



Environmental Research & Education Foundation

Lighting a path to sustainable waste management practices

Trends in Beneficial Use of Landfill Gas & Potential Impacts of Organics Diversion

LMOP Workshop

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LFG Beneficial Use

Beneficial Use of LFG

Landfill gas that is used to provide a secondary benefit beyond reduction in greenhouse gas (GHG) impacts, which includes:

- 1) Electricity Generation
- 2) Heat
- 3) Fuel (eg. CNG/LNG)

Tracking LFG

1) LMOP

- 1) Voluntary reporting from LFGTE projects
- 2) May exclude LFs that flare but don't use gas beneficially

2) EPA Greenhouse Gas Reporting Program

- 1) Must report LFG data if landfill generates 1,000 metric tons CH₄ or more (25,000 metric tons CO₂-equivalent)
- 2) While data includes information on LFG volume and CH₄ destruction, it doesn't indicate if gas is beneficially used

Beneficial Use of LFG Study

Objective:

Assess the extent to which active landfills (accepting MSW) are collecting LFG and using it beneficially.

Approach:

- 1) Develop list of active landfills
- 2) Acquire data via:
 - Utilization of GHG reporting tool (as applicable)
 - State agency databases
 - Direct contact with LF owners
- 3) Compile & analyze data based on:
 - Facilities
 - Tonnage
 - Volume of landfill gas

EREF Study and Comparison to GHG Reporting/LMOP

- Number of landfills identified for this study = 1,577
(only Subtitle D LFs actively accepting waste were included)
- Landfills that provided beneficial LFG usage data = 70.4 %

Number of Facilities: Comparison to GHG Reporting & LMOP

Facility Type	2010			2013		
	EREF	GHG	LMOP	EREF	GHG	LMOP
Open, receiving waste	1,577	1,141	1,282	1,546	1,133	1,241
Closed	-	122	1,112	-	130	1,155
Total	1,577	1,263	2,394	1,546	1,263	2,396

Number of LFs, Ownership & Tonnage

Summary of Landfills, Ownership and Tonnage (*this study*)

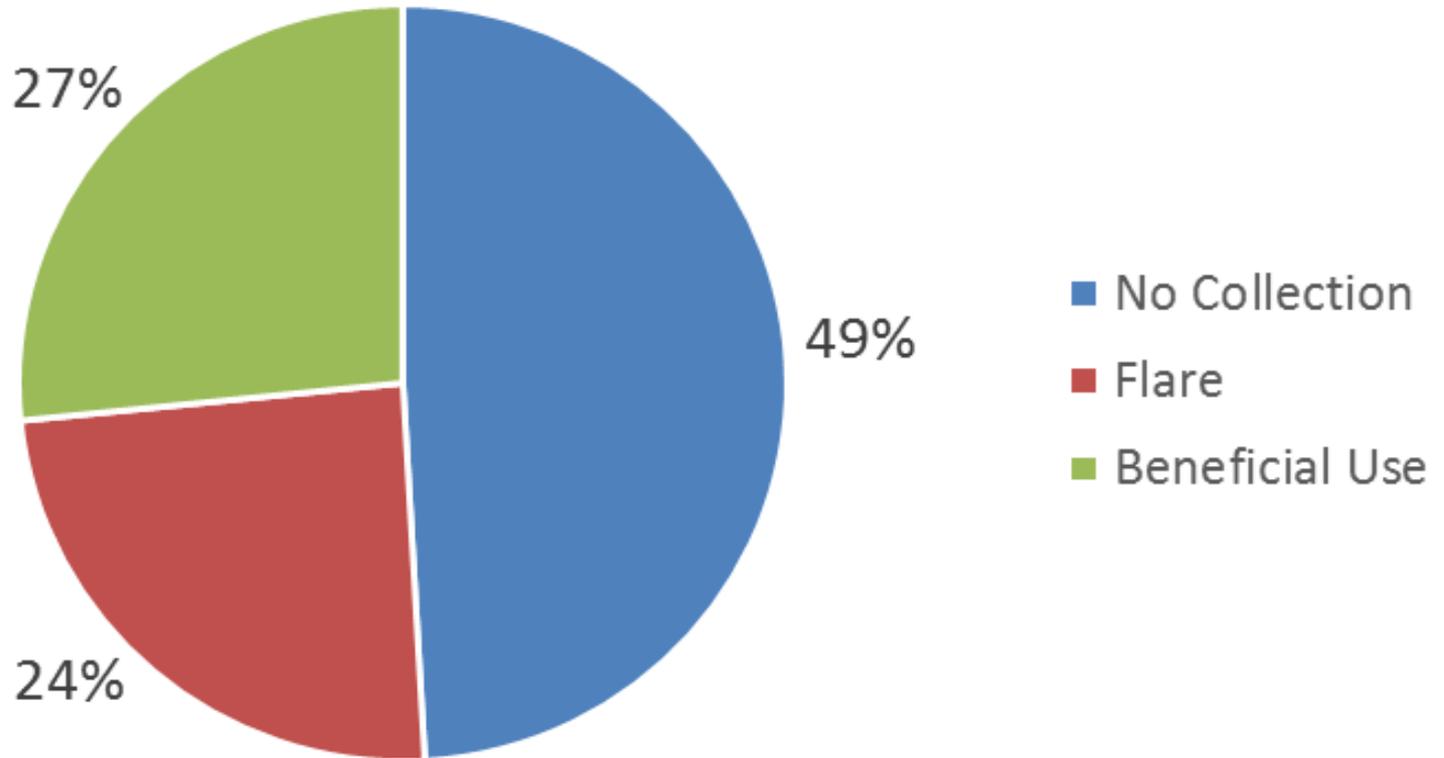
Facility Type	# Facilities	%	MSW Managed (million tons) ¹	%
Publicly Owned	923	64 %	85	33 %
Privately Owned	518	36 %	170	67 %
Total	1,441²	100 %	255	100 %

¹ 2010 data.

² There were 136 landfills that could not be designated as public/private, adding these gives a total of 1,577.

