

# Project Update: Incorporating Life-Cycle Thinking into the Solid Waste Management Industry and Policies

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**University of Florida**

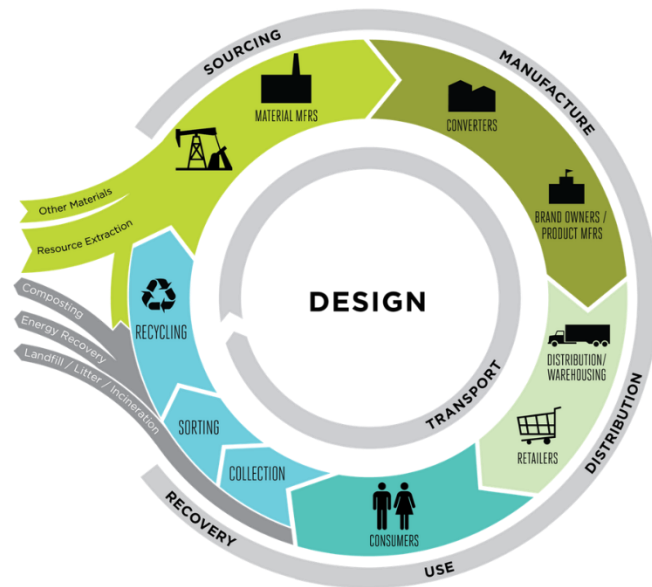


7/17/2018



# Florida Solid Waste Management: State of the State Project

- Hinkley Center and Florida Department of Environmental Protection (FDEP) funded project
- Main Objective: Evaluate application of **sustainable materials management (SMM)** in Florida



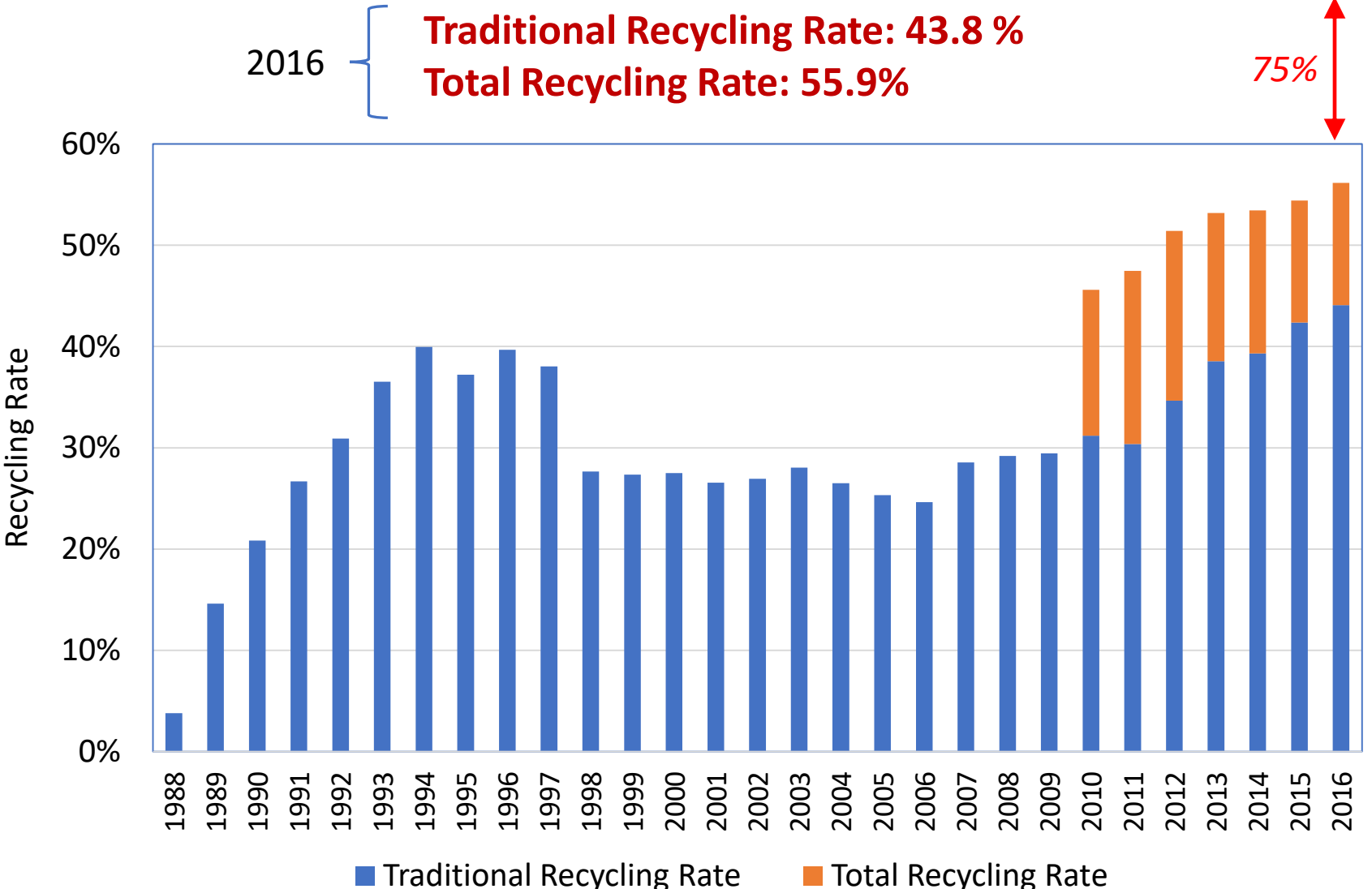
“**SMM** is a systemic approach to using and reusing materials more productively over their entire life cycles. It seeks to **use materials in the most productive way** with an emphasis on using less. ”

