Solid Waste Management Vision of Los Angeles County

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COBY SKYE

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Overview

- State Legislation
- Solid Waste Management Paradigm
- Alternative Waste Management Technologies
  - Biological Conversion Technologies
  - Thermal Conversion Technologies
- Emissions Analysis
- Facility Examples
- Key Takeaways
- Discussion and Questions

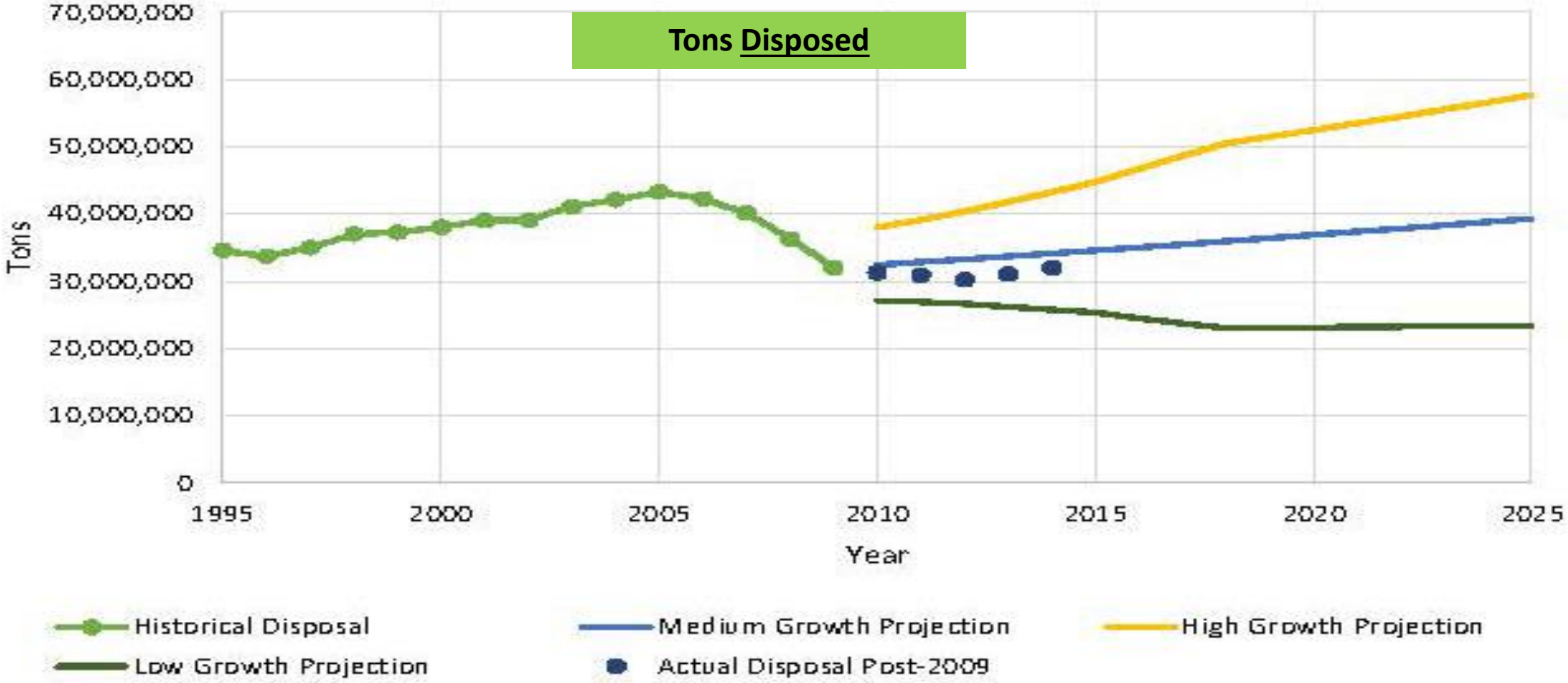
STATE LEGISLATION

Solid Waste Laws

- Assembly Bill 939 (1989)
  - Mandates local jurisdictions to achieve 50% diversion of solid waste by the year 2000

- Assembly Bill 341 (2011) –
  - Establishes statewide goal to achieve 75% diversion of solid waste by 2020
  - Requires mandatory commercial recycling services for large generators

State of Recycling in California (2016)



Source: CalRecycle

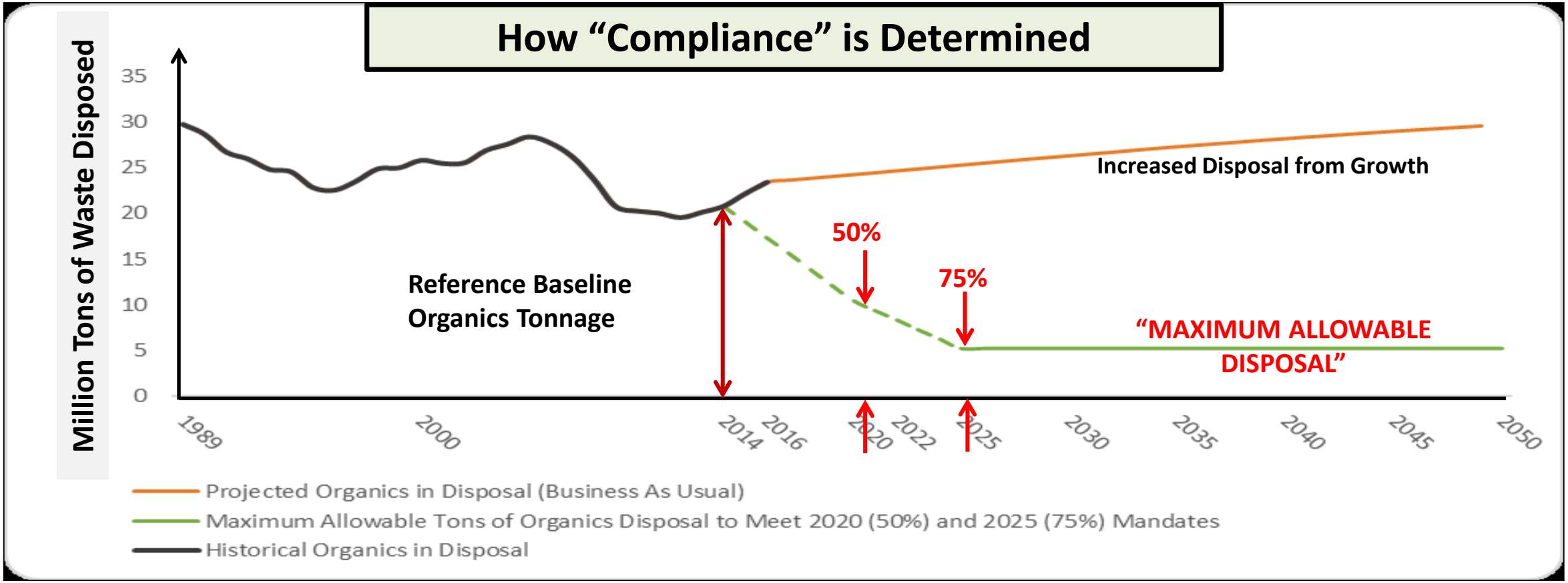
Organic Waste Laws

- Organic waste includes food waste, green waste, wood waste, and food-soiled paper

