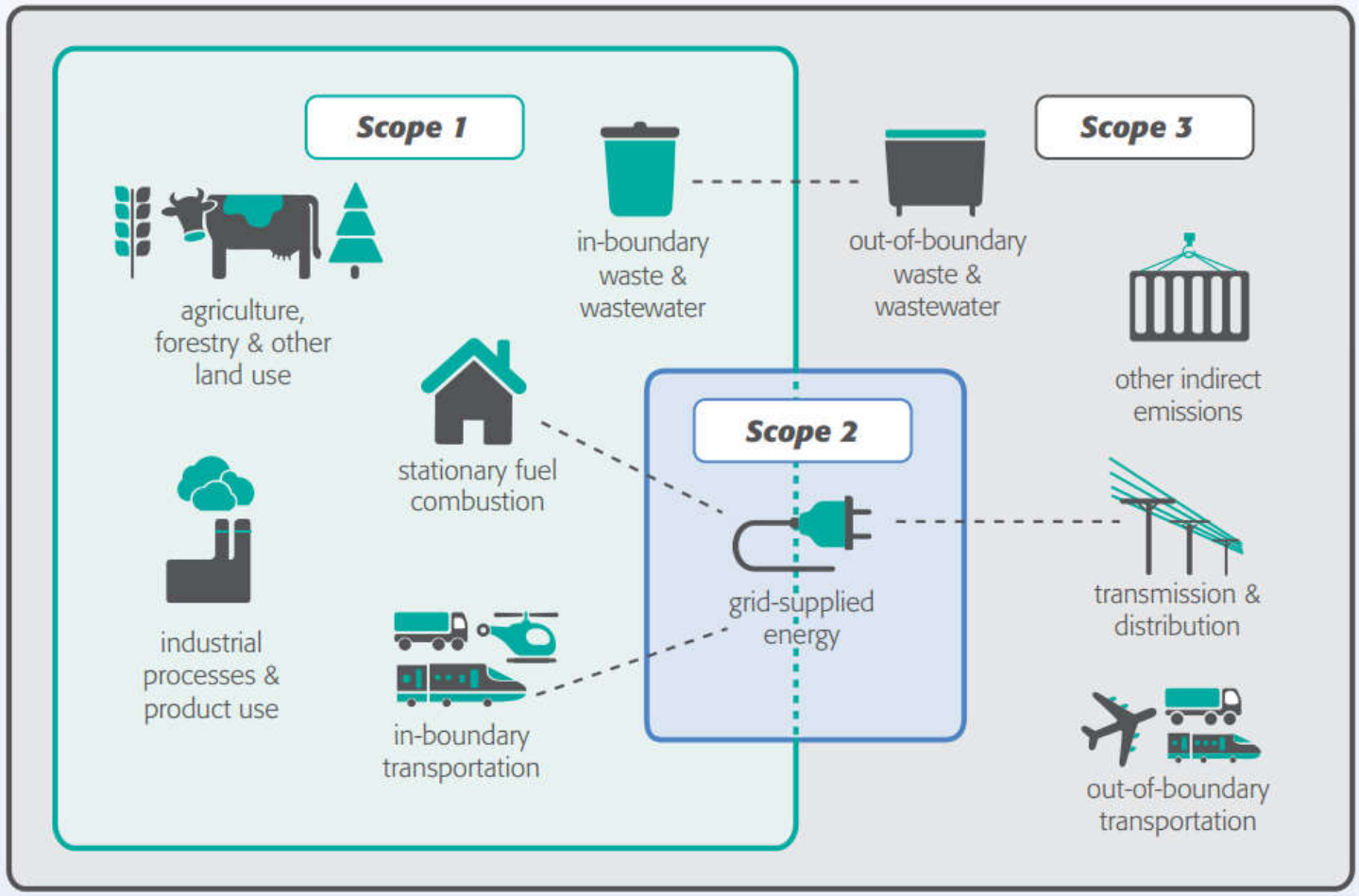
- Tool Enhancements
- Lessons Learned
- CBEI and EF inventories for 5 pilots

Tool Enhancements

Cora Hallsworth Consulting

BCIT

Tool Enhancement: **GPC Alignment**



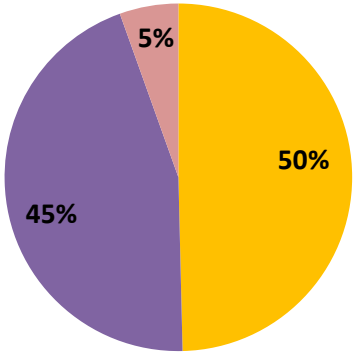
Inventory boundary (including scopes 1, 2 and 3) — Geographic city boundary (including scope 1) — Grid-supplied energy from a regional grid (scope 2)

Source: Global Protocol for Community-Scale Greenhouse Gas Emission Inventories

Tool Enhancement: **GPC Alignment**

GHG Emissions Sources (By Sector)		Total GHGs (metric tons, i.e., tonnes CO2e)					
		Scope 1	Scope 2	Scope 3	BASIC	BASIC+	BASIC+ S3
Stationary Energy	Energy use	179,420	7,434	558	186,853	187,411	187,411
	Energy generation supplied to the grid	0					
Transportation	All II emissions	168,217	880	60,008	169,097	229,106	229,106
Waste	Waste generated in the city	0		20,635	20,635	20,635	20,635
	Waste generated outside the city	0					
IPPU	All IV emissions	0				0	0
AFOLU	All V emissions	0				0	0
OTHER SCOPE 3	All VI emissions			300,434			300,434
Total		347,637	8,314	381,635	376,586	437,152	737,586

