

Webinar #1 | Introduction to Vancouver's Circular Economy

Success and Opportunity in Vancouver's Circular Economy





Next Up

**Rosemary Cooper,
The Share Reuse
Repair Initiative**



Share Reuse Repair INITIATIVE

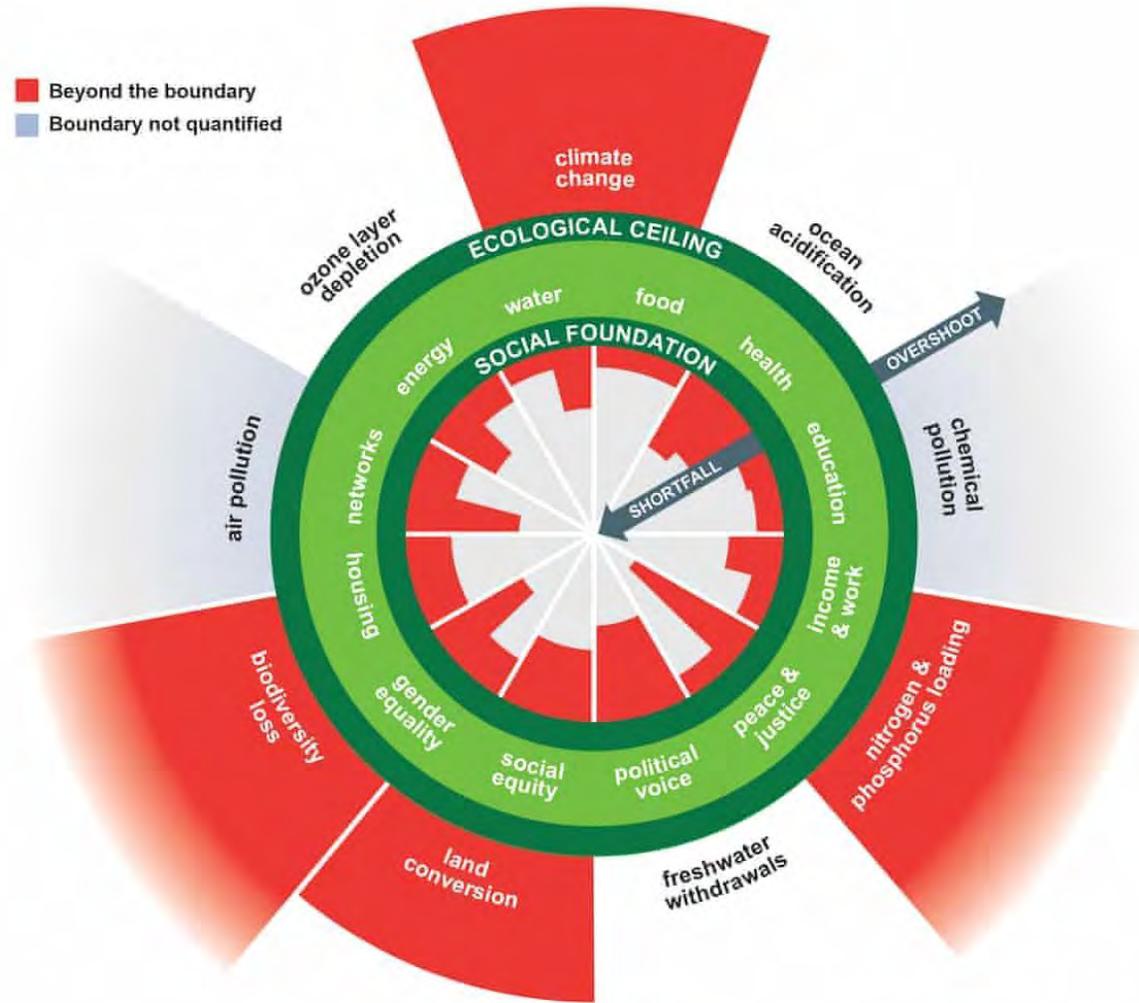
The Circular Economy: Making the Most of Things





COVID-19 has brought home what we already knew...our "Linear Economy" is Broken!

We've crossed critical planetary boundaries...



Kate
Raworth

while failing to meet basic social needs for all.

We Need to Go Circular!

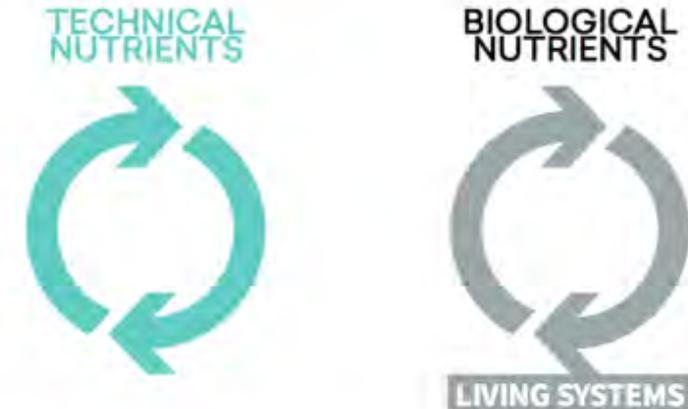
LINEAR ECONOMY



Energy from finite sources

after W McDonough and M Braungart

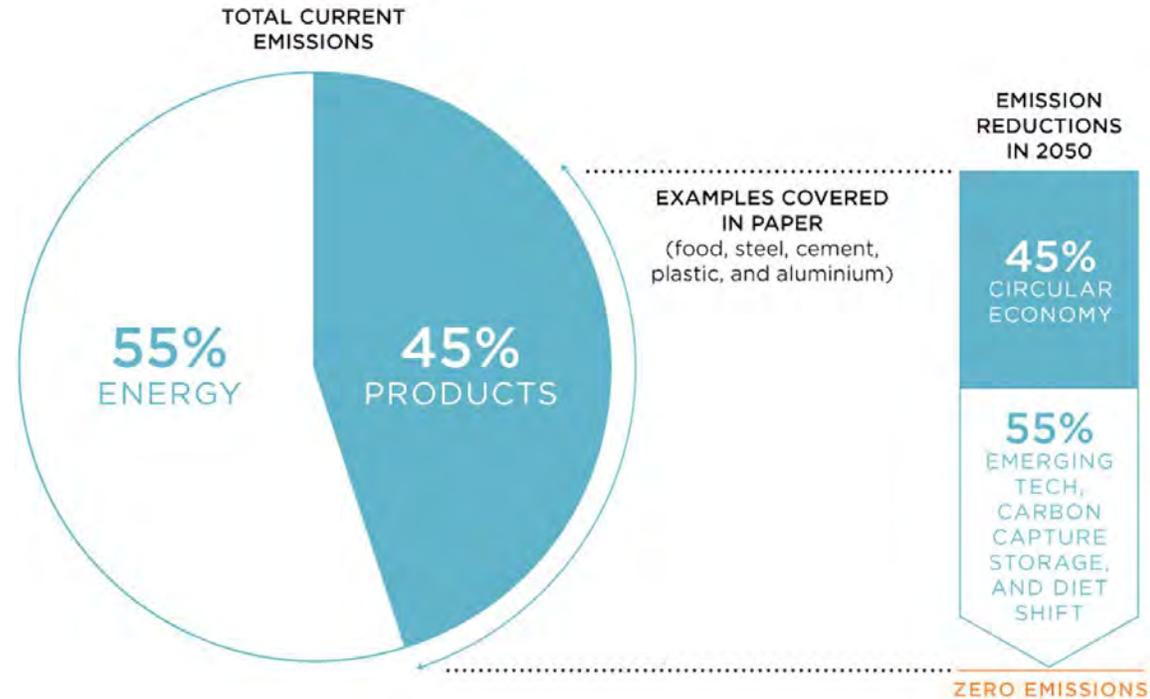
CIRCULAR ECONOMY



energy from renewable sources
RETHINK: REDUCE – REPAIR - RECYCLE

The three Rs (3R)
Reduce, Reuse and Recycle. The rule of the three Rs (3R).

