Trash to Treasure: Climate Solutions Through a Local Solid Waste System

Dereth Glance, Executive Director

Onondaga County Resource Recovery Agency

American Academy of Environmental Engineers & Scientists
Environmental Symposium - Cazenovia, NY
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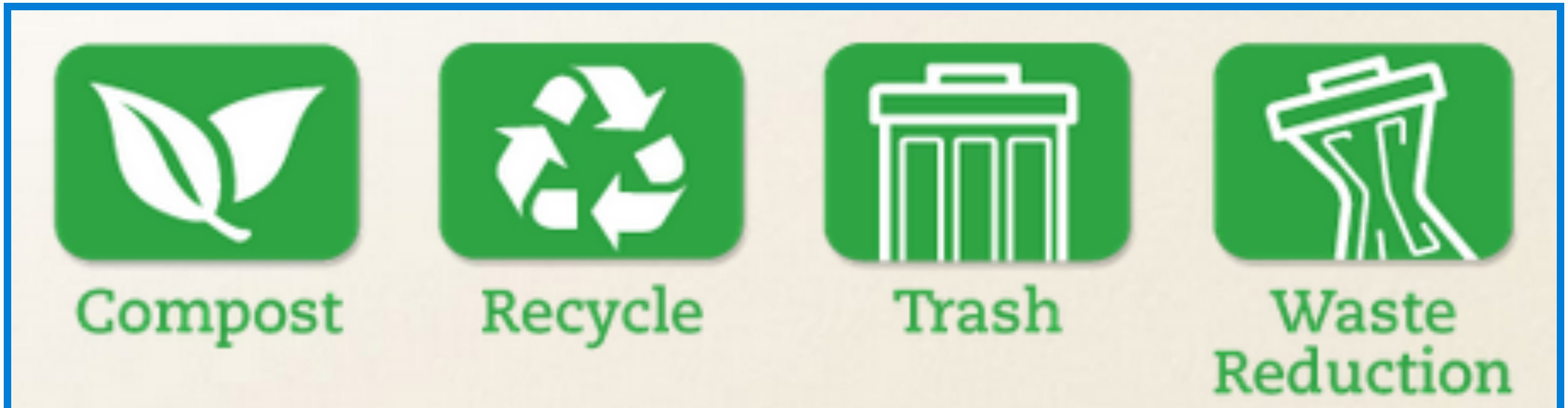
OCRRA serves our community by providing a comprehensive solid waste management system that is environmentally, socially, and fiscally sustainable.

System Features

- Recycling Services and Education
  - ✓ Residential and Commercial Recycling
  - ✓ Environmental Programs (HHW, shredding, mercury, batteries, textiles, litter cleanup
  - ✓ Extensive Public Education
- Trash Disposal (Transfer Stations & WTE Facility)
- Organics Management (Yard & Food Waste)



Popular Environmental Services

- **Blue Bin Distribution**
- **Household Hazardous Waste Collections**
- **Mercury Thermometer Exchange**
  (Partnership with Covanta)
- **Battery & Fluorescent Bulb Recycling**
  (Mercury removal)
- **Earth Day Litter Cleanup**
  (Over 2 million pounds collected since ‘91)

Community Partnerships

- **Municipal** (delivery agreements, shared services)

- **Private business**
  - ✓ Haulers
  - ✓ Covanta
  - ✓ MRF
  - ✓ Environmental Products & Services (HHW)
  - ✓ Wegmans (Batteries)
  - ✓ Local Ace &TrueValue hardware stores (Bulbs)
  - ✓ Paper Shredding Companies (Confidential Docs)
  - ✓ Arc (Compost Bagging + Battery Sorting)
  - ✓ Reuse Organizations:
    Rescue Mission, Salvation Army (Textiles)

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One Sustainable OCRRA
2017 Strategic Direction

MISSION STATEMENT

To sustain a world-class waste management system that benefits our community and environment.

VISION

Using effective and fiscally-sound strategies, including waste reduction, recycling, composting, energy recovery, disposal and public education, OCRRA makes our community a more sustainable and healthy place to live.

OBJECTIVES

1. Maximize reliable solid waste disposal through recycling, composting, energy recovery while minimizing landfill disposal.
2. Optimize revenue sources, control expenses through efficient operations and build reserves for future sustainable investments.
3. Strive for excellence in recycling, compost, and transfer operations and help advance smart sustainable solid waste in North America.
4. Be a good neighbor, leverage partnerships to reduce litter, and consider OCRRA's greenhouse gas emissions in operational decisions.

AREAS OF FOCUS	People	Operations & Assets	Community Programs	Innovation & Leadership	
Priorities	❖ Trust & Respect ❖ Staff Development ❖ Recognition	❖ Optimize WTE Capacity ❖ Transfer Station Infrastructure ❖ Excellence in Equipment Selection & Maintenance ❖ Contracts ❖ Real Estate	❖ Maintain & evaluate programs ➢ Public & School- based Education ➢ Proper Toxic Disposal ➢ Special Events ❖ Waste Stream Composition Analysis	❖ Composting ❖ Modernize Curbside Recycling ❖ 5-Year Material Management ❖ 25-Year Material Management	❖ Waste Reduction: EPR & Packaging ❖ Benchmark Operations & Programs

Core Values: • Integrity & Honesty • Safety • Environmental Stewardship • Fiscal Responsibility • Public Engagement • Excellence in Customer Service •

Opportunities to Reduce GHG in U.S. Material Management

- 42% GHG emissions associated with material management lifecycle

- Avoidance baseline:
  - – Recycling 183 million MT annually
  - – WTE combustion 17 million MT annually

Avoidance Opportunity

- – Source reduction of packaging, enhanced packaging recycling; extending personal computer life
  - *25% = 100 million MT; 50% = 200 million MT*

2006 data, EPA

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Opportunities to Reduce GHG in Material Management

- **Increase Recycling Rate**
  - 50% = 80 million MT avoided
- **Increase Composting of Food Scraps**
  - 100% = 20 million MT
  - 50% = 10 million MT
  - 25% = 5 million MT
- **Enhance WTE combustion of MSW landfilled**
  - 100% = 120 Million MT; 50% 60 million MT

LOCAL Matters: Transportation 28% of US GHG Emissions

2006 data, EPA

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The DRAWDOWN

Top 100 global solutions to reduce GHG now

- **#3: Reduce Food Waste**
  - 70.53 Gigatons avoided, if 50% global food waste reduced by 2050
- **#55 Household Recycling**
  - 2.77 Gigatons avoided if average global recycling rate3 at 65% by 2050
- **#68 Waste to Energy**
  - 1.1 Gigatons avoided if 62.6 GW of WTE facilities installed globally by 2050.

