



 **GBB -- Quality – Value – Ethics – Results**



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

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 **GBB Waste Technology Services**

- Economic, technical, and environmental reviews
- Markets development
- Process planning and design
- Waste characterization and sourcing
- Procurement and negotiation assistance
- Independent feasibility consultant
- Technology due diligence
- Acceptance testing and operations monitoring

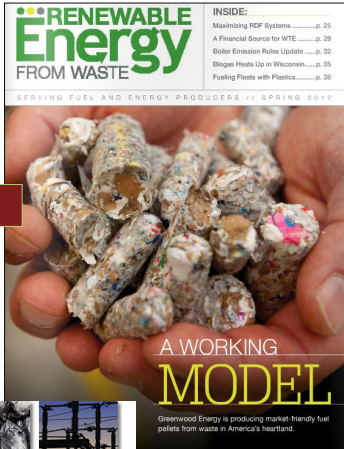



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 **RENEWABLE Energy FROM WASTE** CONFERENCE

[www.rewmag.com](http://www.rewmag.com)







NOVEMBER 18-20 2013 >> WEST PALM BEACH, FLORIDA

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**History of the MSW  
Management in the US**

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## Policy History

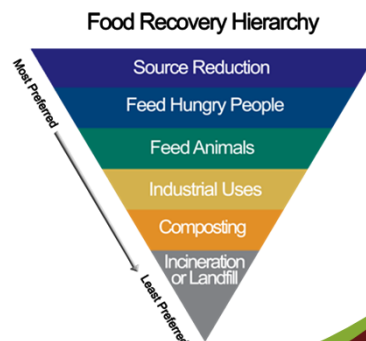
- The first U.S. federal solid waste management law: Solid Waste Disposal Act (SWDA) of 1965
- First Earth Day April in 1970
- The Resource Conservation and Recovery Act (RCRA) of 1976
- 1984 through 1998 RCRA Amendments for policy shift from landfilling to waste reduction, and recovery of materials and energy
- 1990 Clear Air Act Amendment



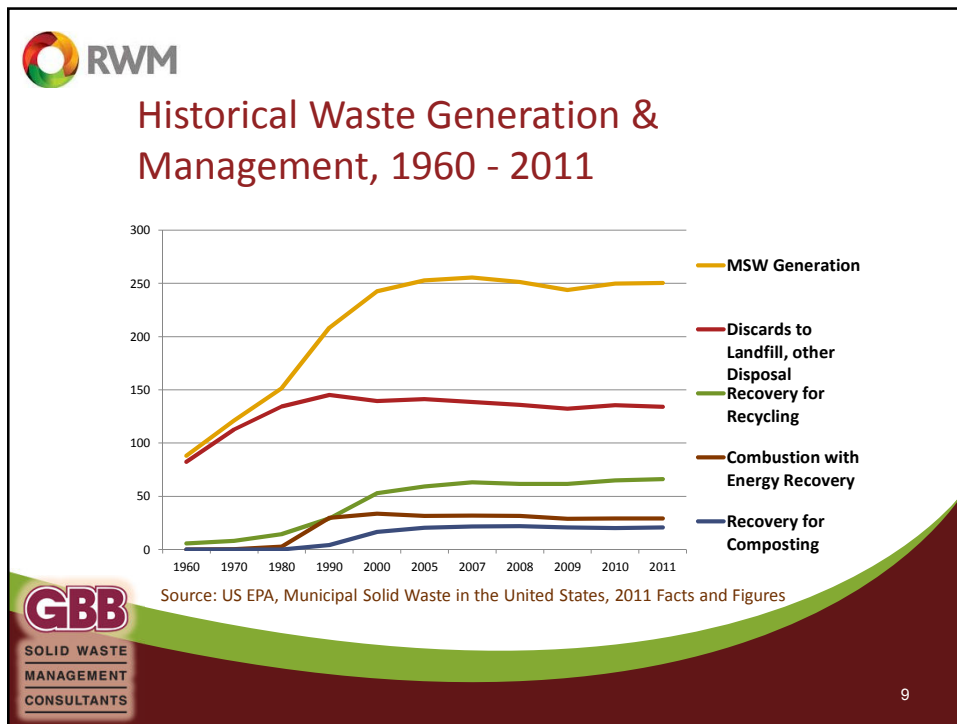
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## EPA Significant Changes to the Waste Management Policy, 2005 EPA Waste Hierarchies