The Circular Economy is a climate solution...



**Completing the Picture: How the Circular Economy Tackles Climate Change
Report 2019, Ellen McArthur Foundation**

An Economic Recovery solution...

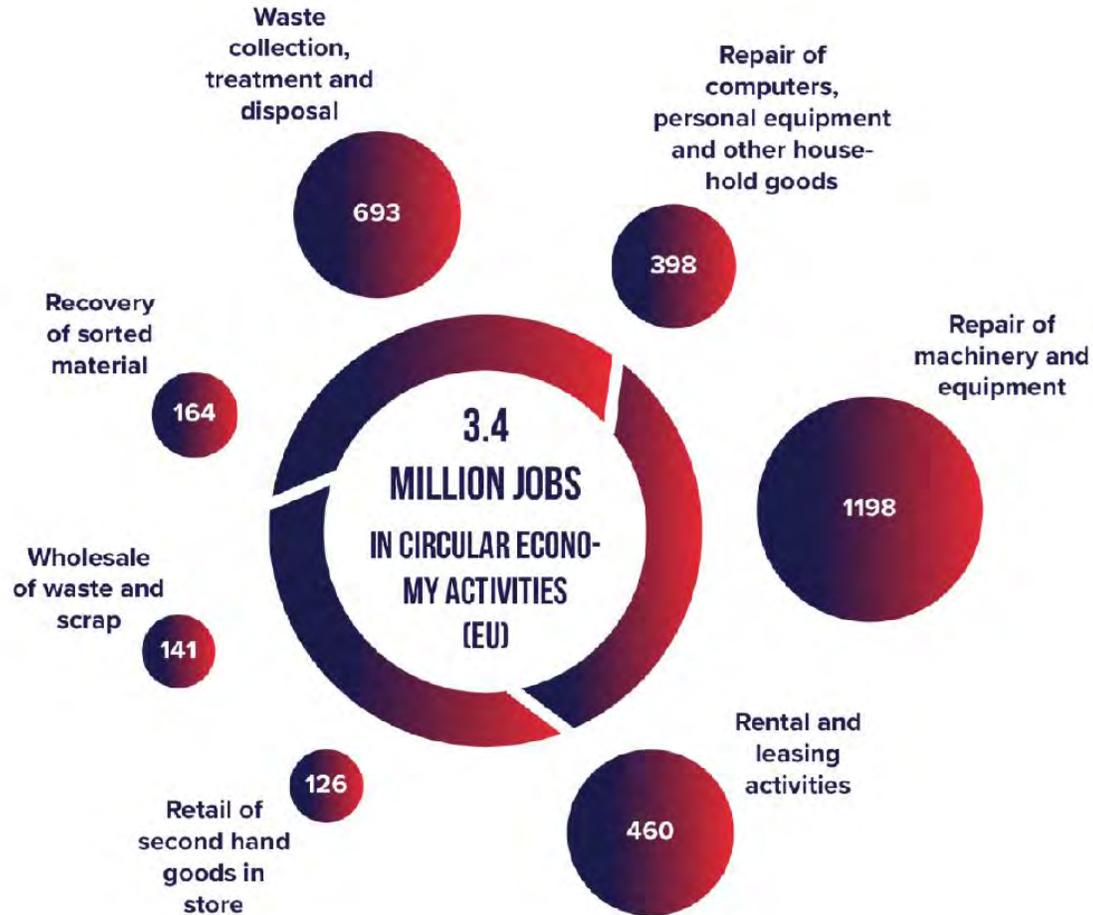
Compared to Landfill:

- 200x more jobs to repair electronics
- 6x more to deconstruct a building



With untapped job creation potential

CIRCULAR JOBS OPPORTUNITIES



Source: Eurostat, WRAP calculations
(jobs estimates in thousands)

A sustainable lifestyle solution...



And an Innovation Opportunity...



Worth \$4.5 Trillion globally!

Why Businesses Go Circular?

TO AVOID LINEAR RISKS

1. Raw material scarcity & volatility
2. Supply chain shocks – pandemics, climate change, political
3. Changing consumer preferences
4. Disruptive technologies & innovations
5. Employees turnover for “better” companies
6. Changing policies & laws

TO GAIN CIRCULAR BENEFITS

1. Security of supply & access to resources
2. Price stability & predictability of inputs; cost sa
3. Customer loyalty; access to new customers
4. Staying ahead, or front, of disruption
5. Attracting & retaining quality employees
6. Getting out ahead of emerging legislation & policy

Vancouver's Circular Economy

An aerial photograph of a lush green forest. In the center, a circular clearing is formed by a stream that flows in a clockwise direction, creating a circular path. The water is a light blue-green color. The surrounding forest is dense and vibrant green. The overall image is set against a light gray, textured background that resembles recycled paper.

1. Designs out waste
2. Keeps materials in use
3. Regenerates nature

Design Out Waste: 7 Leagues



Local leather made from fish skins and tanned with bark instead of toxic and polluting chrome.

Design Out Food Waste



Luv the Grub makes chutneys & spreads from produce seconds through a paid training program for newcomer refugees.



FoodMesh has designed out food waste by linking businesses with excess food to charities & local farmers.

Design Out Packaging Waste

Zero waste refill stores.



THE
SOAP DISPENSARY
& KITCHEN STAPLES

JARR



gomae
meals

Zero waste
grocery & meal
delivery.

Reusable
coffee cups



ShareWares
Stop Buying Garbage

Reusable
platform.

Keep Clothing & Textiles in Use

Arc'Teryx designs clothing to last and buys backs your gear and sells it to a new customer.



Fabcycle resells textiles from fashion designers, brands & apparel manufacturers that would otherwise go to landfill

making the most of Things

SHARE REUSE REPAIR INITIATIVE

Share Things Vs. Own Them

Baby clothing subscription model –
rent and return for the next size!



The Thingery is a cooperative lending
library where members can access goods
when they need them.

making the most of Things

SHARE REUSE REPAIR INITIATIVE

Reuse Things that Already Exist



Urban Repurpose diverts and resells waste materials from demolition and deconstruction

ChopValu reuses restaurant chopsticks to create minimalist homeware décor & furniture.



FREE REPAIR WORKSHOP



Saturday, March 30, 2019

10 am - 1 pm

Trout Lake Community Centre,
3360 Victoria Dr.

Repair Things and Extend their Useful Life

What is a Repair Workshop?

Repair workshops are fun, hands-on, do-it-together community events where volunteer repair specialists help you repair one item for free where possible.



What Can I Repair?

Ripped textiles, broken computers, small electronics and appliances

For more information visit: vancouver.ca/repair or phone 604-871-6443

making



SHARE REUSE REPAIR INITIATIVE

Regenerative Farming... and Beer!



On-site farming in support of local food security, regenerative agriculture and amazing beer (i.e. “farm to table AND farm to barrel”).

making the most of Things

SHARE REUSE REPAIR INITIATIVE

Avoid Using Non-Renewable Resources



Plant-based street food served in bread-based edible cups that avoids the use of plastic, styrofoam etc.

Entirely plant-based, animal-free shoe avoids use of non-renewable synthetics & petro-chemicals.



More Renewable & Less Non-R!

RecycLiCoTM
PATENTED PROCESS

Making Lithium-ion
Last *Forever.*TM

An Innovation of



AMERICAN
MANGANESE INC.