<https://www.epa.gov/smm/sustainable-materials-management-basics>

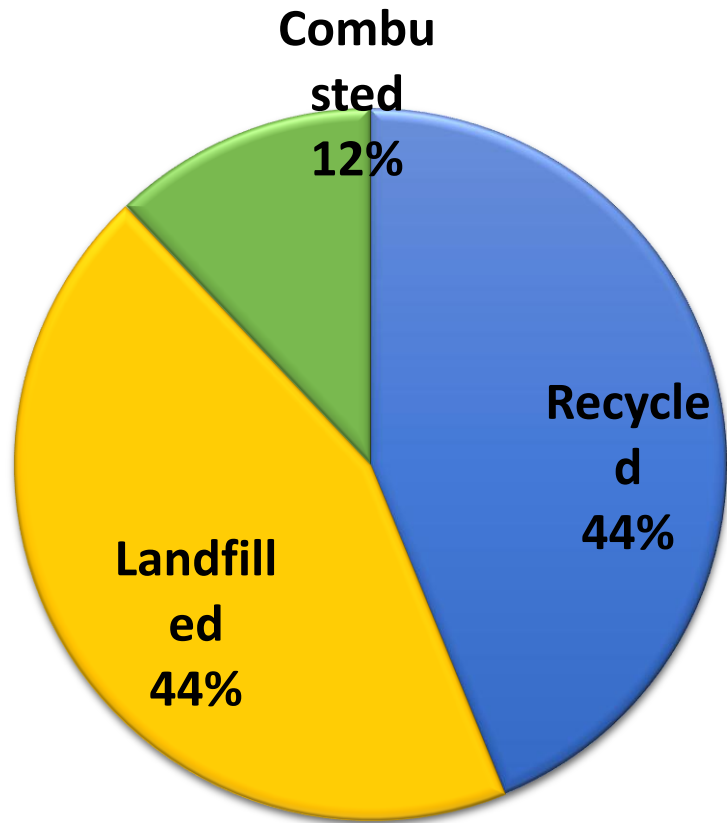
# Florida Solid Waste Management: State of the State Project

- Hinkley Center and Florida Department of Environmental Protection (FDEP) funded project
- Main Objective: Evaluate application of **sustainable materials management (SMM)** in Florida by:
  - A. Mapping Florida's 2016 MSW flow
  - B. Estimate the State's solid waste management based environmental footprint
  - C. Estimate the State's solid waste management costs
  - D. Identify approaches to achieve the 75% recycling goal and evaluate their feasibility, impact on recycling rate, environmental footprint, and costs
  - E. Conduct County based case studies