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### General Trends in the US

- Recognized value for materials and energy from waste
- Waste reduction and product stewardship efforts
- Reduce the environmental impact of products
- Implementation of integrated waste management related policy with recycling goals
- Increased interest in Zero waste and food recycling
- Public and financial support for better waste management

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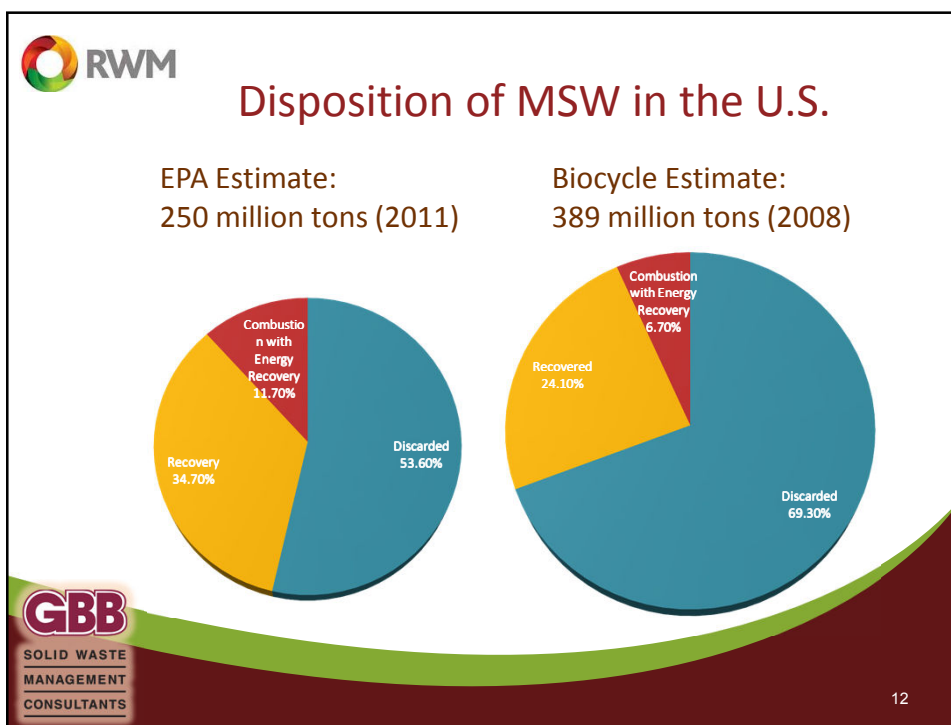



## Management Practices

What are we doing today with our waste?

  
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## Generation and Recovery of Material Types (EPA, 2011)

| Material             | Weight Generated<br>(million tons) | Weight Recovered<br>(million tons) | Recovery as Percent<br>of Generation |
|----------------------|------------------------------------|------------------------------------|--------------------------------------|
| Paper and paperboard | 71.31                              | 44.57                              | 62.5%                                |
| Glass                | 11.53                              | 3.13                               | 27.1%                                |
| Metals               | 22.41                              | 7.87                               | 35.1%                                |
| Plastics             | 31.04                              | 2.55                               | 8.2%                                 |
| Rubber and leather   | 7.78                               | 1.17                               | 15.0%                                |
| Textiles             | 13.12                              | 1.97                               | 15.0%                                |
| Wood                 | 15.88                              | 2.30                               | 14.5%                                |
| Food                 | 34.76                              | 0.97                               | 2.8%                                 |
| Yard trimmings       | 33.40                              | 19.20                              | 57.5%                                |
| Total other wastes   | 80.63                              | 21.58                              | 26.8%                                |
| <b>Total MSW</b>     | <b>249.86</b>                      | <b>85.14</b>                       | <b>34.1%</b>                         |



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## Recycling and Material Recovery Facilities

