A Deep Dive into Food Recovery Program Design:

A comprehensive discussion of the decision points involved in designing a food recovery and composting program

September 11, 2014

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Your Panel

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The University of Winnipeg | Campus Sustainability Office

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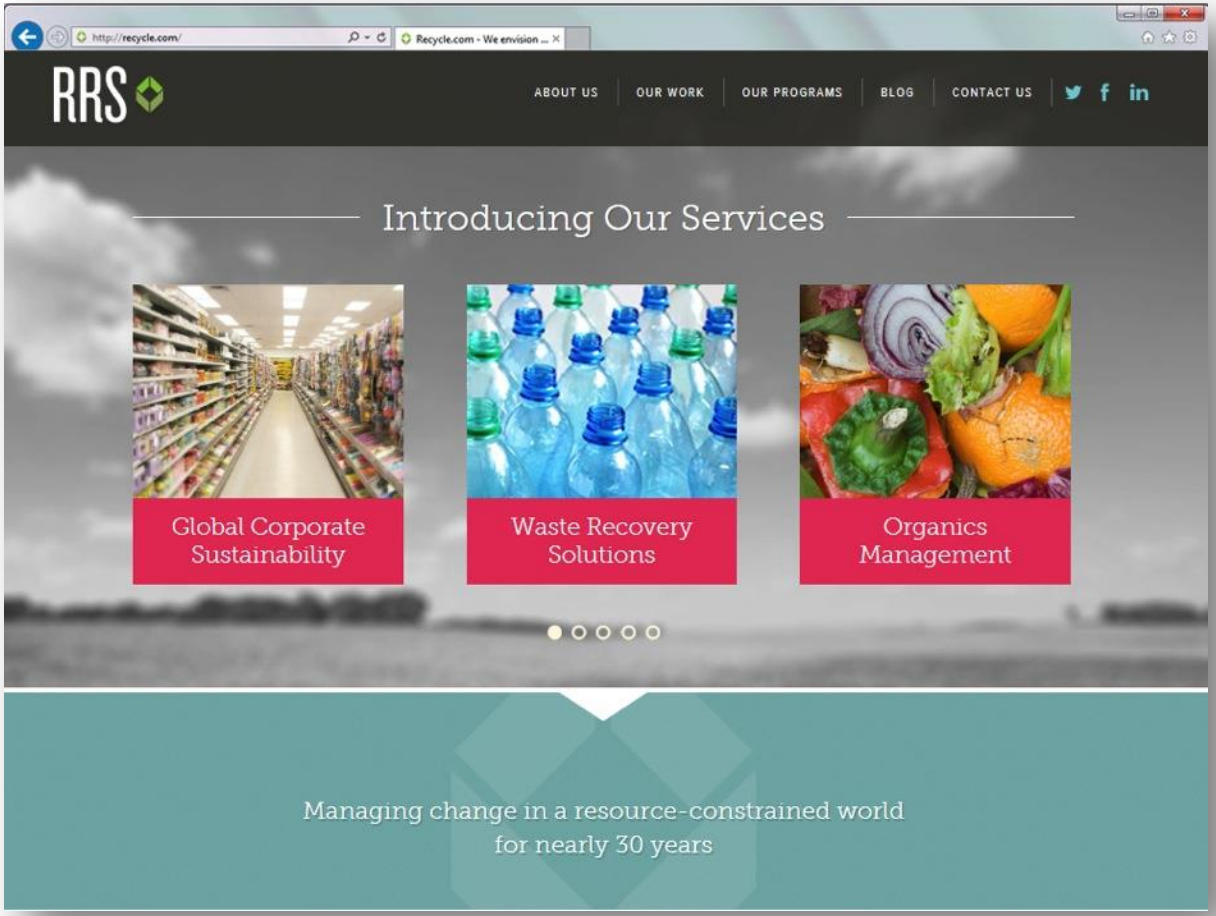
Food Waste Collection and Processing Options

Nicole Chardoul

September 11, 2014

Providing solutions to meet the resource management and waste recovery goals of clients and their supply chains



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The soil is the great connector of lives, the source and destination of all.

It is the healer and restorer and resurrector, by which
disease passes into health,
age into youth,
death into life.
Without proper care for it we can have no community,
because without proper care for it
we can have no life.

Wendell Berry

The Unsettling of America: Culture and Agriculture

Overview

- Why Focus on Food Waste
- Policy Supporting Food Waste Reduction and Composting
- Planning and Considerations
- Collection and Processing Options

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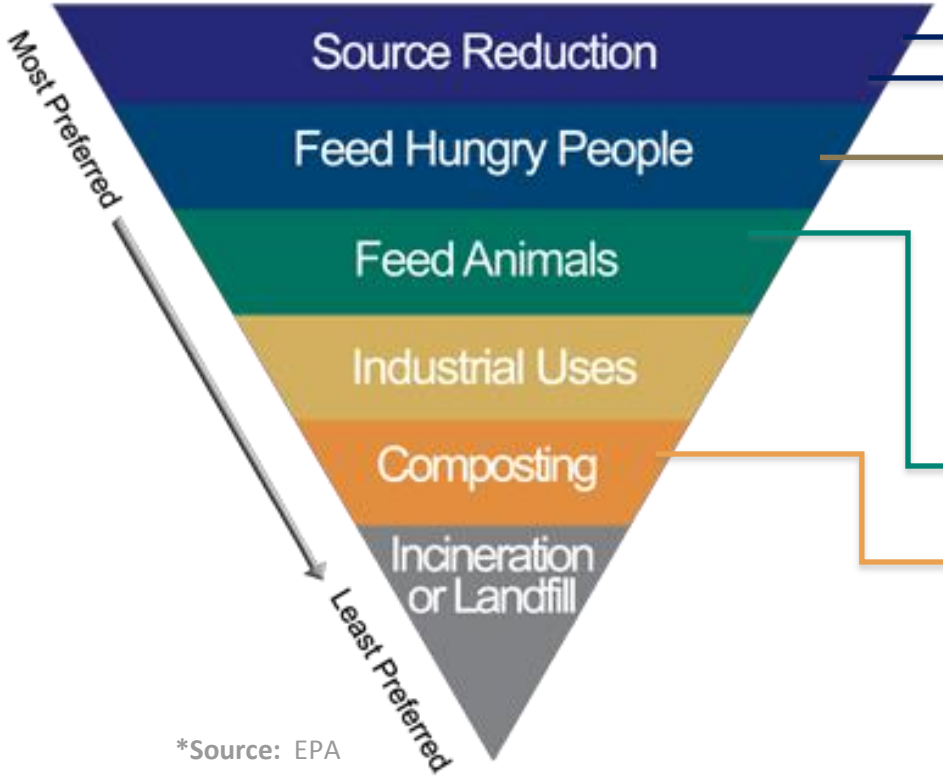
What Can Be Done?