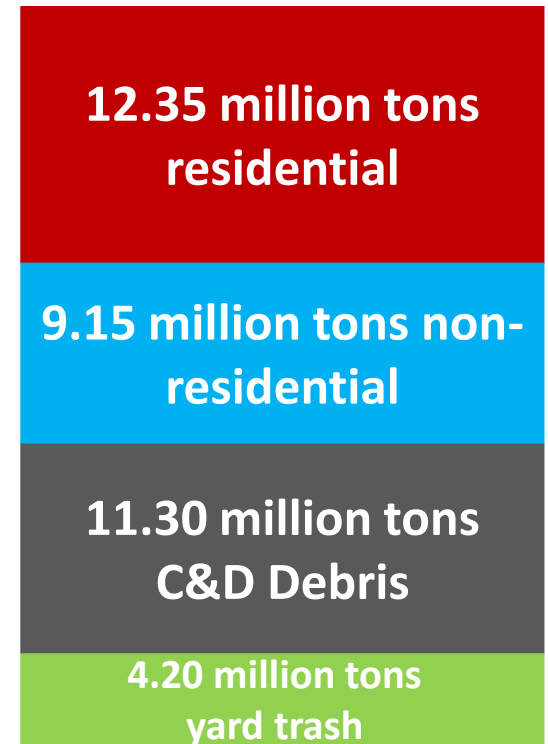
# Florida Historic Recycling Rates



# Florida Waste Disposition



37.4 Million tons

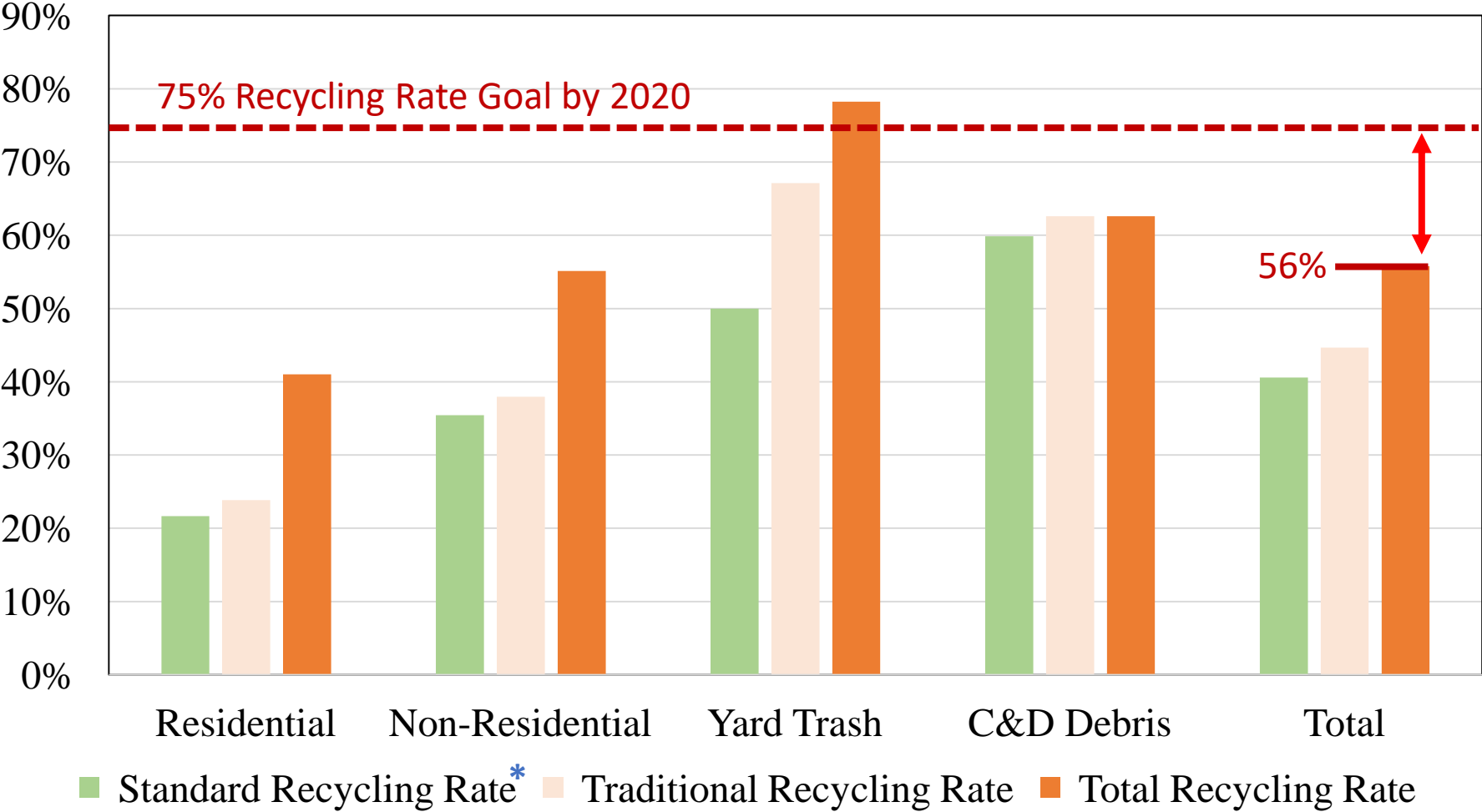


37.4 Million tons

# Florida Solid Waste Management Costs

	Tons	\$/ton	Cost
Residential Collection	12,352,407	\$ 88.70	\$ 1,095,658,501
Non-Residential Collection	9,156,042	\$ 83.73	\$ 766,635,397
Yard Trash Collection	4,590,265	\$ 88.70	\$ 407,156,506
C&DD Collection	11,302,678		\$ -
<b>Subtotal Collection</b>	<b>37,401,392</b>		<b>\$ 2,269,450,403</b>
Recycled (MRF)	5,917,287	\$ (18.96)	\$ (112,191,753)
Yard Trash Recycled	3,210,669	\$ 17.22	\$ 55,287,728
C&DD Recycled	6,765,707	\$ 25.14	\$ 170,089,874
C&DD Disposed	4,536,971	\$ 13.33	\$ 60,477,823
MSW Combusted (WTE)	4,513,600	\$ 60.89	\$ 274,833,104
WTE Ash Landfilled	1,448,968	\$ 20.00	\$ 28,979,360
WTE Metals Recycled	502,733		\$ -
MSW Landfilled	10,505,457	\$ 20.00	\$ 210,109,140
<b>Subtotal</b>	<b>37,401,392</b>		<b>\$ 687,585,277</b>
<b>Transfer Station</b>	<b>18,593,532</b>	<b>\$ 18.25</b>	<b>\$ 339,331,959</b>
<b>Total</b>			<b>\$ 3,296,367,639</b>