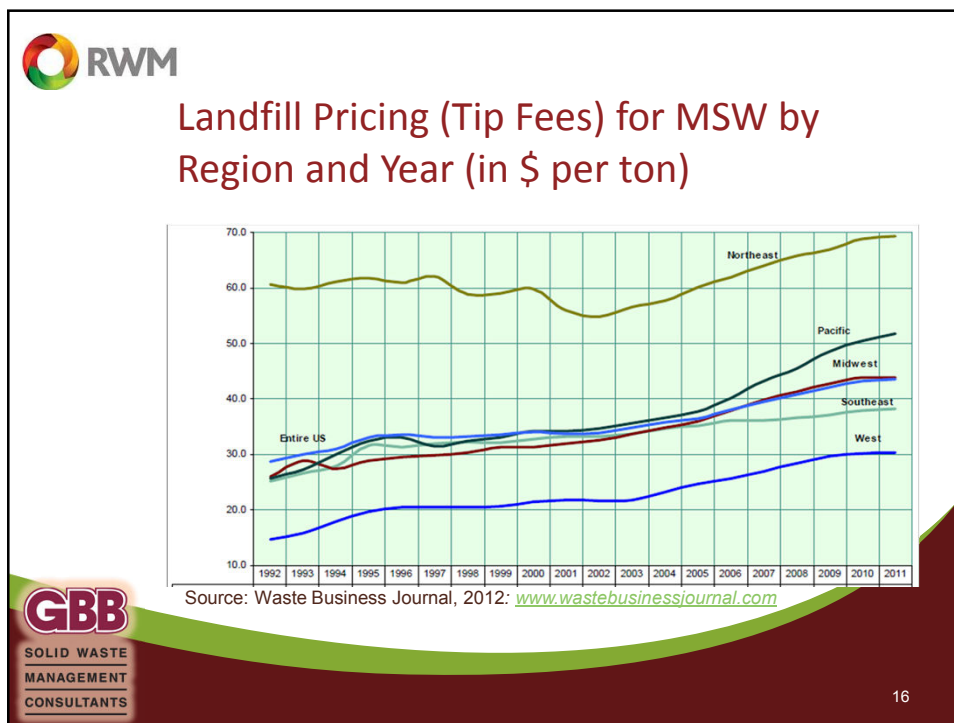
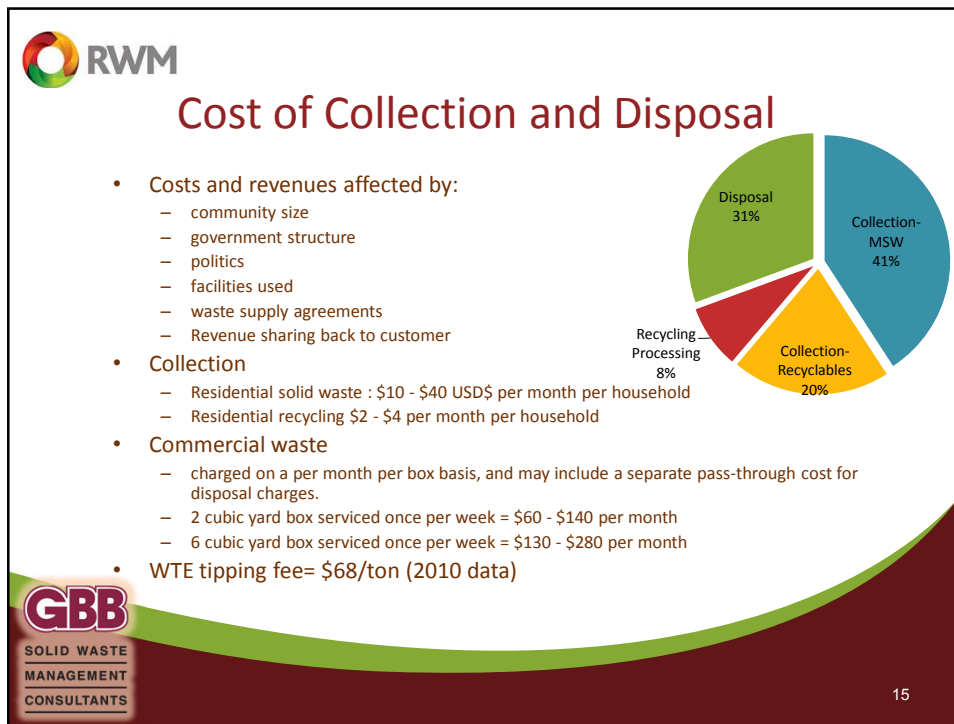
- In 1970, US relied on local scrap yards and waste paper dealers to receive and prepare materials for recycling
- Now, US also has MRFs:

| MRF Type                            | Number of MRFs |            |
|-------------------------------------|----------------|------------|
| Year:                               | 2006           | 2012       |
| Single Stream                       | 144            | 263        |
| Dual Stream                         | 227            | 228        |
| Source Separated,<br>Other Programs | 127            | 95         |
| <b>All MRFs</b>                     | <b>437</b>     | <b>586</b> |

