The Landfill Disposal Index: How To Measure Progress Toward Zero Waste

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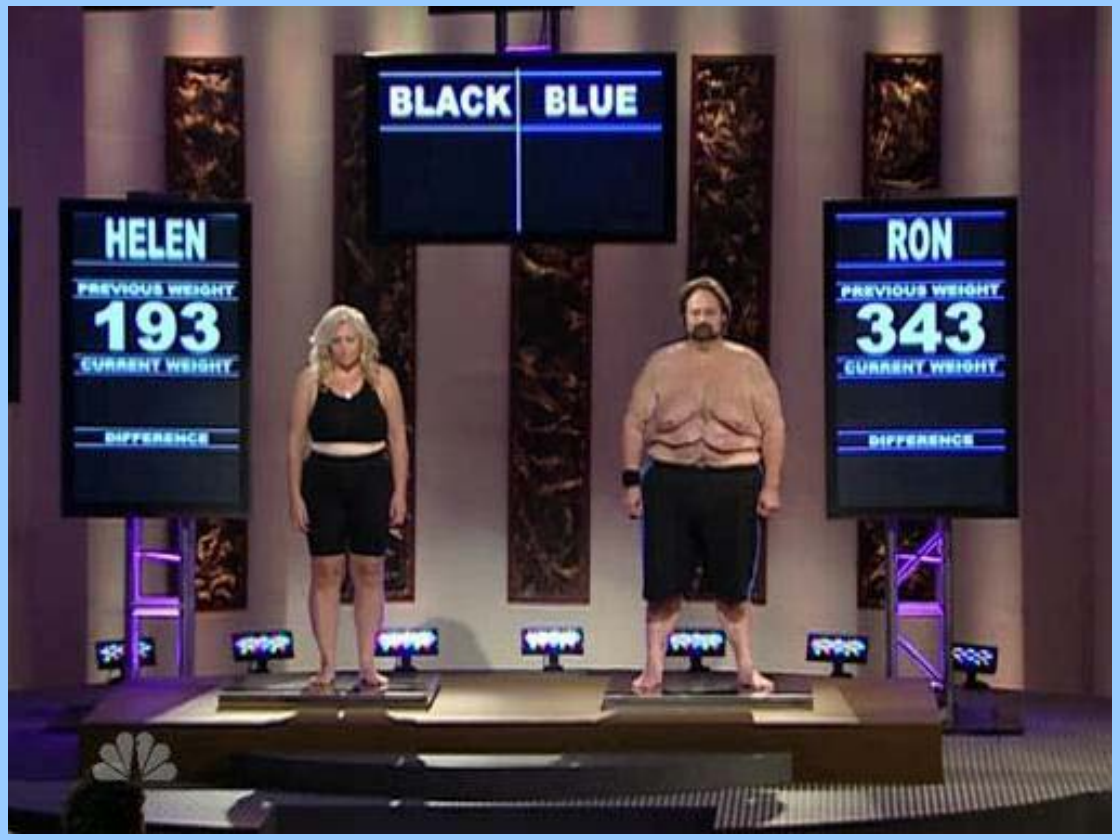
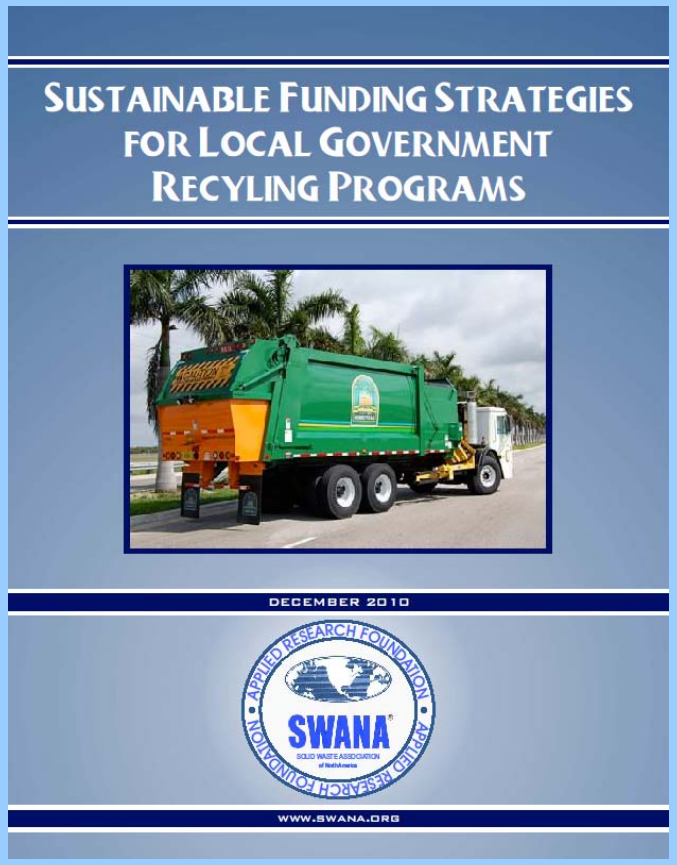
SWANA