Source: *Drawdown: The Most Comprehensive Plan Ever to Proposed to Reverse Global Warming,* Edited by Paul Hawken, 2017

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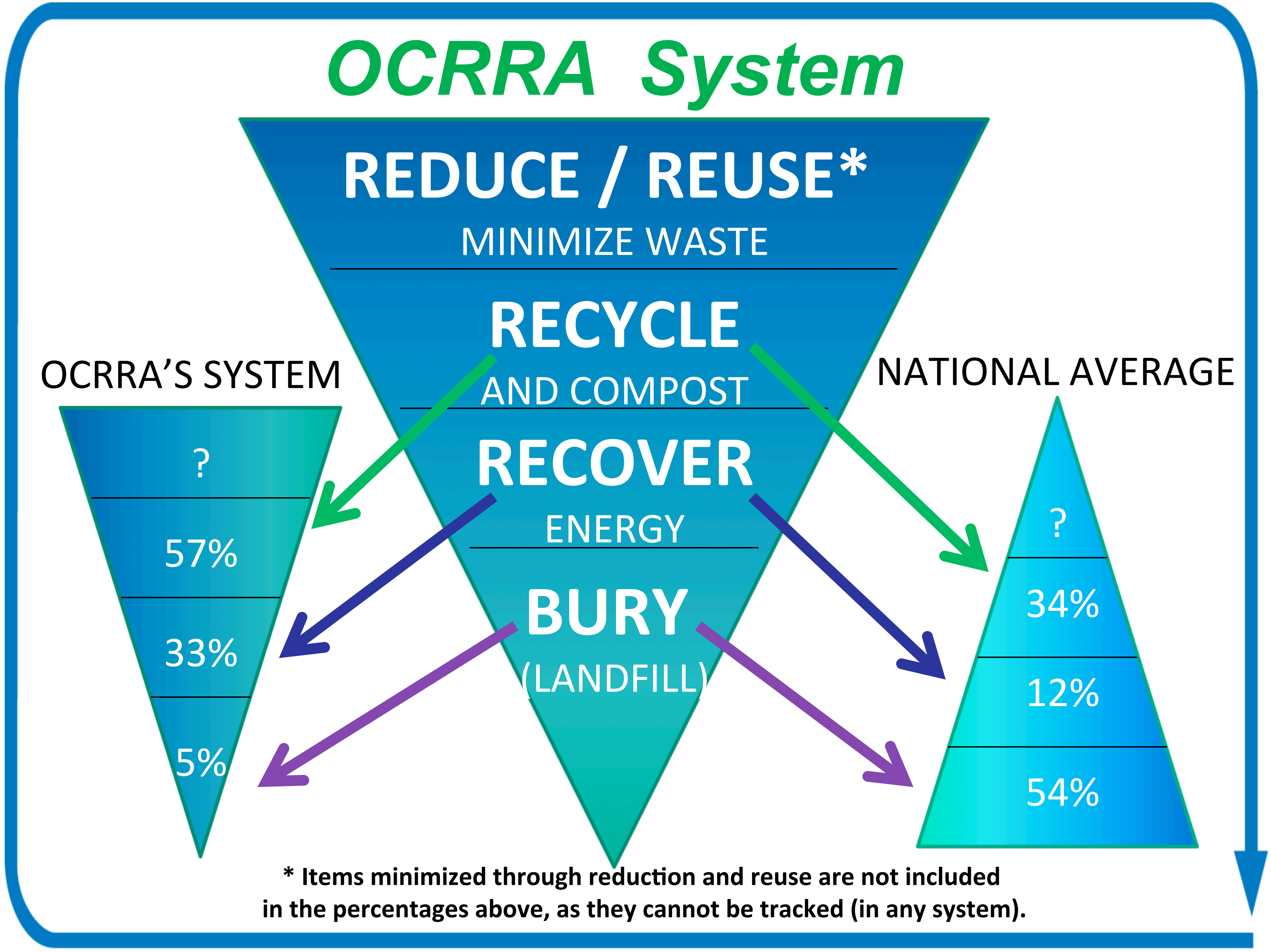
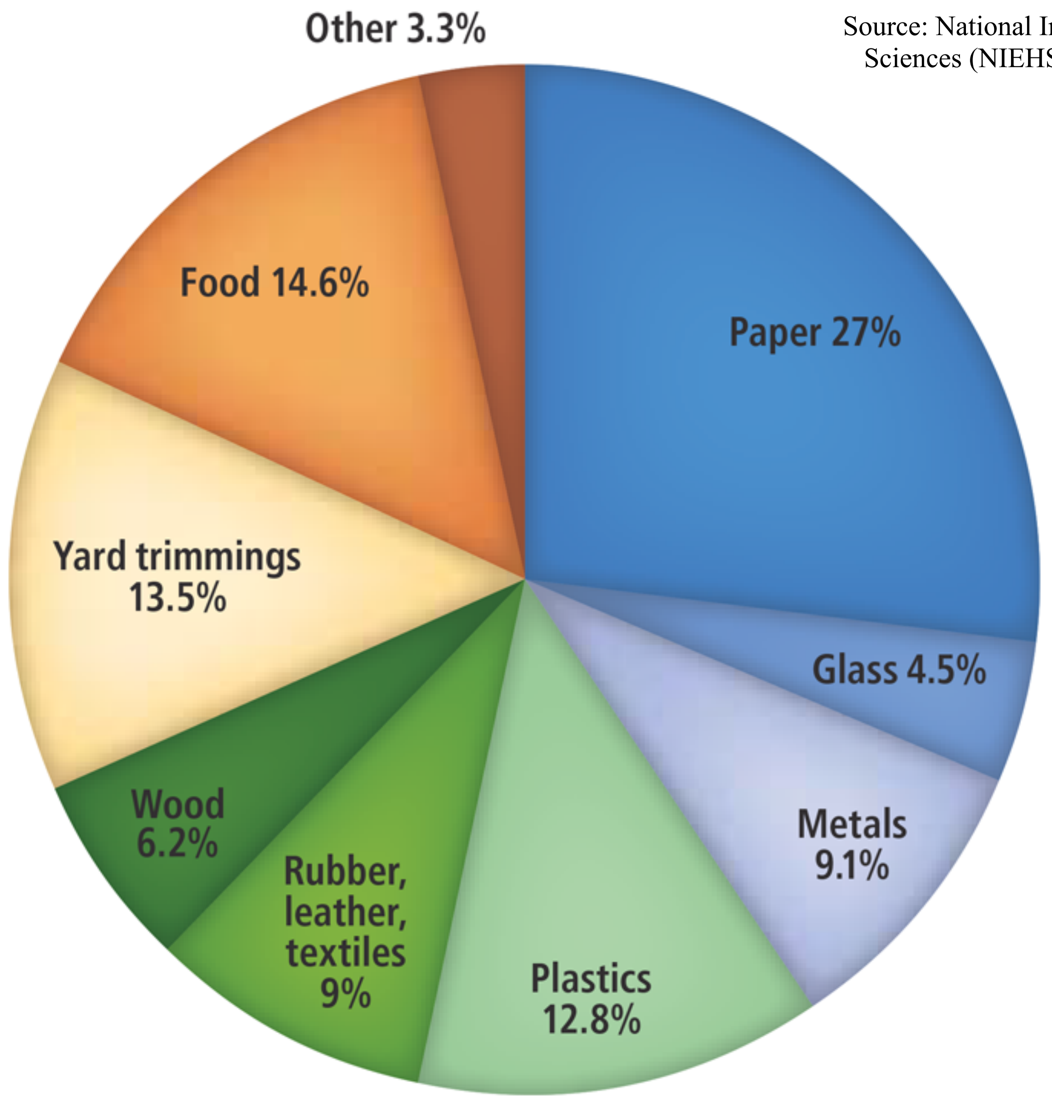
Recycling
225,000 tons
Private MRFs
Paper
Plastic
Glass
Metal
C&D
92,000 tons
Transfer Station
Cardboard & Metal 2,000 tons
9,000 tons metal
10,000 tons
80,000 tons
Trash
240,000 tons
WTE
80,000 tons ash
Food
10,000 tons
Compost Site
Landfill