GPC BASIC



Stationary Energy 2.2 tCO2e/ca

Transportation 2.0 tCO2e/ca

Waste 0.2 tCO2e/ca

Total: 4.4 tCO2e/ca
376,586 tCO2e

Lessons Learned

Cora Hallsworth Consulting

BCIT

Effort to Participate/ Use the Tool

- Student research assistants ~ 100-200 hrs (collecting data, meetings, reporting)
- Total staff time/pilot ~ from 20-200 hrs (collecting data, meetings)
    - City lead ~ 20-100 hrs
    - Other municipal staff ~ 20-80 hrs
    - Some municipalities engaged more staff in meetings
- Regional and Provincial government ~ 20-40 hrs (collecting data, meetings)
- Utilities and other data providers ~ not estimated

Data Collection

Data availability:

- Estimates of personal and commercial vehicle transportation limited
- No data on food consumption at local level
- Waste data at regional level, rather than at municipal level
- Many municipalities do not have detailed infrastructure data
- Some data not available in disaggregated format (i.e., broken down by sector, or by material type)

Impact of Tourism and Workers:

- Challenging to isolate the impact of the local resident population from consumption associated with tourists and regional residents

Training:

- With more training on CBEI and EF theory it will be possible to further streamline the data collection process and possibly to obtain more refined data sets

Testing in the US

- Comparable data sources available in the US
- Data must be converted from imperial to metric
- Desire to convey results in imperial
- Some terminology differences

Key Learning

- Strong appetite for ecoCity Footprint Tool and Consumption Based Emission Inventories
- Data collection process a powerful instrument for engaging staff and stakeholders
- Collaborative learning provides opportunity to seed new ideas
- Tool illuminates broader resource impacts and encourages One Planet framing

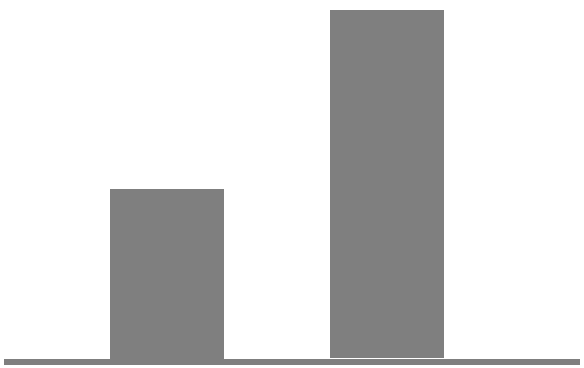
Inventory Results - Highlights

Cora Hallsworth Consulting

BCIT

Results Highlights

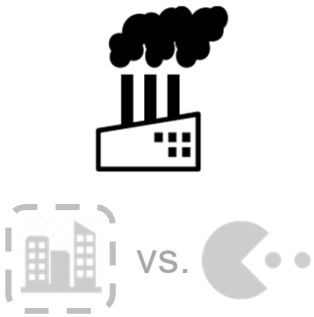
Comparison of Emissions Inventory Calculation Approaches



GPC (territorial) **CBEI** (consumption)

BC Pilots

Vancouver
Victoria
Saanich
North Vancouver



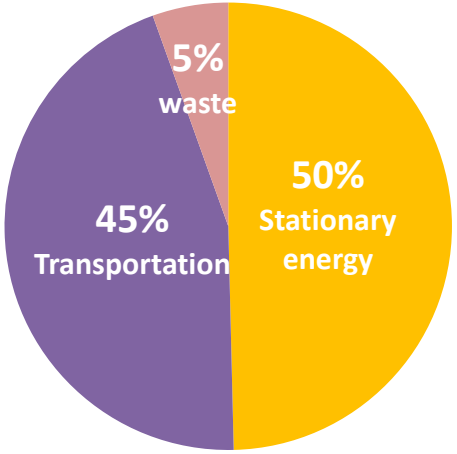
GPC (territorial) **CBEI** (consumption)

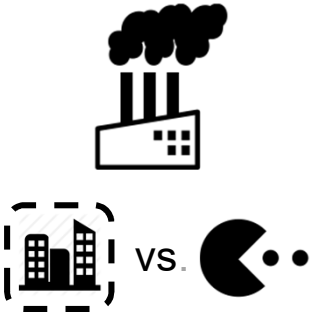
Iowa City, IA

higher levels of industry in Iowa City

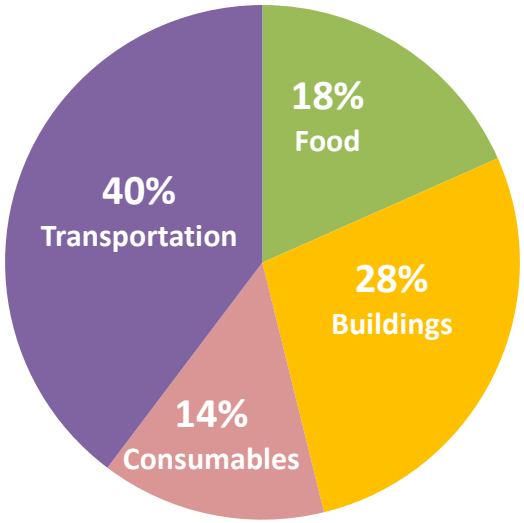
Victoria Results – GPC vs CBEI

Territorial Inventory (GPC Basic)





Consumption-Based Emissions Inventory (CBEI)