- Assembly Bill 1826 (2014)
  - Requires mandatory commercial organic waste recycling services for large organic waste generators

- Senate Bill 1383 (2016)
  - Establishes statewide goal of 50% reduction of organic waste disposal by 2020 and 75% reduction by 2025
  - Establishes statewide goal to recover of 20% of edible food disposed by 2025
  - Requires mandatory organic waste collection services for residents, business, municipal facilities by 2022

Senate Bill 1383



Greenhouse Gas Emission Reduction Laws

- Assembly Bill 32 (2006)
  - Requires California to reduce statewide greenhouse gas (GHG) emissions to 1990 levels by 2020
- Senate Bill 32 (2016)
  - Requires California to reduce statewide GHG emissions to 40% below the 1990 levels by 2030

SOLID WASTE MANAGEMENT PARADIGM

Current Typical Solid Waste Management

Trash

Landfill

SERRF

Recyclables

Materials Recovery Facility

Export

Landfill

SERRF

Green Waste

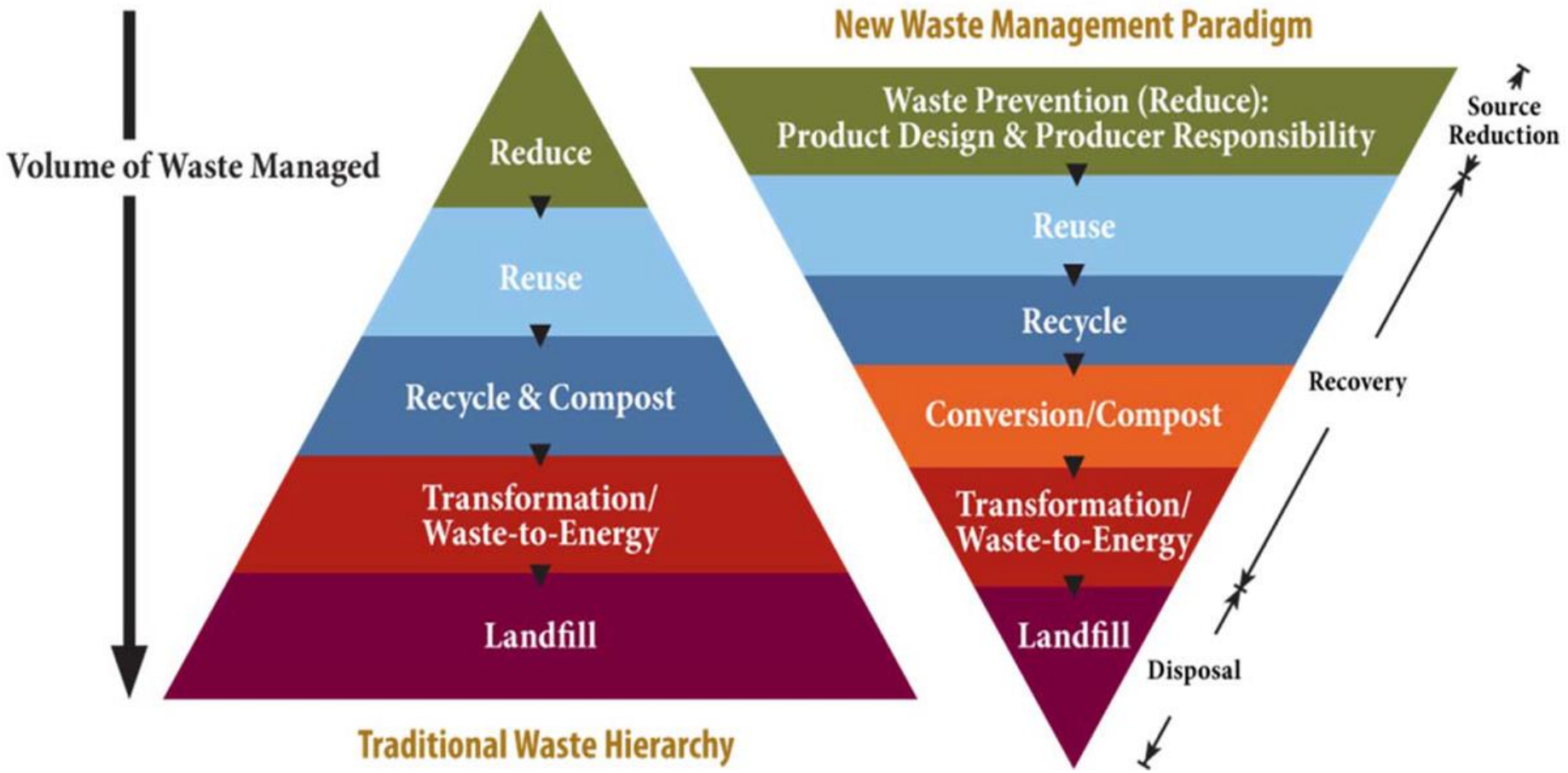
Alternative Daily Cover

Chip & Grind

Compost

Anaerobic Digestion

Waste Management Paradigm



ALTERNATIVE WASTE MANAGEMENT TECHNOLGIES

Alternatives for Waste Materials

BIOLOGICAL

Wet Organics

THERMAL

Dry Organics
Unrecyclable Waste

BIOLOGICAL CONVERSION TECHNOLOGIES

Wet Organic Waste Solutions – Biological Conversion Technologies

- Composting
  - Produces a stable soil amendment

- Anaerobic digestion
  - Produces biogas and solid residual digestate
  - Feedstocks with higher moisture content are preferable
    - Food waste
    - Fats, oils, and grease (FOG)

Operating Biological Facilities

Bioenergy (Food Waste)
Japan

Madrid, Spain

County Sanitation Districts,
Carson CA

Harvest Power, Florida

CR&R, Perris CA

THERMAL CONVERSION TECHNOLOGIES

Dry Organic and Inorganic Fraction of Waste – Transformation and Thermal Conversion Technologies