OCRRA System
REDUCE / REUSE*
MINIMIZE WASTE
RECYCLE
AND COMPOST
RECOVER
ENERGY
BURY
(LANDFILL)
OCRRA'S SYSTEM
?
57%
33%
5%
NATIONAL AVERAGE
?
34%
12%
54%
* Items minimized through reduction and reuse are not included
in the percentages above, as they cannot be tracked (in any system).

Total MSW Generation by Material, 2013

Source: National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health



Bottom line:

we need places for this stuff to go…

Modern Waste-to-Energy

Combustion of municipal solid waste with energy recovery and air pollution controls

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Air Emissions Testing Results

(www.OCRRA.org)

2017 ANNUAL STACK TEST RESULTS

		Constituent	Average Measured Emissions[1]			Permit Limit[2]	Pass/Fail? P/F	3-Boiler Average[3]	% permit limit[4]
			Unit 1	Unit 2	Unit 3				
TESTED ANNUALLY	FEDERAL	Cadmium (mg/dscm @ 7% O_2)	< 1.7E-04	< 1.2E-04	< 2.2E-04	3.5E-02	P	1.7E-04	0.5%
		Cadmium (lb/hr)	< 2.4E-05	< 1.8E-05	< 3.2E-05	1.9E-03	P	2.5E-05	1.3%
		Carbon Monoxide (lb/hr)	7.98E-01	8.19E-01	1.14E+00	8.04E+00	P	9.19E-01	11.4%
		Dioxins/Furans (ng/dscm @ 7% O_2)	6.2E-01	3.8E-01	4.4E-01	3.0E+01	P	4.8E-01	1.6%
		Hydrogen Chloride (ppmdv @ 7% O_2)	2.5E+00	2.3E+00	2.3E+00	2.5E+01	P	2.4E+00	9.6%
		Hydrogen Chloride (lb/hr)	5.52E-01	5.15E-01	4.98E-01	5.24E+00	P	5.22E-01	10.0%
		Hydrogen Chloride Removal Efficiency (%)	99.6	99.7	99.7	>=95	P	99.7	-
		Lead (mg/dscm @ 7% O_2)	2.72E-03	8.17E-04	2.53E-03	4.00E-01	P	2.02E-03	0.5%
		Lead (lb/hr)	3.89E-04	1.21E-04	3.80E-04	3.81E-02	P	2.97E-04	0.8%
		Mercury (lb/hr)	< 6E-05	< 5E-05	< 7E-05	4E-03	P	6E-05	1.5%
		Nitrogen Oxides (lb/hr)	3.54E+01	4.63E+01	3.35E+01	5.80E+01	P	3.8E+01	66.2%
		Particulates (gr/dscf @ 7% O_2)	5.3E-04	1.5E-03	7.0E-04	1.0E-02	P	9.0E-04	9.0%
		PM_{10} (gr/dscf @ 7% O_2)	6.9E-04	8.1E-04	9.7E-04	1.0E-02	P	8.2E-04	8.2%
		PM_{10} (lb/hr)	2.42E-01	2.75E-01	3.20E-01	3.16E+00	P	2.79E-01	8.8%
		Sulfur Dioxide (lb/hr)	1.61E+00	5.29E+00	3.98E-02	1.62E+01	P	2.31E+00	14.3%
	STATE	Ammonia (ppmdv @ 7% O_2)	2.8E+00	2.1E+00	2.6E+00	5.0E+01	P	2.5E+00	5.0%
		Ammonia (lb/hr)	2.86E-01	2.11E-01	2.62E-01	4.88E+00	P	2.53E-01	5.2%
		Dioxins/Furans-2,3,7,8 TCDD TEQ (ng/dscm @ 7% O_2)	1E-02	6E-03	9E-03	4E-01	P	8E-03	2.1%
		Dioxins/Furans-2,3,7,8 TCDD TEQ (lb/hr)	1.49E-09	9.26E-10	1.41E-09	1.29E-07	P	1.28E-09	1.0%
		Mercury (µg/dscm @ 7% O_2)	< 3.8E-01	< 3.7E-01	< 4.6E-01	2.8E+01	P	4.0E-01	1.4%
		Mercury Removal Efficiency (%)	> 99.1	> 98.7	> 99.3	>=85	P	99.0	-
		PAH (µg/dscm @ 7% O2)	1.4E-01	< 1.4E-01	< 1.7E-01	1.0E+00	P	1.5E-01	15.2%
		Zinc (lb/hr)	2.96E-03	1.47E-03	4.35E-03	6.45E-02	P	2.93E-03	4.5%

NOTES:

[1] Based on three test runs; used for compliance with permit limit.

[2] NYSDEC Title V Permit #7-3142-00028

[3] Average provided for informational purposes only; not used for compliance.

[4] Based on 3-Boiler Average; informational only; not used for compliance.

UNITS:

gr/dscf = grains per dry standard cubic foot

ppmdv = parts per million dry volume

lb/hr = pounds per hour

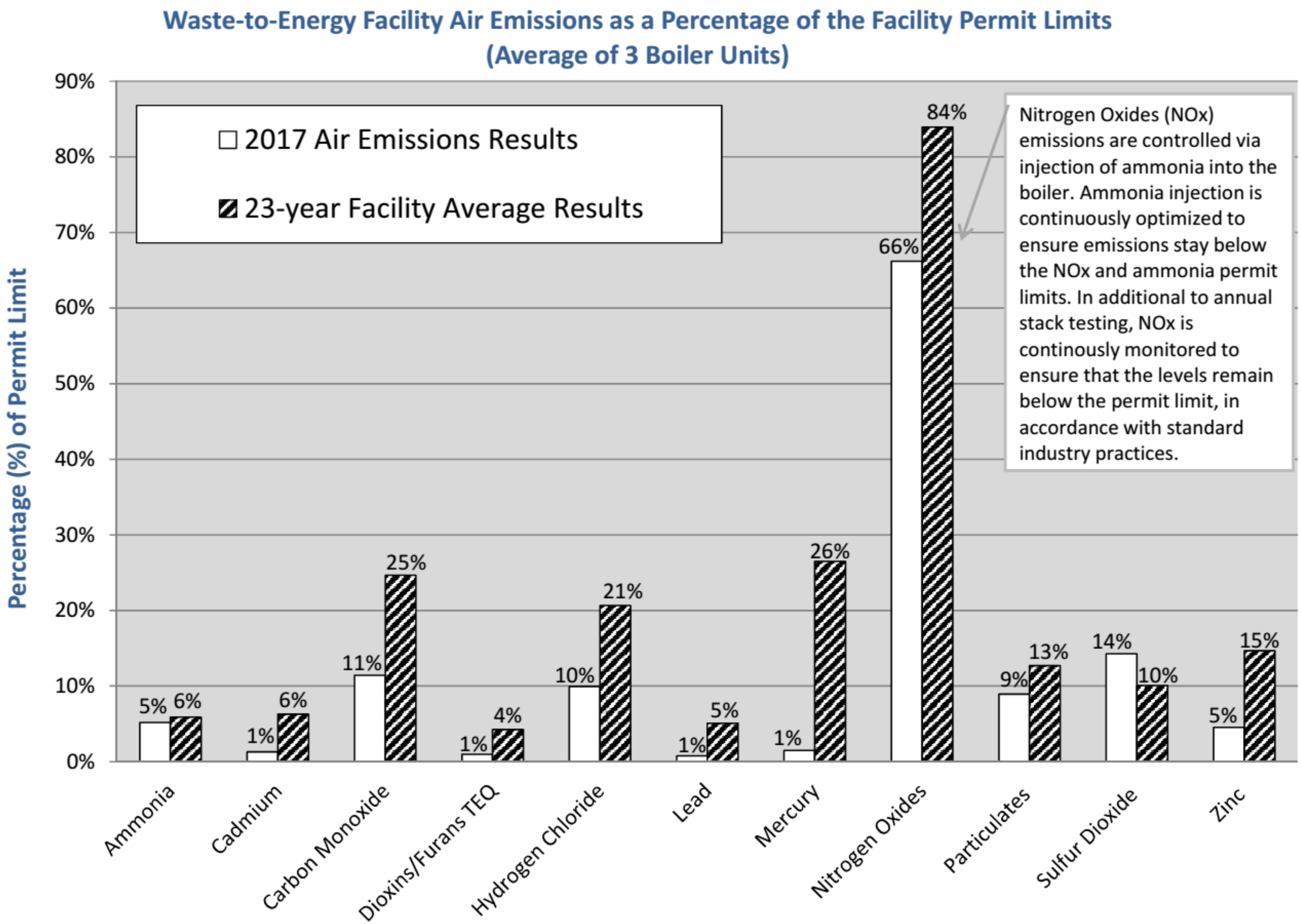
dscm = dry standard cubic meter

@ 7% O_2 = concentration corrected to 7% oxygen

ng = nanograms

µg = micrograms

mg = milligrams


Waste-to-Energy Facility Air Emissions as a Percentage of the Facility Permit Limits
(Average of 3 Boiler Units)
Percentage (%) of Permit Limit
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2017 Air Emissions Results
23-year Facility Average Results
5%
6%
1%
6%
11%
25%
1%
4%
10%
21%
1%
5%
1%
26%
66%
84%
9%
13%
14%
10%
5%
15%
Nitrogen Oxides (NOx) emissions are controlled via injection of ammonia into the boiler. Ammonia injection is continuously optimized to ensure emissions stay below the NOx and ammonia permit limits. In additional to annual stack testing, NOx is continously monitored to ensure that the levels remain below the permit limit, in accordance with standard industry practices.
Ammonia
Cadmium
Carbon Monoxide
Dioxins/Furans TEQ
Hydrogen Chloride
Lead
Mercury
Nitrogen Oxides
Particulates
Sulfur Dioxide
Zinc

USEPA Journal Article
Using MSW-DST model:

- WTE is a better option than LFGTE because WTE generates significantly more electricity from the same amount of waste, with fewer emissions.

Is It Better To Burn or Bury Waste for Clean Electricity Generation?