# Recycling Rates by Category

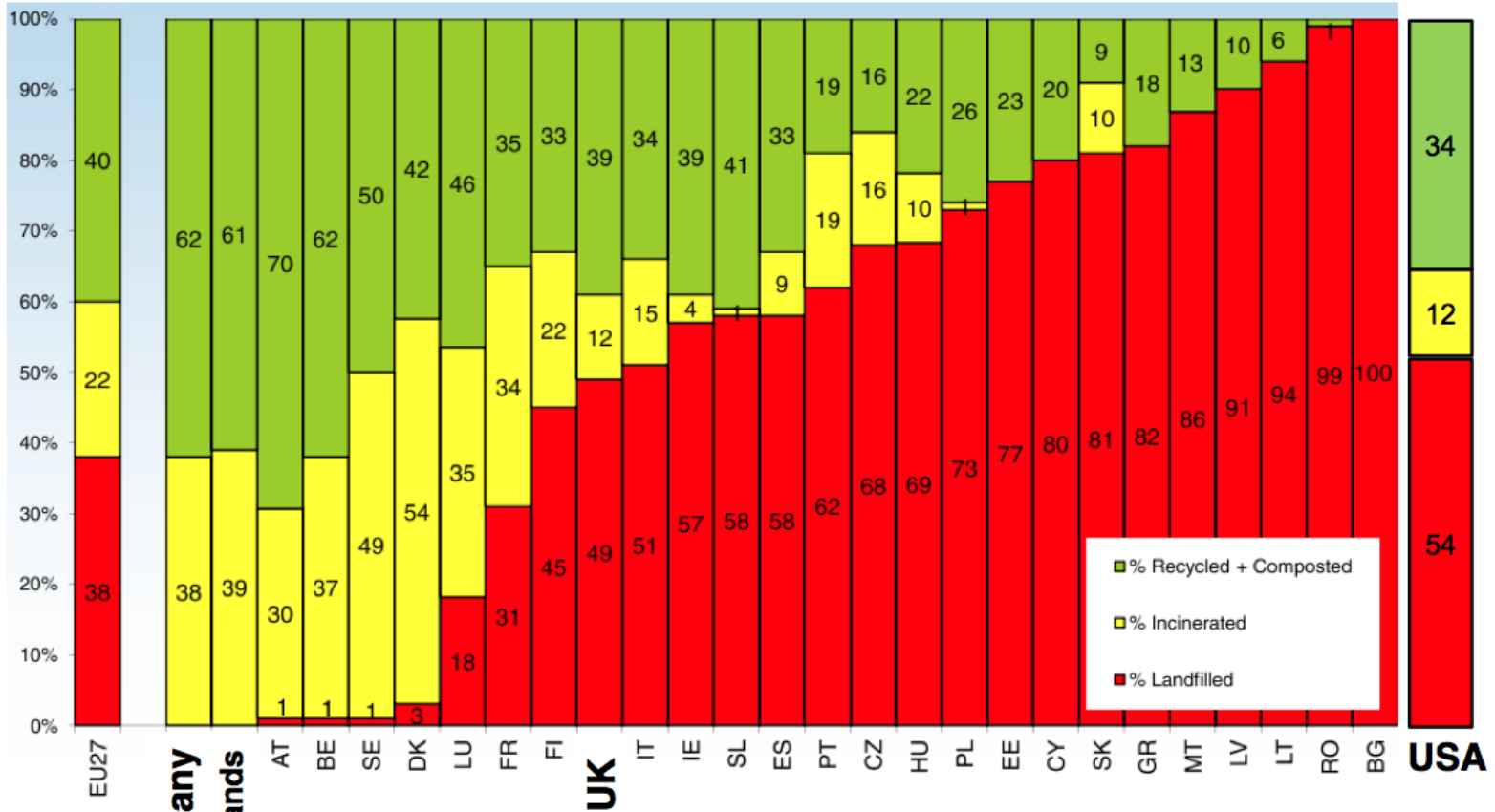


\*Rate developed by UF Research team that includes only the typical materials recycled at a MRF  
7/17/2018

Can 75% be reached?