*Materials Recycling and Processing  
in the United States (BERENYI, 2012)*



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**Technology review**  
Existing and emerging technologies


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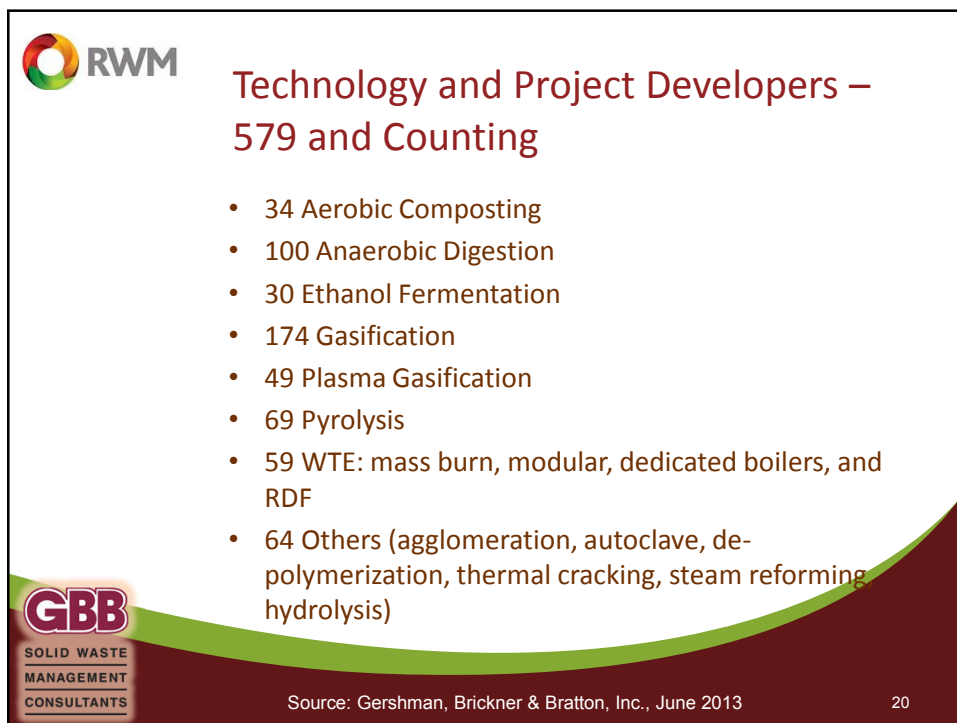
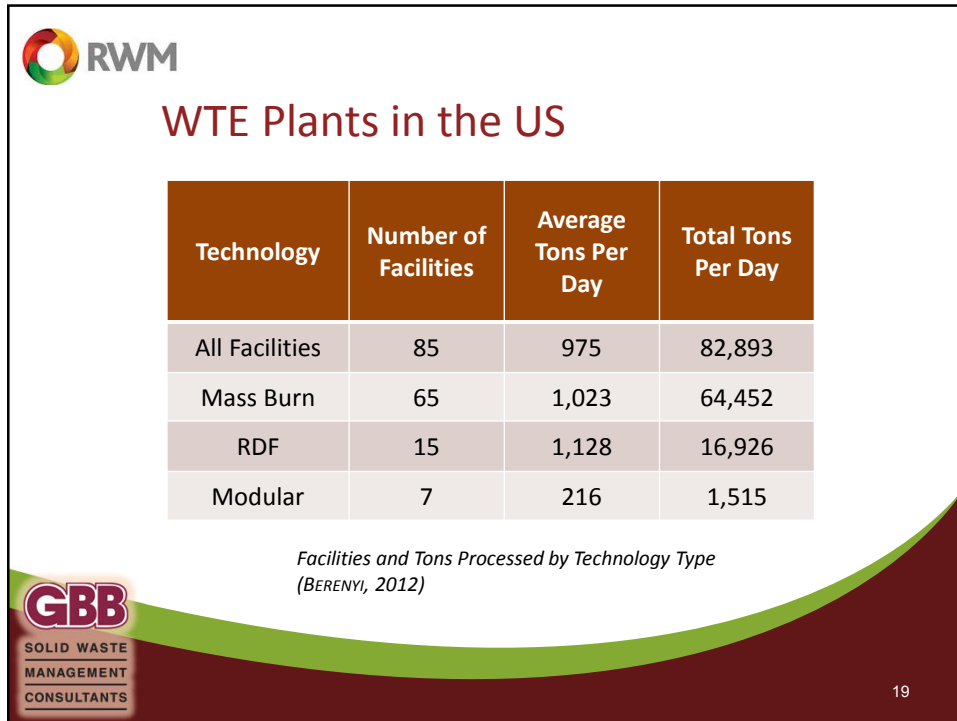
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**WTE Evolution in the US**

