



Alternative Technologies and the Road to Zero Waste to Landfill

For the Maryland Recyclers Network
Annual Conference
The Maritime Institute, Linthicum, MD

Harvey W. Gershman
President

Gershman, Brickner & Bratton, Inc.

June 20, 2014



GBB – Quality – Value – Ethics – Results



- Solid Waste Management and Technology Consultants established in 1980
- Helping Clients Turn Problems into Opportunities

- Proud to be a sustaining sponsor of MRN
- www.gbvinc.com



GBB Clients in Maryland

- Annapolis
- Anne Arundel County
- Attorney General's Office
- City of Baltimore
- Baltimore County
- Calvert County
- Calvert Trash Service, Inc.
- Caroline County
- Charles County
- Clean Rock Industries
- Columbia County
- CSI Norfolk
- Easton Utilities Commission
- F&E Stokers
- Fort Meade
- Frederick County
- Gaithersburg
- Gattlinburg
- Geosyntec
- Harford County
- Howard County
- Johns Hopkins Medical Center
- Legg Mason Wood Walker, Inc.
- Leimbach Development
- Waste News
- Marriott Corporation



- Maryland Department of the Environment
- Maryland Environmental Service/Lower Shore
- Maryland Environmental Service/Prince George's County
- Maryland Reclamation LLC
- Maryland Recyclers Coalition
- Maryland Recycling Conference
- McCormick and Company
- McGuire, Woods, Battle & Booth
- Mitchell Petersen
- Montgomery County
- Northeast Maryland Waste Disposal Authority (NMWDA)
- Ocean City
- Office Paper Systems, Inc.
- OREG Site Work Services, LLC
- Prince George's County
- Queen Anne's County
- Recycling Inc.
- Reese & Carney, LLP
- Rogers Golden Halprin / NMWDA
- Somerset County

- St. Mary's County
- Stark & Keenan/Town of Bel Air
- State of Maryland
- SWANA
- SWANA (as GRCDA)
- Talbot County
- The Recycling Center
- Town of Easton
- URS/Maryland Environmental Service
- US Postal Service-Baltimore Division
- University of Maryland
- Washington County
- Wicomico County



Renewable Energy from Waste

RENEWABLE Energy FROM WASTE CONFERENCE



NOVEMBER 17-20, 2014 SAN JOSE, CALIFORNIA

Food Waste or Fuel Source?

DEPARTMENTS - CRITICAL THINKING

Harvey Gershman
OCTOBER 16, 2013



www.rewmag.com

Harvey... take out the garbage - it stinks! my mom used to remind me of my household chore growing up in Pawlusket, RI. In the 50s, we had a 30-gallon can for food waste in the back corner of our lot waiting to be collected by the city and delivered to pig farmers for feed. Neighboring Providence did it a little differently - it had to be banded in newspapers and set out for collection, eventually to find its way to pig farmers.



harvey | @harveygm

Fast forward to the new millennium. We are awfully good at increasing recycling even more by going after organics. The U.S. Environmental Protection Agency reports that food waste accounts for approximately 21 percent of landfilled municipal solid waste (MSW), or around 35 million tons per year (TPY). This waste is a resource that can be used to produce bioogas, for power production or





Today's Agenda

U.S. Overview

- Disposition and Costs
- Collection Choices

Worldwide Experience

- What other countries have achieved and why

Technologies

- What are they, their status, and availability?

Maryland and the Draft Zero Waste Plan

- Where is Maryland starting from
- Challenges and examples elsewhere

Maryland Needs a Green Gate

- Exporting is not sustainable
- Domestic markets pull needed

Moving Forward in Maryland

- Appropriate Targets for Disposition
- Green Gate Policies



5



U.S. Overview

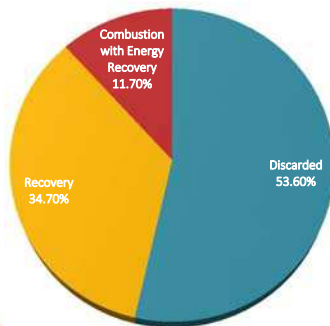


6

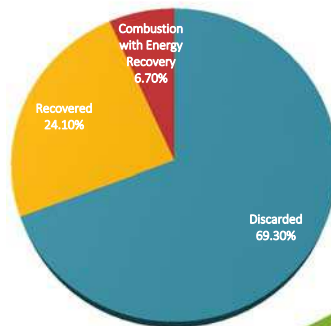


Disposition of MSW in the U.S.