How to Reduce Food Waste?
What can be done with Leftover Food Waste?



*Source: EPA

- Reduce purchasing volumes and packaging
- Educate on food preservation / expiration dates
- Donate to a food bank
- Send residuals to a hog farm
- Compost or anaerobic digestion

And remember to recycle the packaging!

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Benefits of Managing Food Waste

Source: Waste360
Source: Wall Street Journal

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The Numbers Behind Your Food Waste

Food waste represents **25%** of US methane emissions

1 ton Methane = 12 tons CO_2 Equivalent

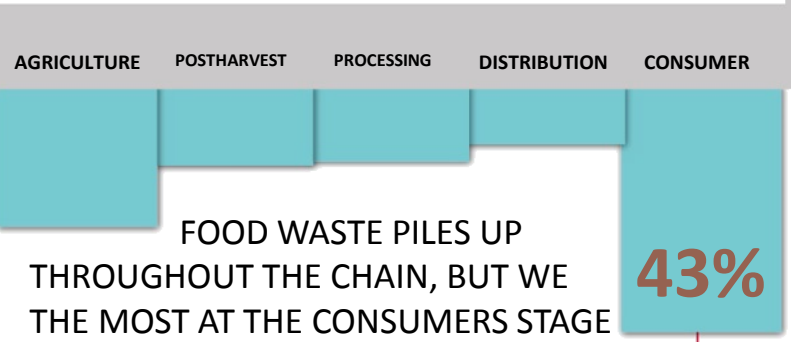
Sustainable waste management, reduction, and disposal practices are a valuable piece of the supply chain.

1/3 of MSW

is food-related waste

5 lbs

per day, per person



FOOD WASTE PILES UP THROUGHOUT THE CHAIN, BUT WE THE MOST AT THE CONSUMERS STAGE

Equivalent of **$165 Billion** Per Year

10% of institutional food purchases become waste

another **4%-10%** become waste before ever reaching the customer

In cafeterias, each meal tray generates **½ lb** of food waste.*

A closed system is a good place to start a zero waste campaign

Source: Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill; Author Dana Gunders, Natural Resources Defense Council

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Planning and Considerations

Material

- Policies & Regulations
- Volumes and Sources

Logistics

- Partnerships & Collaborators
- Collection & Hauling
- Staffing
- Contamination
- Location & Space
- Available Technologies

Financial

- Capital Costs
- Operating Costs
- End Use / Markets

Education

- Training
- Leadership & Staff Buy-In
- Reduction & Diversion

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Regulatory Overview / Trends

National

The State of Connecticut requires composting of food waste for all businesses that generate at least 2 tons/week of source separated organics, and within 20 miles of a composting facility.

The State of Vermont requires source separation of FW and management according to FW hierarchy. Phase-in beginning with entities producing 2T/week or more as of July 2014.

State of Massachusetts requires diversion of food waste from landfill for all businesses that generate at least 1 ton/week of source separated organics.

Regional

County Food Policy Councils and Solid Waste Plans focusing on local food and zero waste campaigns and special events, as well as supporting improved composting infrastructure.

Local

City Solid Waste Resource Plans targeting 40% or more waste diversion rates and expansion of food waste composting and zero waste efforts.

University Sustainability Plans include waste reduction goals and targeting high landfill diversion rates.

Food Waste Diversion and Food Waste Packaging policies are a mechanism for zero waste and diversion goals

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Material

Policies Drive Progress

Policies can encourage composting and zero waste programs

Guidelines/Incentive System

- Requirements for take-out containers (reusable, compostable, recyclable)
- Green Purchasing / Product Bans
- Local Purchasing
- Purchasing Cooperatives

Composting Infrastructure

- Year-round compostables collection
- Local composting facilities
- Collaboration with farms

Zero Waste Collaboration

- Sports events
- Municipal events
- Public space composting
- Waste-free school lunches

Public Education

- Food waste prevention campaign
- Home / Onsite composting
- Food Donation
- Farm to Table / Healthy Food in Schools and Healthcare

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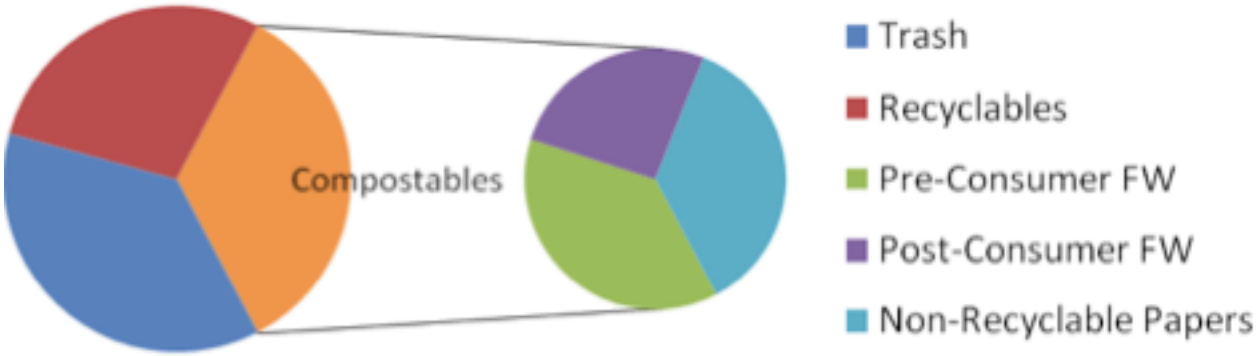
Volumes and Sources

- Assess and Pilot to collect data on participation and volumes
- Evaluate volumes of compostable materials and sources
  - Food waste, yard waste, foodservice ware, paper towel, animal bedding
  - From kitchens, cafeterias, lounges, to-go kiosks and cafes, campus grounds and landscaping, animal research labs