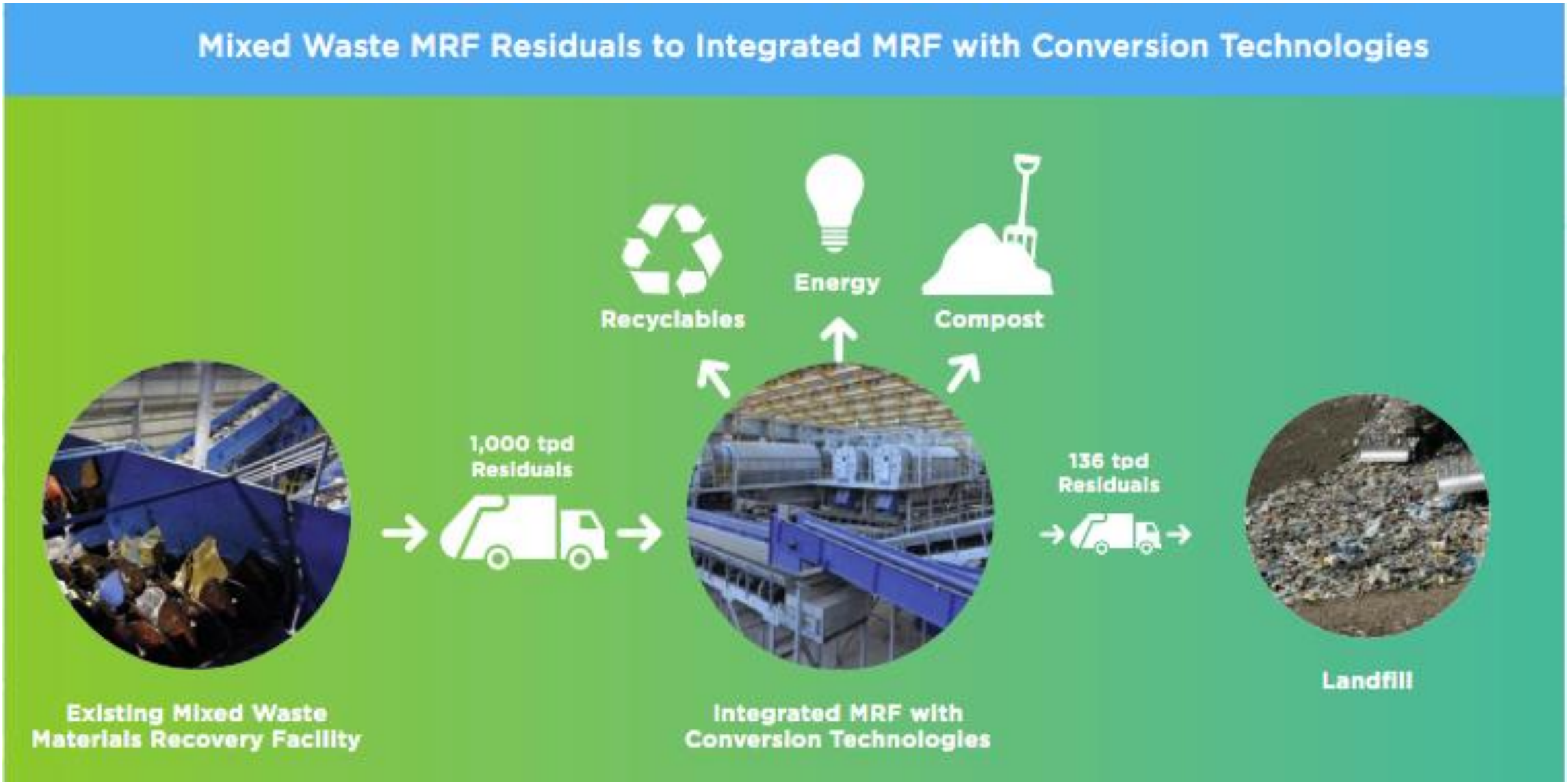
- Solutions for dry organic waste, contaminated waste & unrecyclable solid waste
  - Transformation
    - Incineration of waste to recover energy
    - Used to produce electricity
  - Advanced Thermal Conversion
    - Gasification or Pyrolysis
    - Used to produce electricity, fuel, and/or soil amendments

Why We Need Transformation and Thermal Conversion Technologies

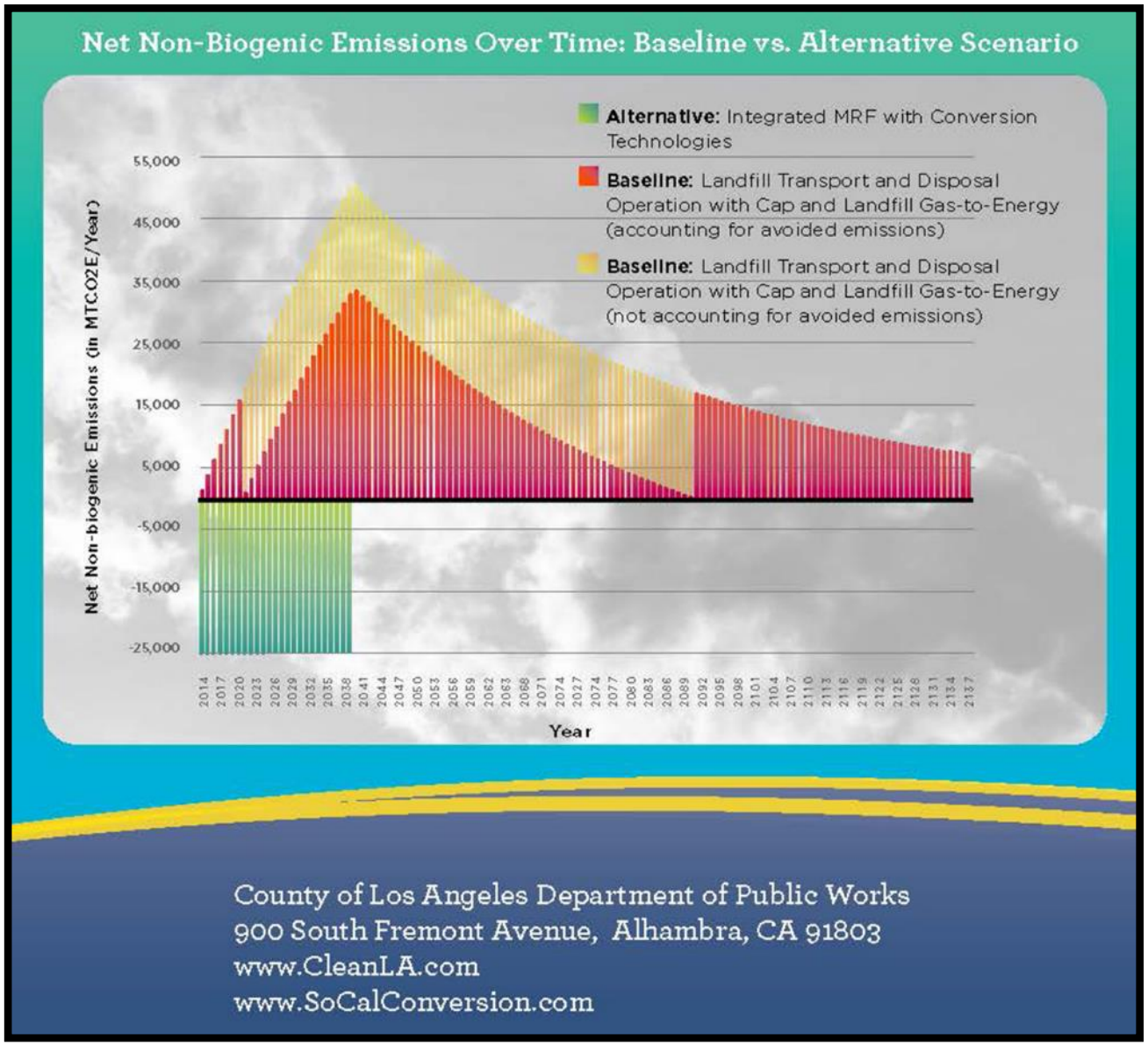
- Only so much of our waste stream is practically recyclable
  - Items like disposable diapers, hybrid materials (paper glued to plastic), medical waste, etc. cannot be recovered for recycling
- New ‘China Sword’ policy shows over-reliance on foreign markets
- Only 2 options for the remainder: landfills or thermal treatment