- Recovery 1 Facility- City of New Orleans- Waste Management, Inc.: 1976-1987
- 150 WTE projects in development in the U.S. in the late 1990s
- 2 US Supreme Court cases and the 1990 Clear Air Act Amendment affected the WTE development
- Today, there are 85 WTE plants operating in 23 states, handling approximately 12% of MSW

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## Gasification Technology Offerors



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## Technologies Processing Mixed Non-recyclable Plastics



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 **Technologies Processing Organic Waste**





















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 **Technology Commercialization Examples**

| Location                       | Edmonton, Alberta, CA                   | Vero Beach, FL                      | Storey, NV                                 | Monterey, CA              | Sacramento, CA        |
|--------------------------------|---|-------------------------------------|--|---------------------------|-----------------------|
| Technology                     | Gasification/<br>Catal. Conv. of Syngas | Gasification/<br>Ferment. of Syngas | Gasification/<br>Catalytic Conv. of Syngas | Anaerobic Digestion       | Anaerobic Digestion   |
| Developer                      | Energem                                 | INEOS Bio                           | Fulcrum Bioenergy                          | Zero Waste Energy         | Clean World Partners  |
| Feedstock                      | Non-recycled MSW                        | Yard, vegetative, residential waste | Post-sorted MSW                            | SSO (food and yard waste) | Commercial food waste |
| Throughput (TPD)               | 300                                     | 450                                 | 400  | 15                        | 100                   |
| Energy Products                | Methanol; Ethanol                       | Ethanol                             | Ethanol; Propanol                          | Biogas; Electricity       | Biogas; Electricity   |
| Cost                           | \$80M                                   | \$130M                              | \$120M                                     | \$1.6M                    | \$12M                 |
| Federal Grants/Loan Guarantees | \$23.5M                                 | \$125M                              | --   | --                        | \$1.8M                |
| Start Date                     | 2014                                    | June 2012                           | 2015                                       | Jan 2013                  | 2014                  |

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## Locations Advancing “Proven” Technologies

- Mass burn WTE expansions completed
  - Hillsborough County, FL - Covanta
  - Lee County, FL - Covanta
  - Olmsted County, MN – Olmsted County
  - Honolulu, HI – Covanta
- Mass burn WTE facilities under construction
  - Durham York (Ontario CN) - Covanta
  - Palm Beach County, FL (SWAPBC) – B&W
- Example of Locations advancing new facilities with ‘proven’ technologies:
  - Baltimore, MD – Energy Answers
  - Frederick County, MD (NMWDA) - Wheelabrator
  - City of Los Angeles, CA – Green Conversion Systems
  - Region of Peel, Ontario, CN - Covanta
  - Puerto Rico – Energy Answers
  - Metro Vancouver, CN – To be determined




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## Locations Advancing “Proven” Technologies (cont’d)

- Anaerobic digestion specific RFPs issued:
  - Humboldt Waste Management Authority, Eureka, CA
  - Montgomery, AL- under construction w/Zero Waste Energy
- Anaerobic Digestion plants under development based on private companies initiatives:
  - 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- w/W2E
  - City of Portland, OR- w/Columbia Biogas
  - Monticello, IN- w/ Waste No Energy LLC
  - City of Charlotte, NC- w/Blue Sphere



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## Featured Ongoing Projects in North America

-  **City of Cleveland- Long-Term Waste Recycling and Disposal Project**
-  **City of Houston- One Bin for all**
-  **Prince William County- Demonstration plant of an emerging MSW WTE conversion technology**
-  **County of Maui- Integrated Waste Conversion and Energy Project**
-  **Iowa City- Conversion technology as part of the solid waste management system**



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## Opinion: Trends for the Future

- Many conversion projects advancing
- Will need 4-6 years to learn what works and their economics
- Continuation of public sector taking “Low Risk” attitude until “proven”
- Demand for more recyclables expected to continue at attractive pricing
- More mixed waste processing systems...again!
  - Many conversion technologies require MSW pre-processing... for feedstock sizing and inerts removal
  - Electric utilities may become a player for RDF
- ‘Environmentalists’ and ‘Zero Waste’ proponents will continue to fight WTE and Waste Conversion Technologies calling them all “incineration”




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## Applicability to Brazil

What are the solutions and what can be expected to happen?