Surrey-based company recovers lithium from electric vehicle batteries avoiding carbon-intensive & toxic smelting method and reducing the need to mine cobalt and other critical metals.

making the most of Things

SHARE REUSE REPAIR INITIATIVE

Some Circular Innovation Gaps

Textiles

- Clothing repair & resale at scale e.g. Renewal Workshop
- More circular fashion – subscription, take-back & resale
- Circular fibre development and recycling infrastructure

Consumer Goods

- Circular shopping mall/Transform stations (e.g. Retuna Mall)
- Circular repair - household appliances, furniture, electronics, farming equipment
- Circular reuse App e.g. DonateNYC
- More product-as-service models e.g. IKEA furniture rental

Some Circular Innovation Gaps

Food

- Smart design labels to overcome “best before” problem
- More food products using food production by-products
- Refill models to easily buy needed quantity of food
- Scaled bioplastic packaging (bio-based & biodegradable)

Mobility

- Converting regular cars into EVs (e.g. Retrofuture)
- Integrated, electrical shared mobility system (public & private modes) with user-friendly app

More Inclusive Circular Enterprises



Algramo sells food & personal care products “by the gram” for an affordable price overcome the “poverty tax”

Second Chance is a social enterprise that equips those with employment challenges to master building deconstruction skills.



making the most of Things

SHARE REUSE REPAIR INITIATIVE

An aerial photograph of a lush green forest. In the center, a circular clearing is formed by a stream that flows in a clockwise circle. The water in the stream is a light blue-grey color. The surrounding forest is dense and vibrant green. A small figure of a person can be seen on the right side of the circular stream.

Growing Vancouver's Circular Economy

making the most of Things

SHARE REUSE REPAIR INITIATIVE



START-UPS

- Fill innovation gaps
- Disrupt & lead
- Join Project Zero Incubator!

BUSINESSES

- Develop circular goods & services
- Circular procurement
- Partner to go circular

CITIZENS

- Share, reuse and repair
- Purchase circular
- Shape markets

GOVERNMENT

- Circular Roadmaps
- Policy & procurement
- Innovation partners

UNIVERSITIES

- Circular Research
- Train circular leaders
- Innovation support

BANKS, FOUNDATIONS & MORE

- Invest in circular innovation
- Grants for non-profits
- Innovation partners



Bringing community, business and government to identify and advance cultural, policy and market shifts in order to to foster a vibrant culture and economy of sharing, reuse and repair that makes the most of things.

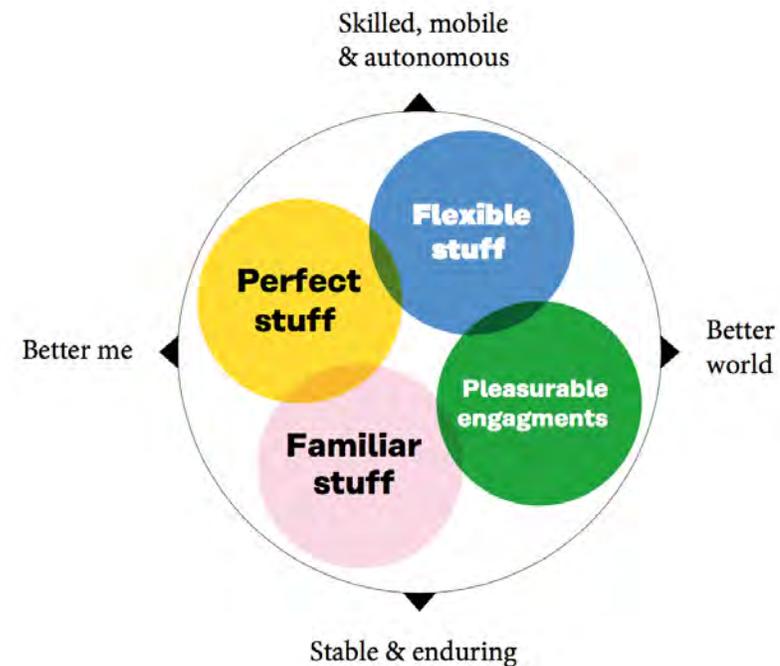
Creating a Greater
SUPPLY of Circular
Goods & Services



Cultivating Cultural
and Consumer
DEMAND

Front Runner Youth Insights Project

- Based on SITRA's approach that is driving circular innovation globally
- Participate in sessions to learn how front runner youth respond to your circular concepts
- Receive strategic guidance from SITRA, Circular Citizen & SRRI to fortify & elevate your concept & prepare for launch
- Learn and collaborate with a non-competitive Innovation Leadership Circle





Social Influence



Habit Formation



Individual Self



Feelings and Cognition



Tangibility

The **Harvard Business Review**
Elusive
Green
Consumer



People say they want sustainable products, but they don't tend to buy them. Here's how to change that.

Journal of Marketing

How to SHIFT Consumer Behaviors to be More Sustainable: A Literature Review and Guiding Framework

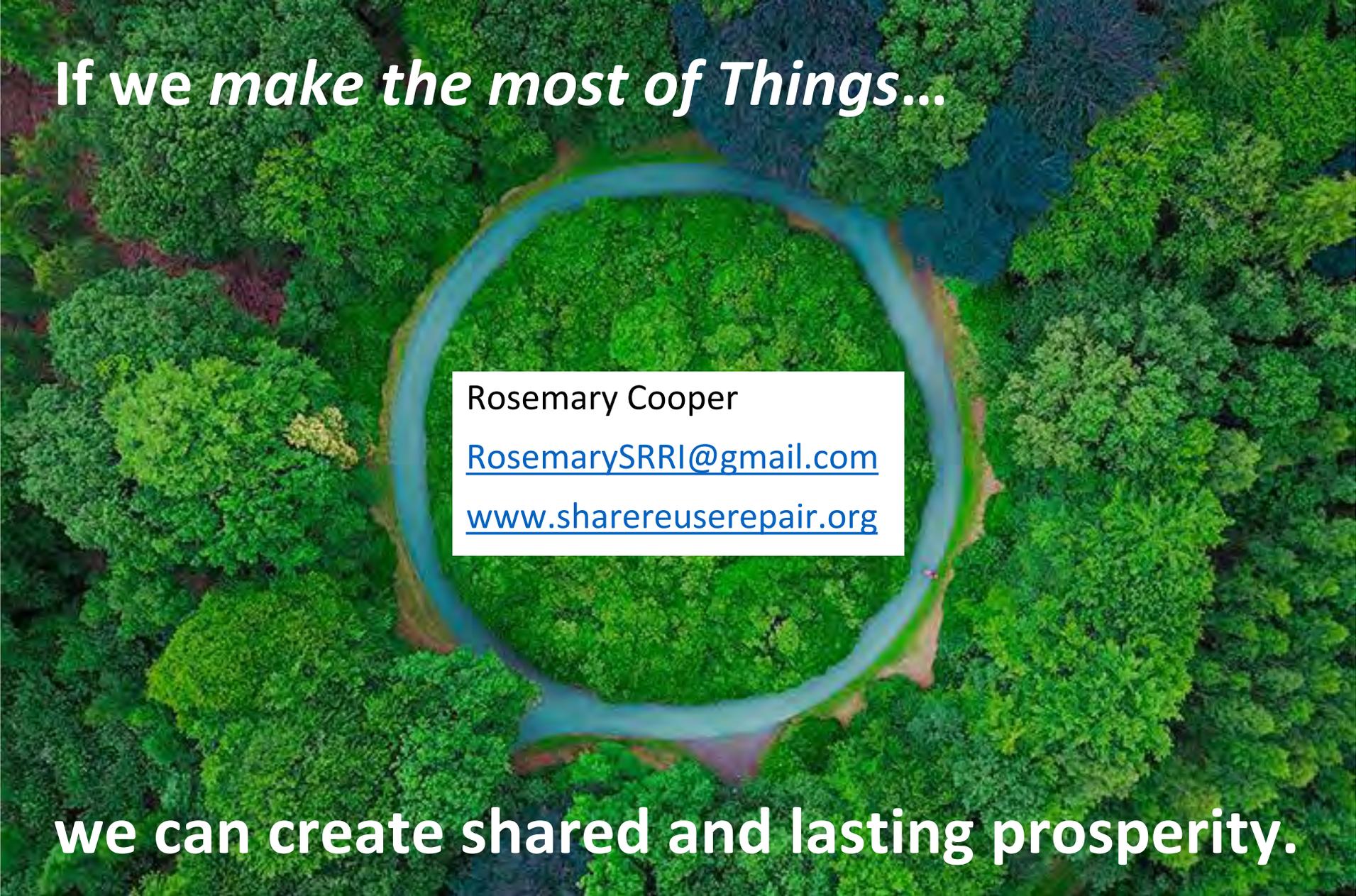
Katherine White^{ORCID}, Rishad Habib, and David J. Hardisty