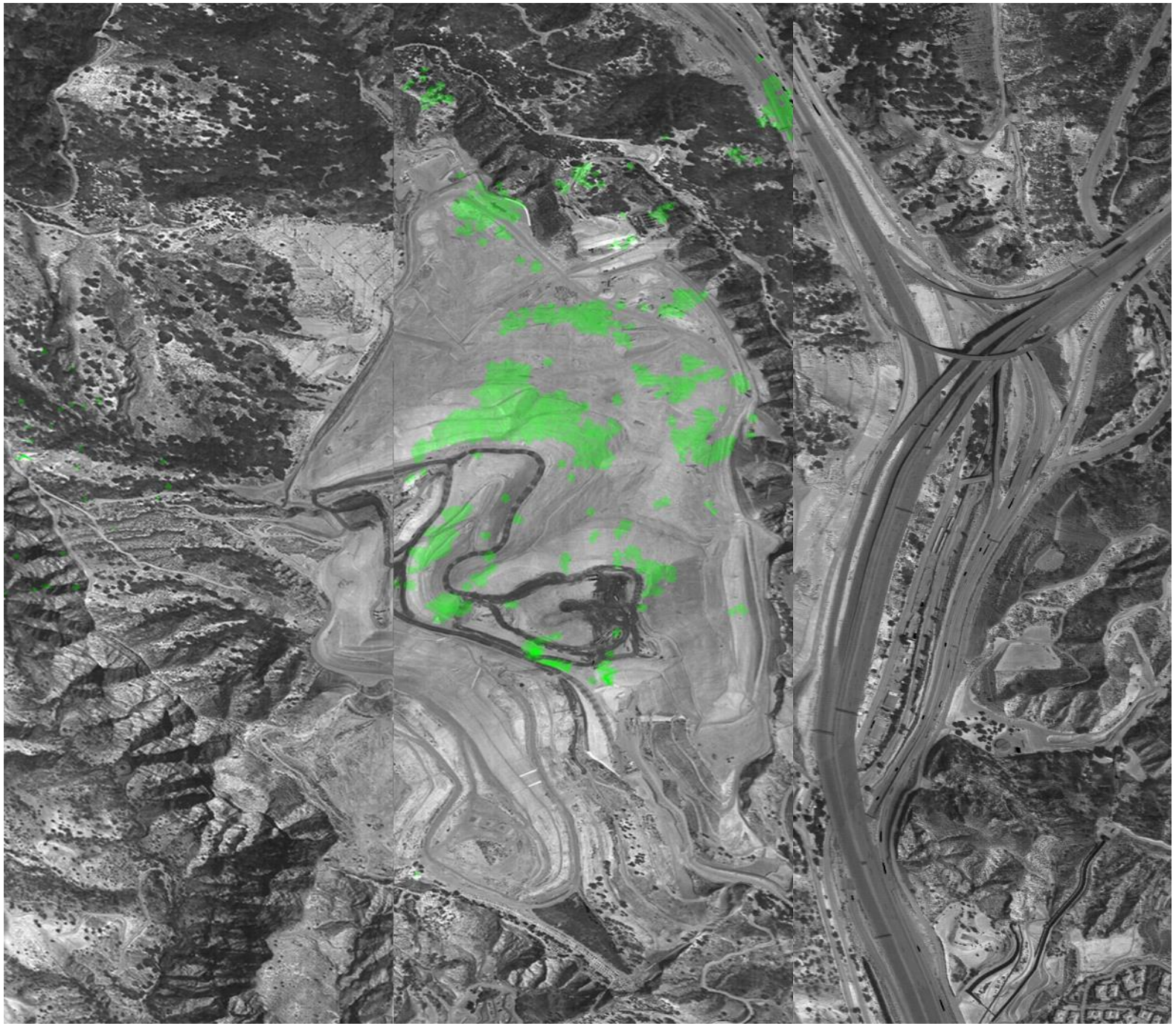
EMISSIONS ANALYSIS

Comparative Analysis



Alternative Technologies Emissions





NASA / JPL
July 2014

Methane Emissions from Landfill

Emissions Meets Established Limits

Evaluation of Emissions from Thermal Conversion Technologies Processing Municipal Solid Waste and Biomass

Final Report

Prepared for:

BioEnergy Producers Association
3325 Wilshire Blvd, Ste. 708
Los Angeles, CA 90010

University of California, Riverside
Riverside, California 92521

June 21, 2009

Measured Data

No.	Facility	Applied Technologies for reducing DXNs emission					Emission Standard ng-TEQ/Nm³	Measured Result ng-TEQ/Nm³
		Two-way Flue Gas Furnace	Hybrid ACC	Boiler + Gas Cooling Tower	Activated Carbon Injection	SCR		
1	S-City 90 t/d × 3	○	○	○	○	○	0.1	0.00043 0.00043 0.0027
2	K-City 140 t/d × 2	○	○	○	○	○	0.05	0.0087 0.0027
3	O-City 450 t/d × 2	○	○	○	○	○	0.1	0.0000065 0.0008
4	K-City 150 t/d × 1	○	○		○		0.1	0.017
5	R-City 90 t/d × 2	○	○	○	○	○	0.1	0.016 0.028
6	Y-City 400 t/d × 3	○	○	○	○	○	0.1	0.00026 0.00021 0.00045
7	M-City 135 t/d × 3	○	○	○	○	○	0.1	0.0027 0.03 0.0028