**EPA Estimate:
250 million tons (2011)**



**Biocycle Estimate:
389 million tons (2008)**



7



U.S. Waste Management Infrastructure

Technology	Number
Source Separation Collections	9,000
Material Recovery Facilities (MRF)	586
Composting	2,300
Mixed Waste Processing Facilities (MWPF)	51
Mass Burn WTE	65
Modular WTE	9
RDF -Processing &/ or Combustion	20
Anaerobic Digestion	19
Transfer Stations	3,350
Landfills	1,908

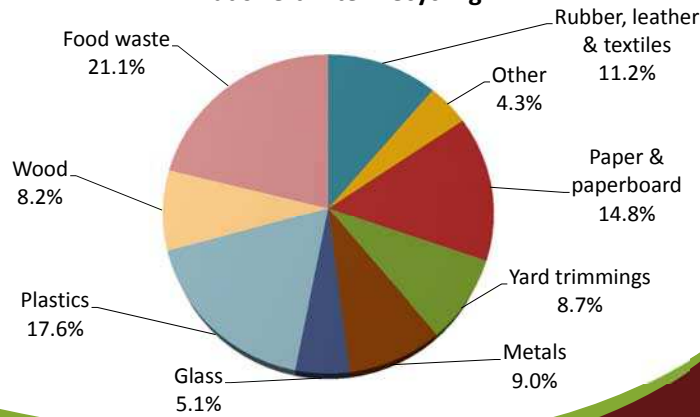


8



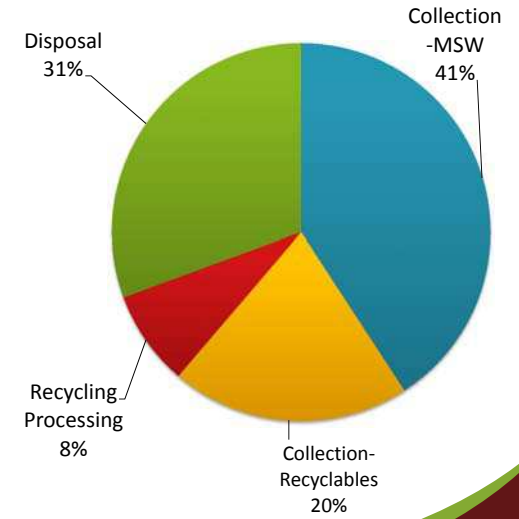
MSW Going to Landfill – EPA 2012

What's Left After Recycling



"System" Cost

- Everything = \$100 to \$500 per ton
 - WTE = \$68 per ton (2010)
 - Landfill = \$45 per ton (2012)



Collection Needs to Match Up with Technologies

One bin – two bin – three bin – four?
Which shall it be to be greener evermore?



Residential Food Waste Collection Growing - 2.2 % in 2013

183 communities offer curbside collection of residential food waste

18 states

2.55 million households

726,250 tons in 2012*

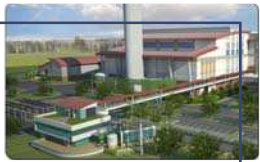


Source: BioCycle Magazine, March 2013

* 79% of programs reporting



New Projects in the U.S.



SWAPBC



Newby Island (San José)



Quasar



Enerkem



Honolulu



INEOS Bio



Companies in U.S. at Work with AD



Locations Advancing Processing/WTE Technologies

- Mass burn WTE expansions completed
 - Hillsborough County, FL - Covanta
 - Lee County, FL - Covanta
 - Olmsted County, MN – Olmsted County
 - Honolulu, HI – Covanta
- Mixed Waste Processing/AD Operating
 - Newby Island (San Jose, CA) – Republic/Zero Waste to Energy
 - Montgomery, AL- Infnitus /Zero Waste Energy
- Mass burn WTE facilities under construction
 - Durham York (Ontario CN) - Covanta
 - Palm Beach County, FL (SWAPBC) – B&W
- Advancing new facilities
 - Allentown, PA – Delta Thermo Energy Inc.
 - Baltimore, MD – Energy Answers
 - City of Cleveland, OH – to be determined
 - County of Hawaii, HI – to be determined
 - City of Houston, TX – to be determined
 - City of Los Angeles, CA – Green Conversion Systems
 - County of Maui, HI - Anaergia
 - Frederick County, MD (NMWDA) - Wheelabrator
 - Iowa City, IA – to be determined
 - Metro Vancouver, CN – to be determined
 - Prince William County, VA – LEEP
 - Puerto Rico – Energy Answers
 - Region of Peel, Ontario, CN – Covanta
 - Prince George’s County, MD
 - Wicomico County, MD