The Biggest Loser – What SWANA Members Can Learn



SWANA Applied Research Foundation

- Founded in 2001 to conduct applied research on collectively-defined and funded projects of interest to members
- 32 Local Government and Corporate Subscribers
- Funded by “Penny Per Ton” contributions
- Four Research Groups – WTE, Landfill, Recycling and Collection



SWANA Applied Research Foundation - FY2010 Waste-to-Energy Group Subscribers

Organization	Contact	Title
HDR Engineering, Inc.	John Williams	Senior Vice President
I-95 Landfill Owners Group	Carl Newby	Arlington County WTE Contract Manager
	John Snarr	Metro Washington COG Project Manager
Lancaster County Solid Waste Authority	Gary Forster, P.E.	Senior Manager, RRF Contract Administration
Wheelabrator Technologies, Inc.	David Tooley	Vice President, Government and Public Affairs
Three Rivers Solid Waste Authority	Colin Covington	General Manager

SWANA Applied Research Foundation - FY2011 Recycling Group Subscribers

Jurisdiction	Representative	Title
Edmonton, Alberta, Canada	Dr. Christian Felske, PEng	Technical Specialist - Waste Management Branch
Fairfax County, Virginia	Pamela Gratton	Chief, Recycling and Administrative Services
North Vancouver, British Columbia, Canada	Allen Lynch	Manager – Waste Reduction
Solid Waste Agency of Northern Cook County, Illinois	C. Brooke Beal	Executive Director
Monterey CA Regional Waste Management District	Tim Flanagan	Assistant General Manager

Charlotte, NC (Mecklenburg County)