(2)朝日環境センター測定分析結果

① 排ガス測定結果 測定回数：2ヶ月に1回

項目	単位	18.4~18.5	18.6~18.7	18.8~18.9	18.10~18.12	18.12~19.1	19.2~19.3	環境審全管理値
ばいじん量	g/m³N	<0.0035	<0.0038	0.0039	<0.0029	<0.0032	<0.0036	0.01以下
		<0.0028	<0.0037	<0.0031	<0.0042	<0.0031	<0.0037	
		<0.0036	<0.0036	<0.0039	<0.0035	<0.0041		
硫黄酸化物	ppm	1.3	0.57	1.5	<0.40	<0.40	0.81	10以下
		1.3	1.0	0.56	0.53	0.54	<0.40	
		<0.42	<0.43	1.3	0.46	0.61		
塩化水素	ppm	1.9	1.6	1.8	0.46	0.69	1.6	10以下
		1.1	0.35	2.0	1.9	0.60	0.22	
		3.1	<0.23	1.3	0.70	1.6		
窒素酸化物	ppm	13	18	18	9.0	11	<4.5	50以下
		16	10	23	9.6	8.7	17	
		35	14	9.5	14	26		
亜鉛	mg/m³N	0.0022	<0.0028	0.0045	0.0033	0.0032	0.0060	-----
		<0.0021	<0.0026	<0.0023	0.0033	0.0029	<0.0026	
		<0.0022	<0.0025	<0.0026	<0.0022	<0.0025		
鉄	mg/m³N	0.020	0.080	0.034	<0.0020	0.036	0.032	-----
		0.077	0.010	0.10	0.28	0.0030	0.0055	
		<0.0024	0.0055	<0.0024	0.014	0.0091		
マンガン	mg/m³N	<0.0023	<0.0026	<0.0024	<0.0020	<0.0021	<0.0023	-----
		<0.0021	<0.0024	<0.0021	<0.0023	<0.0023	<0.0024	
		<0.0022	<0.0023	<0.0024	<0.0024	<0.0023		
カドミウム	mg/m³N	<0.0023	<0.0031	<0.0024	<0.0022	<0.0023	<0.0023	-----
		<0.0023	<0.0024	<0.0011	<0.0023	<0.0023	<0.0024	
		<0.0022	<0.0023	<0.0024	<0.0022	<0.0025		
鉛	mg/m³N	<0.012	<0.015	<0.013	<0.011	<0.011	<0.012	-----
		<0.011	<0.012	<0.011	<0.012	<0.013	<0.012	
		<0.011	<0.012	<0.012	<0.011	<0.012		
銅	mg/m³N	<0.0023	<0.0031	<0.0024	0.0025	0.0025	<0.0025	-----
		0.0026	<0.0026	<0.0021	0.0026	<0.0023	<0.0026	
		<0.0022	<0.0025	<0.0024	<0.0024	0.034		
水銀	mg/m³N	0.00090	<0.00082	<0.00085	<0.00077	<0.00077	0.00078	-----
		<0.00079	0.00084	0.0012	<0.00080	<0.00076	0.0014	
		0.00096	0.00087	<0.00081	0.0033	<0.00078		

Lots of Data and References Available from Regulatory Agencies Internationally

FACILITY EXAMPLES

Waste-to-Energy in Europe in 2016

- WtE Plants operating in Europe (not including hazardous waste incineration plants)
- Waste thermally treated in WtE plants (in million tonnes)

Data supplied by CEWEP members and national sources

*** Includes plant in Andorra**

CEWEP Confederation of European Waste-to-Energy Plants

Delivery of Waste Incineration Plants (2010.07)

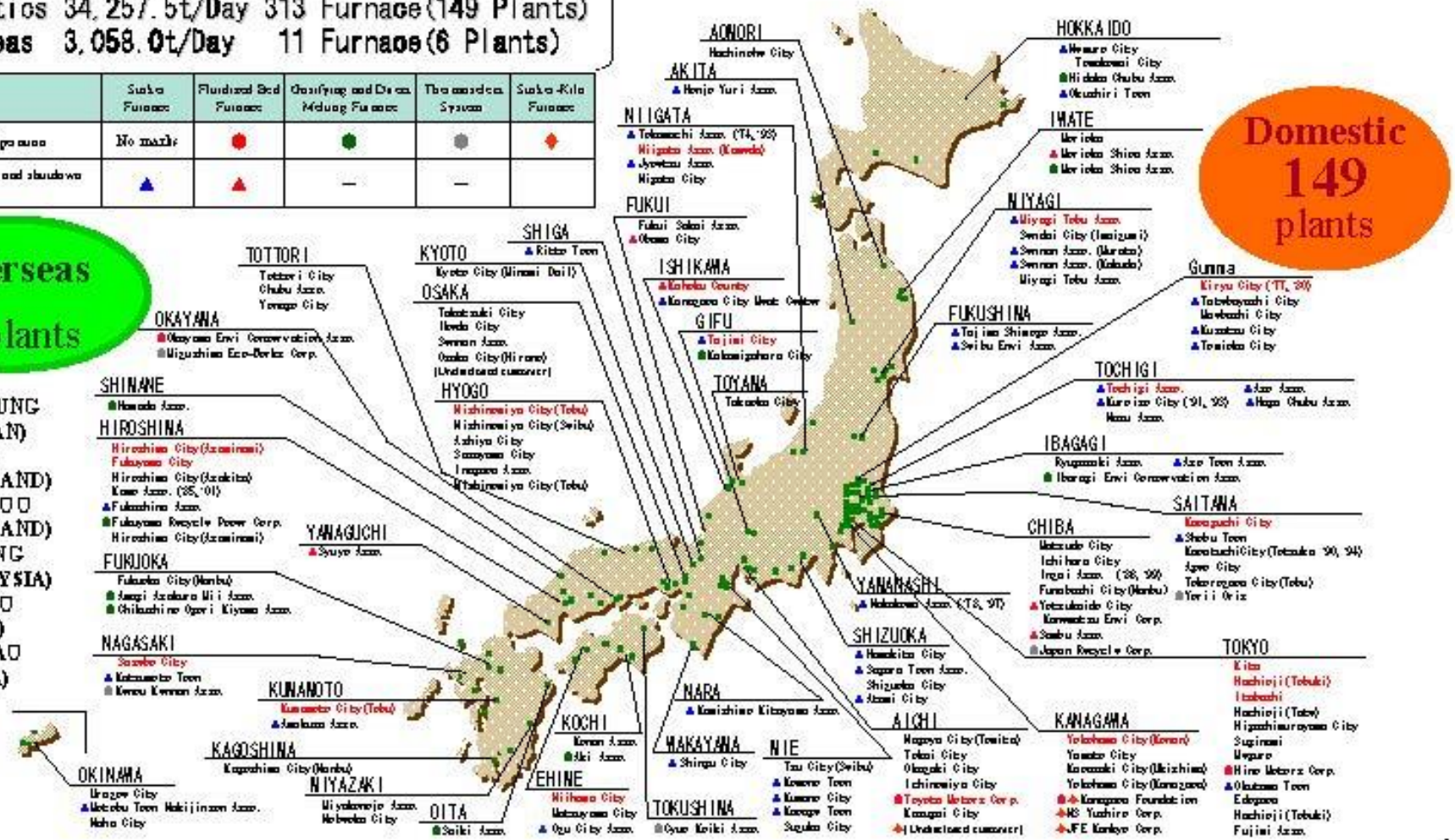
Domestics 34,257.5t/Day 313 Furnace (149 Plants)
Overseas 3,058.0t/Day 11 Furnaces (6 Plants)

	Stoker Furnace	Fluidized Bed Furnace	Gasifying and Direct Melting Furnace	Thermoselect System	Stoker-Kiln Furnace
Continuous Operation	No mark	●	●	●	◆
Daily start-up and shutdown Operation	▲	▲	–	–	