Locations Advancing Conversion Technologies

- Advancing new facilities with thermal technologies:
 - Three Rivers Solid Waste Management. Authority - Pontotoc, MS – Enerkem
- Anaerobic digestion specific RFPs issued:
 - Humboldt Waste Management Authority, Eureka, CA
- Anaerobic Digestion plants under development :
 - City of Newport News, VA - quasar
 - Town of Bourne, MA - Harvest Power
 - Town of Brunswick, ME - quasar and Village Green Ventures
 - City of Columbia, SC - W2E
 - City of Portland, OR - Columbia Biogas
 - Monticello, IN- Waste No Energy LLC
 - City of Charlotte, NC - Blue Sphere
 - Perris, CA - CR&R/Eisenmann
 - County of Santa Barbara, CA – Mustang Renewable Power Ventures
 - Prince William County, VA – to be determined





What can reduce the 60% of America's Waste that's currently going to Landfills?

- More source separated single-stream recycling
- Food scraps/ expanded organics collections
- Conversion technologies for liquid fuels and chemicals – *if they work!*
- Mixed waste processing for recyclables and fuel/feedstocks
- Proven WTE; but depends on:
 - Energy economics
 - Political will
- All together, called "MBT"



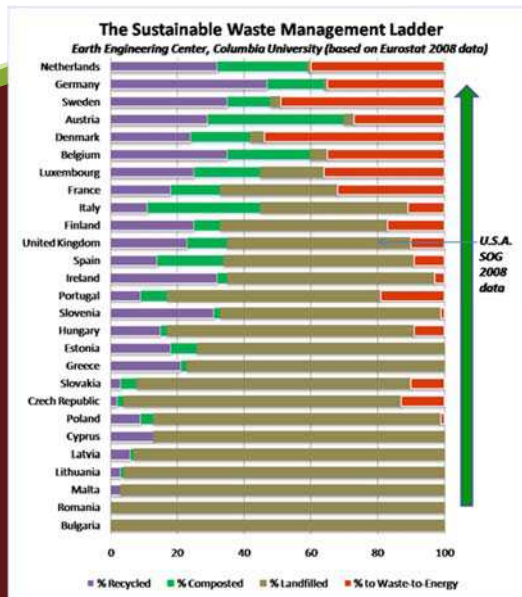
17



Worldwide Experience



18



Source: Earth Engineering Center, Columbia University, 2009

19



How High are the EU Landfill Taxes?

- Highest landfill tax rates and a ban too!
 - More than \$100 per ton!!
- 1999 EU Landfill Directive
 - Reduce biodegradable waste sent to landfill 65% by 2020
- EU targets to be met by 2020 (the '20-20-20' targets):
 - Greenhouse gas emissions of at least 20 percent below 1990 levels
 - 20 percent of energy consumption from renewables
 - 20 percent reduction in primary energy use by energy efficiency

Country	Landfill Tax
Austria	€ 87
Belgium	€60-€80
Denmark	€ 63
Finland	€ 40
France	€ 70
Germany	Ban
Ireland	€ 50
Netherlands	€ 107
Norway	€ 59
Sweden	€ 43
UK	€ 63



20



WTE Ash Utilization

Source: Frank Roethel, SUNY-Stoneybrook

- Metals recovery and aggregate production at facilities
- Beach and shoreline erosion control
- Aggregate for concrete blocks
- Aggregate substitute in both hot mix and cold mix asphalt