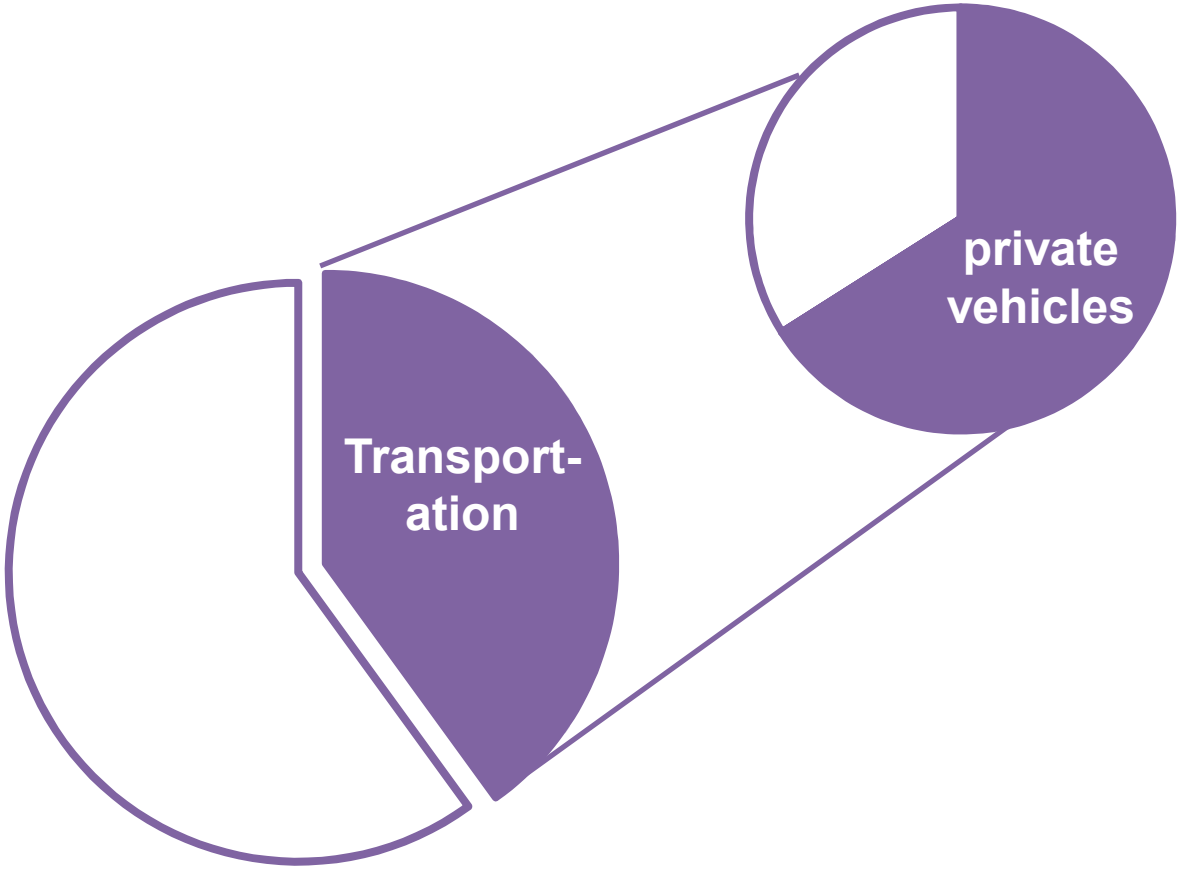
- *The territorial inventory just considers waste, but the CBEI also includes upstream impacts of consumables*
- *Food and consumables together represent 32% of the CBEI*

Victoria Results – Transportation CBEI

Transportation

Dominated by fuel use in private vehicles.

With embodied energy of vehicles, private vehicle transportation represents 2/3.



Victoria Results – Transportation CBEI

Victoria's Transportation CBEI
279,000 tCO_2e

Embodied Energy: **Private Vehicles (18%)**

Roads (1%)

Commercial Vehicles (1%)

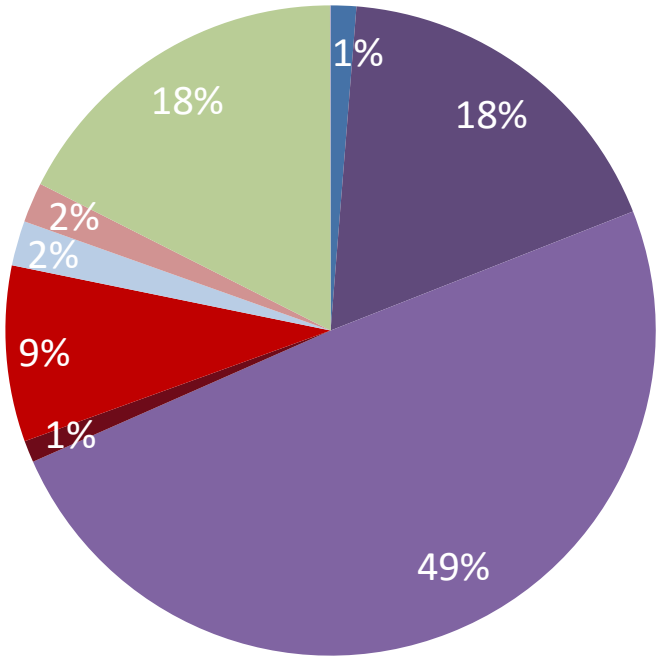
Operating Energy: **Private Vehicles (49%)**

Air Travel (18%)

Commercial Vehicles (9%)

Public Transportation (2%)

Ferry Travel (2%)

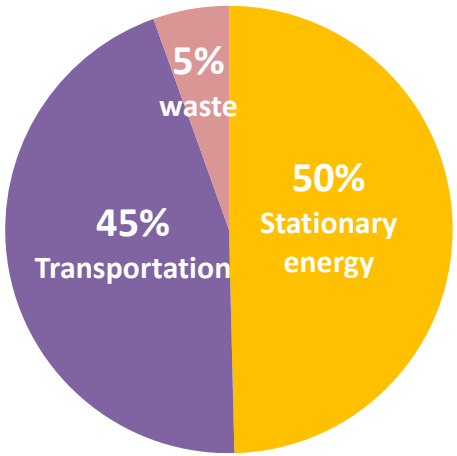


TOTAL **3.3 tCO_2e/ca**

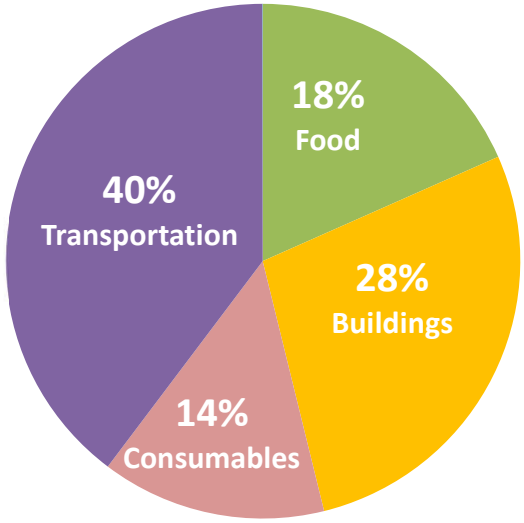
about 2/3 private vehicle transportation