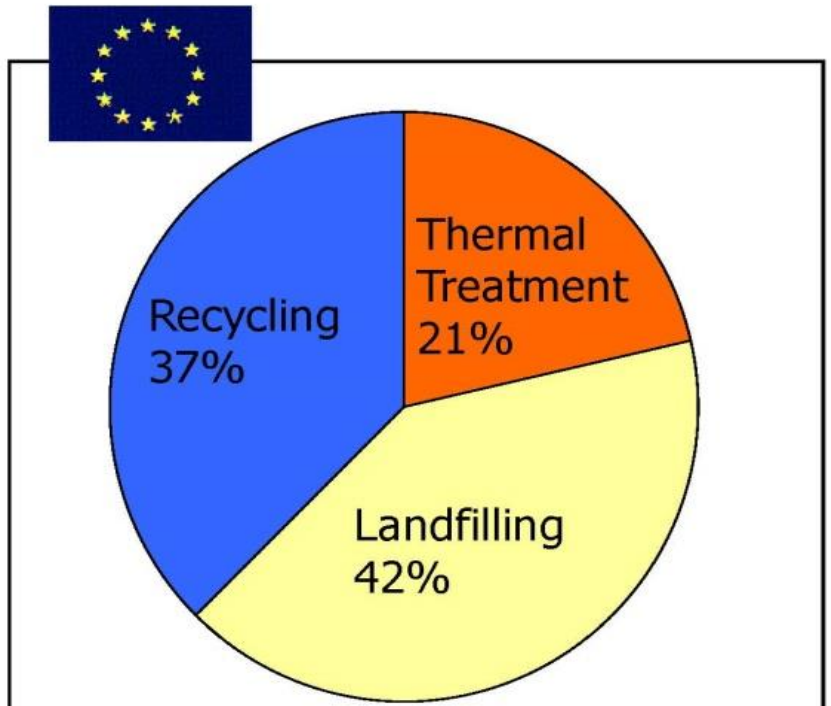
Domestic 149 plants

Overseas 6 plants

1. TAICHUNG (TAIWAN)
2. SAMUI (THAILAND)
3. BANGPOO (THAILAND)
4. GENTING (MALAYSIA)
5. ALBANO (ITALY)
6. QINGDAO (CHINA)

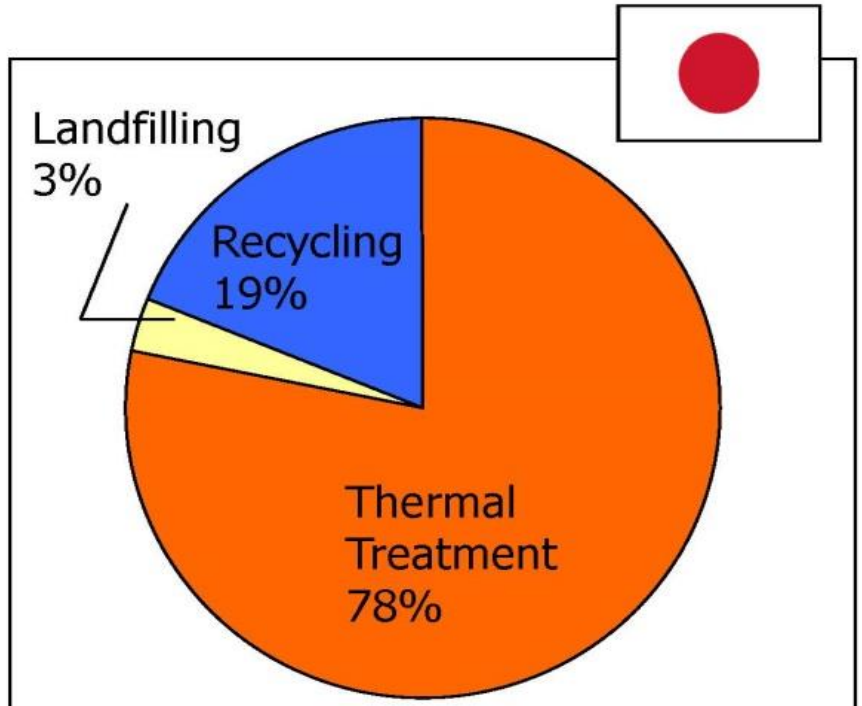


Waste Management Comparison



In the whole of Europe
about 60 million tons of MSW
is thermally treated in some
420 Waste-to-Energy plants

Source: CEWEP('07)

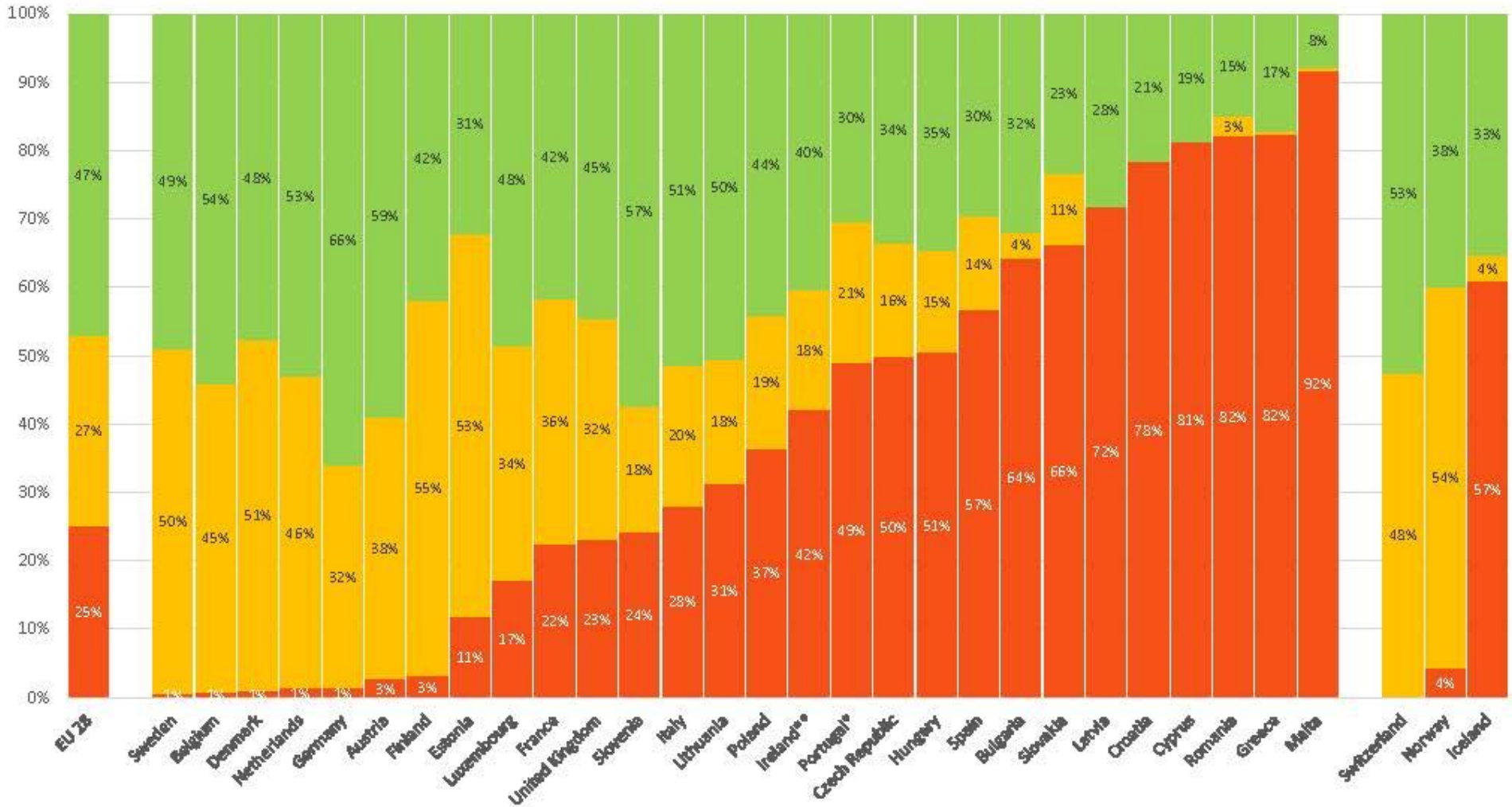


In Japan
about 40 million tons of MSW
is thermally treated in
1,301 Waste-to-Energy plants