# Global MSW Management

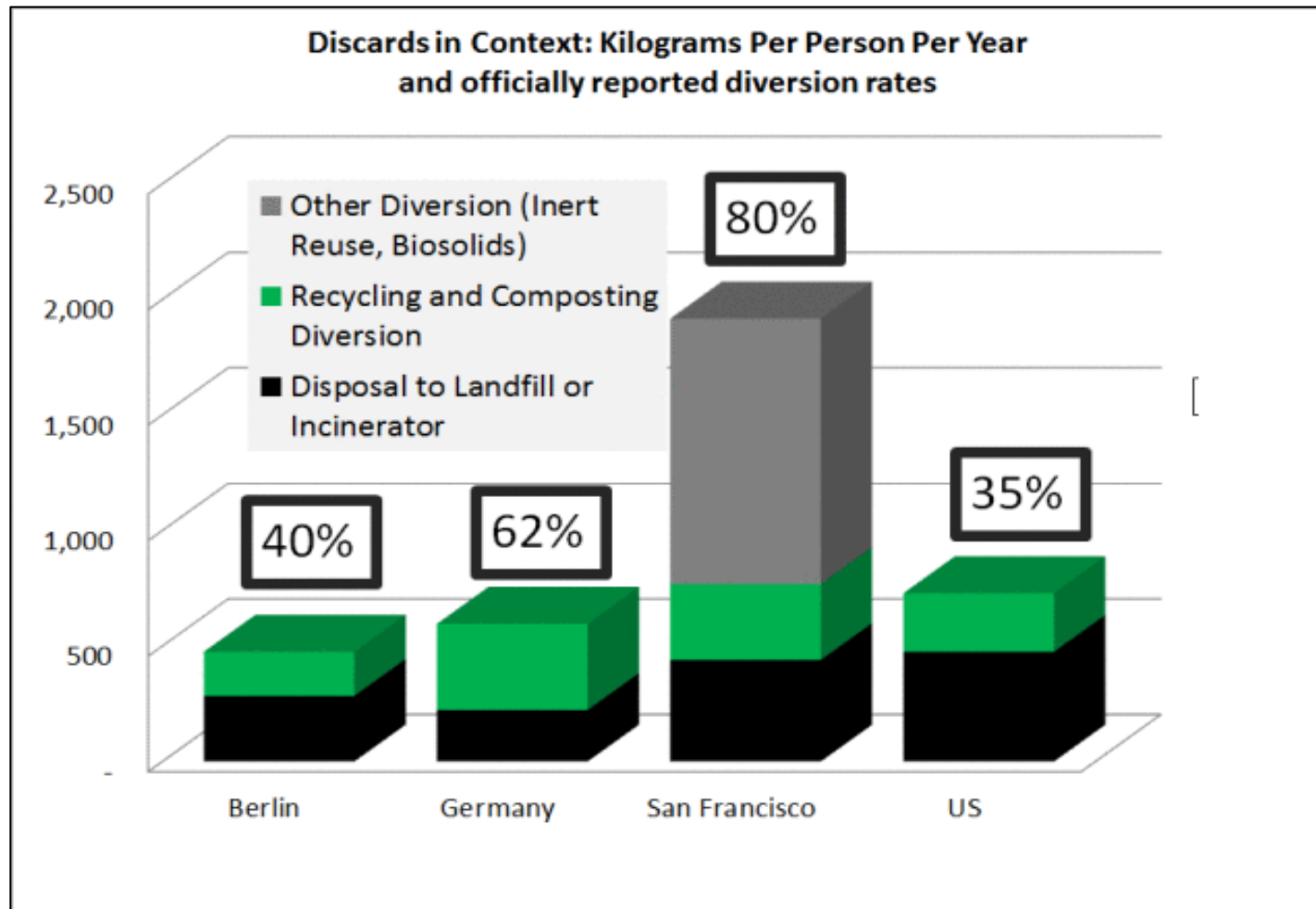


EUROSTAT : Municipal waste treatment in EU 27 in 2010

# Reported Recycling Rates Across the US

Location	Recycling Rate	Comment
San Francisco, CA	<b>80%</b>	Zero Waste Policies, ban on disposable plastic bas, mandatory recycling and composting
Los Angeles, CA	<b>76%</b>	Planning and implementation of programs to achieve the 2025 zero waste to landfill goal
Portland, OR	<b>70%</b>	Aggressive recycling and waste diversion program that requires more labor which increases the cost per ton of collecting MSW
San Antonio, TX	<b>29%</b>	Pilot Program for organic waste that focuses on composting
NYC, NY	<b>19%</b>	Low rate due to inefficiencies related to the performance of private companies
Atlanta, GA	<b>12.5%</b>	New residential recycling programs, “Cartlanta Program”
Chicago, IL	<b>9%</b>	Lack of recycling interest and public participation