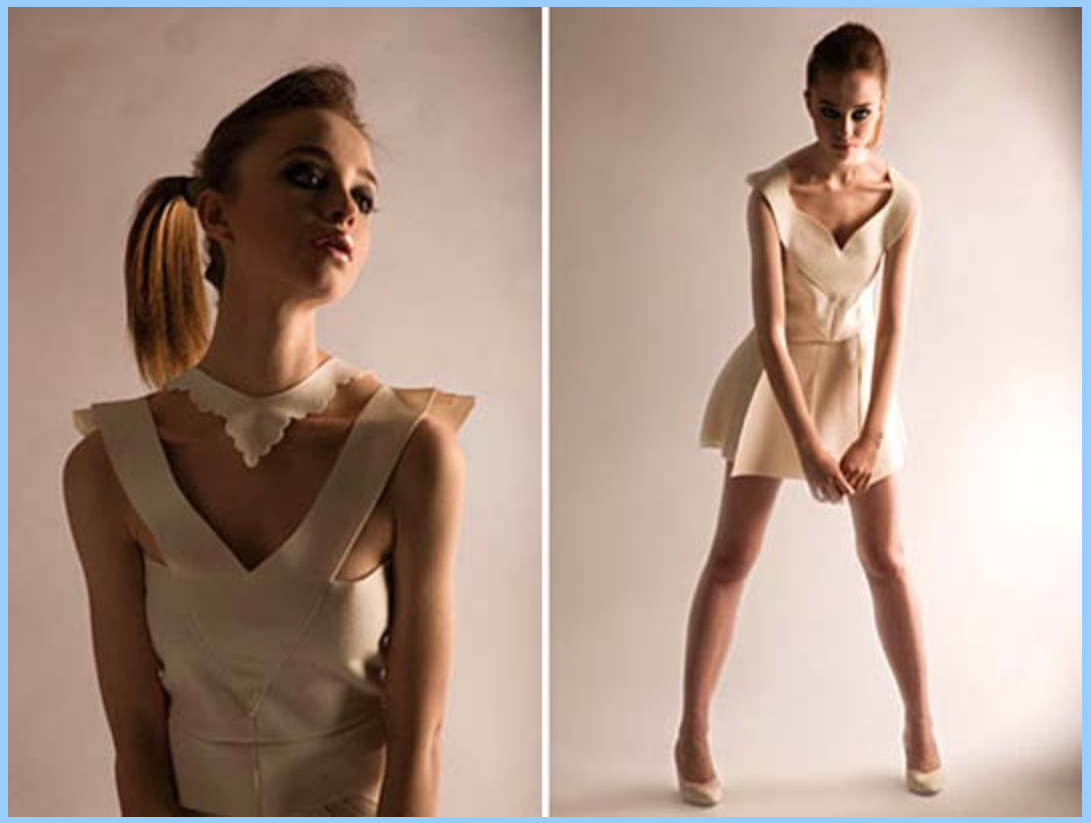
"Critics of ReVenture Park say the county should instead move toward a "zero-waste" policy to minimize the amount of trash it produces.

Charlotte Observer, February 13, 2011

Overview of Presentation

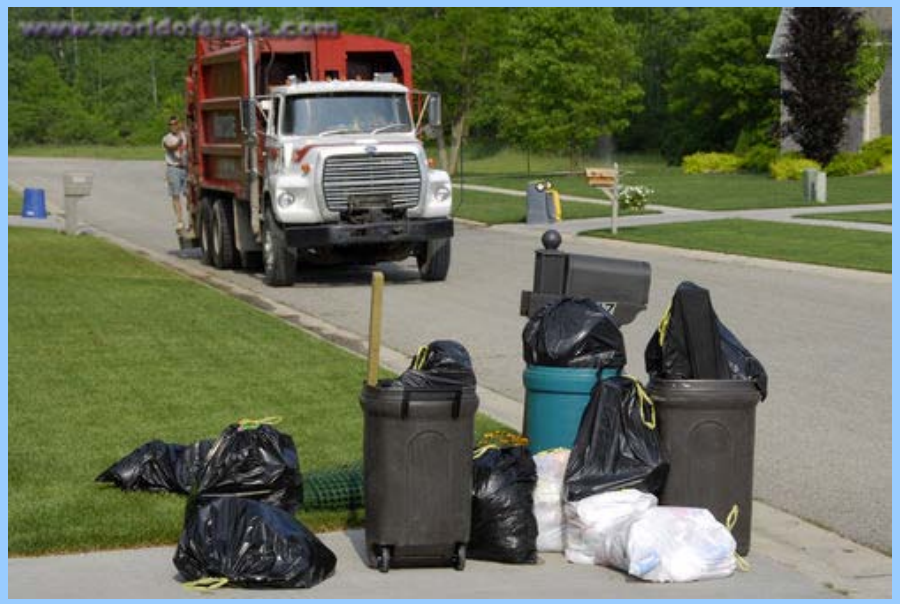
- Zero Waste and Waste Diversion
- Shortcomings of the Diversion Rate Metric
- The Landfill Disposal Index (LDI)
- Using the LDI Approach to Compare Zero Waste and WTE Systems
- Conclusions