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Volumes and Sources

Example Food Waste Projections

Assumptions		Facility	Cafeteria transactions per day	Without bioware Lbs /day	With bioware Lbs /day
Participation rate	80%	Residence Hall 1	600	168	288
Cafeteria transaction lbs	0.35	Residence Hall 2	1300	364	624
Cafeteria lbs w/bioware	0.60	Residence Hall 3	168	47	81
Density (lbs/CY)	600	**TOTAL**		**579**	**993**

Volumes and Sources

Example Compost Recipes if composting on-site

	Weight (tons/year)	Volume (CY)	Nitrogen (dry weight %)	C:N (dry weight)	Moisture Content	Bulk Density
Expected Food Waste	87	290	3.1%	15	70%	600
Expected Yard Waste	56	321	2.5%	20	50%	350
Wood Chips	50	250	0.1%	600	50.0%	400
Corrugated Cardboard	5	100	0.1%	550	8.0%	100

C:N	28.37	Moisture Content	58%
Desired Carbon Ratio is	30:1	Desired Moisture Content is	55% to 60%

Other Food Waste Assessment Tools:
http://www.epa.gov/foodrecovery/tools/index.htm

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Partnerships/Collaborators

Education and Enforcement

- Funding for education, oversight
- Development and maintenance of resources

Foodservice Vendors

- Foodservice providers (internal/external)
- Recyclables versus compostables

Policies and Regulations

- EPP and zero waste policies for reusables, compostables and recyclables
- Planning/Zoning
- Health department rules for reusable containers
- Use of food waste as animal feed (USDA)

Infrastructure / Space

- Space for new waste streams and containers
- Compost sites accepting food waste
- Transportation/Haulers
- Compost markets

Food Waste Sources

- Residence Hall Cafeterias (pre- and/or post-consumer)
- Take-out cafés
- Research lab animal bedding
- Athletics
- Special events

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In-Building Collection and Infrastructure Considerations

- Pre-Consumer / Food Prep Waste
  - From prep station directly into Brute barrel or Slim Jim, lined or unlined
  - Can run through pulper
- Bins for Post-Consumer Food Waste
- Tray and Dishwashers
- Signage
- Staffing

Source: Resource Recycling Systems Inc. Bronson Hospital, MI

Source: City of Ann Arbor

Source: Cornell University

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Dewatering/Digester Option

- $20 to $50/ton
- 20 – 500 lbs/day
- 24 hours, followed by composting and curing for 30 days
- Pulper and Digester: $25,000-$50,000
- Maintenance cost and odor considerations

Dock Collection and Upgrades

- Containers rolled to dock
  - Cart-swap program
  - Emptied into compactor, compacting truck or dumpster lined with cardboard
  - Can be emptied / transported into on-site in-vessel composter
- Dock Modifications
  - Dumpsters
  - Compactors / Electrical
  - Dock / Railings

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On-Site Space and Site Restrictions

- Space and site constraints are the primary factor dictating in-building and dock containers, and composting method
  - Food waste hauled to an off-site composting facility
  - On-site farm for windrows/aerated static piles
  - On-site in-vessel unit

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Transportation

- Off-site processing requires transportation to the composting site or local farm
- Cost varies, but usually is more cost effective than landfilling if site is local
- Composting sites can work with haulers to provide this service
- Collaborate with other food waste generators, haulers, farmers, processors

Source: Resource Recycling Systems Inc.

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Financial EXAMPLE

Avoided Food Waste

Operational Costs
Education/Outreach –"How To"

Environmental Cost/(Benefit)

For every ton of food waste avoided, almost 2.0 tons of CO2e are avoided

Avoided Disposal
Disposal cost estimate based on $50/ton tipping fee

Operating Costs

Education Program	$19.0/ton
Avoided Disposal	$(50.0)/ton
	$(31.0)/ton

Environmental Costs/(Benefits)

Avoided Transport	$(36.0)/ton
Avoided Landfill	$(40.0)/ton
	$(76.0)/ton

Capital Costs **None**

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Financial EXAMPLE

Small Scale On-site Composting

Source: The Green Team

Capital Costs
Approx. $25,000 ($50,000 w/shredder)
Finished Compost in 2 to 4 months

Operational Costs
Education/Outreach –"How To"
Small operational costs

Environmental Cost/(Benefit)
Avoided transport costs and landfill methane emissions based on $28/ton CO2e

Avoided Disposal
Residential disposal cost estimate based on $50/ton tipping fee

Operating Costs

Education Program	$19.0/ton
Marginal Coll. And Op. Costs	$20.0/ton
Avoided	$(50.0)/ton
	$(31.0)/ton

Environmental Costs/(Benefits)

Avoided Transport	$(36.0)/ton
Carbon Emissions	$25.0/ton
Avoided Landfill	$(40.0)/ton
	$(51.0)/ton

Capital Costs

Bin Purchase	$57.5/ton
	$57.5/ton

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Financial | EXAMPLE

Source Separated Collection

Capital Costs
Site construction (10 yr amort)

Operational Costs
Collection, education and transfer to compost site

Environmental Cost/(Benefit)
Carbon cost of collection vehicles and transfer based on $28.24/ton CO2e

Operating Costs

Transfer Tipfees	$15.0/ton
Education	$18.5/ton
Collection Costs	$450.0/ton
	$483.5/ton

Environmental Costs/(Benefits)

Collection/Transfer	$10.8/ton
Avoided Landfill	$(40.0)/ton
	$(29.2)/ton

Capital Costs

Site Mods	$59.9/ton
Truck Modifications	$165.9/ton
Carts/Bins	$149.5/ton
	$375.3/ton

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Financial EXAMPLE

Co-Collection With Yard Waste

Additional Infrastructure
Site Modifications (10 yr amort)

Operational Costs
Education/Outreach, additional stop time, collection costs, transfer costs and tip fees to site

Environmental Cost/(Benefit)
Carbon cost of collection and transfer based on $28.24/ton CO2e

Operating Costs

Education Program	$19.0/ton
Marginal Coll. Costs	$141.0/ton
	$160/ton

Environmental Costs/(Benefits)