# How do we compare?

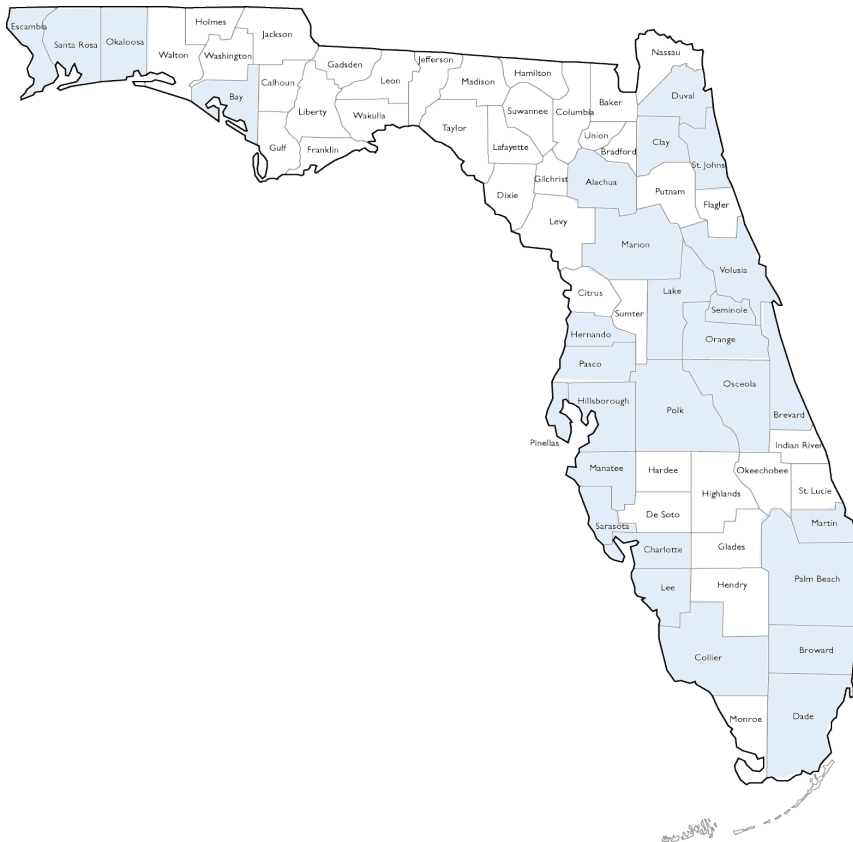


## San Francisco's Famous 80% Waste Diversion Rate: Anatomy of an Exemplar

<https://discardstudies.com/2013/12/06/san-franciscos-famous-80-waste-diversion-rate-anatomy-of-an-exemplar/>

# Possible Changes to Florida's Solid Waste Management Approach

## 1. WTE Approach

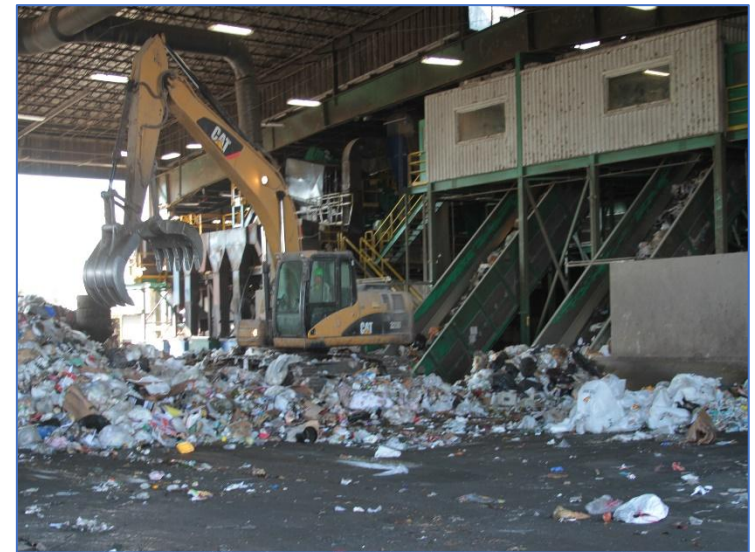
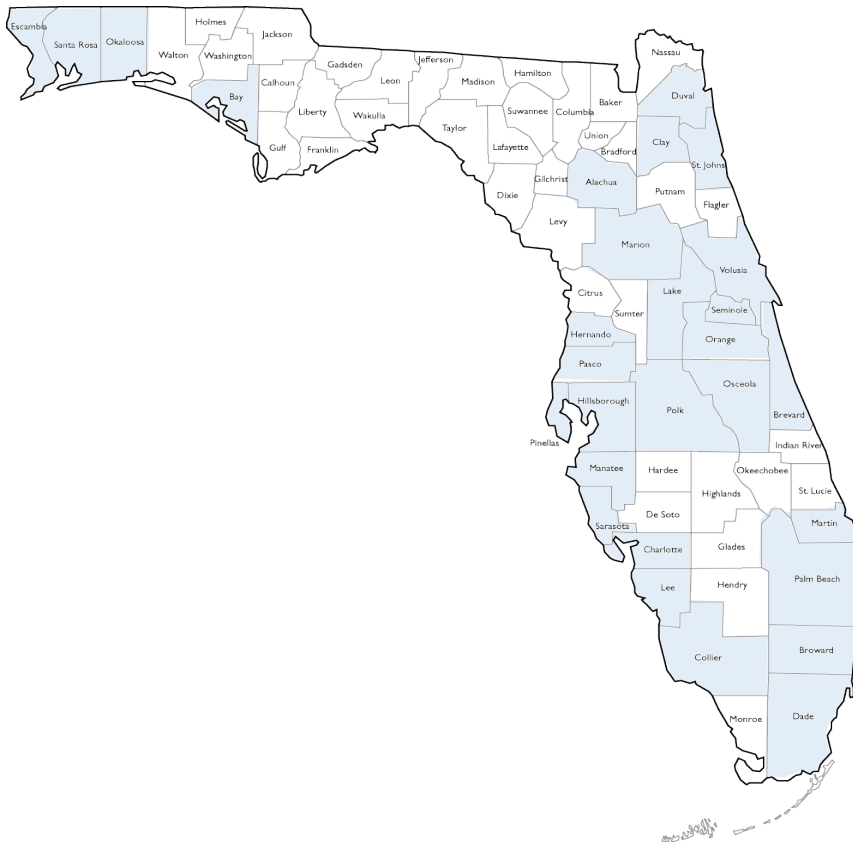