Zero-Waste (Waist)



Mark Liu – Zero Waste Fashion Design

Not Zero Waste (Waist)



Grass Roots Recycling Network

- ***"Zero Waste is a philosophy and a design principle for the 21st Century. It includes 'recycling' but goes beyond recycling by taking a 'whole system' approach to the vast flow of resources and waste through human society. Zero Waste maximizes recycling, minimizes waste, reduces consumption, and ensures that products are made to be reused, repaired, or recycled back into nature or the marketplace."***

City of San Francisco

- "Imagine a world in which nothing goes to the landfills or incinerators. We think it's achievable …Today, San Francisco **recovers 72 percent of the materials it discards**, bringing the city ever closer to its twin goals of **75 percent landfill diversion by 2010**, and bringing the city to zero waste by 2020."

City of San Francisco

- **Current Recovery Rate = 72%**
- **City is close to meeting its "75% <u>landfill diversion</u> by 2010"**
- **Implications**
  - 72% waste recovered = 72% waste diverted from landfill disposal
  - City is landfilling only 28% of its waste
  - 100% waste diversion = no landfill disposal

Per Capita Disposal Rates for Selected Zero Waste Communities

Jurisdiction	Year	Tons Disposed	Population	MSW Disposed (Tons/ Person/Yr)
San Francisco, CA[1]	2008	594,660	808,976	0.68
Seattle, WA	2009	351,688	602,000	0.58
1. Assumes 7% of waste disposed from San Francisco is C&D waste.				

San Francisco's MSW Generation Rate

MSW Generation Rate

= **Measured** Landfill Disposal Rate

(1 **- Reported** Diversion Rate)

= 0.68/(1-0.72)

= 2.43 tons/person/year.

= 13.3 pounds per person per day.

Organization	Geographic Area	Year	MSW Generation Rate	
			Tons/Person/Year	Pounds/Person/Day
City of San Francisco	San Francisco	2008	2.43	13.3
Columbia University - Earth Engineering Center/Biocycle	California	2008	1.67	9.2
	United States	2008	1.28	7.0
US EPA	United States	2008	0.82	4.5

The Landfill Disposal Index

- **"Waste management performance should be based on "tons landfilled" per capita (i.e. the fewer tons landfilled per capita the more sustainable the solid waste system.)“**

Dr. Nicholas Themilis, Columbia University

CalRecycle

- New per capita disposal measurement system starting in 2007
- Simpler, more timely and more accurate
- Shift from emphasis on estimated diversion rates
- Allows for jurisdiction growth
- = reported disposal/jurisdiction population
- 50% per capita disposal target = 50% of average waste generation (2003-2006)

The Landfill Disposal Index (LDI)

- Defined as the tons of solid waste generated by a community that are disposed in landfills.
- Reported on an annual weight per capita basis (e.g., tons of waste landfilled per person per year).

WM's Altamont Landfill (Disposal Site for San Francisco's Non-Diverted MSW)

The Landfill Disposal Index (LDI)

Waste Stream	LDI	Performance Measure
Municipal Solid Waste (MSW)	MSW-LDI	Overall effectiveness of MSW Reduction, Recycling and Recovery Programs
	Biodegradable MSW-LDI	Effectiveness of MSW Stabilization Systems (Composting, Anaerobic Digestion, WTE, Bioreactor Landfills)
- Residential MSW	RSW-LDI	Effectiveness of Residential MSW Reduction, Recycling and Recovery Programs
- Commercial MSW	CSW-LDI	Effectiveness of Commercial MSW Reduction, Recycling and Recovery Programs
Construction and Demolition (C&D) Waste	C&D-LDI	Effectiveness of C&D Reduction, Recycling and Recovery Programs

Using the LDI Approach To Compare the Performance of Zero Waste and WTE systems

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Waste Management Data for Selected U.S. WTE Communities