LFG Management

(based on # of landfills)



- Nearly ½ of landfills in study did not collect LFG
- 27% of facilities used gas beneficially

n = 1,036 landfills

LFG Management

(based on # of landfills)

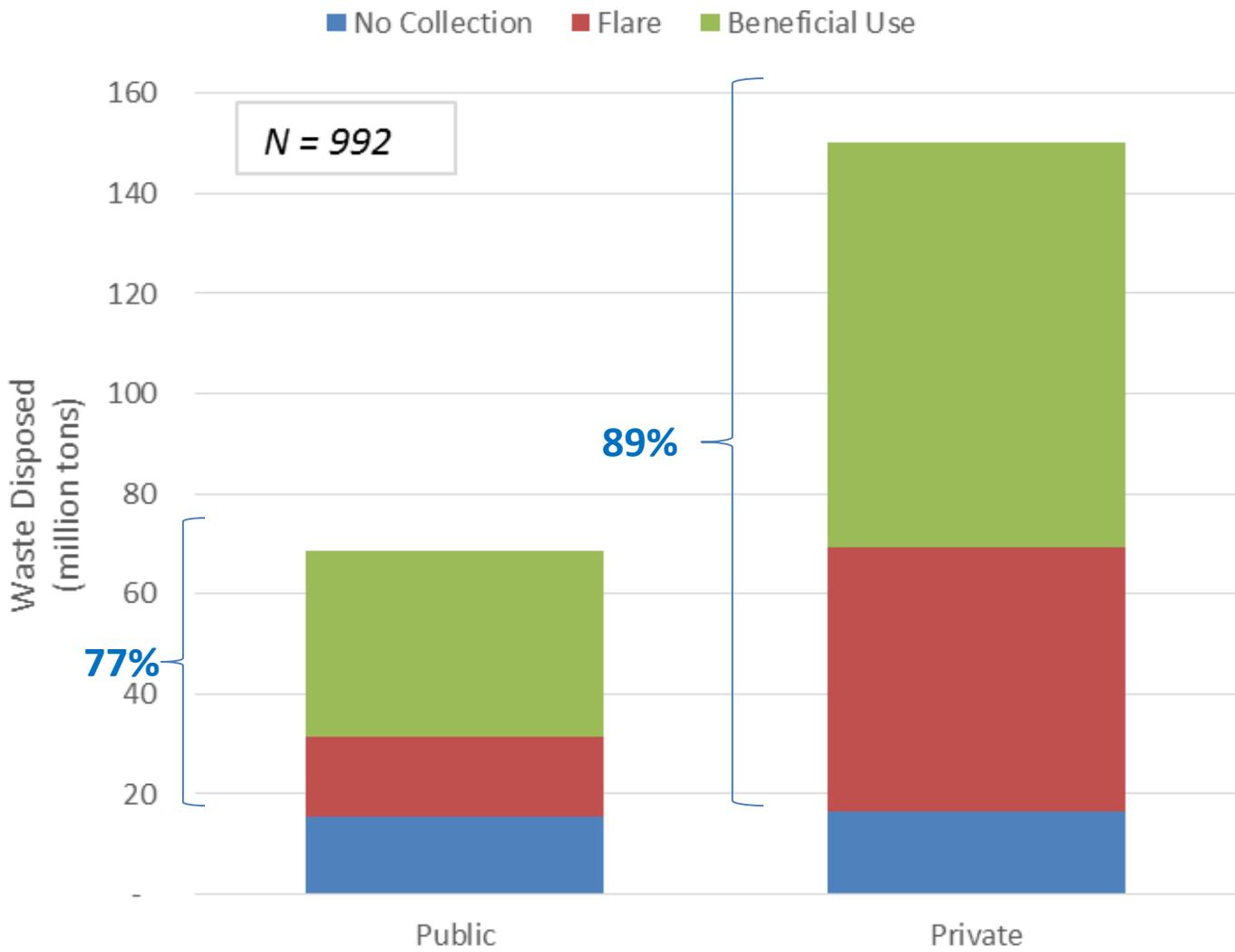
Facilities with:	Publicly Owned	Privately Owned
No Gas Collection	65 %	23 %
Flare Only	16 %	36 %
Beneficial Use	19 %	41 %
Total	100 %	100 %

Note: n = 1,036 landfills

- LFG management differs significantly based on ownership
- Prevalence of LFG Collection & Control:
 - 35% of publicly owned landfills
 - 77% of privately owned landfills

LFG Management

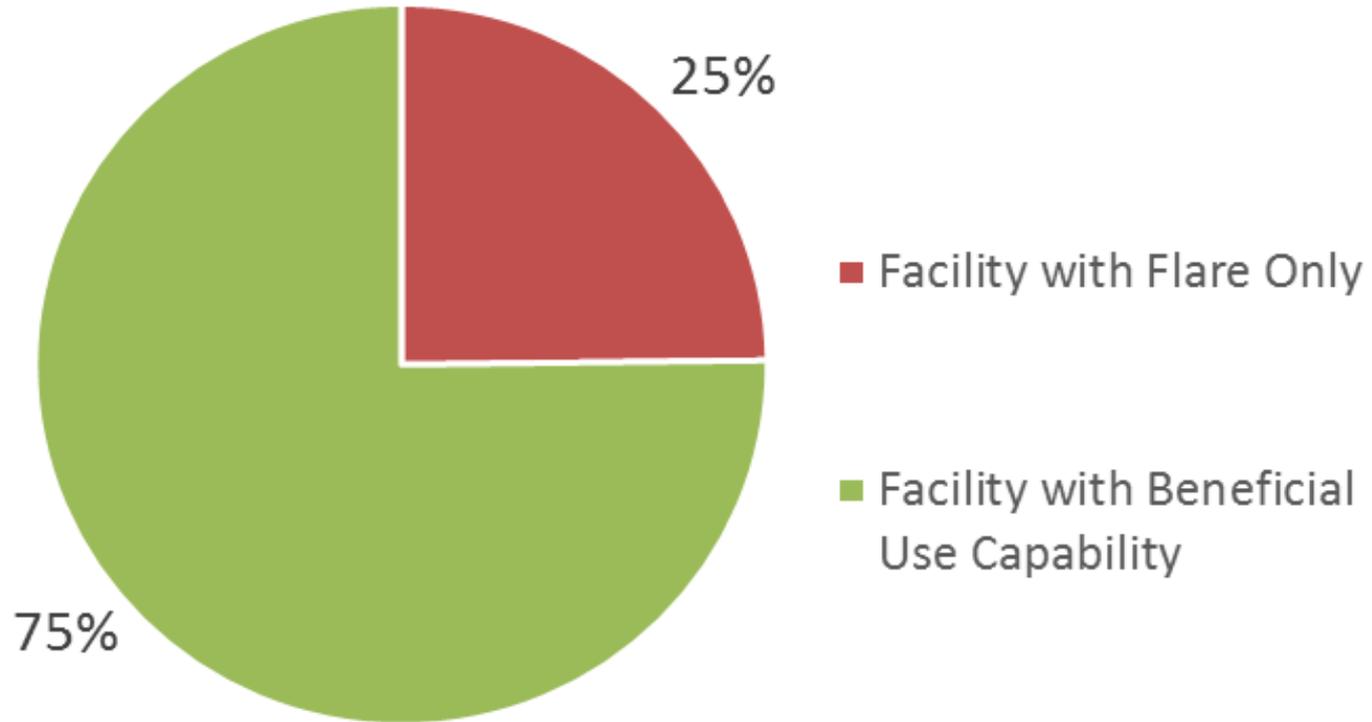
(based on tonnage)