21



Technologies



22



Increased Interest Worldwide in Renewable EfW Technologies

476 Technology/Project Development Companies

- 28 Aerobic Composting
- 106 Anaerobic Digestion
- 30 Ethanol Fermentation
- 117 Gasification
- 30 Plasma Gasification
- 31 Pyrolysis
- 63 WTE: mass burn, modular, dedicated boilers, and RDF
- 69 Others (e.g., thermal cracking, hydrolysis, steam reforming, agglomeration, de-polymerization)

157 Commercial or Demonstration Facilities

- 70 Anaerobic Digestion
- 57 Gasification
- 10 Plasma Gasification
- 12 Pyrolysis



Source: Gershman, Brickner & Bratton, Inc., June 2014

23



Gasification Technology Offerors



24



Technologies Processing Organic Waste



25



Technologies Processing Mixed Non-recyclable Plastics



26



Energy/Fuel Product Values Are Key

Converting MSW to...	Product	1 ton MSW yields	Value Per Production Unit	Revenue Per Ton
	Power	500-600 kWh	@ \$0.06 / kWh	\$30-\$36
	Synthetic Crude	4 barrels	@ \$80 / barrel	\$320.00
	Ethanol	80 gallons	@ \$2.50 / gallon	\$200.00

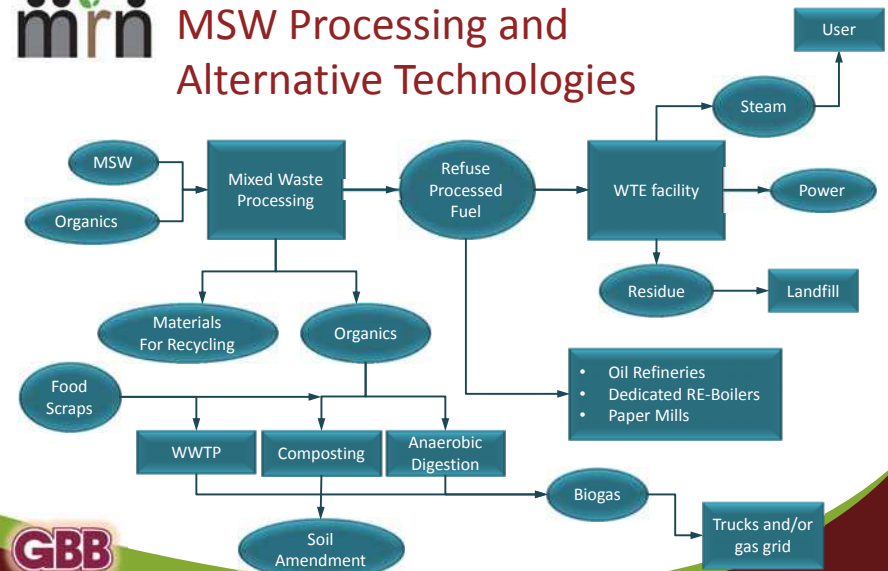
++ sale of chemical feedstocks, heat and/or recovered metals
System Capital Costs and O&M Costs impact the NET MSW costs!



27



MSW Processing and Alternative Technologies



28



German System

81% of German household goes waste to MBT Plants

0.4% goes to LF



29



Mechanical Biological Treatment

- Originated in Germany in 1999 (now 36 operating MBTs)
- 330 plants in EU most in: Germany, Austria, Italy, Switzerland and the Netherlands; UK catching up
- Includes:
 - Mechanical sorting of recyclables and organics
 - Food scraps and green waste to AD, composting, and mulching
 - Residuals converted to high BTU refuse-derived fuel (RDF)
- RDF key to MBT diversion results
 - 54% to dedicated boilers, 16% to coal plants, 11% to cement kilns and 19% to others



Source: Mechanical Biological Treatment of Municipal Solid Waste. UK Department for Environment Food & Rural Affairs (DEFRA). February 2013

30



Waste Management Centre Pohlsche Heide, Germany

MBT with partial flow anaerobic dry digestion

- Publicly owned, privately operated
- The complex has MBT, landfill, WWTP, composting and tunnel anaerobic dry digestion plant for organic waste, and convenience center
 - mixed waste sorting for materials and RDF (double grind)
 - biogas with CHP and biogas to gas grid
 - composting for soil amendment and fertilizer products
 - residue to landfill



31



Minden, Germany

Small Sized Industrial RDF With Combined Heat and Power Plant



- Facility takes 35,000 tons of RDF per year from MBT
- BASF, chemical company, next door, uses for process steam
- RDF pays to be combusted as a fuel
 - 35 - 65 Euro per ton



32



Hannover, Germany Energy from Waste Facility



...where the rest of the waste goes!!