Collection/Transfer	$10.8/ton
Avoided Landfill	$(40.0)/ton
	$(29.2)/ton

Capital Costs

Site Mods	$ 64.0/ton
Cart Costs	$146.9/ton
	$**210.9/ton**

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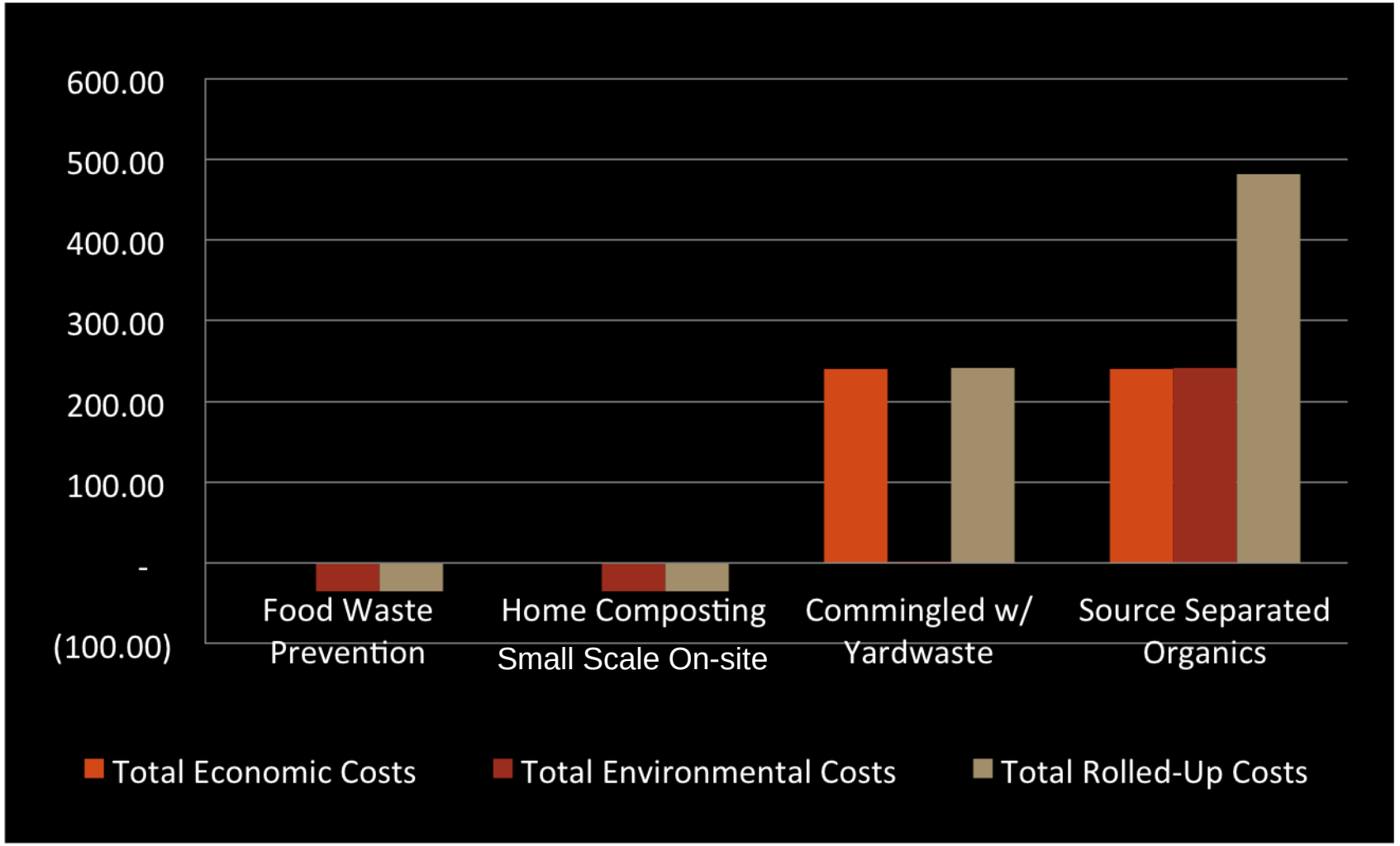
Financial EXAMPLE

Collection Performance



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Financial EXAMPLE

Windrow Composting

Capital Costs
Assume use of existing facility

Operational Costs
Full marginal operating costs based on local tip fees. Avoided landfill tip fees.

Environmental Cost/(Benefit)
Site operations and emissions and avoided landfill emissions based on $28.24/ton CO2e

Operating Parameters
10 to 200 tons/day
4 to 12 months to compost
1 acre of windrows per 1,000 tons of material

Operating Costs

Labor/Maintenance	$12.0/ton
Operating Costs	$ 5.0/ton
Avoided Landfill Fees	$(50.0)/ton
	$(33.0)/ton

Environmental Costs/(Benefits)

Site Operations	$57.1/ton
Landfill Emissions	$(39.6)/ton
Fertilizer Replacement	$(84.1)/ton
	$(64.6)/ton

Capital Costs

Site improvements	$3.0/ton
Equipment Purchase	$ 3.0/ton
	$**6.0/ton**

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Financial EXAMPLE

Aerated Static Pile

Source: Stopwaste.org

Capital Costs
Assume use of existing facility

Operational Costs
Full marginal operating costs based on local tip fees. Avoided landfill tip fees.

Environmental Cost/(Benefit)
Site operations and emissions and avoided landfill emissions based on $28.24/ton CO2e

Operating Parameters
10 to 200 tons/day
4 to 12 months to compost

Operating Costs

Labor/Maintenance	$11.0/ton
Operating Costs	$ 5.0/ton
Avoided Landfill Fees	$(50.0)/ton
	$(32.0)/ton

Environmental Costs/(Benefits)

Site Operations	$57.1/ton
Landfill Emissions	$39.6)/ton
Fertilizer Replacement	$(84.1)/ton
	$(64.6)/ton

Capital Costs

Site improvements	$ 4.0/ton
Equipment Purchase	$ 3.0/ton
	$**7.0/ton**

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Financial EXAMPLE

Covered Aerated Static Pile (ASP)

Capital Costs

Assume use of existing facility needing Additional equipment and building costs

Operational Costs

Full marginal operating costs based on local tip fees. Avoided landfill tip fees

Environmental Cost/(Benefit)

Site operations and emissions and avoided landfill emissions based on $28.24/ton CO2e

Operating Parameters

0.5 to 800 tons/day

4 to 6 months

Operating Costs

Labor/Maintenance	$14.0ton
Operating Costs	$ 5.0/ton
Avoided Landfill Fees	$(50.0)/ton
	$(31.0)/ton

Environmental Costs/(Benefits)

Site Operations	$65.1/ton
Landfill Emissions	$(39.6)/ton
Fertilizer Replacement	$(84.1)/ton
	$(58.6)/ton

Capital Costs

Site and Buildings	$ 4.8/ton
Equipment Purchase	$ 7.2/ton
	$**12.0/ton**

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Financial | EXAMPLE

In-Vessel Composting

Source: Hot Rot Composting Systems


Source: Engineered Compost Systems

Capital Costs
Brand new facility
Specialized equipment purchase

Operational Costs
Full operating costs based on real costs of operation. Avoided landfill tip fees.