Roughly ~80 million more tons goes to private vs public LFs

LFG Management

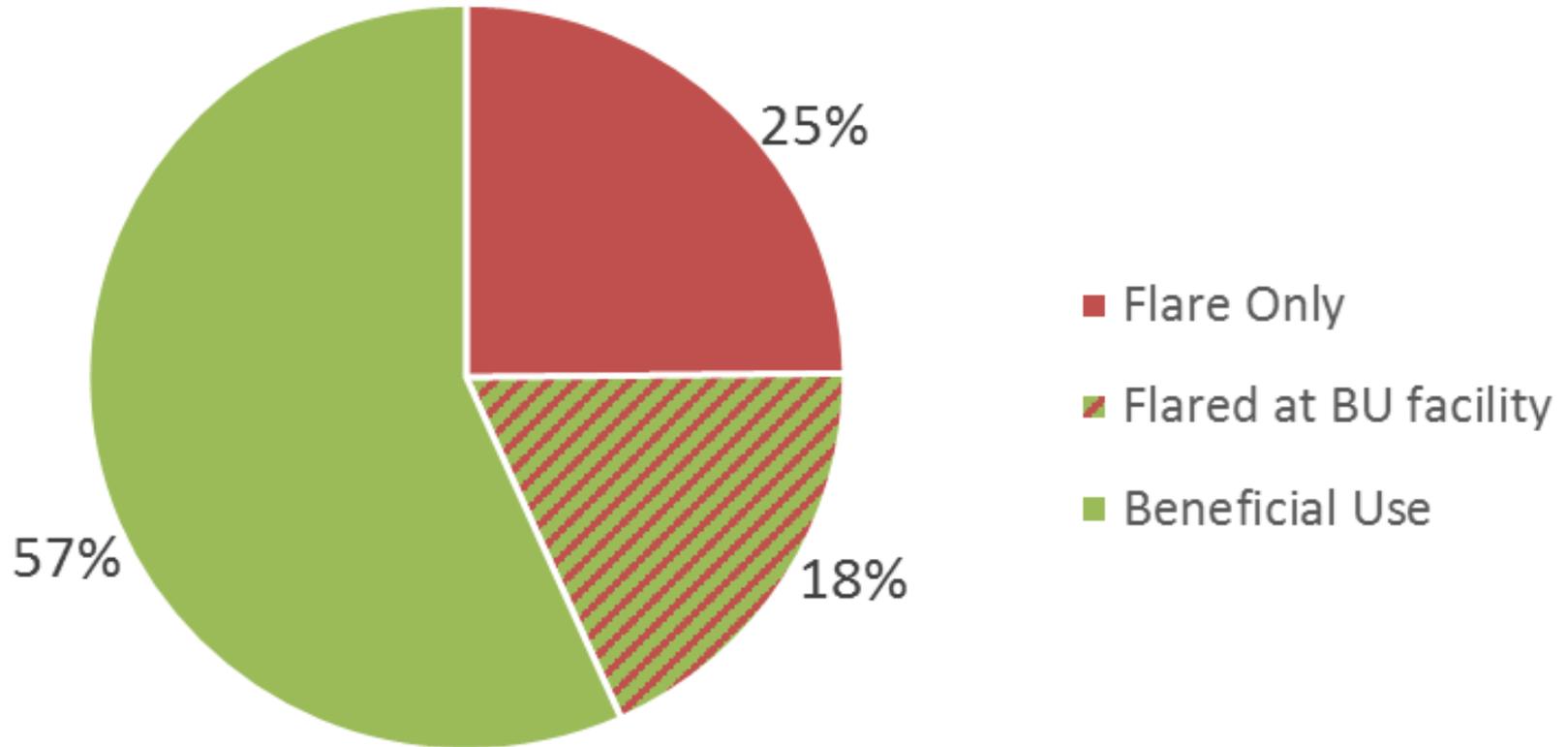
(based on gas collected)



- Majority of LFG collected occurs at facilities with beneficial use
- Does not account for gas flared at beneficial use facility

LFG Management

(based on gas collected)



- 18% is flared at BU facility as a result of downtime, excess generation, supply/demand imbalance, etc.

LFG Management

(based on gas collected)

Facilities with:	Publicly Owned	Privately Owned
Flare Only	15 %	29 %
Flared at Beneficial Use Facility	21 %	17 %
Beneficial Use	64 %	54 %
Total	100 %	100 %

- Beneficial Use Efficiency (% of LFG volume utilized beneficially):
 - Publicly Owned = 75.3%
 - Privately Owned = 75.7%

LFG Trends and Organics Diversion

The Tonnage Connection

Landfill gas is created via microbially mediated anaerobic decomposition of the MSW organics.