Green and Just Economic Recovery

Strategy Brief focused on
Circular Innovations that:

- Create inclusive local jobs
- Support sustainable & affordable lifestyles
- Foster resilient local economies & communities



An aerial photograph of a lush green forest. In the center, a circular clearing is formed by a stream that flows in a clockwise direction. The water is a clear, light blue-green color. The surrounding forest is dense and vibrant green. The overall scene is peaceful and natural.

If we make the most of Things...

Rosemary Cooper

RosemarySRRI@gmail.com

www.shareuserrepair.org

we can create shared and lasting prosperity.



Next Up

**Marc Wandler,
Susgrainable**

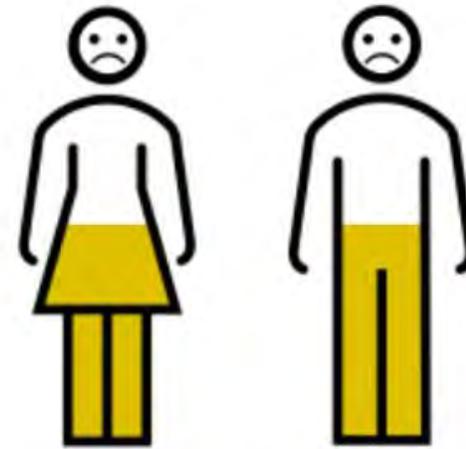


Susgrainable Health Foods

Sustainability baked into every bite

Problem

Canadian craft breweries create
650,000kg/ Day Beer Waste



Canadians get less than 50% of
their RDI of fiber

Solution



32% GRAIN USED



Beer "Waste"
also known as Spent Grain



172% ↑ utilization
87% GRAIN USED



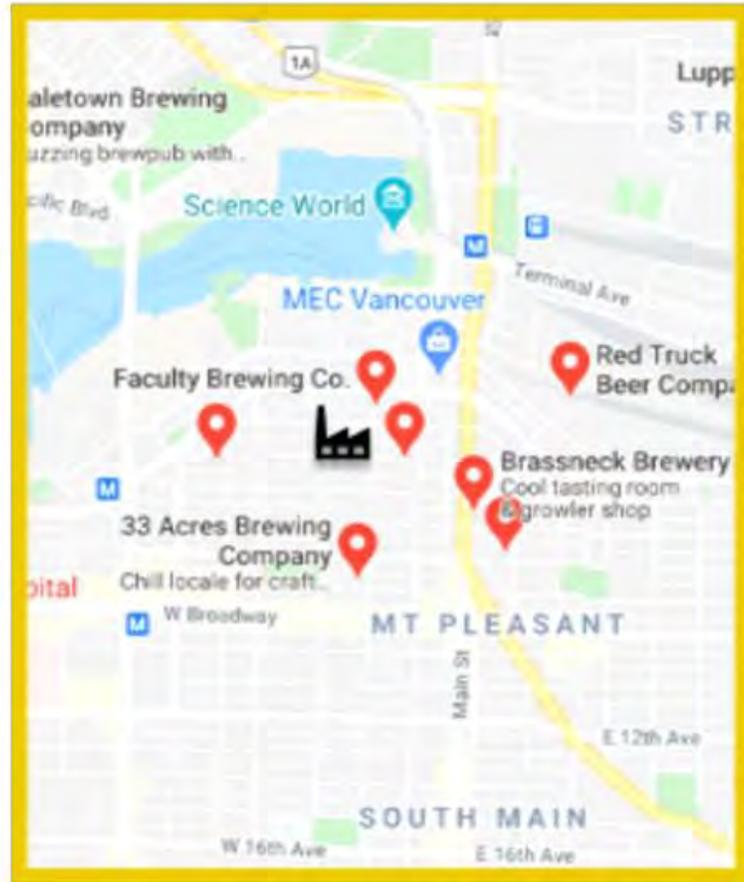
Upcycled Barley Flour

upcycled
/ˈʌpˌsaɪkəld/



(adj.) reused in such a way as to create a product of **higher quality or value** than the original.

Urban Micro-Factory Approach



Retail



Cafe



Online



Markets



Growth Opportunity

Geographic Characteristics

- Demand for local foods is high
- Clusters of sustainability focussed businesses
- Health focused people
- Clusters of craft breweries

Local – Replicable

- Local Vancouver micro-factory
- Reducing food waste
- High fibre, high protein flour alternative



National Expansion Opportunity

- Identify urban environments with shared characteristics across Canada



Regional Expansion Opportunity

- Identify urban environments with shared characteristics in the Pacific Northwest



Market Opportunity

- The upcycled food industry was worth more than **\$46 billion** in 2019 and will experience a **5% CAGR** over the following decade.
- Consumers associate greater positive environmental benefit with the term “**upcycled**” than “organic”. (Drexel University study)



Great Tasting + Healthy

- 5 star reviews on Google
- Red Seal Chef
- Nutrient dense

Sustainably Minded

- Susgrainable Story
- Solving a real problem

Diverse Products = DATA

- 1 Core SKU – Upcycled Flour
- Familiar products
- Various Formats

Impact

Circular Economy Workshops

Linear Economy

Circular Economy

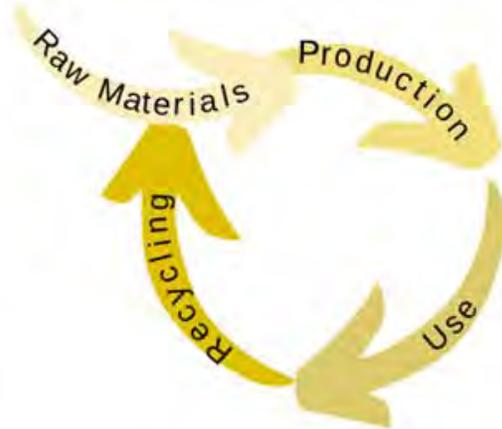
Raw materials

Production

Use

Non-recyclable waste

Extractive



Regenerative

Impact Metric Tracking

Percentage of barley "wasted" during brewing process

68%

Typical **Linear** Production System



13%

Susgrainable's **Circular** Production System

In Progress:

- Life cycle assessment
- Tracking fiber contribution



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BY ORDERING AT
[SUSGRAINABLE.COM](https://www.susgrainable.com)
#SUPPORT LOCAL



ASK 😊

IF YOU HAVE ANY
CONNECTIONS TO KEY
DECISION MAKERS AT ANY
OF THE LOCAL VANCOUVER
COFFEE SHOP CHAINS WE'D
LOVE AN INTRODUCTION!



Next Up

**Carolyn Bailey,
Quagrogen**

QUADROGEN



CORPORATE PRESENTATION

Presented for:

VEC + Vancity Circular Economy Webinar

Presented by:

Carolyn Bailey

Manager, Business Development

Quadrogen Power Systems, Inc.