Environmental Cost/(Benefit)
Facility operations and emissions and avoided landfill emissions based on $28.24/ton CO_2e

Operating Parameters
2 to 800 tons/day
10 days to 4 months

Operating Costs

Labor/Maintenance	$ 9.0/ton
Operating Costs	$ 4.0/ton
Avoided Landfill Fees	$(50.0)/ton
	$(37.0)/ton

Environmental Costs/(Benefits)

Site Operations	$82.1/ton
Landfill Emissions	$(39.6)/ton
Fertilizer Replacement	$(84.1)/ton
	$(41.6)/ton

Capital Costs

Site and Buildings	$ 3.0/ton
Equipment Purchase	$32.0/ton
	$**35.0/ton**

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Financial EXAMPLE

Anaerobic Digestion (AD)

Source: Univ of California at Davis

- $50 to $150/ton
- 500 to 250,000 gals/day
- 5 tons/day food waste minimum
- 2 to 3 months
- Methane production a bonus! Potentially use with a CHP to generate electricity
- Requires post-digestion composting to finish and cure product
- High capital costs requires partnerships with municipalities, commercial establishments and other institutions (community college, hospitals)

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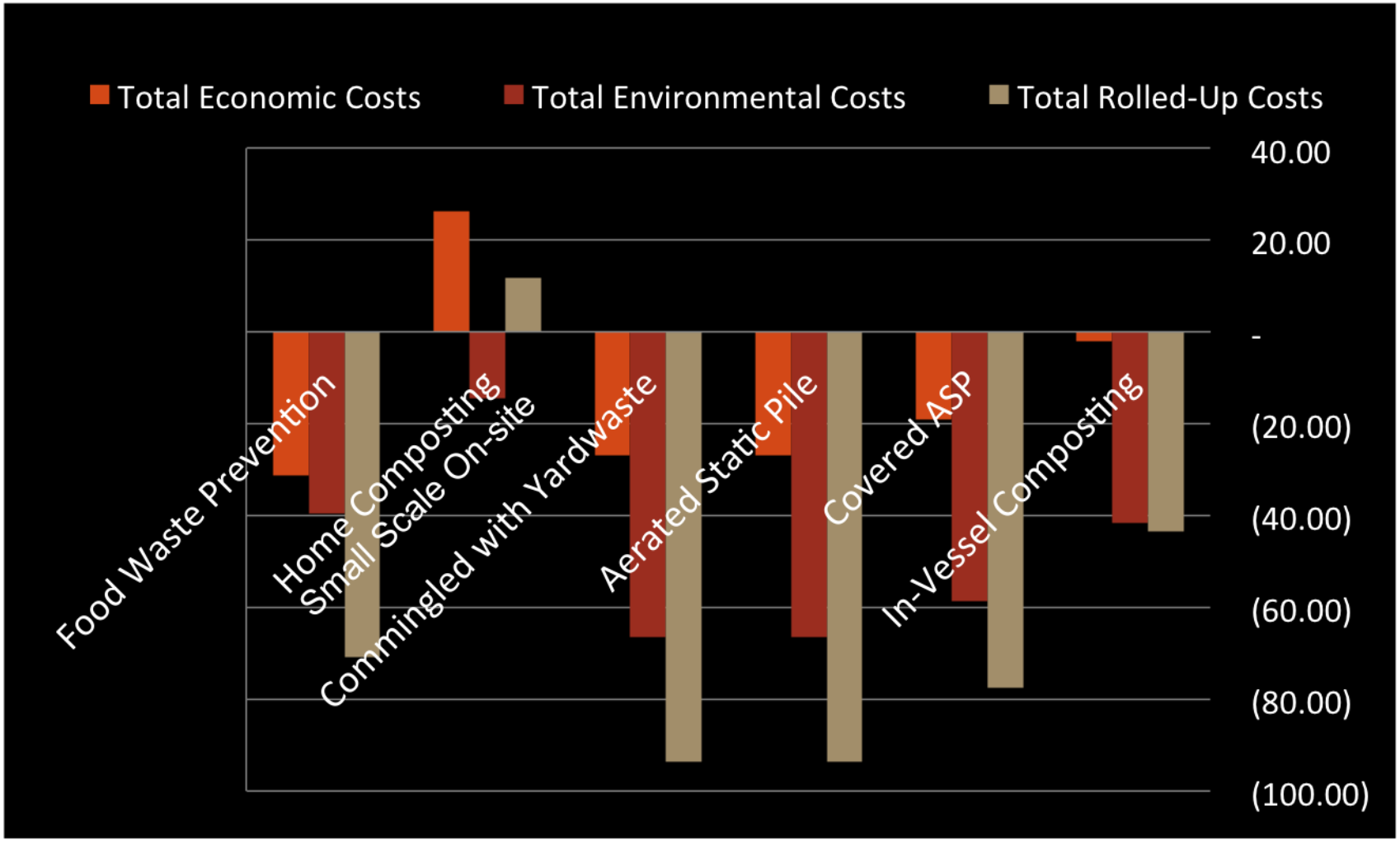
Financial EXAMPLE