State	No. of WTE Facilities[1]	Population Served by WTE Facilities[2]	Tons Recycled[3]	MSW To WTE Facilities[4]	MSW Generated[7]		Ash/Bypass Waste Disposed		Landfill Disposal Index[11]
		Persons	Tons/Year	Tons/Year	Tons/Year	Per Capita	Tons/Year[9]	%[10]	Tons/Person/Yr
California	3	2,082,069	1,694,873	858,112	3,802,317	1.83	1,411,515	37%	0.68
Connecticut	6	3,081,621	907,213	2,181,010	3,329,921	1.08	653,909	20%	0.21
Florida	11	8,494,222	3,184,586	5,736,740	12,162,693	1.43	4,325,611	36%	0.51
Hawaii[12]	1	970,000	543,617	607,301	1,329,430	1.37	336,101	25%	0.35
Maryland	3	1,952,955	1,614,668	1,392,238	3,754,635	1.92	1,010,862	27%	0.52
Massachusetts	7	3,239,216	1,607,923	3,296,431	4,904,354	1.51	623,025	13%	0.19
Minnesota	9	3,376,057	1,685,268	1,501,753	3,906,072	1.16	1,002,882	26%	0.30
New Jersey	5	2,182,216	922,143	2,177,208	3,099,351	1.42	411,492	13%	0.19
New York	10	4,275,024	1,874,923	3,890,383	5,765,306	1.35	735,282	13%	0.17
Pennsylvania	6	4,869,512	1,863,423	3,110,530	6,211,789	1.28	1,825,726	29%	0.37
Virginia	5	2,659,944	1,119,532	2,028,993	3,269,563	1.23	504,518	15%	0.19
Totals	66	37,182,836	17,018,169	26,780,699	51,535,431	1.39	12,840,924	25%	0.35
				0.72					
Percent			33%	42%	100%			25%	

MSW-LDI's for WTE Communities[1]

Parameter	%	Tons/Person/Yr
MSW Materials Recycled	33%	0.46
MSW Converted to Energy or Recycled at WTE Facilities	42%	0.58
MSW Disposed (LDI)	25%	0.35
MSW Generated	100%	1.39
Biodegradable MSW Disposed	15%	0.21

1. Based on data from 66 communities with WTE systems serving 37.2 million people.

Using the MSW-LDI

Parameter	Data Source	WTE Communities	San Francisco
		Tons/Person/Year	
MSW Recycled or Diverted	Recycling/Diversion Estimates	0.46	1.75
MSW Converted to Energy or Recycled at WTE Facilities	Scalehouse Data	0.58	0
MSW Disposed (MSW-LDI)	Scalehouse Data	0.35	0.68
Total – WTE/Disposal	Scalehouse Data	0.93	0.68
MSW Generation Rate (Estimated)	Recycling/Diversion Estimates and Scalehouse Data	1.39	2.43

San Francisco Diversion Rates

- Residential waste
  = 23% of waste disposed (measured?)
  = 136,772 tons
  = 0.17 tons/person/year (RSW-LDI)
  = 0.93 pounds per person per day
  = 37% of EPA's RSW generation rate (2.5 lbs/per/day)
  = 63% diversion rate (if EPA numbers are correct).

The Scalehouse - One Potential Source of Error

- **Multi-family waste**
  - Collected in Front Loader Compactors
  - Collected by private haulers
  - Residential or commercial
- **Combined Loads**
  - Residential or commercial or both
- **Potential solutions**
  - Driver and Scalehouse operator education
  - On-board truck scales

Conclusions

- **WTE**
  - Much less landfill disposal than Zero Waste
  - Even lower biodegradable waste landfilled
- **Zero Waste**
  - Less waste to WTE plants+landfills
- **Landfill Disposal Index**
  - Based on scalehouse and population data
  - Measured not estimated
  - Applicable to all SWM system types.
- **Need – Better Use of Scalehouse Data**
  - More accurate classification of waste vehicle loads
  - SWANA can play key role