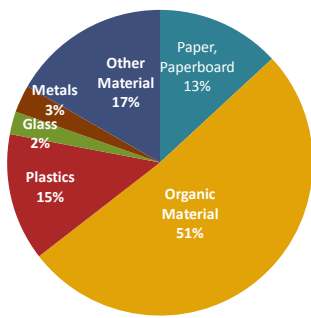
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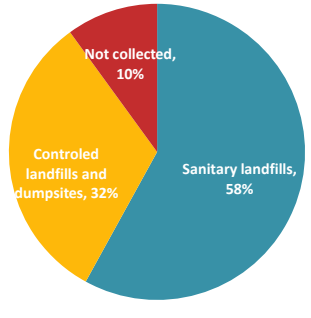
## Brazil Current Situation

**Waste Composition**




| Material          | Percentage |
|-------------------|------------|
| Organic Material  | 51%        |
| Other Material    | 17%        |
| Paper, Paperboard | 13%        |
| Plastics          | 15%        |
| Metals            | 3%         |
| Glass             | 2%         |

**Final Disposal of MSW in 2012**



| Disposal Method                    | Percentage |
|------------------------------------|------------|
| Sanitary landfills                 | 58%        |
| Controlled landfills and dumpsites | 32%        |
| Not collected                      | 10%        |

Source: ABRELPE, 2012

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## Brazil National Policy and Goals

- National Solid Waste Policy- PNRS
- National goals for 2021 within the region include:
  - Prevention of illegal dumping and remediation of dump sites
  - Control of existing landfills and developing sanitary landfill
  - Improve solid waste collection services
  - Increase recycling
  - Increase capacity for waste processing
  - Reduce exportation of wastes for treatment and/or disposal
  - Reduce the greenhouse gas impacts of the treatment of organic waste through capture and use of gases produced

Sources: Universidad Estadual Paulista, Abrelpe, IPT, Ministry of Science and Technology, Brazil; CETESB, CPLEA, Plastivida, Abiplast.




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## Brazil Recycling and Composting