Processing Performance



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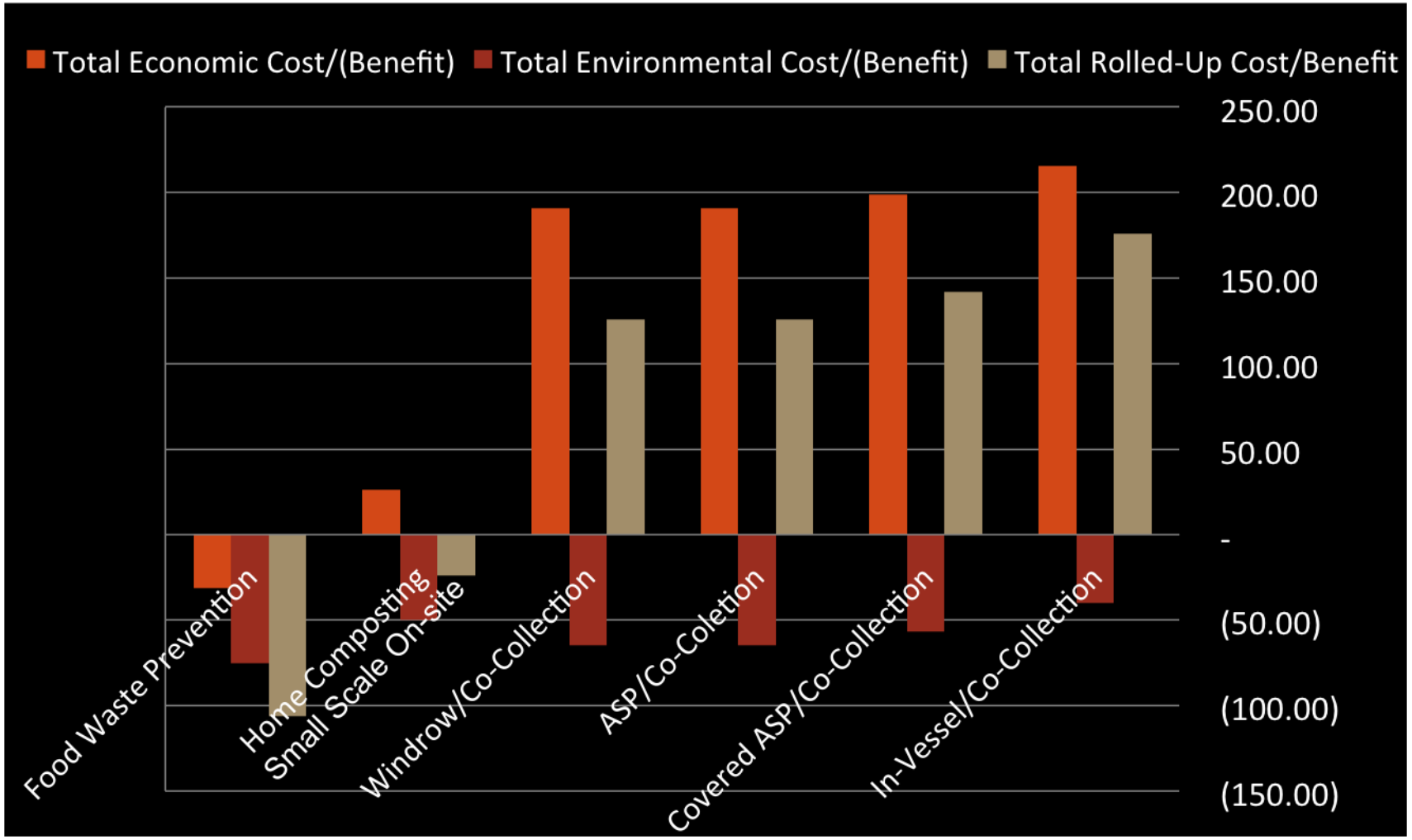
Financial EXAMPLE

Overall System Performance



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Create a Business Case

- Develop a business case analysis to consider all options, including compost markets
- Review capital and operating costs specific to your location and staffing
- Make the case for leadership and employee buy-in
  - Financials / pay-back
  - Sustainability /diversion goals

Develop a Local Market and Community Awareness

- Use compost to grow local, healthy food
- Use as mulch in facility's landscaping
- Provide to employees to take home

Decentralized, local systems
support local farmers,
create local jobs and
promote community awareness

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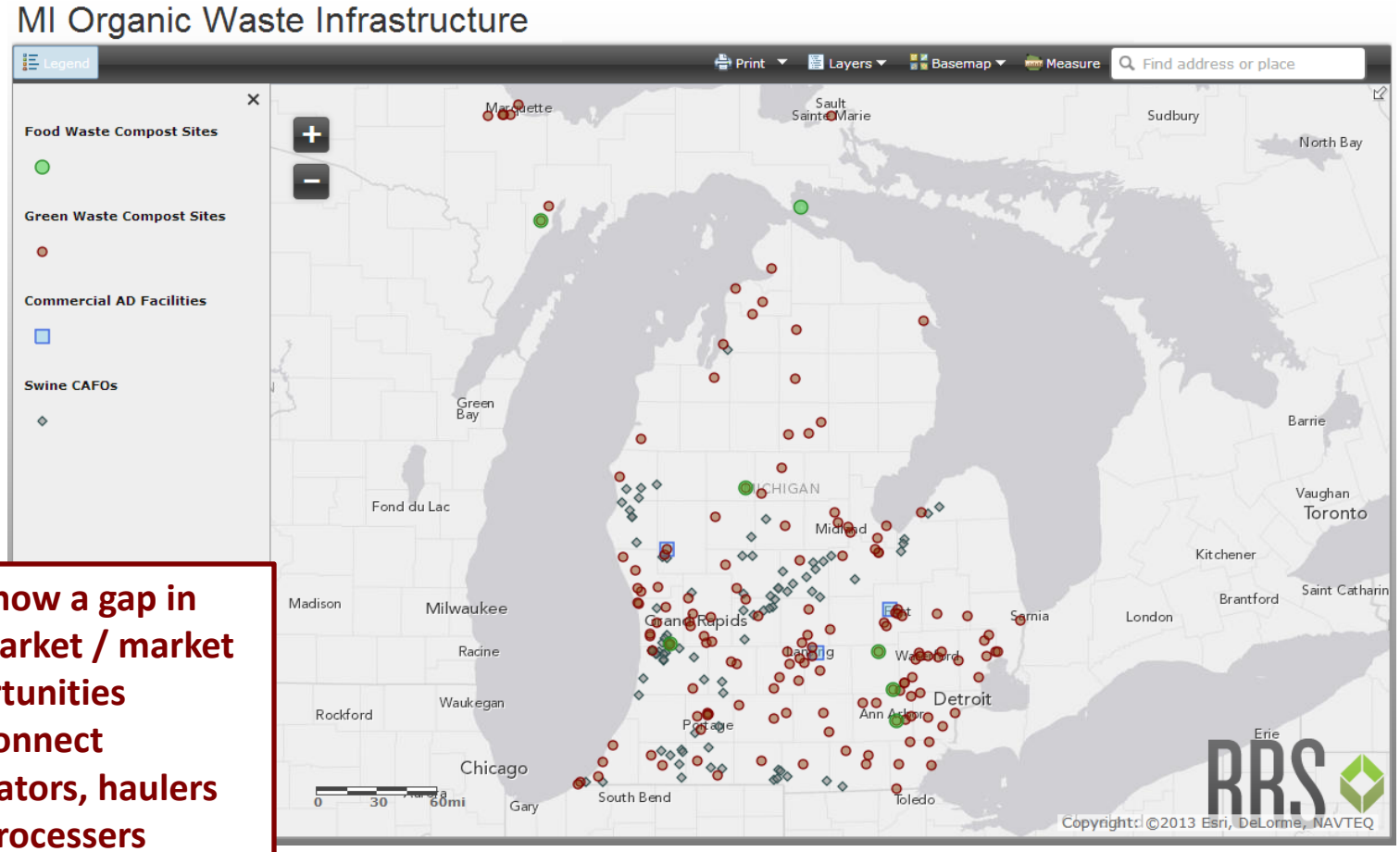
Using Technology to Educate and Create Solutions for Diversion