October 1, 2020

Presentation Outline

- 1 Corporate Overview
- 2 Waste to Energy Market
- 3 Project Highlights and Applications



1. Corporate Overview

Company Overview



Quadrogen is a manufacturer of gas clean-up and upgrading systems

Our Vision: *A Greener Planet by Sustainable Energy*

Our Mission: *To provide our customers with world-class gas clean-up products and services to convert waste gases into clean energy*



Company Overview



OUR COMPANY

Founded in 2007, Quadrogen designs, builds, and installs high performance biogas clean-up and upgrading systems.



OUR MARKETS

Biogas clean-up and upgrading for municipal wastewater treatment plants, landfills, solid-separated organics, and agricultural wastes.



OUR PARTNERS, CUSTOMERS & USERS



2020- Ranked 3rd Fastest Growing Company in British Columbia



2014, 2015, 2016, 2017 & 2019 Ready to Rocket Winner by Rocket Builders



2013 BC Bioenergy Network / KÉTEP CFC Competition Winner

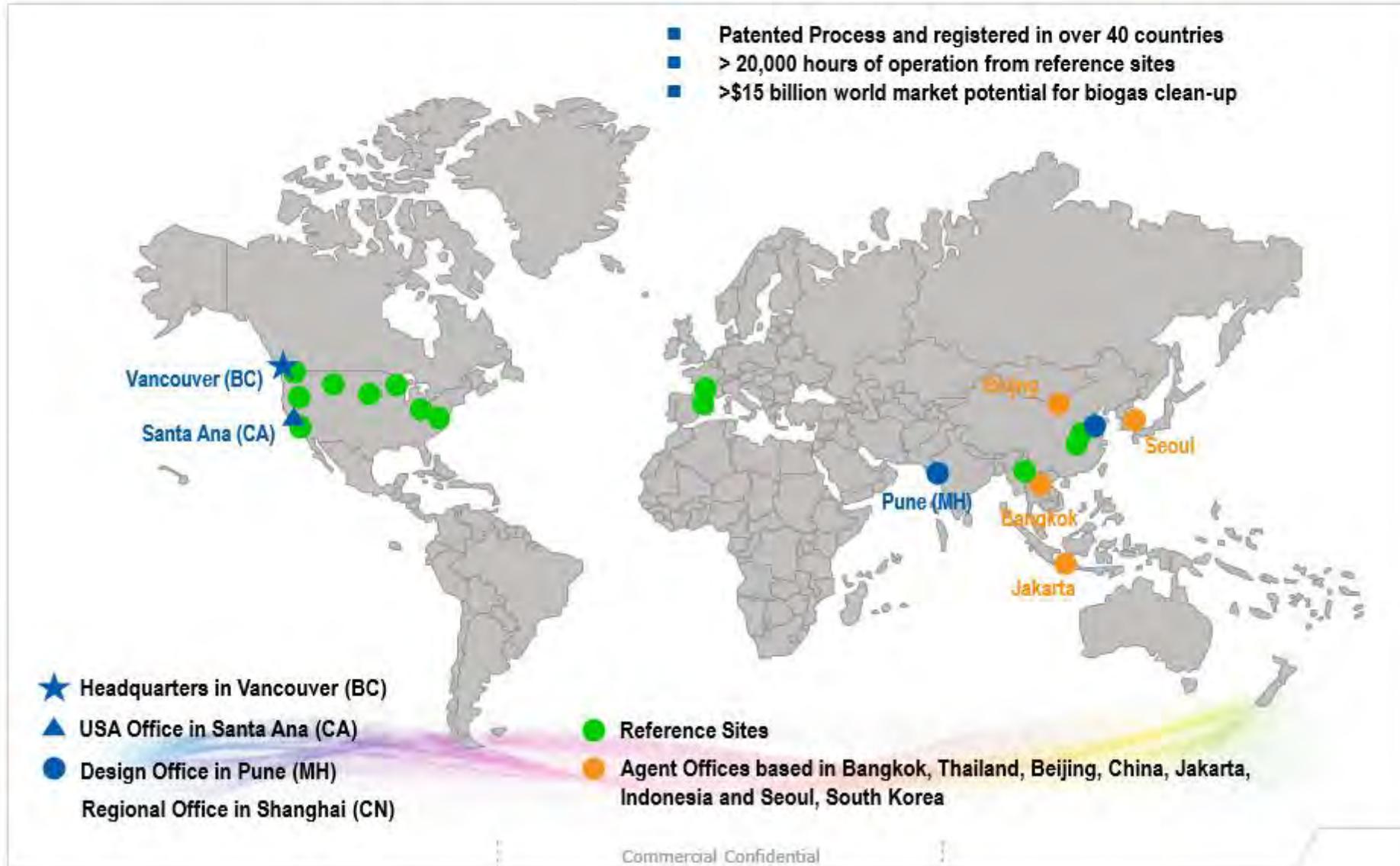


2012 Top 10 most Promising Start-ups by Corporate Knights

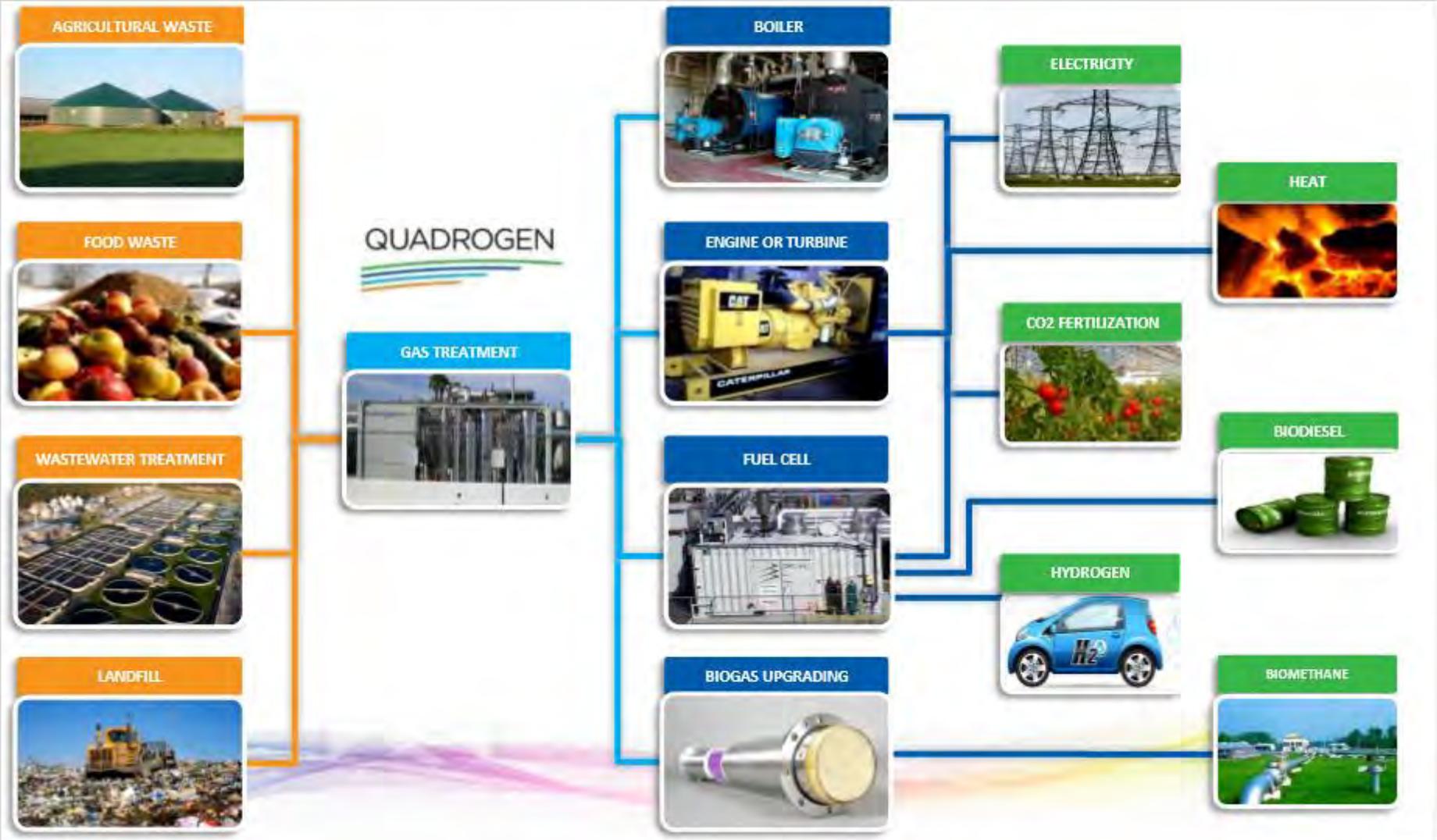


2012 Best Presenting Company – Early Stage Award by Canadian Financing Forum

Quadrogen Worldwide



Quadrogen in Biogas Value Chain



Project Highlights

ORANGE COUNTY SANITATION DISTRICT (CA, USA)

BIOGAS SOURCE: WWTP
COMMISSIONED DATE: June 2011
CLAIM TO FAME: 3 years of continuous operation exceeding all customer requirements.