1) Historically, more tonnage to landfill → more organics → more landfill gas

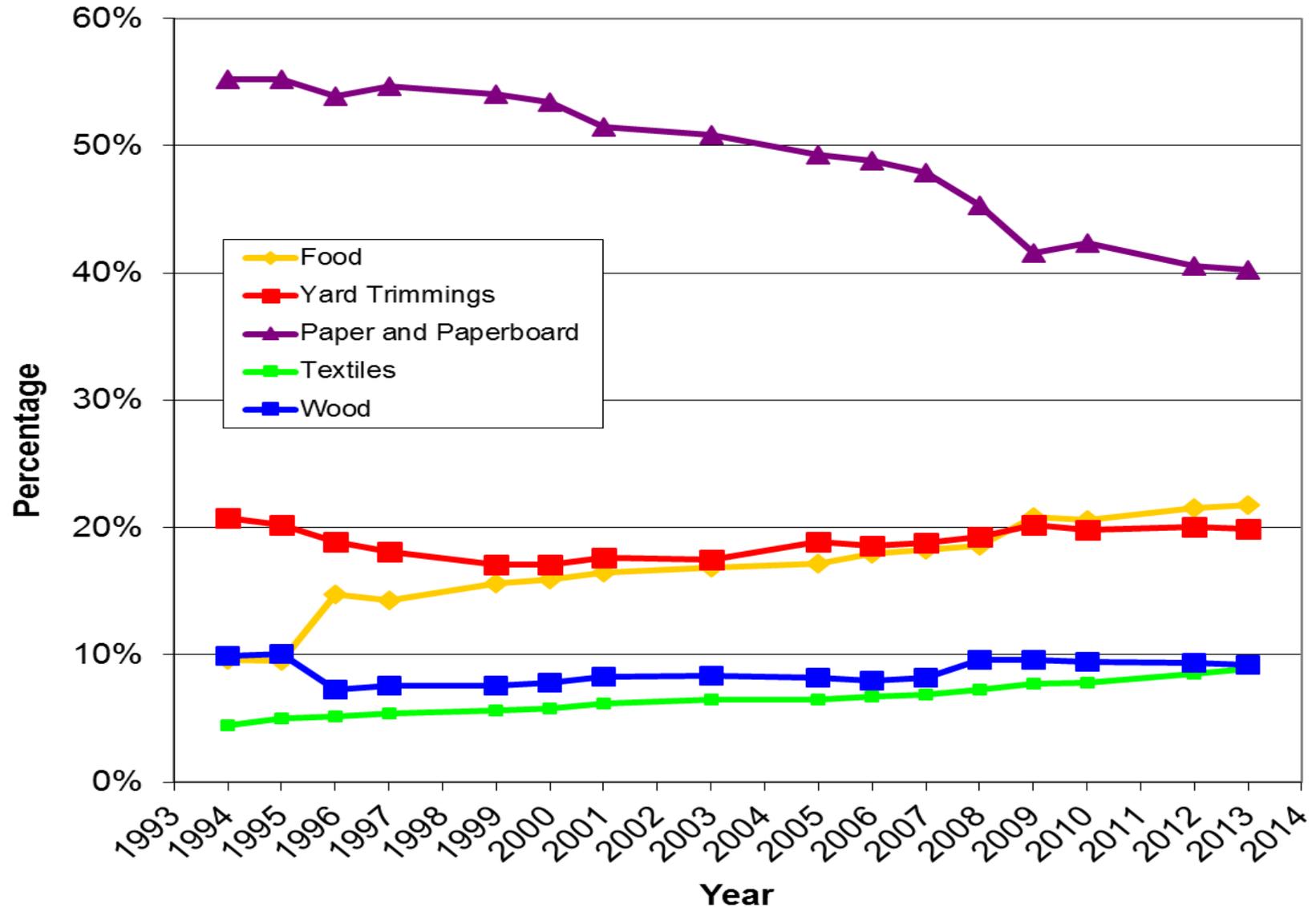
2) Evolving Ton Concept

1) Changing waste composition results in changes to what goes to landfill

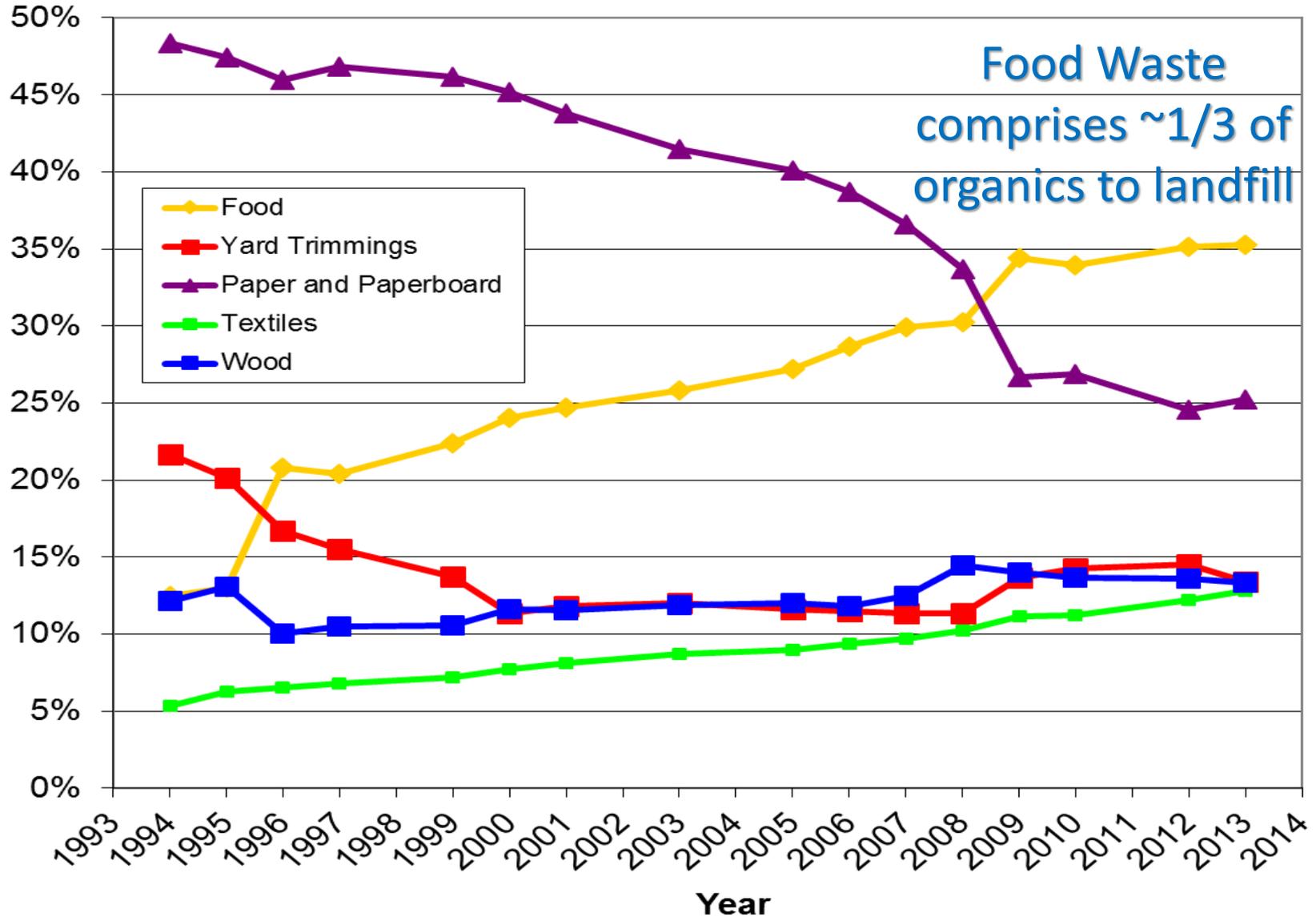
2) Facilitated by:

- Policy
- Product manufacturing decisions
- Human behavior

% of Generated MSW Organics

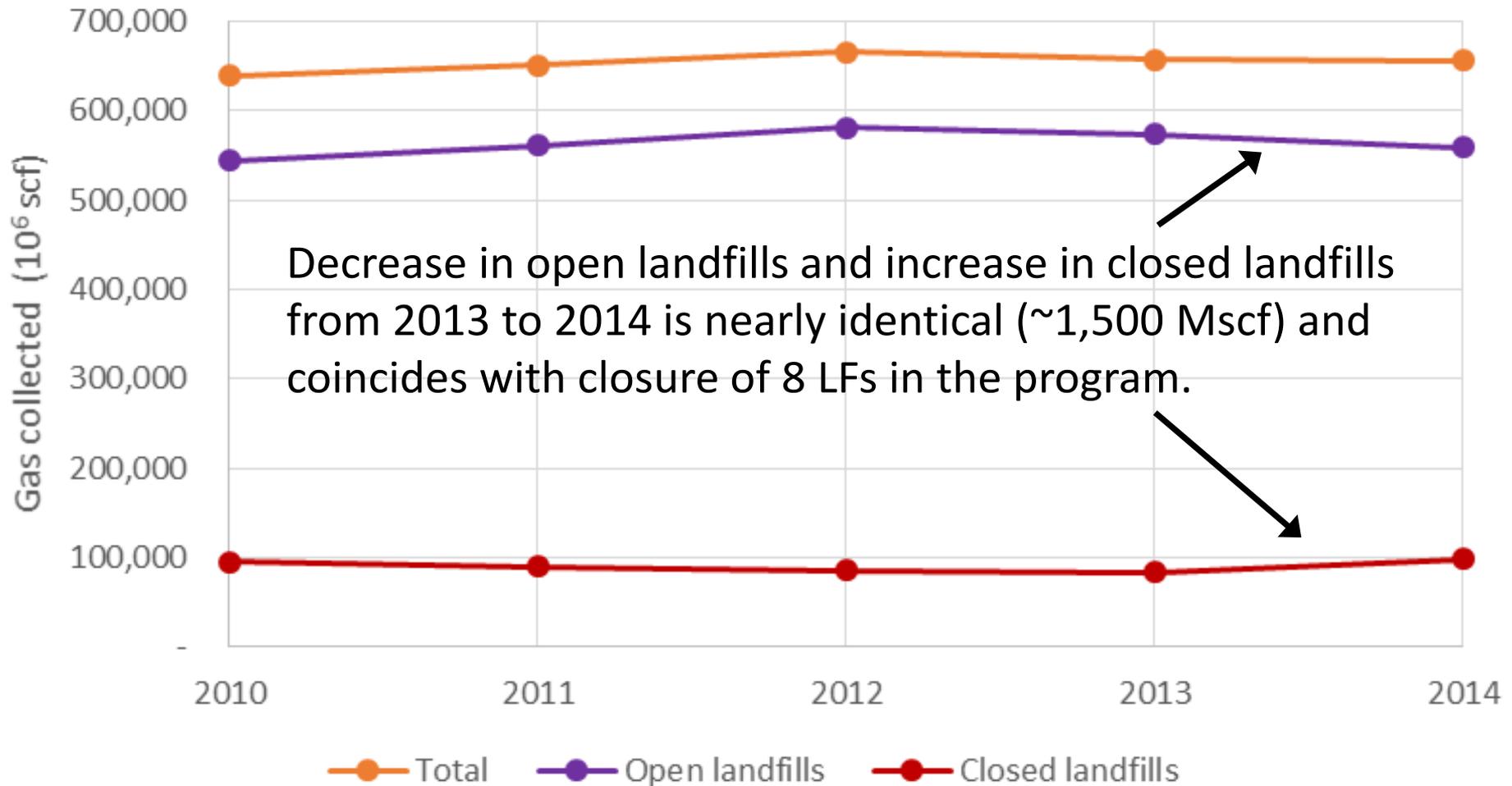


MSW Organics to Landfill



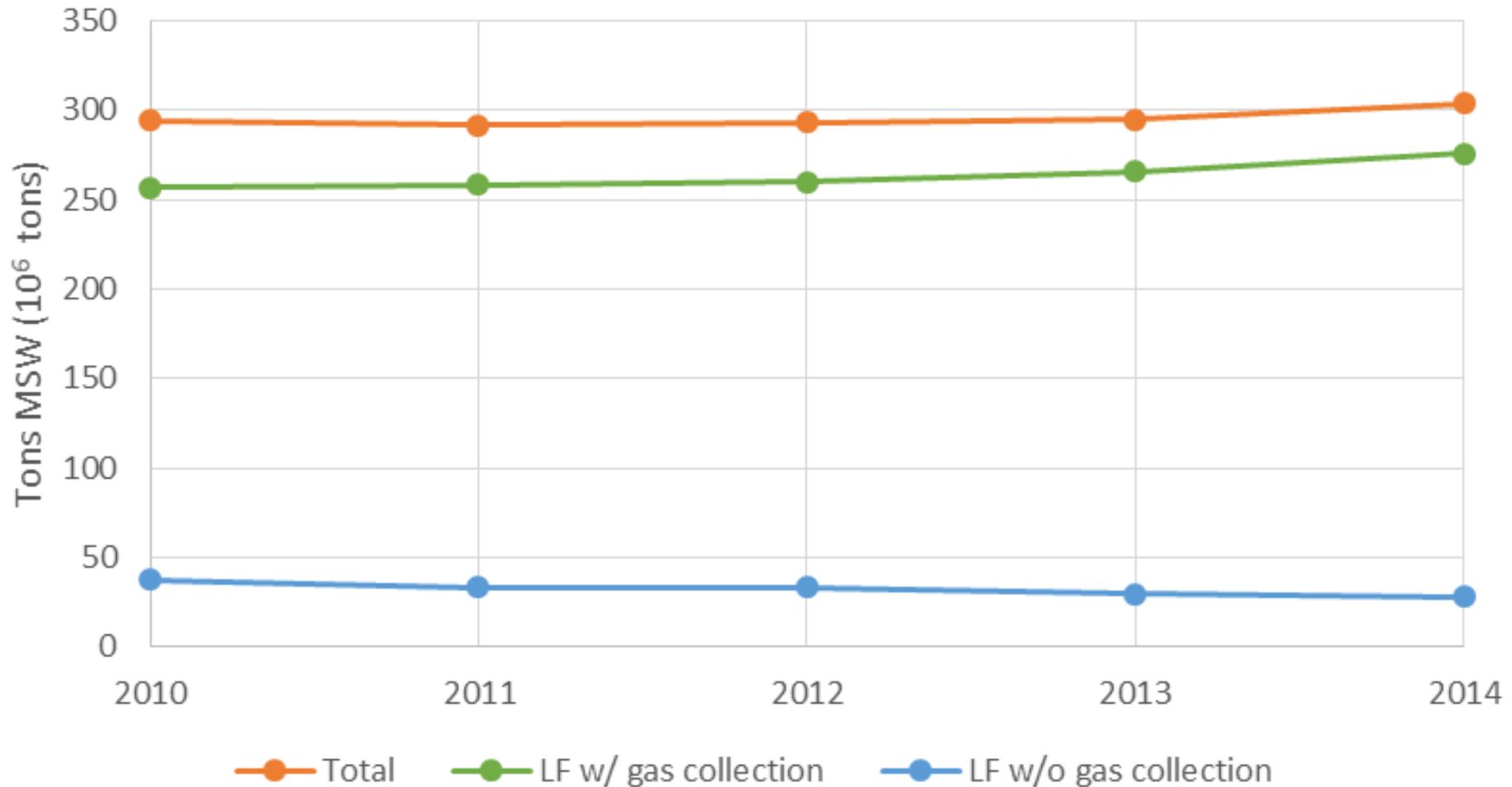
GHG Reporting Data

Collected LFG



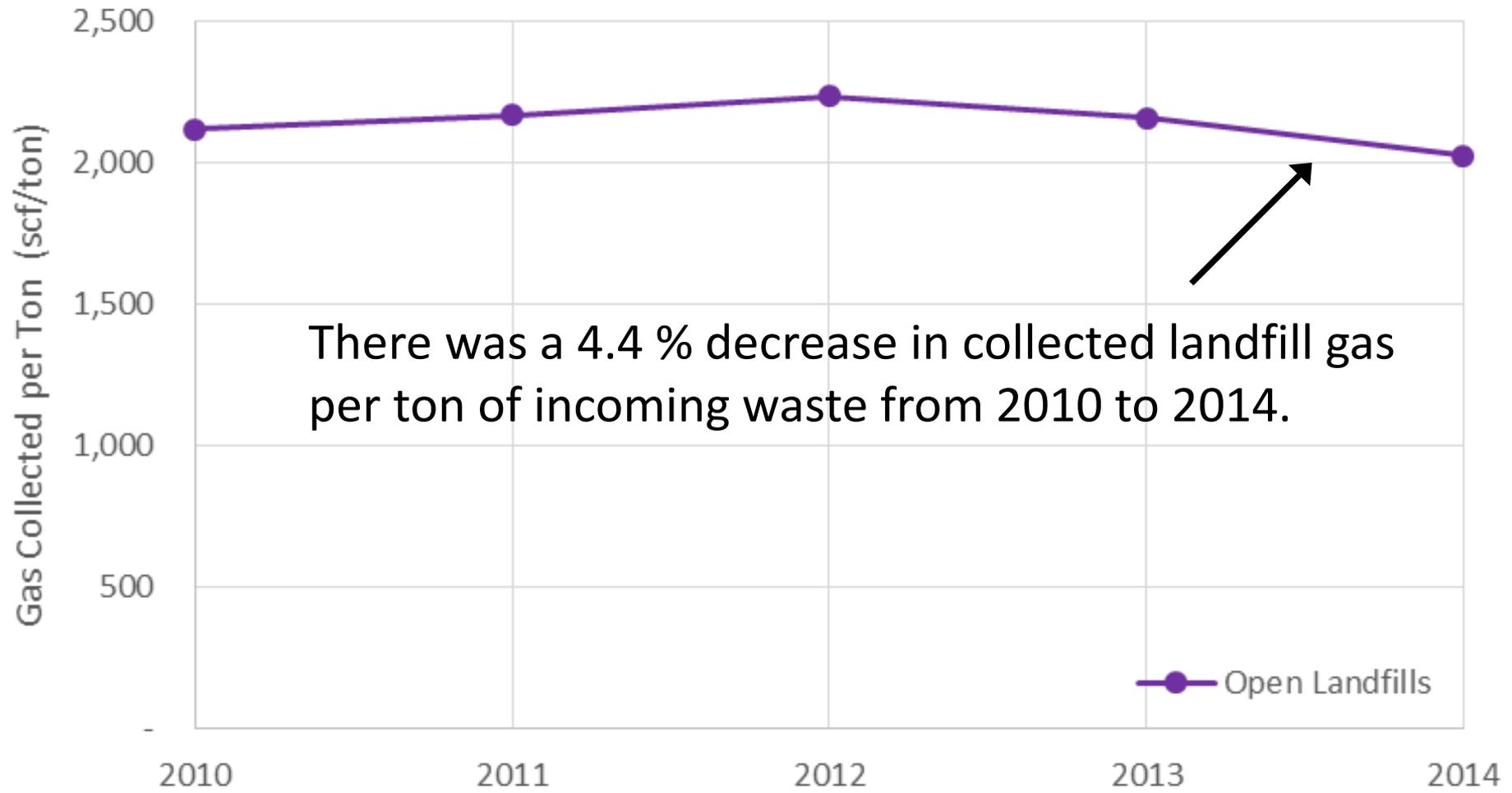
GHG Reporting Data

Waste Received



GHG Reporting Data

LFG per Ton Waste



Case Study in LFG Trends:

Aggressive (Altamont) vs. Typical (Scholl Canyon)

Altamont
Landfill

Scholl Canyon
Landfill



Comparison of Policies

San Francisco – Aggressive Policy (Altamont Landfill)