P. OZGE KAPLAN,*,†
JOSEPH DECAROLIS,‡ AND
SUSAN THORNELOE§

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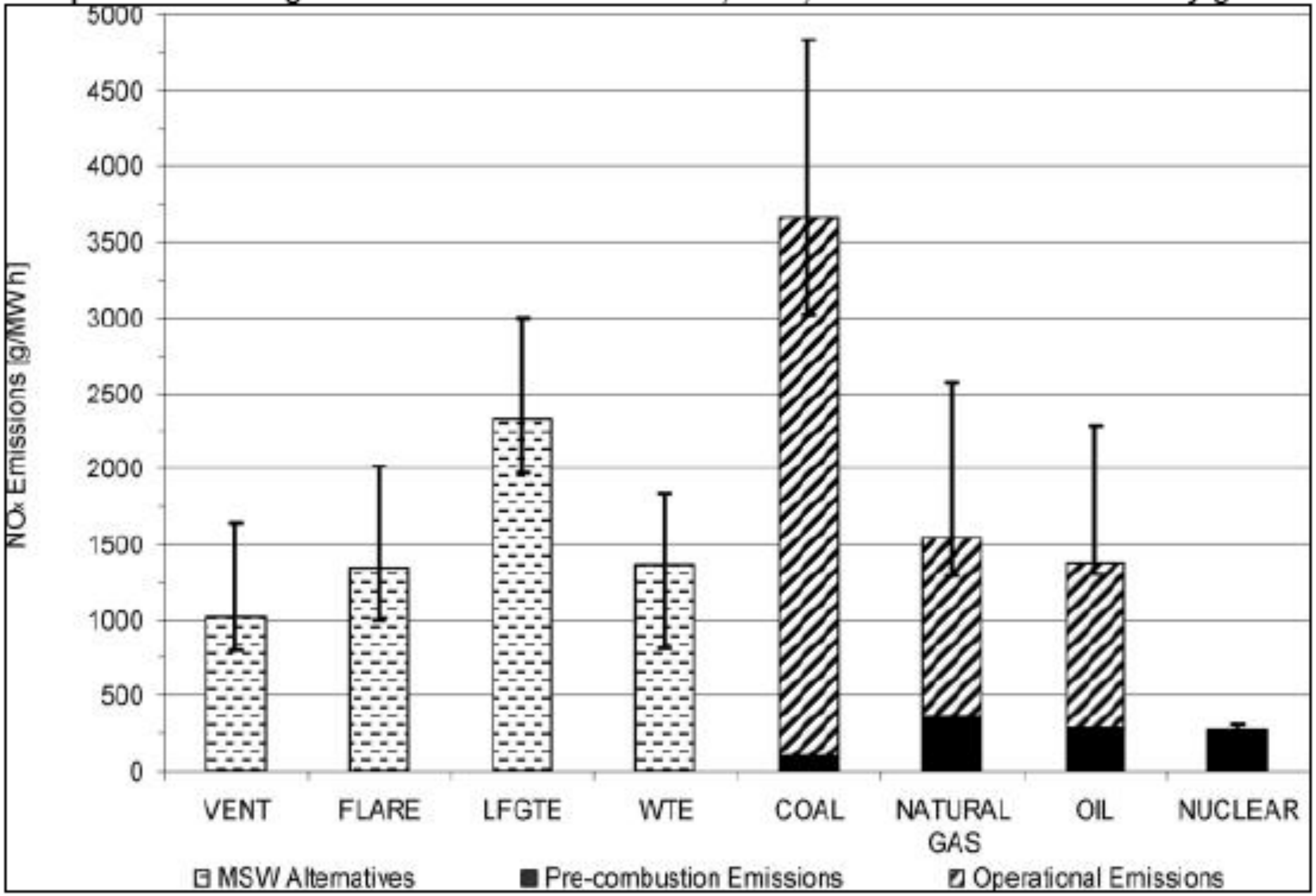
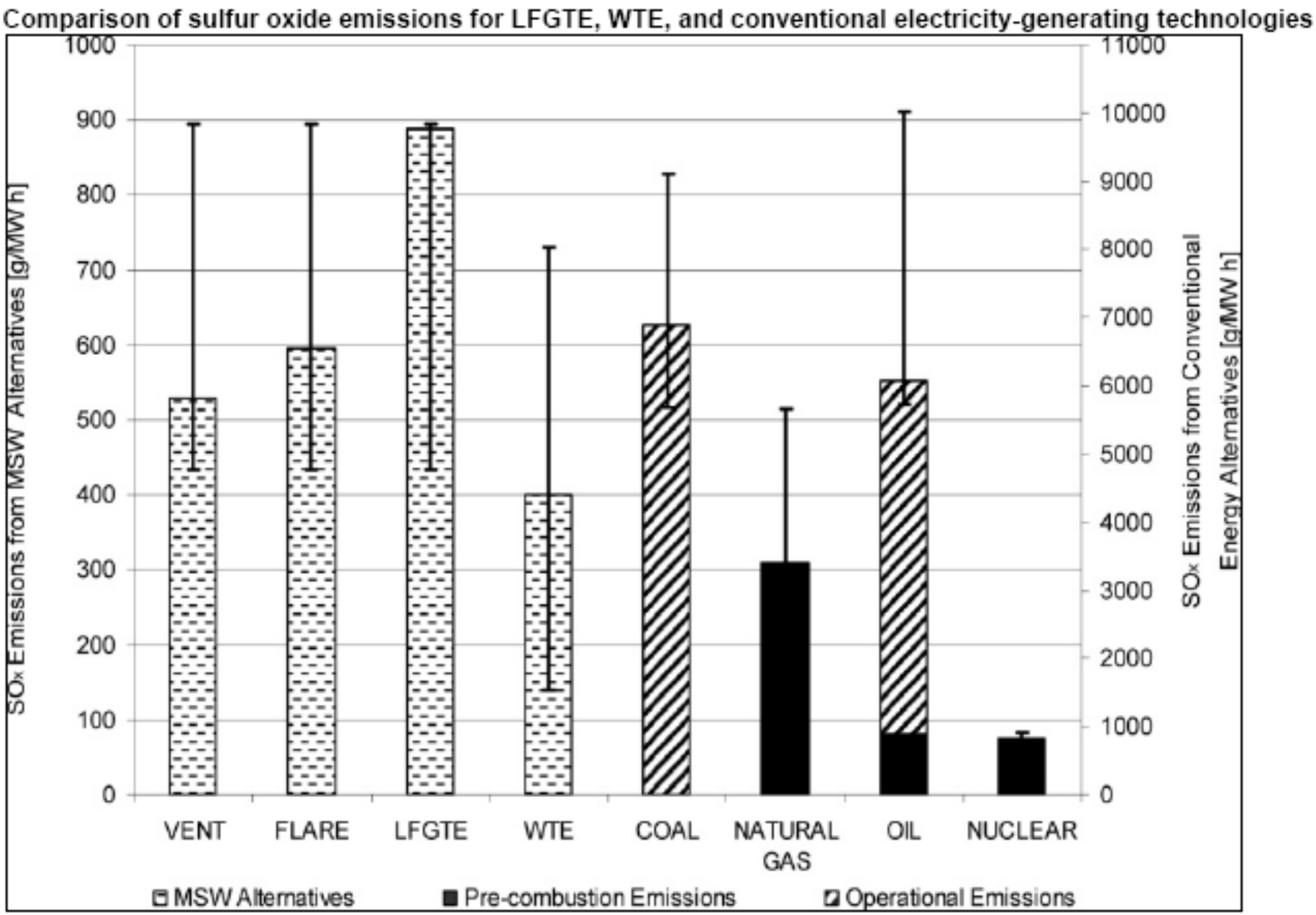
Comparison of nitrogen oxide emissions for LFGTE, WTE, and conventional electricity-generating technologies