Victoria Results – Comparison of Outputs

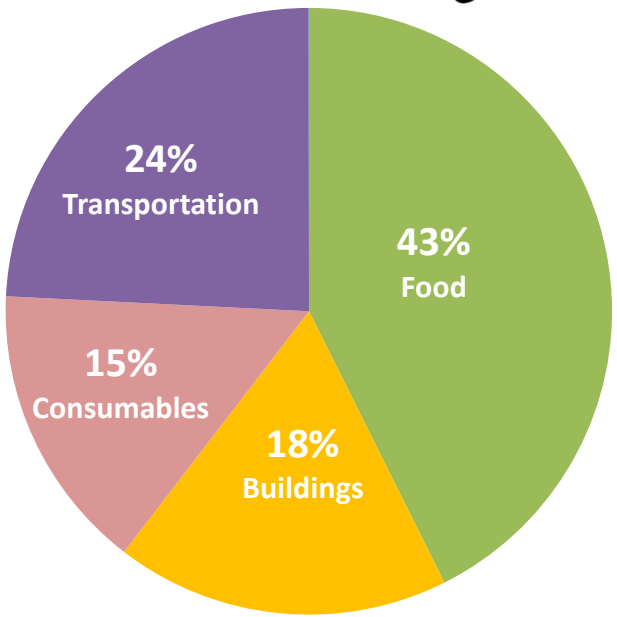
Territorial Inventory (GPC Basic)



Consumption-Based Emissions Inventory (CBEI)



Ecological Footprint

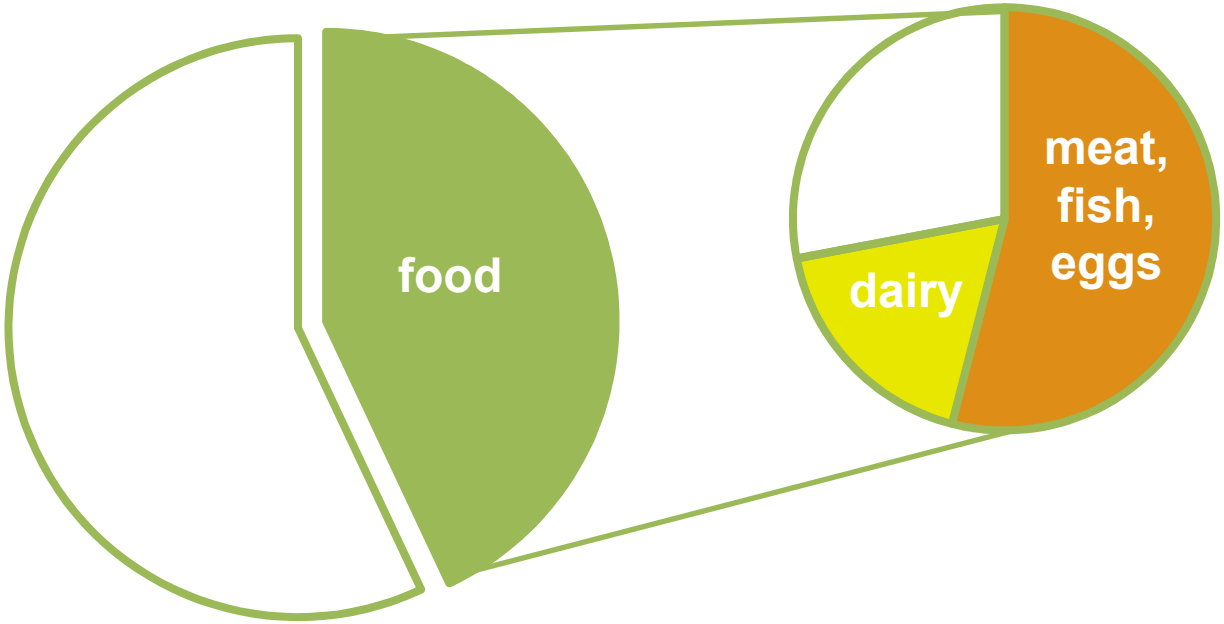


- *Waste/Consumables is a much lower component of the GPC inventory*
- *In the CBEI the largest impact is transportation (40%) followed by buildings*
- *Food has a much greater impact in the EF*

Victoria Results – Food Footprint

Food

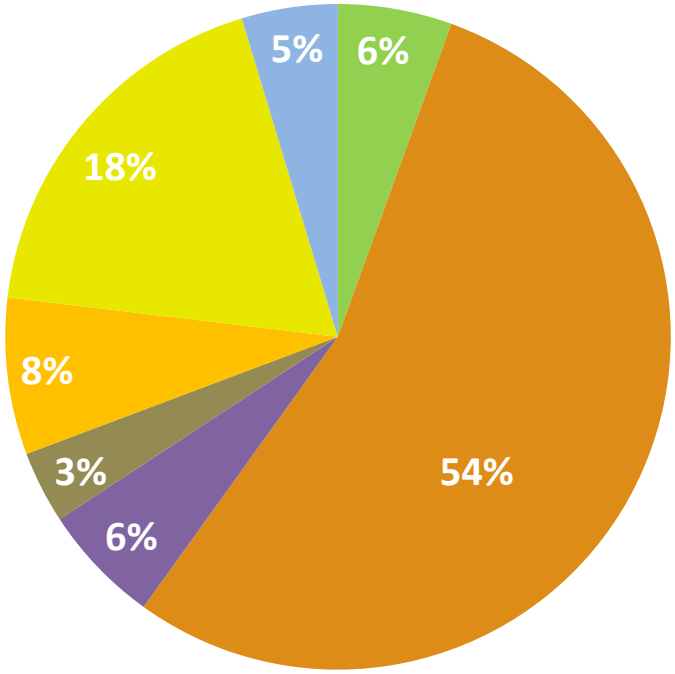
Animal proteins are the biggest factor in the food footprint.