WTE Facility in Palm Beach County, FL

**NOTE: Applied only to counties with populations of 150,000+**

# Possible Changes to Florida's Solid Waste Management Approach

## 2. Mixed Waste Processing (MWP) Approach

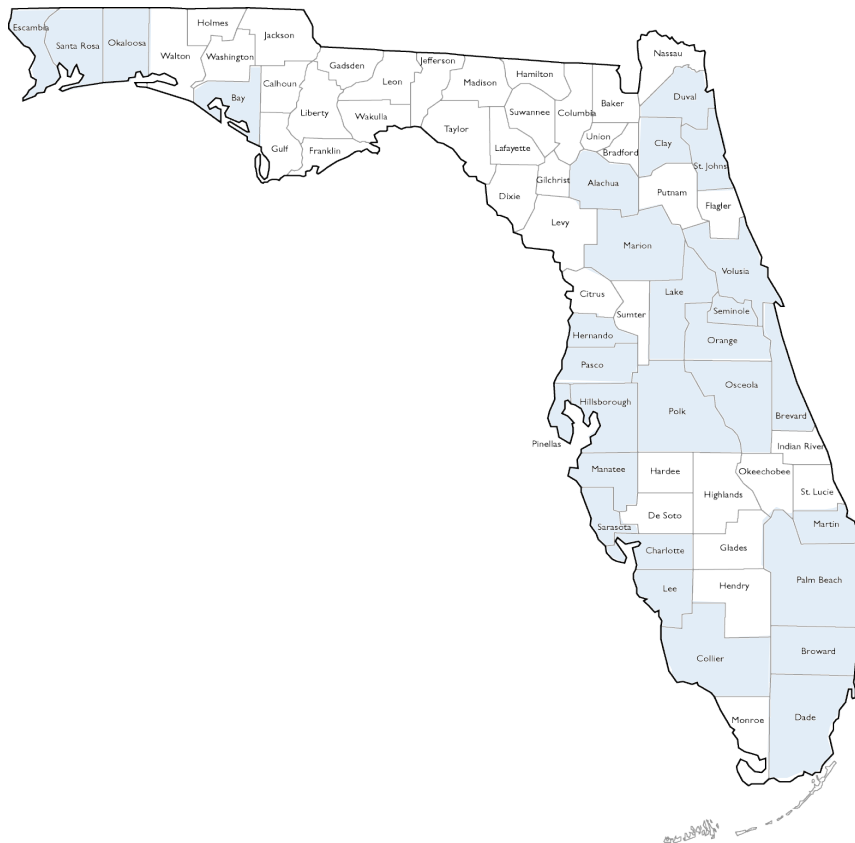


Mixed Waste Processing Facility in Santa Clara, CA

**NOTE: Applied only to counties with populations of 150,000+**

# Possible Changes to Florida's Solid Waste Management Approach

## 3. Mandatory Residential Curbside Recycling Approach



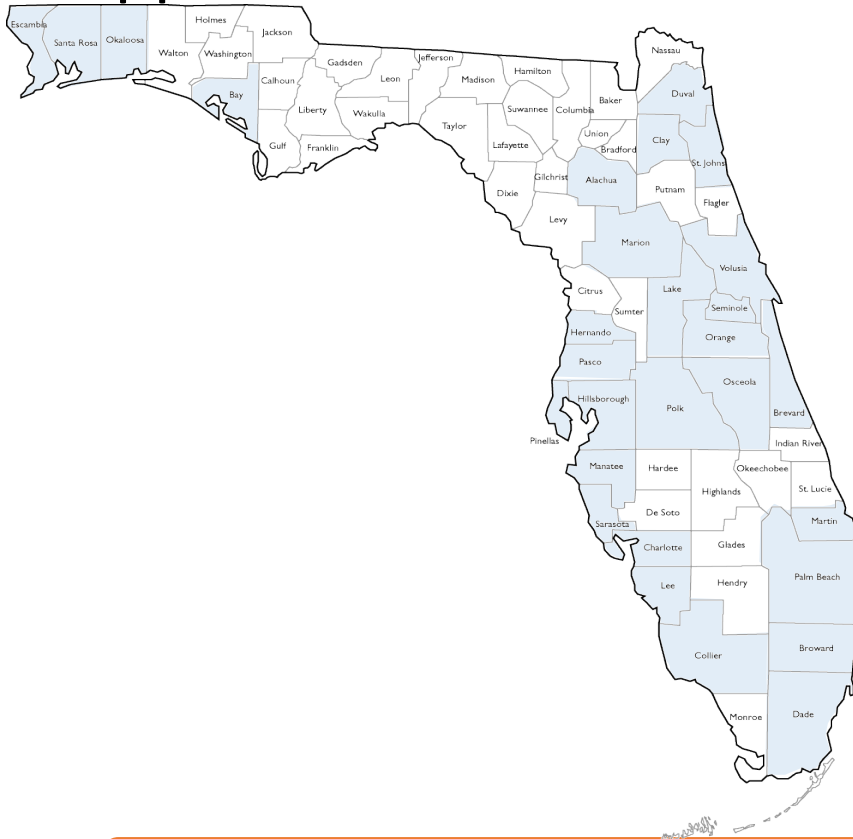