<http://www.eew-energyfromwaste.com/en/unsere-standorte/hanover.html>



SOLID WASTE
MANAGEMENT
CONSULTANTS

33



Technologies and Risk

Alternative	Risks/Liability	Risk Summary
Processing for Recyclables and Fuel	Proven commercial technology	Low
Composting	Proven commercial technology	Low
Mass Burn Combustion	Proven commercial technology	Low
RDF Combustion	Proven technology; limited U.S. commercial experience	Moderate to Low
Anaerobic Digestion	Proven technology; limited U.S. commercial experience	Moderate to Low
Mixed-Waste Composting	Previous large failures; limited large-scale plants in operation; product quality issues	Moderate to High
Pyrolysis and Gasification	Previous failures at scale; no operating experience with large-scale operations in the U.S.; full-scale demonstrations nearing operation	High



SOLID WASTE
MANAGEMENT
CONSULTANTS

Source: Gershman, Brickner & Bratton, Inc. 2014

34



Maryland and the Draft Zero Waste Plan



SOLID WASTE
MANAGEMENT
CONSULTANTS

35



The Draft MD Zero Waste Plan



SOLID WASTE
MANAGEMENT
CONSULTANTS

Source: MD Draft Zero Waste Plan, April 30, 2014

36



Draft MD Zero Waste Plan and Alternative Technologies

Objective 6 – 2014-2020

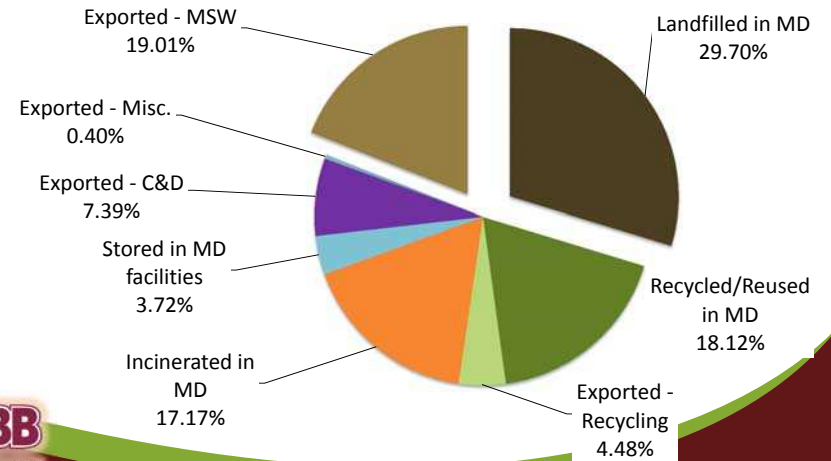
- 6.2 Encourage anaerobic digestion
- 6.3 Support gasification and other clean energy technologies
- 6.4 Utilize waste-to-energy (WTE) for managing solid waste, after maximum removal of recyclables



Source: MD Draft Zero Waste Plan, April 30, 2014



Maryland Solid Waste Management Practices – 8,141,492 Tons (2012)



Source: Tables 14 and 15 of the 2013 MD SW Management & Diversion Report. Percentages shown do not reflect MRA counting or rates.



MRFs in Maryland

1. BFI Baltimore
2. Weyerhaeuser Recycling Services
3. Prince George's County Recycling
4. Baltimore Co. Resource Recovery Facility
5. Montgomery Co. Recycling Center
6. Recycle America Commercial Waste
7. Recycle America Single Stream Facility
8. Office Paper Systems, Inc. Fiber MRF
9. Carroll County-Northern Landfill Processing Facility



Waste-to-Energy Facilities in Maryland

1. Harford Waste-to-Energy Facility, Joppa
2. Baltimore Refuse Energy Systems Company (BRESKO), Baltimore, MD
3. Montgomery County Resource Recovery Facility, Dickerson, MD