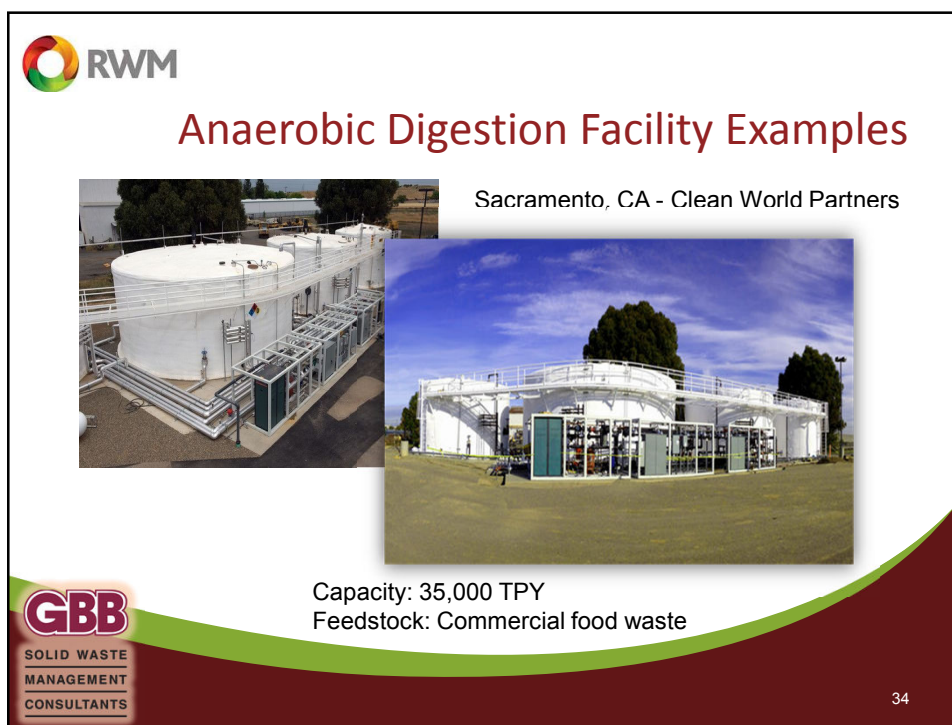
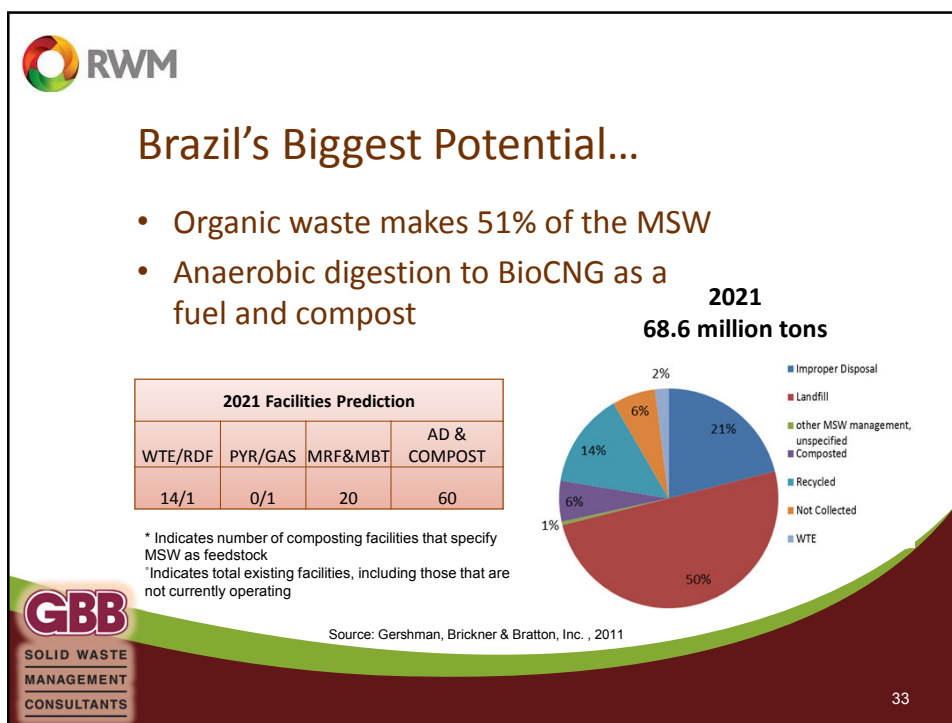
- Few formal MRFs
- 643 informal recycling and sorting centers in 2011
- 44 composting facilities processing MSW as a feedstock in 2011
- Northeast (Belem, Sao Luis) and Southeast regions of Brazil have highest number of collection programs for MSW and recyclables
  - In 2001, fewer than 8.2% of municipalities with garbage collection also collected recyclables separately
  - In 2010, the percentage that have separate collection had reached 57.6%
- Initiated WTE projects:
  - Rio de Janeiro,
  - Belo Horizonte,
  - Campo Grande,
  - Ferraz de Vasconcelos,
  - Sao Bernardo do Campo, Sao Sebastiao,
  - Santos

Sources: Universidad Estadual Paulista, Abrelpe, IPT, Ministry of Science and Technology, Brazil; CETESB, CPLEA, Plastivida, Abiplast.



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## Anaerobic Digestion Facility Examples



Monterey, CA - Zero Waste Energy



Capacity: 5,000 TPY  
Feedstock: MSW food & yard waste



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## Brazil's Challenges to Achieve Sustainable Solid Waste Management

- Public education
- Integrate informal recycling into a formal integrated waste management system
- Develop efficient collection systems to create flows for more recycling and waste conversion
- Develop financing mechanisms to minimize the burden on the citizens and develop processing capacity
- Energy/fuel revenues for the waste processing facilities need to be high to compete with landfilling
- Encourage landfill bans and waste diversion through landfill taxes as in EU and UK



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A Realistic & Ultimate Goal:

Fully Sustainable and Efficient Waste  
Management System with Significant  
Diversion (Recycling) and WTE-WCT  
...in a 50-50 partnership!  
*...for more jobs, better environment,  
and energy independence!*



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Questions and comments?

***Thank you!!***

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