- **Can show a gap in the market / market opportunities**
- **Can connect generators, haulers and processers**

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Training and Outreach

- Cafeteria users / customers
- Kitchen staff and practices
- Operations / housekeeping staff
- Lined vs. unlined carts
- Compostable ‘to-go’ containers
- Equipment (disposals, pulpers)
- Transportation / Dock operations
- Minimizing odors
- Alignment with Sustainability Goals

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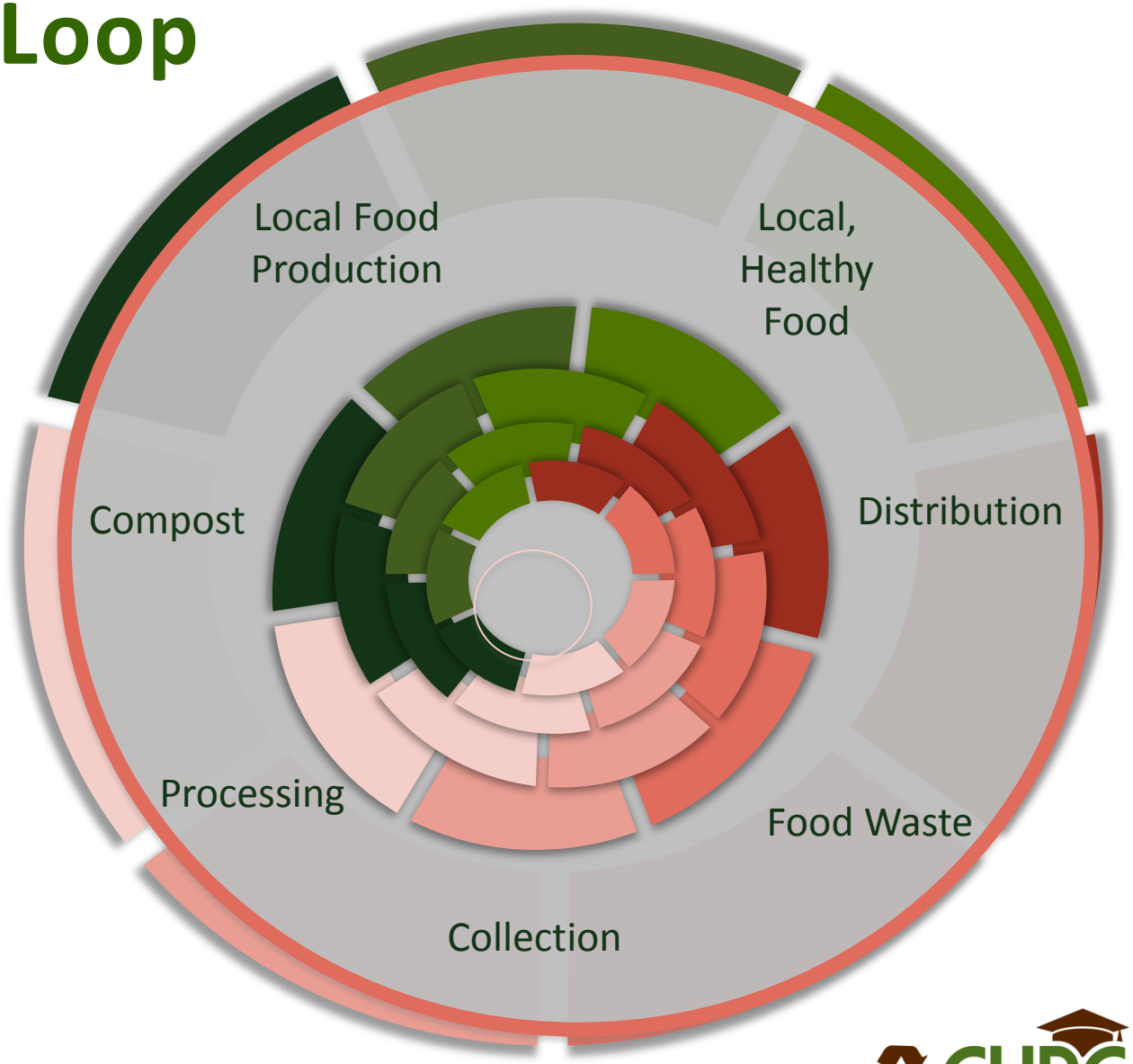
Closing the Loop

Be a leader in and support the growing trend of zero waste, sustainability and local, healthy food



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Thank you!

Nicole Chardoul, P.E.

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Composting at The University of Winnipeg

Melissa Dupuis

Sustainability Officer

September 11 2014

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The University of Winnipeg

- Downtown campus
- 10,000 students & 800 staff/faculty
- Winter city
- No municipal organic waste program

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Composting Overview

- Pre & post-consumer program started in 2007
- 1st stage: Food service areas only
- Campus growth = opportunity for bins throughout campus

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Partners: Institutional Commitment

THE UNIVERSITY OF WINNIPEG

NEWS RELEASE

March 4, 2005
For Immediate Release

Going Green:
University of Winnipeg To Create
Kyoto Compliance Task Force

WINNIPEG—The University of Winnipeg will announce its intention to join a growing number of educational institutions committed to embracing sustainable practices and policies that embody the spirit of the Kyoto accord.

At 1:00 p.m. on Saturday, March 5, 2005 at the **University's OmniTRAX/Broe QUEST: North** conference, **President Lloyd Axworthy** will call for the development of a comprehensive sustainability plan for the campus. Axworthy, on behalf of The University of Winnipeg, will also announce a plan to encourage all members of the Association of Universities and Colleges in

Axworthy Calls for Fully Sustainable Campus

UWinnipeg President releases Campus Development Plan and challenges all to make 'four dimensions of sustainability' integral to learning, research, university operations.