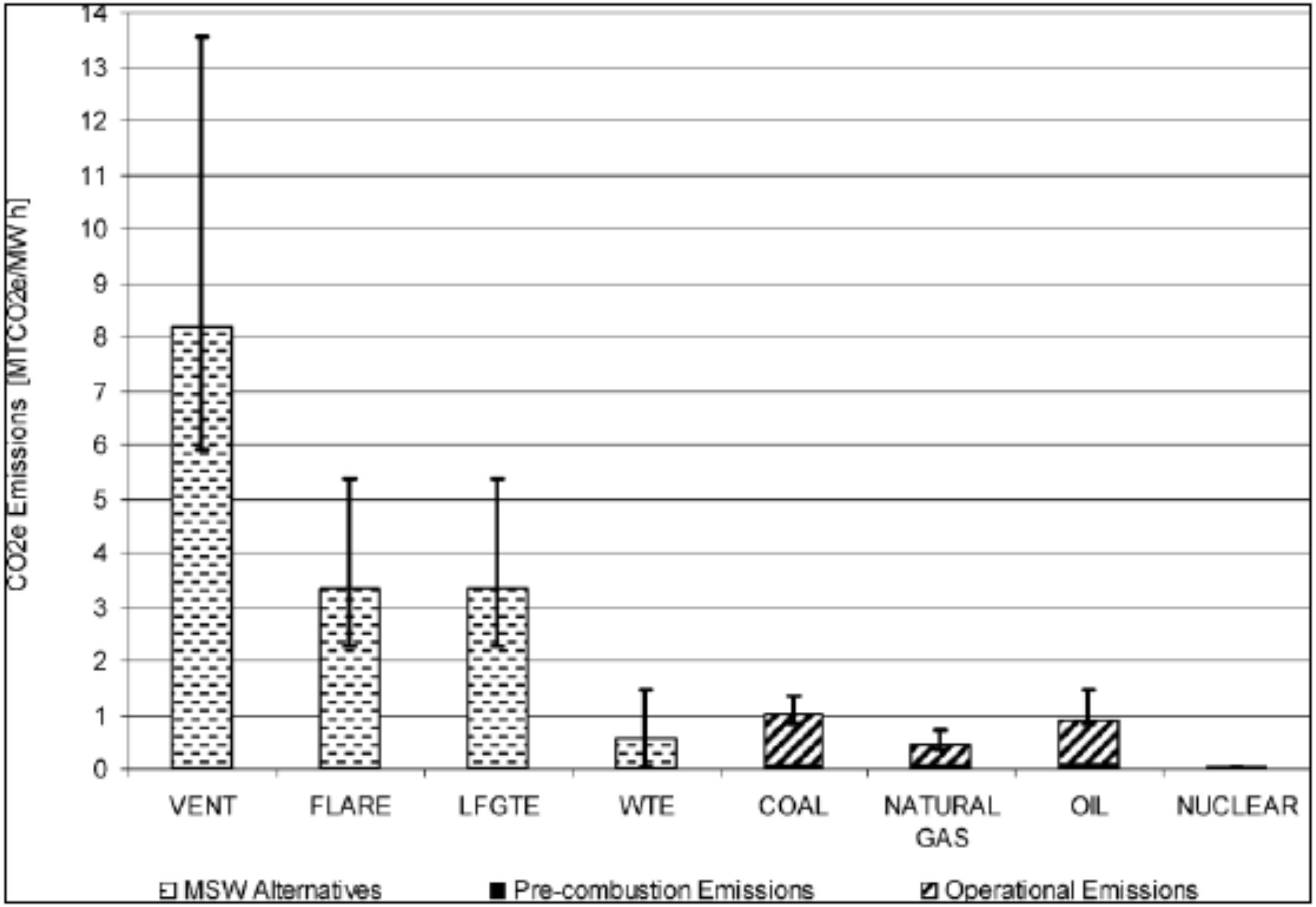


Source: Kaplan, Decarolis, and Thornloe, 2009 (Figure 4)



Source: Kaplan, Decarolis, and Thornloe, 2009 (Figure 3)

Comparison of greenhouse gas emissions for LFGTE, WTE, and conventional electricity-generating technologies



Source: Kaplan, Decarolis, and Thornloe, 2009 (Figure 2)

Greenhouse Gas Emissions

By sending the community's non-recyclable trash to the WTE Facility greenhouse gas emissions are avoided.

- Approximately 1 ton of trash processed prevents 1 ton of carbon dioxide emissions.
- In 2016, the WTE Facility avoided 327,869 tons of carbon dioxide emissions; the equivalent of taking about 60,000 cars off the road!

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WTE Greenhouse Gas Calculation

\+ CO_2 Stack Emissions
\- Fugitive Landfill Gas Emissions (methane)
\- avoided GHG emissions – electricity generation
\- avoided GHG emissions – metal recovery

= 1 ton avoided GHG emissions per ton of trash

This does not even take into account avoided transportation-related GHGs!

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GHG Avoidance from Recycling (WARM)

Table 4 – 2016 Greenhouse Gas Emissions Avoidance					
Material[1]	**Recycling / Composting Emission Factors (MTCO2E per short ton)**	**Combustion Emission Factors (MTCO2E per short ton)**	**Difference**	**Tons Recycled/ Composted**	**GHG Emissions Mitigated ($MTCO_2E$)**
Food	(0.18)	(0.14)	-0.04	104,392	-4,176
Yard Waste	(0.18)	(0.14)	-0.04	28,678	-1,147
Wood	(2.46)	(0.61)	-1.85	4,203	-7,776
Mixed Plastics	(1.02)	(1.22)	0.20	8,210	-1,642
Mixed Metals[3]	(4.34)	(1.02)	-3.32	106,918	-354,968
Corrugated Box	(3.12)	(0.51)	-2.61	88,255	-230,346
Magazines	(3.07)	(0.37)	-2.70	3,118	-8,419
Newspaper	(2.75)	(0.58)	-2.17	16,157	-35,061
Mixed Paper - Office	(3.53)	(0.51)	-3.02	41,755	-126,100
Books[4]	(3.11)	(0.49)	-2.62	633	-1,658
Glass	(0.28)	(0.03)	-0.25	7,437	-1,859
Electronics/Batteries[5]	(2.50)	(0.19)	-2.31	4,134	-9,550
				TOTAL GHGs Mitigated	**-779,416**

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Organics Recovery

- Largest municipal facility in NYS
- Goal: Process 10,000 tons of food waste / year
- Compost available in bulk and by the bag

We Waste a LOT of Food

- Nationally, about 35 million tons/year; $165 billion wasted
- In Onondaga County: about 36,000 tons / year trashed
- 25% of the food we buy wasted
- 265 lbs. / person / year

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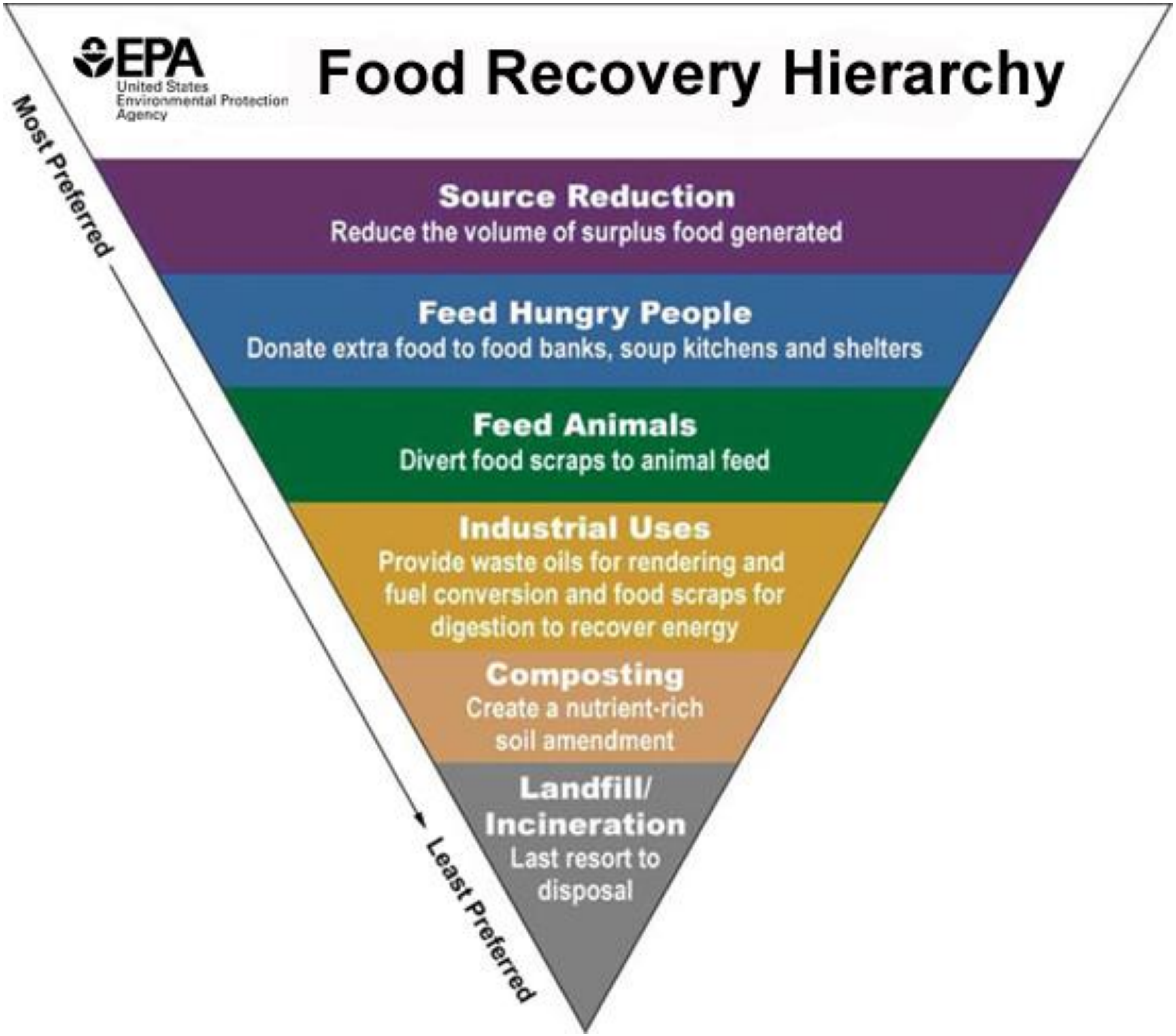
Environmental Impacts