Victoria Results – Food Footprint

Victoria's Food Footprint
116,741 gha

Fish, Meat, eggs	
Dairy products	
Oils, nuts, legumes	
Grains	
Fruits and Vegetables	
Beverages	
Stimulants (coffee, tea, sugar, cocoa)	
TOTAL	1.38 gha/cap



Victoria Results – Food Footprint

Victoria's Food Footprint
116,741 gha

Materials: **Cropland**

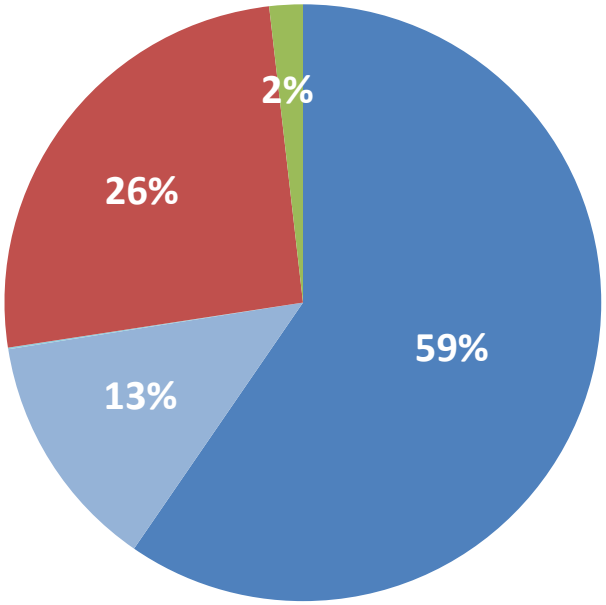
Pasture Land

Fishing Area (0%)

Embodied Energy (production)

Operating Energy (food miles)

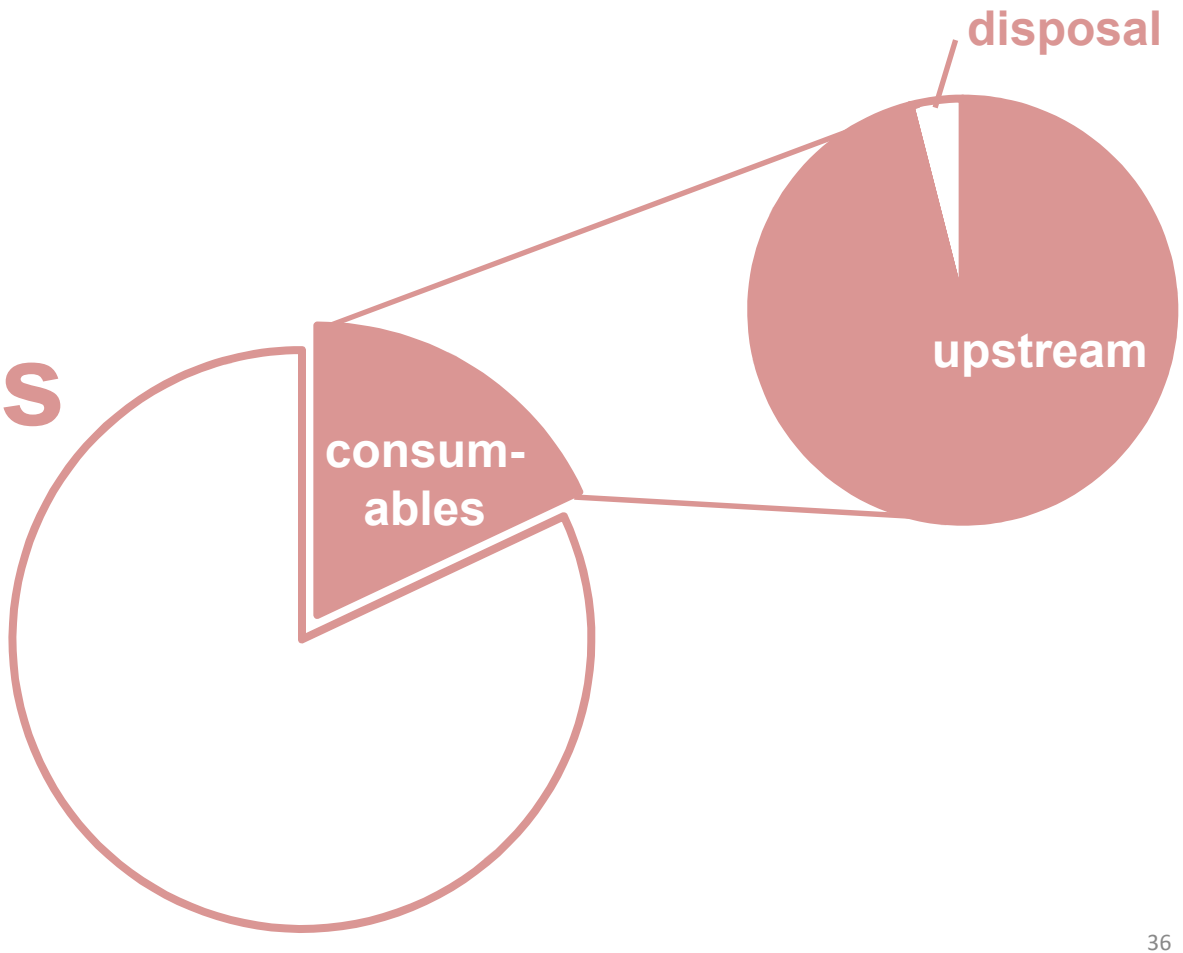
TOTAL	**1.38 gha/cap**



Victoria Results – Consumables Footprint

Consumables

Dominated by upstream impacts (not disposal).