AIR PRODUCTS

MICROSOFT DATA PROCESSING CENTRE (WY, USA)

BIOGAS SOURCE: WWTP
COMMISSIONED DATE: Dec 2014
CLAIM TO FAME: System performance meets the required ppbv levels of contaminants.



HEX-GENERATION AT VILLAGE FARMS (BC, CANADA)

BIOGAS SOURCE: Landfill
COMMISSIONED DATE: Q4 2019
CLAIM TO FAME: First of its kind, innovative hex-generation to produce power, heat, H2, RNG, biodiesel and CO2 for greenhouse.



Project Highlights



Project Highlights

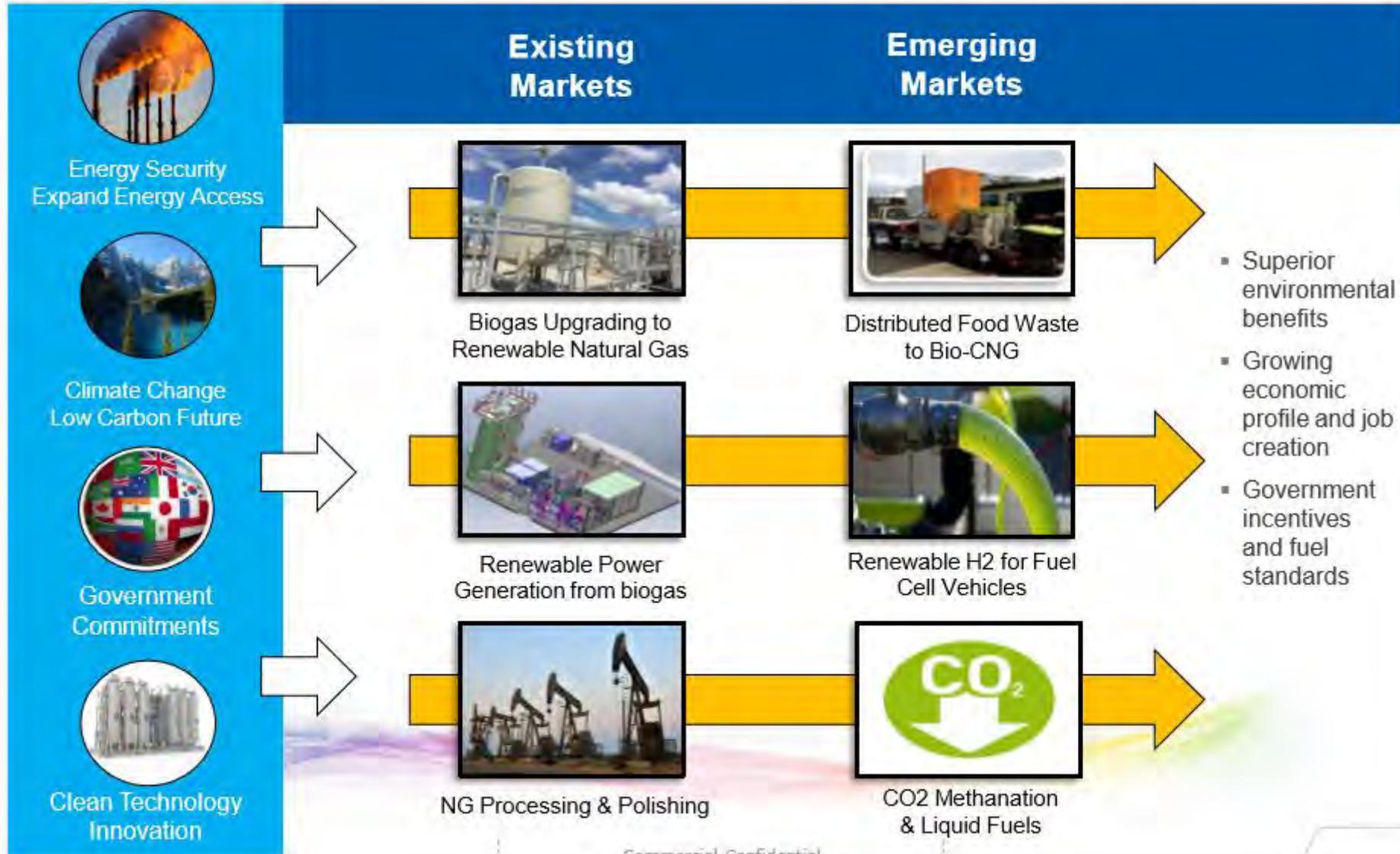


Project Highlights



2. Waste to Energy Market

Global Drivers - Waste to Energy



Driving Down Emissions with Renewable Natural Gas



Proven natural gas vehicle technology is 90% cleaner than current U.S. EPA standards. Fueling NGVs with biomethane (RNG) improves emissions even further. Waste-derived gas, captured and conditioned above ground, yields ultra-low, carbon-neutral, or even carbon-negative lifecycle emissions.

RNG Growth



2018 NGV Fuel Use

In 2018, **32%** of all on-road fuel used in natural gas vehicles was RNG

- Total NGV Fuel Use
645 Million GGE
- RNG Component
204 Million GGE



Over the last five years, RNG use as a transportation fuel has increased **577%**, displacing **7+ million tons** of carbon dioxide equivalent (CO₂e).

Note: GGE = gasoline gallon equivalent, EGE = ethanol gallon equivalent. EGE units are converted to GGE using a 0.67 multiplier (77,000 Btu/115,000 Btu). Total Natural Gas in Transportation Figure derived from U.S. EIA's Annual Energy Outlook (2019). RNG numbers derived from U.S. EPA RFS Reporting. Total greenhouse gas emissions and associated carbon dioxide equivalent (CO₂e) metric here identified using the California Air Resources Board's Low Carbon Fuel Standard carbon-intensity scores as well as the U.S. DOE's Argonne National Laboratory Heavy-Duty Vehicle Emission Calculator.