2001:

- Must meet 75% diversion by 2010 to send waste to Alameda County's Altamont Landfill.
- 3 bin system to collect organics

2009:

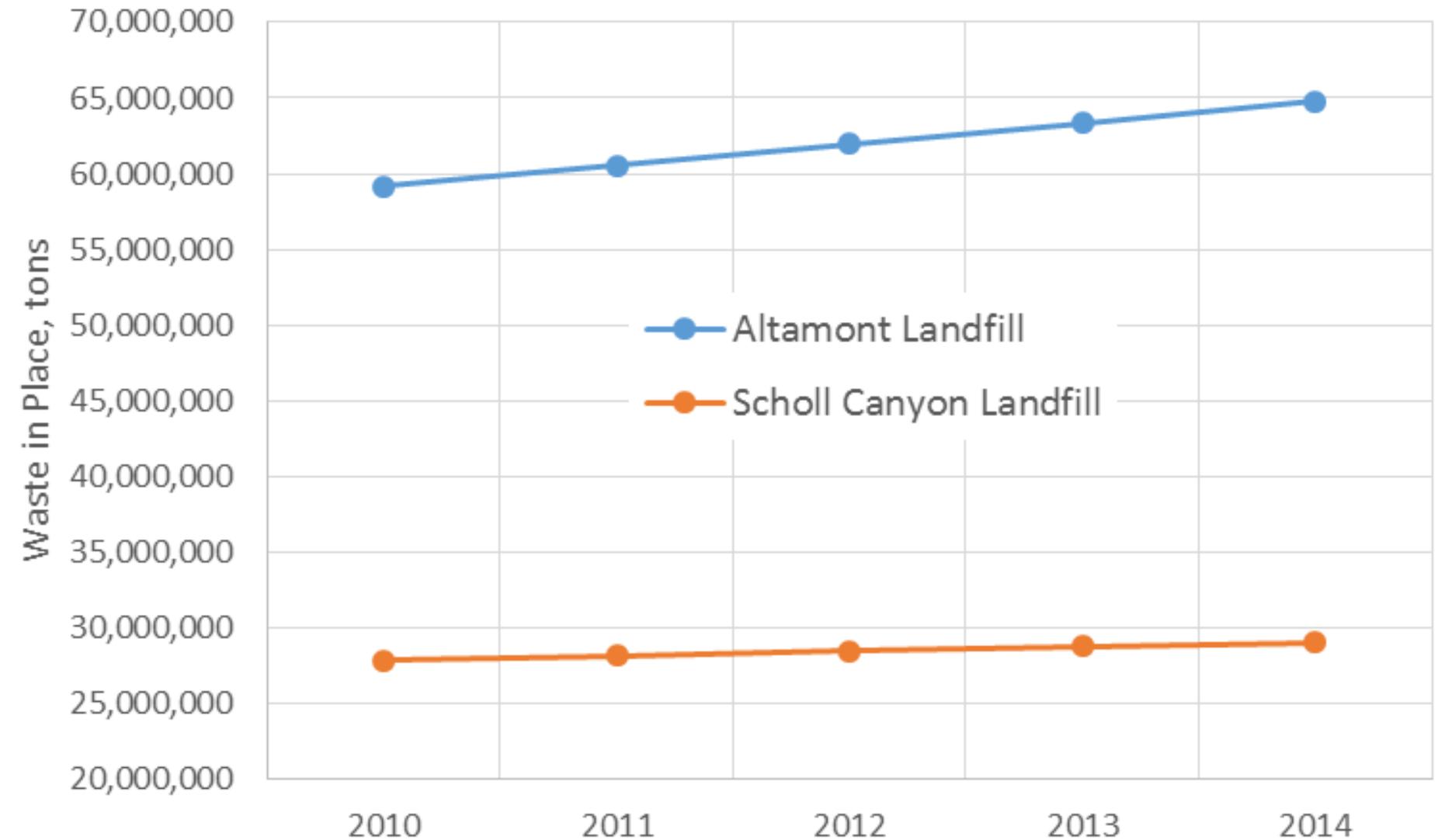
- San Francisco Mandatory Recycling and Composting Ordinance
- All residents must divert organics

CA State – Typical Policy (Scholl Canyon Landfill)

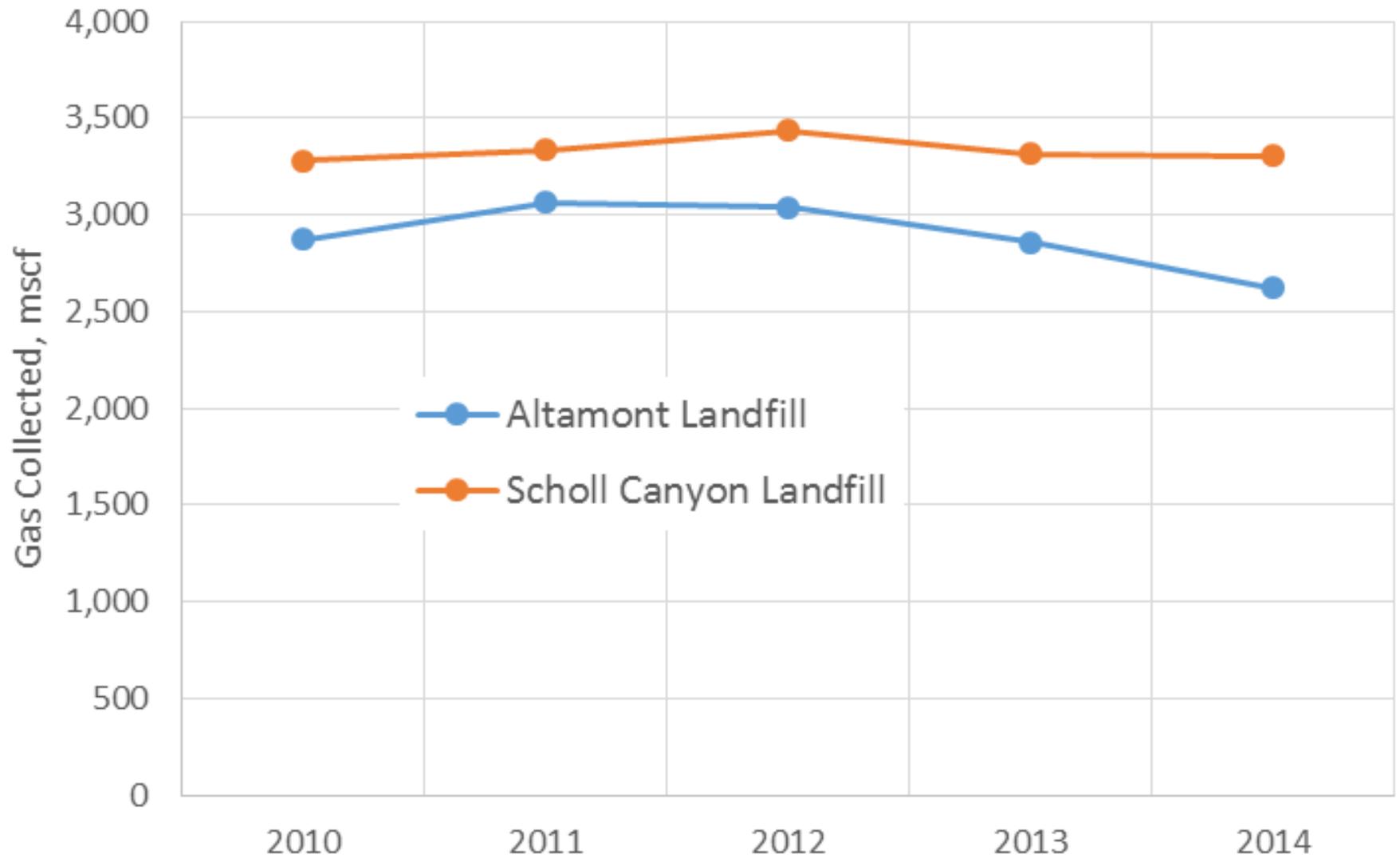
2012: AB 341- 75% recycling and composting rate by 2020