Publicly-Owned MSW Landfills in MD

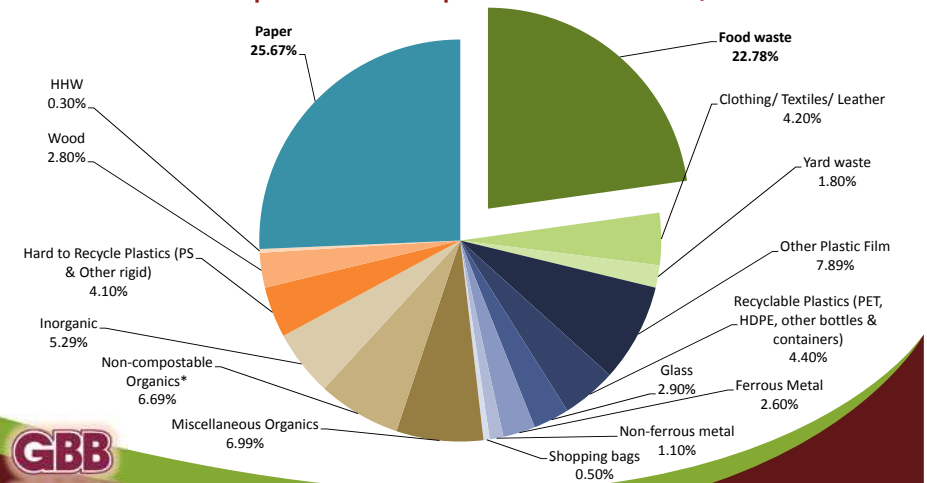
- 22 locations with 54.8 million tons remaining capacity
- Largest ones locations & capacity (tons):
 - Washington County – 8 million
 - City of Baltimore – 6 million
 - Anne Arundel County – 5.4 million
 - Baltimore County – 5.1 million
 - Mid-Shore II Regional – 4.4 million
 - Howard County – 4 million
 - Prince George’s County – 3.6 million



Source: 2013 MD SW Management & Diversion Report



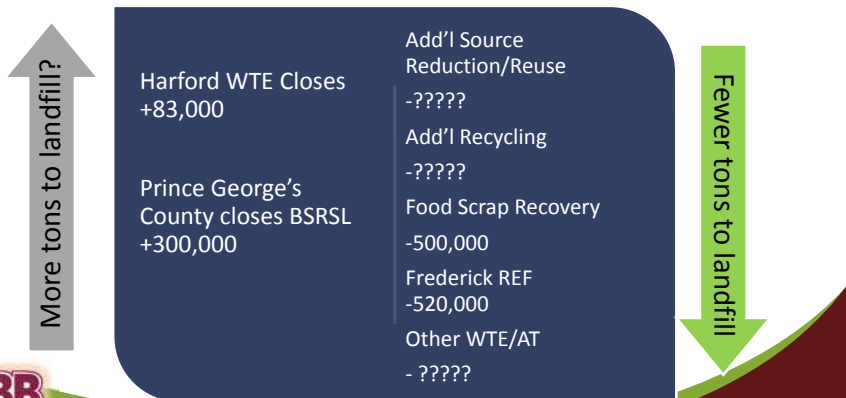
Montgomery County, MD Waste Disposed Composite Composition – 2012/13



Source: SCS Engineers Report, July 26, 2013



Changes to the MD MRA Tons Landfilled



Organics – What’s Coming to Maryland?

Commercial Food Waste Collection Services

Transfer to Peninsula in DE for Processing

Howard County Residential Organics Pilot Collection

Prince George’s County Organics Composting Pilot

Proposed NMWDA Regional Organics Facility

Proposed - Peninsula Composting Project





WTE/CT – What May Come to Maryland?

- Energy Answers – Baltimore
 - 4,000 TPD of Processed Refuse Fuel for 160 MW combined heat and power and 1,150 TPD recyclables and aggregates
 - *Still going forward?*
- Frederick Regional Renewable WTE Facility (through NMWDA)
 - 1,500 TPD Mass Burn for 45 MW power
 - Wheelabrator contracted; permits obtained
 - MSW and biosolids from Frederick, County; looking for another party to take Carroll County's place
- Prince George's County procurement
- Wicomico County procurement



SOLID WASTE
MANAGEMENT
CONSULTANTS

45



Challenges in using AT to advance ZWLF

- Expensive to build
- Some require collection changes
- New facilities in the works
- Commercial waste collection not controlled
- Landfilling will cost less without intervention
- AT technologies need reliable and predictable streams of waste
 - Can't be an "add-on" or wait for "leftovers"