Global Drivers - Waste to Energy



HOW IS RNG USED?
RNG CAN BE USED TO POWER OR FUEL ANYTHING THAT RUNS ON NATURAL GAS

RNG



HOMES



MANUFACTURING



VEHICLES

SOURCES OF ORGANICS TO PRODUCE RNG



FOOD WASTE

66.5 MILLION
TONS/YEAR



WASTE WATER

17,000
FACILITIES



AGRICULTURAL WASTE

8,000
LARGE FARMS AND DAIRIES



LANDFILL GAS

1,750
LANDFILLS

The RNG Opportunity and Play

Rapidly growing market for biogas upgrading, as utilities make room for it in their renewable portfolios

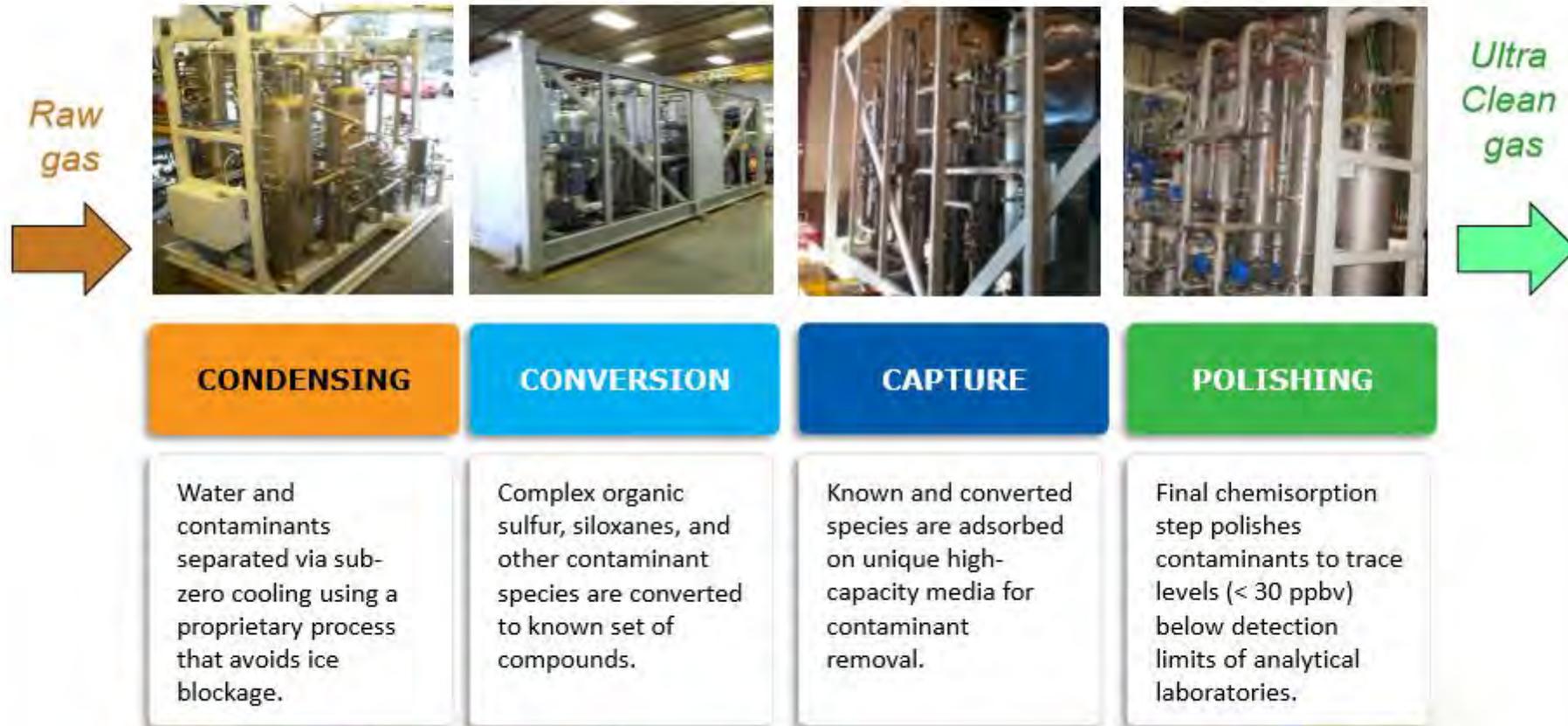
- Growing global demand, with Asia and Europe leading the way
- RIN Incentives in USA
- RNG Pricing in BC, Canada
- RNG as a transportation fuel blend

Going forward, as the “natural gas for vehicle” market picks up speed, we expect demand for renewable gas to increase significantly as a result of low carbon requirements



3. Project Highlights and Applications

C³P Technology



Hex-Generation at Village Farms



Biogas: Landfill

Location: Delta, BC

Feed Capacity: 650 NCMH

Equipment: Biogas Clean-up,
Biogas Upgrading

Starting Operation: Q4 2019

Soon Claim to Fame:

- 1) First of its kind, innovative hex-generation to produce power, heat, H₂, RNG, biodiesel and CO₂ for greenhouse.

Case Study: Sun Paper Mill



Biogas: WWTP

Location: Shandong, China

Feed Capacity: 1250 NCMH

Equipment: Biogas Upgrading

Started Operation: Oct 2017

Claim to Fame:

- 1) Removal of $<15\%$ N_2 in feed biogas to make pipeline natural gas
- 2) ROI is 20 months

Sun Paper Mill II



Sakol Energy PLC / RE Biofuels



Sakol Energy PLC / RE Biofuels



Biogas: WWTP, Tapioca Starch

Location: Birnam, Thailand

Feed Capacity: 800 NCMH

Equipment: Biogas Upgrading

Started Operation: Oct 2018

Soon Claim to Fame:

- 1) Removal of $<10\%$ N_2 in feed biogas to CNG specifications (95% CH_4)
- 2) Largest commercial waste biogas to CBG plant in Thailand

THANK YOU



Quadrogen Power Systems, Inc.

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Burnaby, BC

Canada V5J 0C7

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Phone: (604) 221 7170

Email: carolynbailey@quadrogen.com



Next Up

**Adam Corneil,
Unbuilders**

LOOP Construction Group
and its subsidiaries:

unbuilders

Heritage Lumber



A New Future For Old Buildings

Investor Information Guide

September 1, 2020

Introduction

Abundance of dedication, perseverance, experience & knowledge

Adam Corneil - Founder & CEO

- 19 years in sustainable construction
- Passive House certified; reclaimed wood & deconstruction expert
- Policy change advisor to City of Vancouver & other regions
- Demolition Committee Member, National Zero Waste Council

Unbuilders

- Established in 2018
- Deconstruct buildings to maximize the salvage and minimize waste

Heritage Lumber

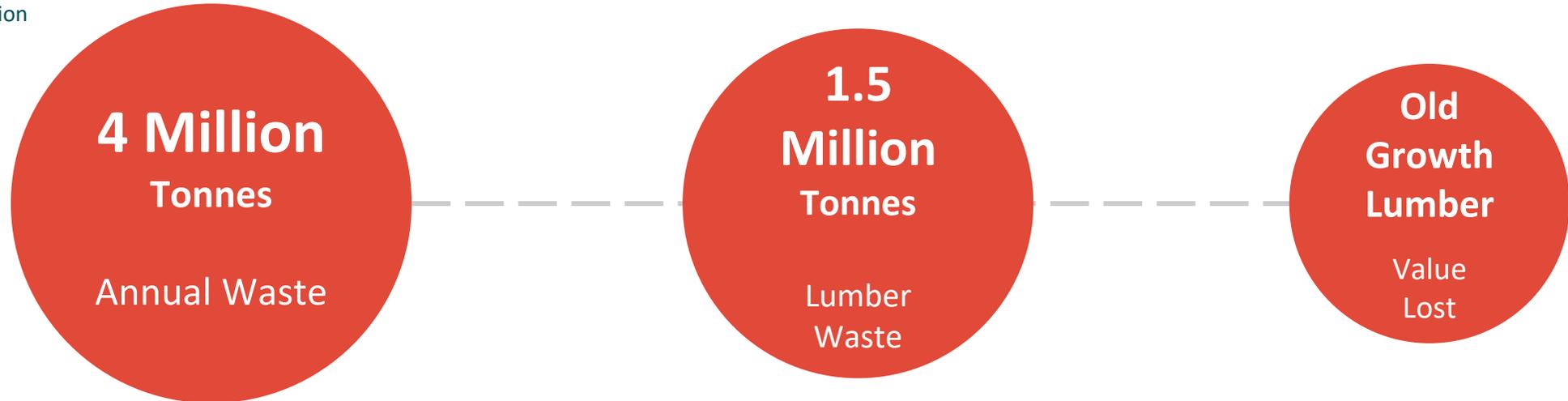
- Currently being branded for launch
- Reclaimed wood broker & product manufacturer