Source: MOE('06)

Municipal waste treatment in 2016

EU 28 + Switzerland, Norway and Iceland



Graph by CEWEP, Source: EUROSTAT 2018
*: partial data for 2016
**: latest data 2014

Newest EU Integrated Facility: EveRe Facility (France)

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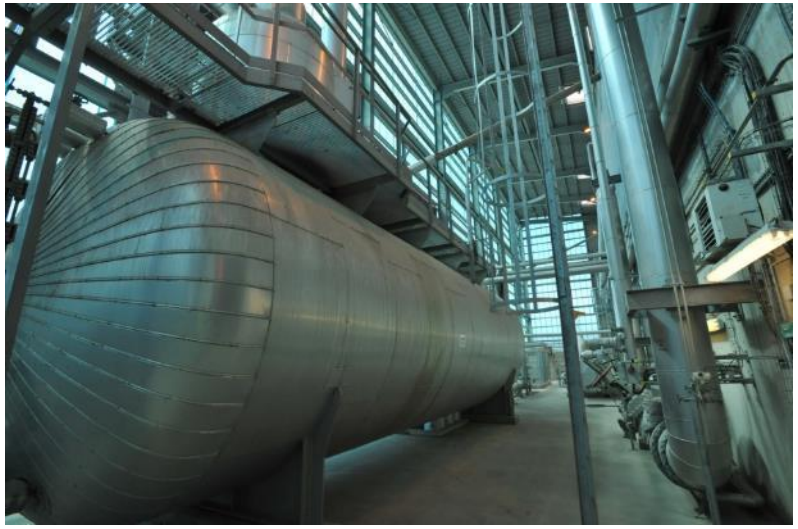
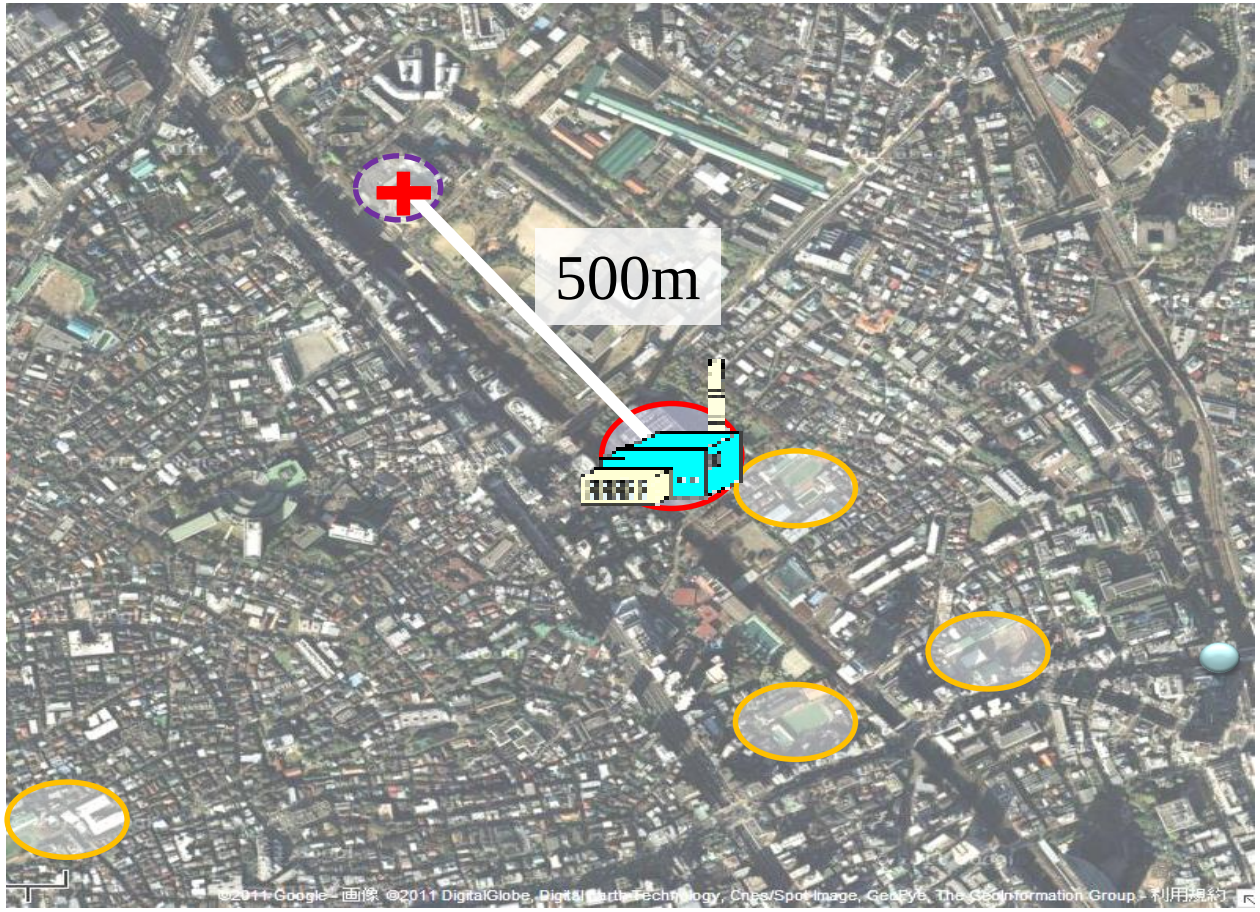


International Reference Benchmarks

- Strictest Environmental Standards
- Community Based Facilities
  - Determinative Social / Cultural Factors
- Comprehensive Systems Integration
- Eco Parks / Eco Towns
- “Recycling-Based Society”
  - Resource-poor and high density living
- Dominant Regulatory Driver: Public Health