FOR IMMEDIATE RELEASE - SEPTEMBER 13, 2007

WINNIPEG, MB - Dr. Lloyd Axworthy, President & Vice-Chancellor of The University of Winnipeg, today released UWinnipeg's Campus Development Plan and challenged students, faculty, staff and community members to develop a fully sustainable campus - one that meets the needs of the "four dimensions of sustainability: ecological, economical, social and cultural."

Axworthy made his remarks in his State of the University Address, held this morning before a capacity crowd in the newly-renovated Convocation Hall. The address served as the kickoff event to the university's 40th Anniversary Homecoming & Reunion Weekend that runs through this Sunday, and coincides with the public release of the University's Campus Development Plan.

"Our ultimate goal is to create a truly sustainable campus," Axworthy said, "a campus that acts upon its local and global responsibilities to protect and enhance the health and well-being of humans and ecosystems. In doing so, we will meet the needs of current generations in such a way that ensures that future generations can meet their needs."

The 45-minute presentation was a visionary speech by Axworthy - one that blended the institution's accomplishments of the past with its goals for the future. He reflected on the areas where the university has already established itself as a leader, such as the influential Institute of Urban Studies, the interdisciplinary Environmental Studies program and the innovative Student-Designed Majors.

Looking forward, Axworthy stressed the need for action on the recent recommendations of the Access Task Force to make post-secondary education more available to people who normally do not attend university. He called for solution-driven research to address our most pressing sustainability problems and to create a "participatory culture" in educational programming with no barriers to artistic expression and civic engagement.

He also addressed the task of fulfilling the goals of the university's recently-announced graduate studies programs, the benefits of the proposed Science Complex, the need for continued dialogue and partnerships with the community, and the establishment of a Model School of Science for inner-city children situated within the proposed Richardson College for the Environment.

"The strategy I am proposing is large," Axworthy said, "however, the vision of an ecologically, economically and socially healthy university community with a thriving culture of cooperation and a notable ability to adapt to the demands of the coming age is the lens through which all activity undertaken on campus must be taken.

"This comes down to our own personal human development," he continued, "a notion embedded in the idea of sustainable development. Our intention here is to support our students, faculty, staff, administrators and neighbours to continuously develop individually so that we might continually develop as an institution."

To provide the road map for the future, UWinnipeg released its Campus Development Plan as a working document for further discussion and review. The Campus Development Plan - which is the culmination of campus and community consultations that began in 2004 and continued through 2005 and 2006 - proposes a holistic approach to campus and community development that breaks down barriers between the university and the neighborhood.

Key proposed projects, many of which are already underway, include an enhanced theatre, a new fitness centre open to the campus and community, affordable mixed housing and an expanded daycare to benefit both University of Winnipeg students and members of the community.

Axworthy added that the group that developed the plan will be going back to the community for further consultation and follow-up in the near future.

Excerpts from Dr. Axworthy's address may be seen at The University of Winnipeg's website, at: http://www.uwinnipeg.ca/index/axworthy-address-excerpts-070913. The full text of his address may be viewed at http://www.uwinnipeg.ca/index/axworthy-address-070913. The complete Campus Development Plan may be seen, at: http://www.uwinnipeg.ca/index/campus-development-plan.

University of Winnipeg students have pushed hard on the issue of sustainability, and we've risen to their challenge calling for this University to become a leader in sustainable practices and policies.

-President & Vice-Chancellor Lloyd Axworthy, March 2005

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Partners: Food Services

- Diversity Food Services
- 3 locations on campus
- Offers both reusable and compostable take-out containers.

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Partners: Compost Collection

- The Forks – a year round meeting place in downtown Winnipeg
- Target Zero commitments
- Biovator system
- Pick up compost from UWinnipeg

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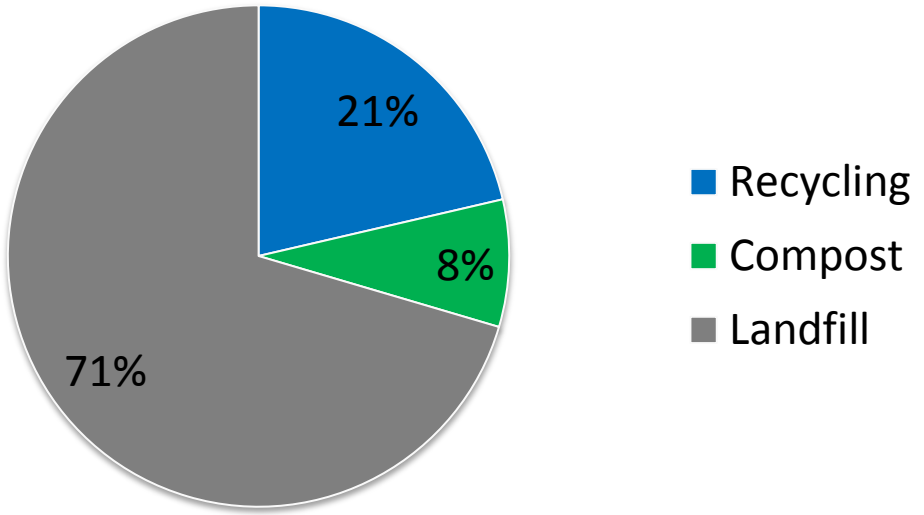
Challenges: Collection & Reporting

- Our current goal is 65% waste diversion by 2015
- Data collection and service providers problems



UWinnipeg's Waste Profile for FY2013, including waste sent for recycling, compost and disposal in the landfill.

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Challenges: Bags

- Much more expensive than garbage/recycling bags
- More prone to ripping

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Challenges: Sorting

Bins get moved, removed, and not replaced, leaving signs pointing to nowhere…

… and bins with no signs telling people what goes where.

- Cleaning staff
- Students/Staff
- External food service providers

Bin sizes around campus do not match the proportion that each waste stream

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Solutions

- Student educators
- New bins
- Cleaning staff education
- Consistent imagery/icons across campus

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Thank you.

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THE UNIVERSITY OF WINNIPEG | Campus Sustainability Office

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An in-depth look at the business decisions campuses are making to improve operational efficiency

Thursday, November 13
1 PM – 2:30 PM ET

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