The carbon footprint of food produced and not eaten (world wide) is estimated at 3.3 billion tons of greenhouse gases: making food wastage the third top GHG emitter after the U.S. and China.

– U.N. Food and Agricultural Organization


EPA
United States Environmental Protection Agency
Food Recovery Hierarchy
Most Preferred
Source Reduction
Reduce the volume of surplus food generated
Feed Hungry People
Donate extra food to food banks, soup kitchens and shelters
Feed Animals
Divert food scraps to animal feed
Industrial Uses
Provide waste oils for rendering and fuel conversion and food scraps for digestion to recover energy
Composting
Create a nutrient-rich soil amendment
Landfill/ Incineration
Last resort to disposal
Least Preferred

State Policy Targets Organics Recovery

1) Organics recovery is a TOP priority in NYSDEC's "Beyond Waste" Plan to reduce waste & GHG

2) Proposed law targets major food scrap generators

- Organics (carbon based!) = 30% of materials generated and waste disposed
- Multiple environmental and economic benefits:
  - reduces the generation of greenhouse gases; compost is considered a "carbon sink;" returns carbon to the soil for the long term
  - reduces reliance on waste disposal.
  - creates jobs (4 to every 1 for disposal)

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How Composting Impacts Global Climate Change

1. Feedstocks
2. Composting Process
3. Compost Use

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How Composting Impacts Global Climate Change

1. Feedstocks
   a. Avoidance of CH_4 or N_2O in landfills
   b. Transportation; if compost facility is closer than landfill

2. Composting Process

3. Compost Use

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How Composting Impacts Global Climate Change

1. Feedstocks

2. **Composting Process**
   a. CO_2 impacts from diesel minimized with Aerated Static Piles (ASP)
   b. CO_2 can be further reduced w/ biofuel
   c. CO_2 minimized with BMP

3. Compost Use

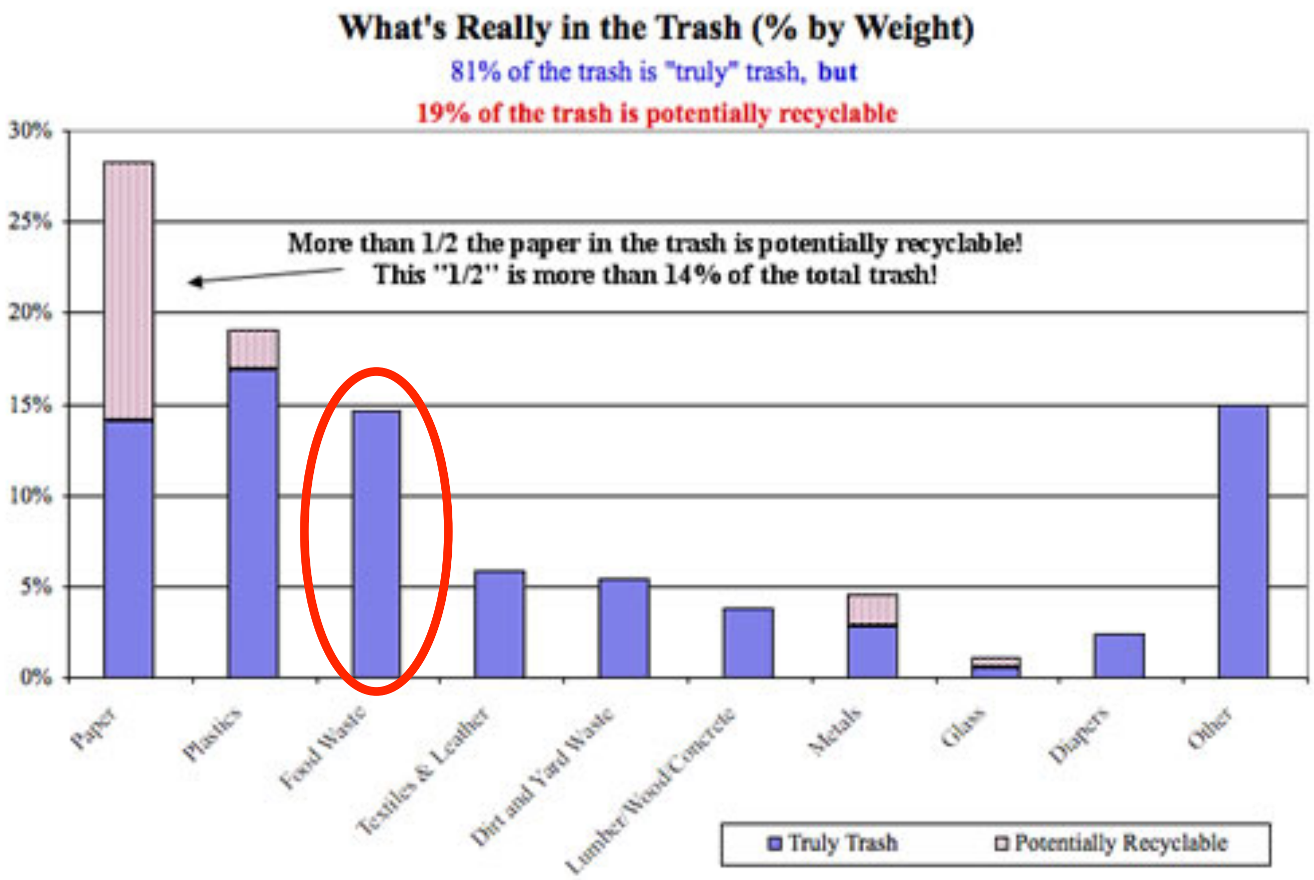
How Composting Impacts Global Climate Change