Victoria Results – Consumables Footprint

Victoria's Consumables Footprint
39,000 gha

Wood waste, textiles, rubber

Paper

Plastic

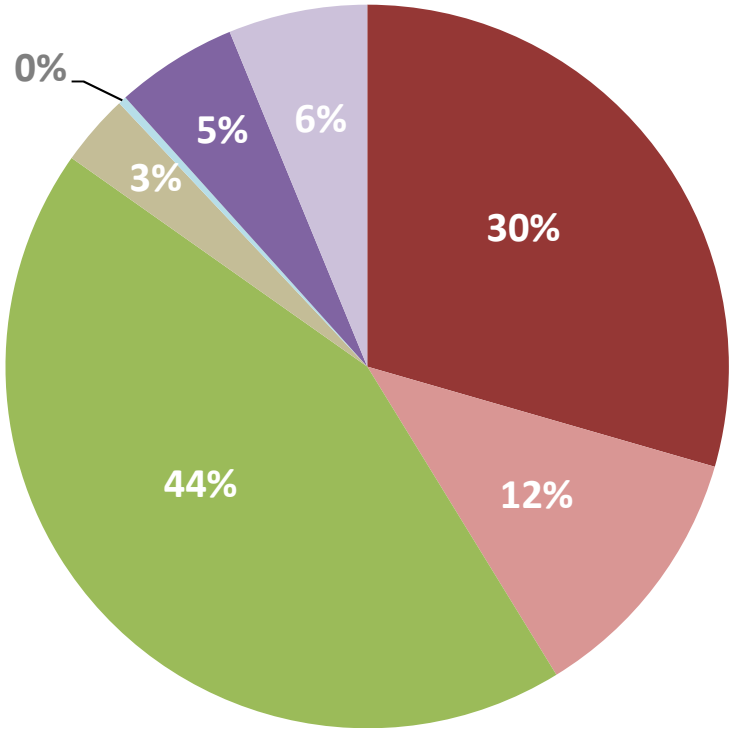
Metals

Household Hygiene

Other

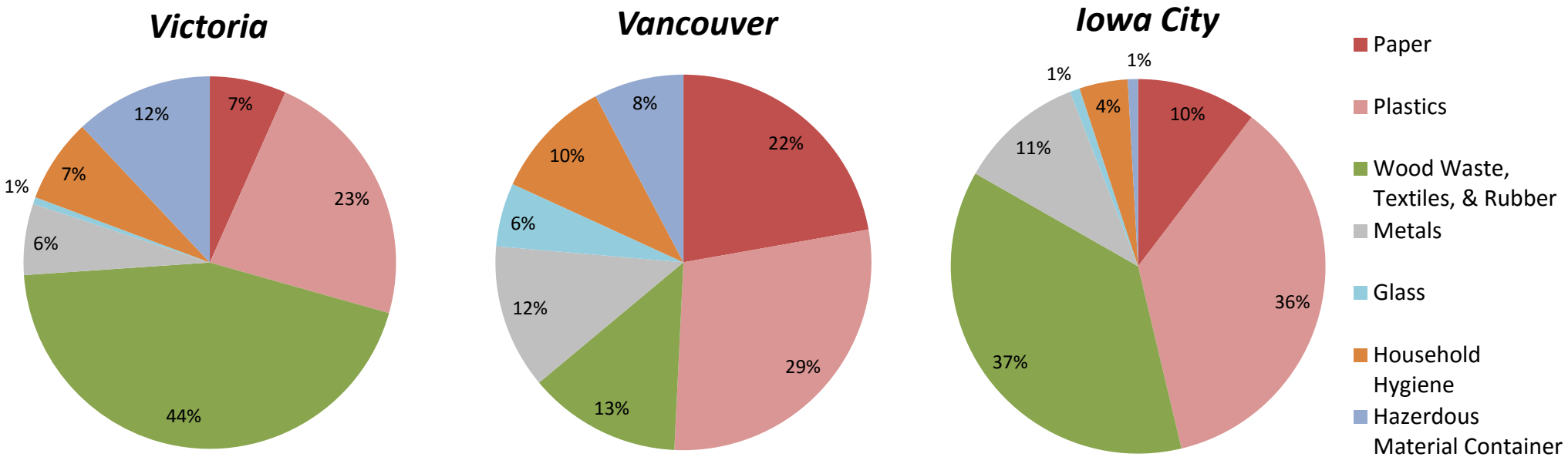
Glass

TOTAL **0.46 gha/cap**

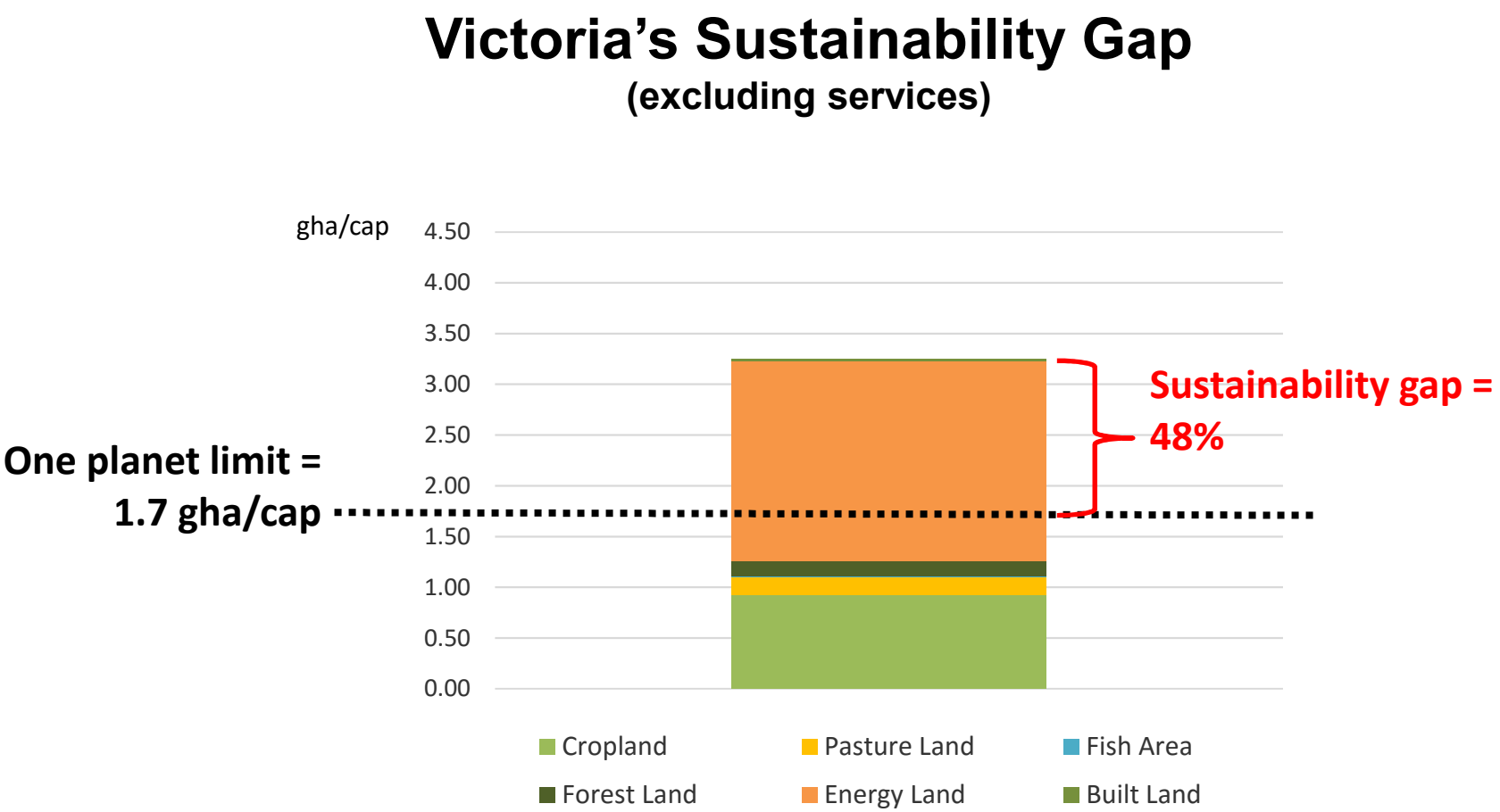


Pilot Results: **GHG Emissions**

Consumption-Based Emissions for (non-food) Consumables – Sample Pilot Results

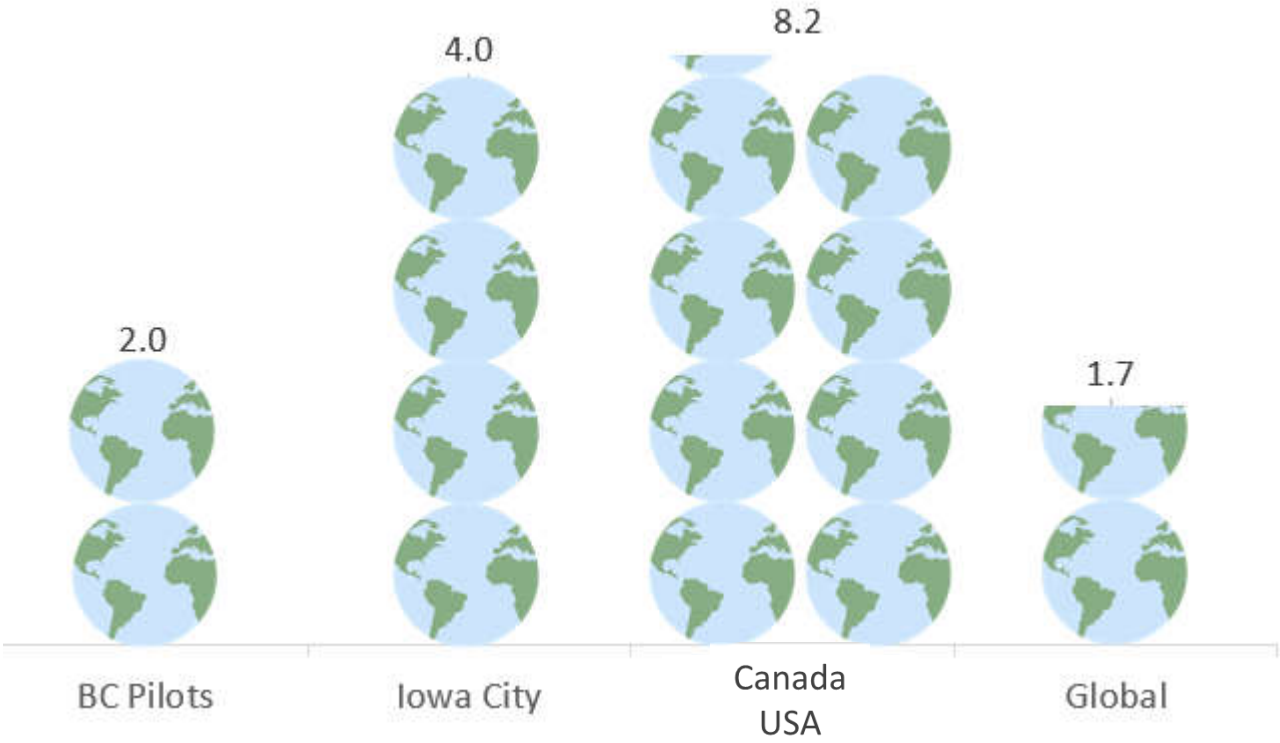


Victoria Results – Sustainability Gap



Ecological Footprint Comparison

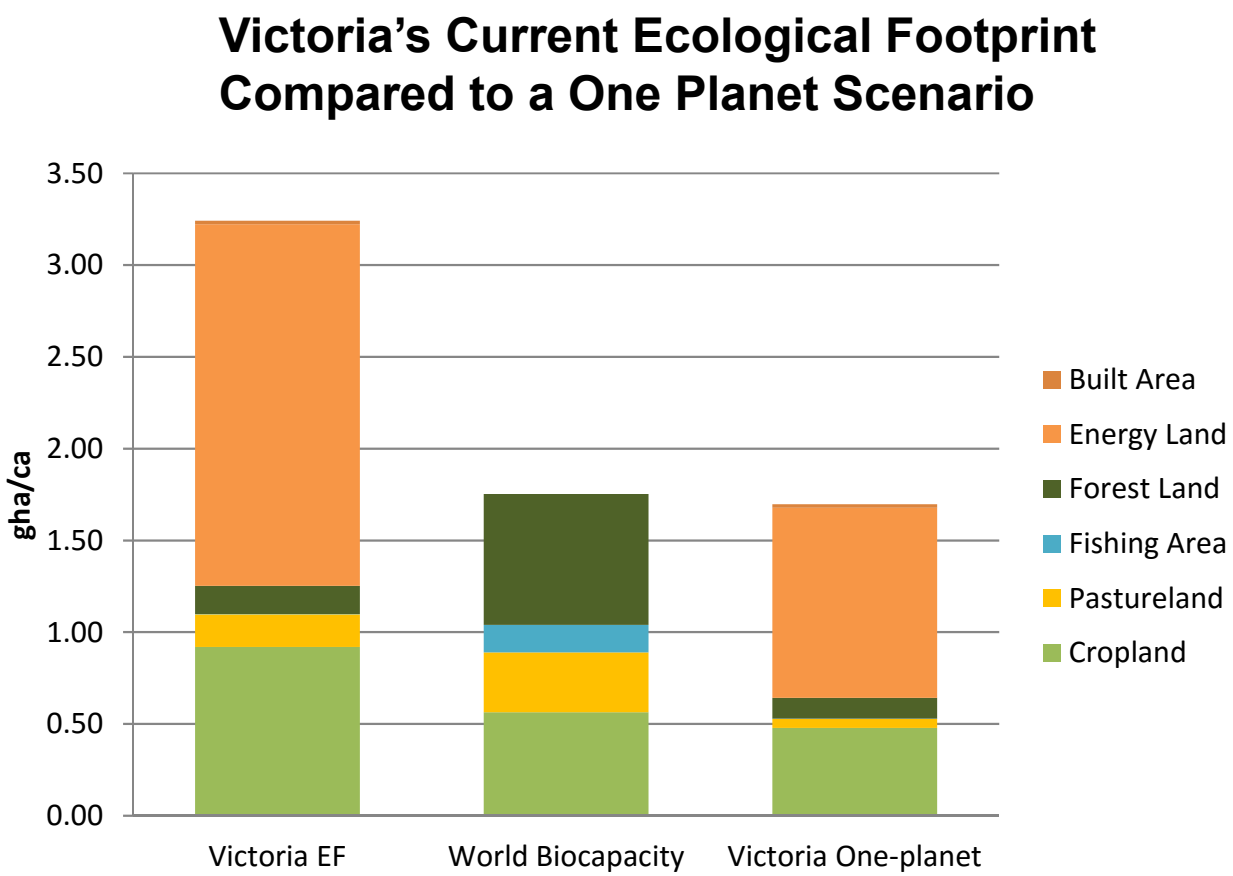
Earths Needed to Sustain Consumption Patterns of Pilot Communities (2015)



One Planet Scenario: Victoria

MEASURE	EF reduction (gha/capita)	GHG reduction (tCO_2e/capita)