The Problem - Demolition & Disposal

Construction industry wastes valuable resources, incl. **premium old growth lumber**

Canadian Construction
Industry Figures:



Comparatively, Plastics Industry generates **2.8M**

100% of which can be **salvaged & recycled**

Retails for **4x more** than new lumber

Linear Construction Framework

Construction industry builds **single-use buildings** with **single-use products**

Typical Canadian
Construction &
Demolition:



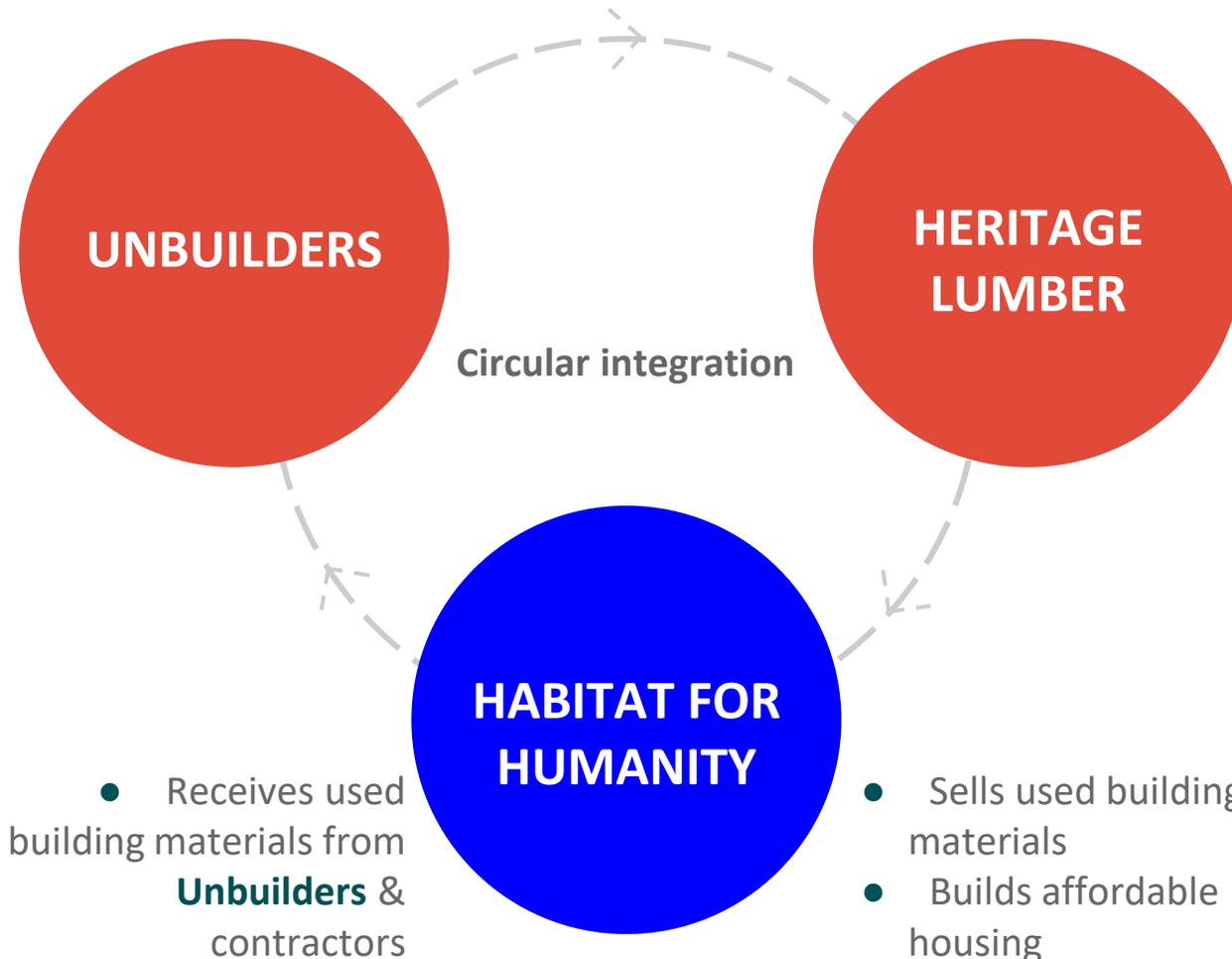
Traditional Demolition



Our Solution - Salvage & Reuse

Unbuilders deconstructs & salvages; Heritage Lumber resells & remanufactures; Habitat resells & builds affordable housing

- **First** dedicated deconstruction & salvage company in Canada
- **1,100 tonnes diverted** from disposal in 2019 (50 tonnes / project)
- Record setting **99% salvage & recycle** on single family home



- Receives used building materials from **Unbuilders** & contractors

- Sells used building materials
- Builds affordable housing

- Reclaimed wood brokerage
- Establishing **receiving yard** for wider industry
- **Innovative** reclaimed products - flooring, furniture, cladding, structure, etc.

Deconstruction



Partnerships

Collaborative, locally focused, rooted in the **Circular Economy**

The Rebuild Hub

- Funded by a \$250,000 grant from The City of Vancouver (COV), with more funding to come
- In partnership with Habitat for Humanity in Burnaby to receive salvaged materials from wider industry
- Educate and expand deconstruction sector



Partnerships

- Habitat for Humanity, The ReUse People of Canada
- Western Reclaimed Timber, Nickel Bros House Movers, Fleck Contracting, Wood Shop Worker's Coop
- Extensive industry network of builders, developers, woodworkers, policy-makers, architects & designers



Our Roots – Old Growth Lumber

Our company is harvesting more than a raw material, we are salvaging **our history**

Old Growth Lumber

- Trees **2000 years old** once covered our continent
- Used for framing buildings up until 1970
- **Scarce resource**, rarer with every demolition & will not grow back for generations
- Small amount left standing & no longer cut for dimensional lumber

Benefits of Old Growth Lumber

- **12 times less embodied carbon** & **3 times stronger** than new lumber¹
- Most sustainable building material on the market¹

Though our cities may be young, they were built with **ancient trees**



¹ – “Using Reclaimed Lumber and Wood Flooring in Construction: Measuring Environmental Impact Using Life-Cycle Inventory Analysis .” Proceedings of the International Convention of Society of Wood Science and Technology and United Nations Economic Commission for Europe – Timber Committee October 11-14, 2010, Geneva, Switzerland .

Our Lumber

Various sizes and types of reclaimed lumber

Types

- Species: Fir, Cedar, Oak (flooring)
- Types: based on how it was milled; all Old Growth:
 - Heritage (pre-1920) - true dimensional, rough on 4 sides
 - Antique (1920-1950) - large dimension, rough on 2 sides
 - Vintage (1950-1975) - modern dimension, smooth



Reclaimed Products

Reclaimed Wood Products & Finishes

Applications

- Flooring, wall/ceiling cladding, stairs, counters, tables, furniture, decks, siding, soffit, fascia

Product Types

- Wide plank flooring - solid & engineered





Future Outlook

Entire construction industry evolution required

Unbuild

- Make unbuilding the industry standard; Minimal buildings demolished
- Policy: deconstruction policy across Canada

Incorporate Used Building Materials

- Install used building materials in new construction & renovations
- Policy: reuse policy in tandem with deconstruction regulation

Low Impact Design

- Prefabrication, off-site construction, mass timber
- Design for disassembly - new buildings & renovations with reusable materials that are designed to come apart or adapt

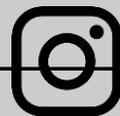


It's Not Waste,



It's Just Wasted.

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