2014: AB 1826- Mandatory commercial organics recycling, beginning 2016

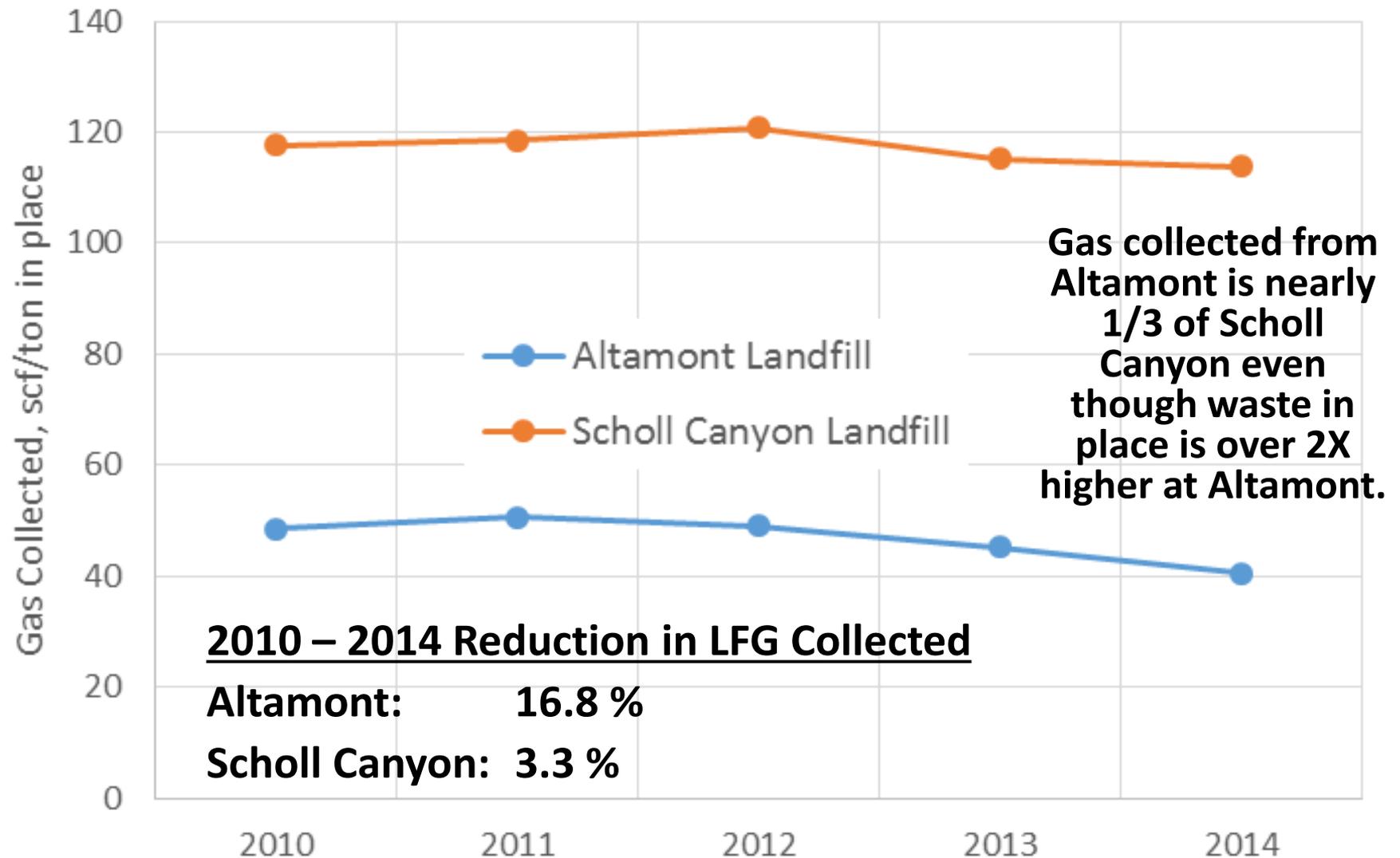
Altamont/Scholl Canyon *Waste in Place*



Altamont/Scholl Canyon *Collected LFG*



Altamont/Scholl Canyon *Collected LFG per Ton*



Key Take-Aways

1) Beneficial LFG Usage

- 1) Majority of placed tonnage goes to LFs with collection/control (77%-public, 89% private)
- 2) Private LFs manage the majority of tonnage & LFG
 - 75% of collected LFG occurs at beneficial use LFs
- 3) Efficiency of gas utilization at beneficial use LFs = 82%

2) LFG Trends

- 1) Organics composition to LFs is changing
- 2) GHG reporting data indicates declining LFG
- 3) Case study demonstrates diversion policies substantially affect LFG volume and LFG produced per ton of placed waste



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Thank you!

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