SOLID WASTE
MANAGEMENT
CONSULTANTS

46



Maryland Needs a Green Gate



SOLID WASTE
MANAGEMENT
CONSULTANTS

47



China's Green Fence



- Enforcing contaminant levels in recyclables
- Could lead to increased exporting costs
- U.S. will need to find other outlets for recyclables sent to China
- Requires increased processing, resulting in higher costs and lower revenues
 - If we have to make more expensive commodities, why not utilize them domestically?
 - U.S. needs to create market pull for recyclables to be converted domestically



SOLID WASTE
MANAGEMENT
CONSULTANTS

48



Maryland Can Become a "Green Gate"



Create circular economies to convert Mid-Atlantic recyclables for manufacturing feedstocks or consumer products



SOLID WASTE
MANAGEMENT
CONSULTANTS



State	Tons Recycled
MD	1,572,200
PA	4,465,949
DE	125,919
NJ	4,346,256
DC	20,122
WV	345,271
VA	2,830,702
Regional Total	13,706,419

Tons Recycled in U.S. EPA Region 3 (plus New Jersey)

Source: GBB



SOLID WASTE
MANAGEMENT
CONSULTANTS



Moving Forward in Maryland



SOLID WASTE
MANAGEMENT
CONSULTANTS



General Trends in the U.S.

- Recognition of waste as a resource
- Waste reduction, product stewardship, and sustainability efforts
- Reduced environmental and energy impact of products
- Increased recycling goals
- Increased interest in Zero Waste and food scrap recycling
- More mixed waste processing
- One-Bin, Wet/Dry, and closed market collection approaches
- Continued dialogue regarding WTE and Conversion Technologies
- Public and financial support for better waste management



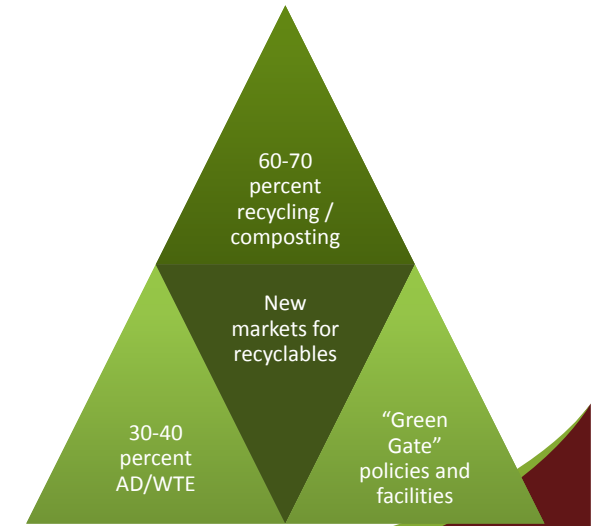
SOLID WASTE
MANAGEMENT
CONSULTANTS



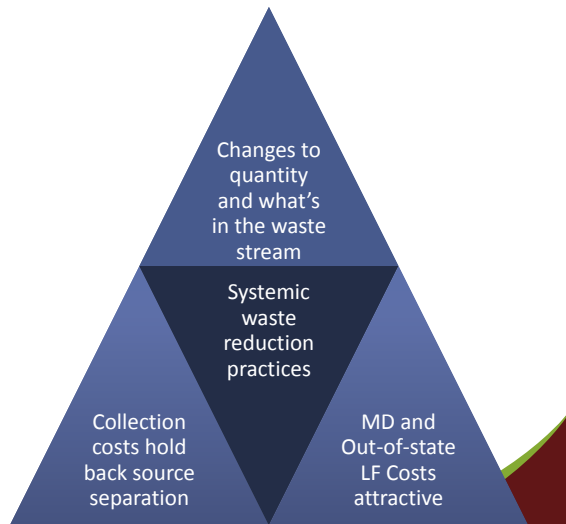
Recommended Maryland Policies



Achievable Goals for Maryland



Real Challenges to ZWLF Programs & Policy Planning



Thank you!!

Harvey Gershman

Hgershman@gbbinc.com

1-703-573-5800

1-800-573-5801

1-703-698-1306 (fax)

www.gbbinc.com