Reduce beef (and substitute with chicken) and dairy (without substitution) by 25%[18]	0.12	0.11
Purchase 25% less food (all categories except Oils, Nuts, Legumes in which the target is a 20% reduction)	0.11	0.23
Reduce consumption of textiles by 60%	0.12	0.26
Reduce purchase of non-food consumables by 30%[19]	0.15	0.35
Eliminate fossil fuel emissions in residential, commercial and institutional buildings	0.41	1.86
Convert 50% gas private vehicles to electric	0.18	0.7

One Planet Scenario: Victoria

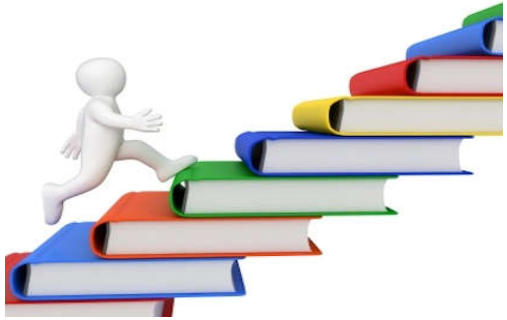


Next Steps

Cora Hallsworth Consulting

BCIT

Next Steps



- Continue to evolve functionality of the Tool
  - Online version
  - Evolve user guidance
  - Interactive scenario analysis capacity
  - Integrate Meta Flow (sankey) software to visualize urban metabolism
  - Explore ‘hybridized’ approach for consumables which would be informed by regional or national sales data.
  - Additional CBEI output (charts)
  - Potential testing with new pilots
- Work with pilots on stakeholder engagement
- Exploring creation of a BCIT Research Centre
  - Expansion of peer learning opportunities (peer learning group)

Discussion

Cora Hallsworth Consulting

BCIT

Contacts

Dr. Jennie Moore
Associate Dean,
School of Construction and the Environment
ecocityfootprint@bcit.ca

Cora Hallsworth
Project Manager, ecoCity Footprint Tool Pilot
cora-h@live.com 778-749-0089

Cora Hallsworth Consulting

BCIT