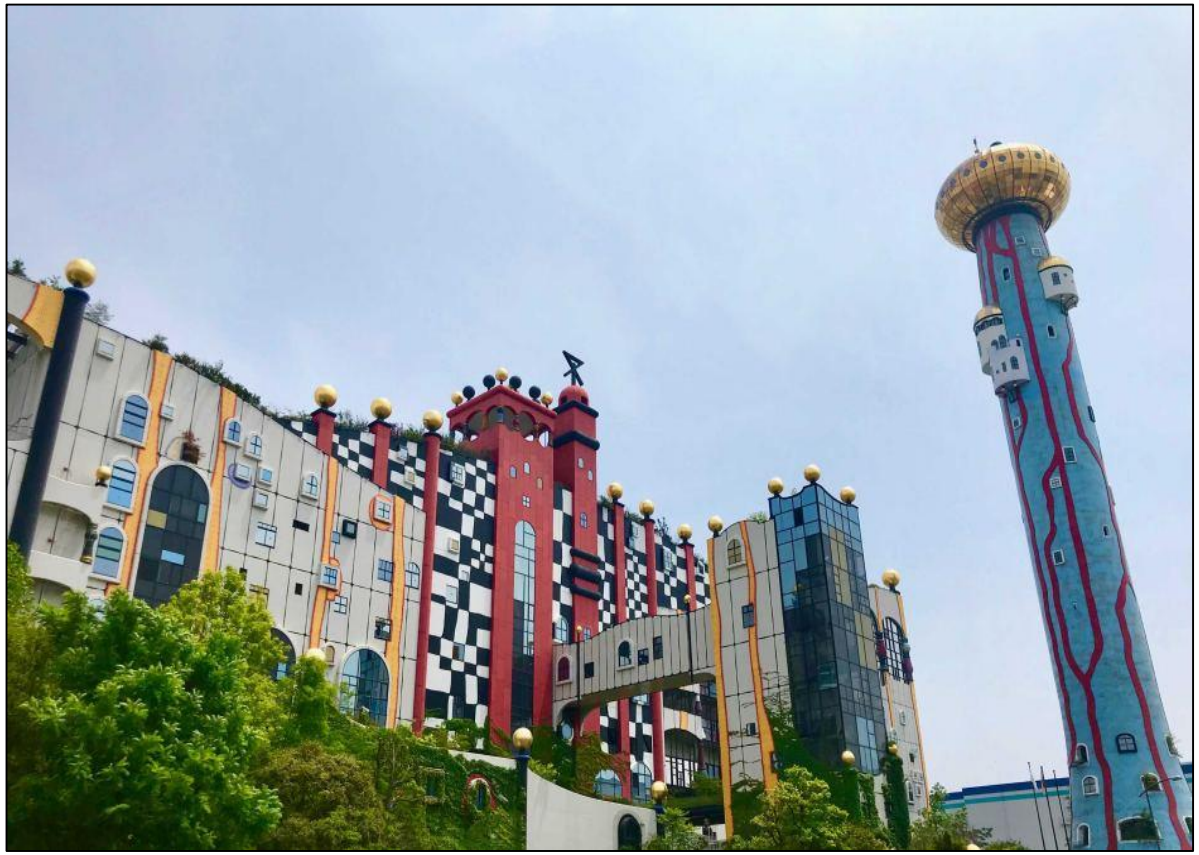
Compatible Land Uses: Public Health is Primary Driver



Date Completed: March 1991
Capacity : 300ton/day x 2 lines
Power Output : 11,000 kW

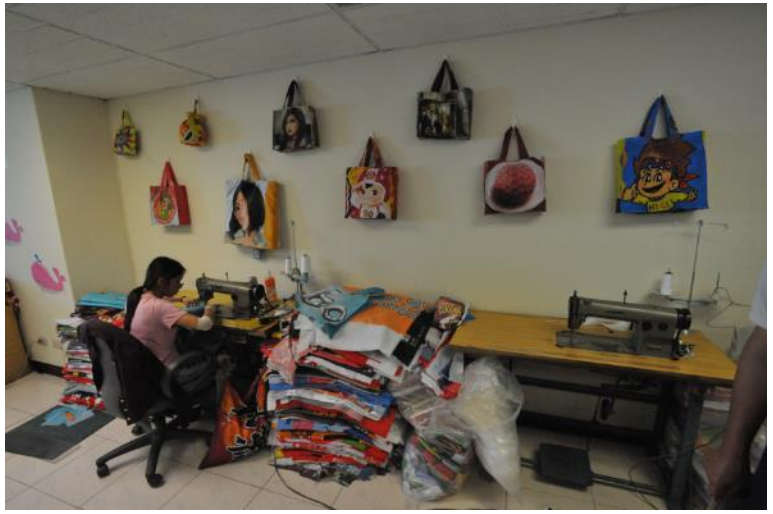
WtE Plant
Hospital
School
Train Station

Facilities are Integral Part of Community



Bali Waste to Energy Facility, Taiwan (I.M. Pei)

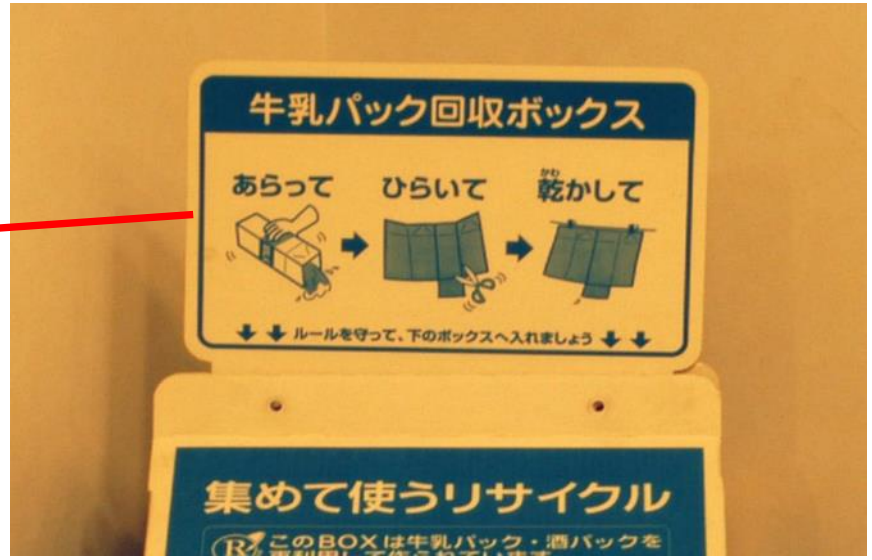
Examples of Japanese Thermal Processing Facility



Molten Slag (JFE Gasifier, Japan)

Products from Bottom Ash (Japan)

Community / Residential Programs (Cultural Factor)



KEY TAKEAWAYS

Key Takeaways

- Capacity
  - Existing waste processing capacity for City of Long Beach and other jurisdictions - better than landfilling

- Waste Streams
  - Outlet for materials that cannot feasibly be recycled due to China ban and contaminated organics
  - Anaerobic Digestion and Transformation/Thermal Conversion handle different waste streams

- Sustainability and Compliance
  - Reduce GHG emissions
  - Maximize diversion from landfills
  - Public health

Key Takeaways

- Financial Viability
  - Operate SERRF as long as financially viable
    - Transformation provides 10% diversion credit
    - No new transformation facilities likely to be built in California
    - Stabilization of long term costs and maintain control

- Further down the road - Add CTs in phases
  - More Materials Recovery Facility to sort waste
  - Anaerobic Digestion for wet organic fraction
  - Gasification for dry organic fraction and inorganic waste
  - CTs are proven technologies - safe emission levels
  - Cost and regulatory uncertainty are main barriers

Discussion and Questions

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