1. Feedstocks

2. Composting Process

3. Compost Use
   a. Carbon Sequestration
   b. Replaces energy needed to produce synthetic fertilizers & herbicides
   c. Reduces water use

What is in Onondaga County's Trash (data from the 2005 comprehensive waste analysis)



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OCRRA: A Statewide Leader in Organics Recovery

- **2005 Waste Q&C: 36,000 tons of food scraps (14% of waste stream)**
- **50% commercial / institutional (18,000 tons)**
- **Goal: capture 50% (9,600 tons annually)**

- **Result: In 2013, Largest <u>Municipal</u> Food Scrap Recovery Facility in NYS**

Early Program Adopters Include:

SYRACUSE UNIVERSITY
SUOS CULTORES SCIENTIA CORONAT
FOUNDED AD 1870

ONONDAGA
COMMUNITY COLLEGE

LE MOYNE
COLLEGE

Wegmans

destiny usa

UPSTATE
UNIVERSITY HOSPITAL
State University of New York

CROUSE HEALTH

PAUL DELIMA
coffee

EMPIRE BREWING CO

Sheraton
HOTELS & RESORTS

pastabilities

Early Program Adopters Include:

7,000+ students in four local school districts

JORDAN-ELBRIDGE CENTRAL SCHOOL DISTRICT

http://www.westhillschools.org

WESTHILL Central School District

Tully Central Schools
Education Today For Tomorrow's Challenges

F-M
FAYETTEVILLE-MANLIUS SCHOOLS

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OCRRA's Aerated Static Pile Composting System

SWANA® GOLD

2017 Excellence Award Winner: Composting Systems

SWANA.org

DEPARTMENT OF ENVIRONMENTAL CONSERVATION • NEW YORK STATE •

US Composting Council®

OCRRA's Food Scrap Composting Vision

Process 20 million pounds of commercial and institutional food scraps annually . . .

. . . into premium, USCC "STA-Certified" Compost

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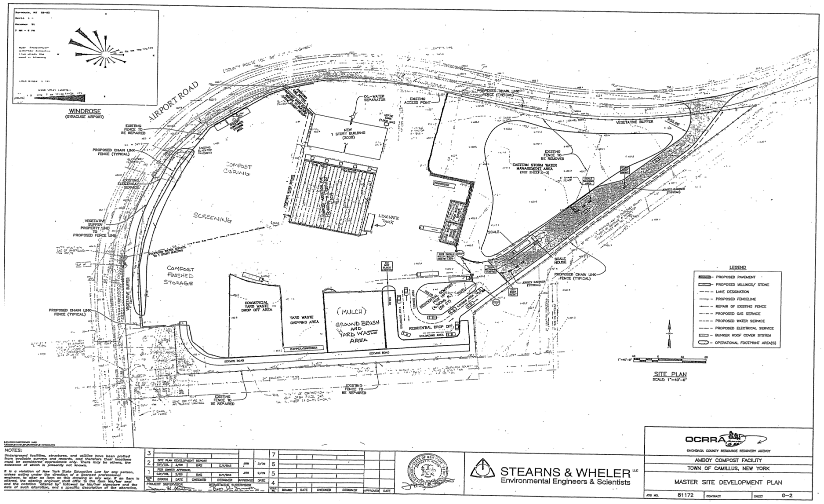
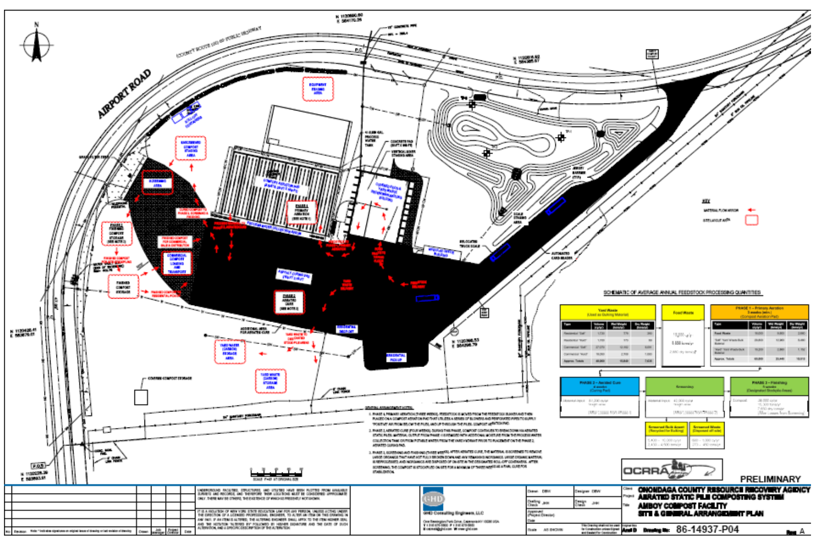
OCRRA's Compost Journey:





- **2009 – 2010** - Preliminary Site Planning and Cost Assessments
- **2010-2011** – Refine process, technology and storm water design needs
- **2012** – Final Design and Permitting
- **2013** – Build! Six months of oversight

Our Process:

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Our Process:

If It Isn't STA-Certified Compost, What Is It?

Certified Compost™
STA | Seal of Testing Assurance
US Composting Council®

OCRRA operates the only food waste composting facilities in CNY that have the US Composting Council's Seal of Testing Assurance, and do not contain any bio-solids or sludges.

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If You're Not Using STA-Certified Compost, What Are You Using?

CERTIFIED COMPOST ANALYZED FOR THE FOLLOWING PROPERTIES:

- pH
- soluble salts
- nutrient content (total N, P2O5, K2O, Ca, Mg)
- moisture content
- organic matter content
- bioassay (maturity)
- stability (respirometry)
- particle size (report only)
- pathogen (Fecal Coliform or Salmonella)
- trace metals (Part 503 regulated metals)

Environmental Benefits of Using Compost

- Carbon Sequestration
- Storm Water Control
- Moisture Retention
- Erosion Control
- Robust Plant Growth
- Replaces Chemical Pesticides and Fertilizers

Engineering/Environmental Applications

- Onondaga Lake habitat restoration
- Broome County highway slope stabilization
- Jacob Javits Center green roof
- Rosamond Gifford Zoo Rain Gardens
- West Point Parade Grounds

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Engineering / Environmental Applications

- Home gardens & lawns
- Green Roofs
- Erosion Control
- Slope Stabilization
- Habitat Restoration
- Agricultural Soil Improvement

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General Discussion

1. OCRRA's current challenges

2. Implementing creative solutions

3. Discussion / questions & answers

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