Single Stream MRF in Tallahassee

**NOTE: Applied only to counties with populations of 150,000+**



# Possible Changes to Florida's Solid Waste Management Approach

## 4. Mandatory C&D Debris and Yard Trash Recycling Approach

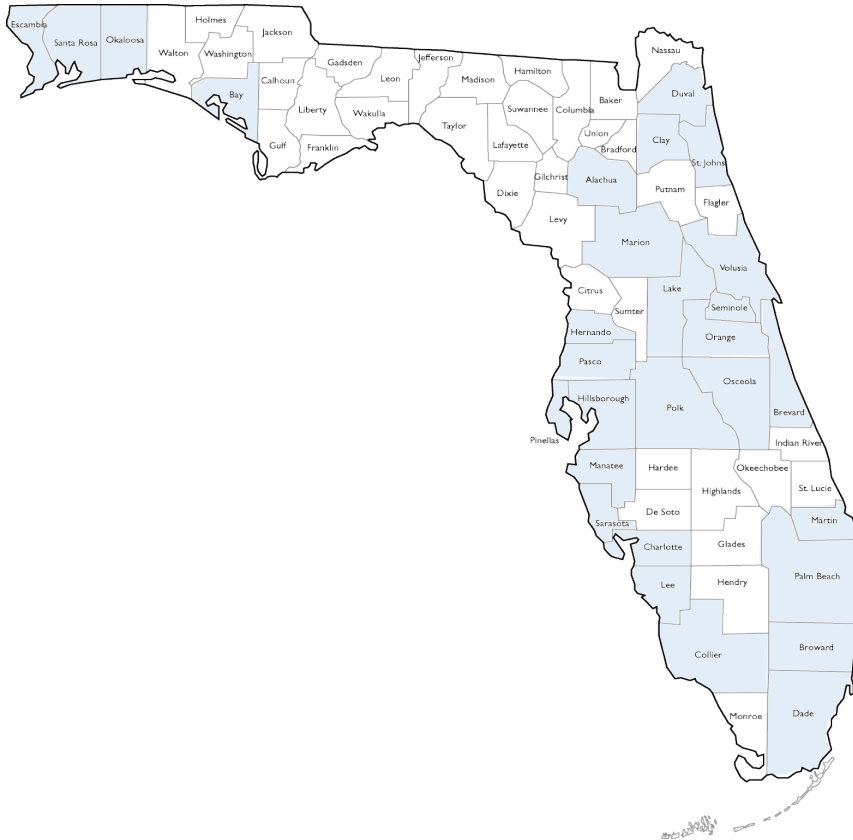


C&D Recycling Facility in Tallahassee

**NOTE: Applied only to counties with populations of 150,000+**

# Possible Changes to Florida's Solid Waste Management Approach

## 5. Mandatory Non-Residential Food Waste Composting Approach

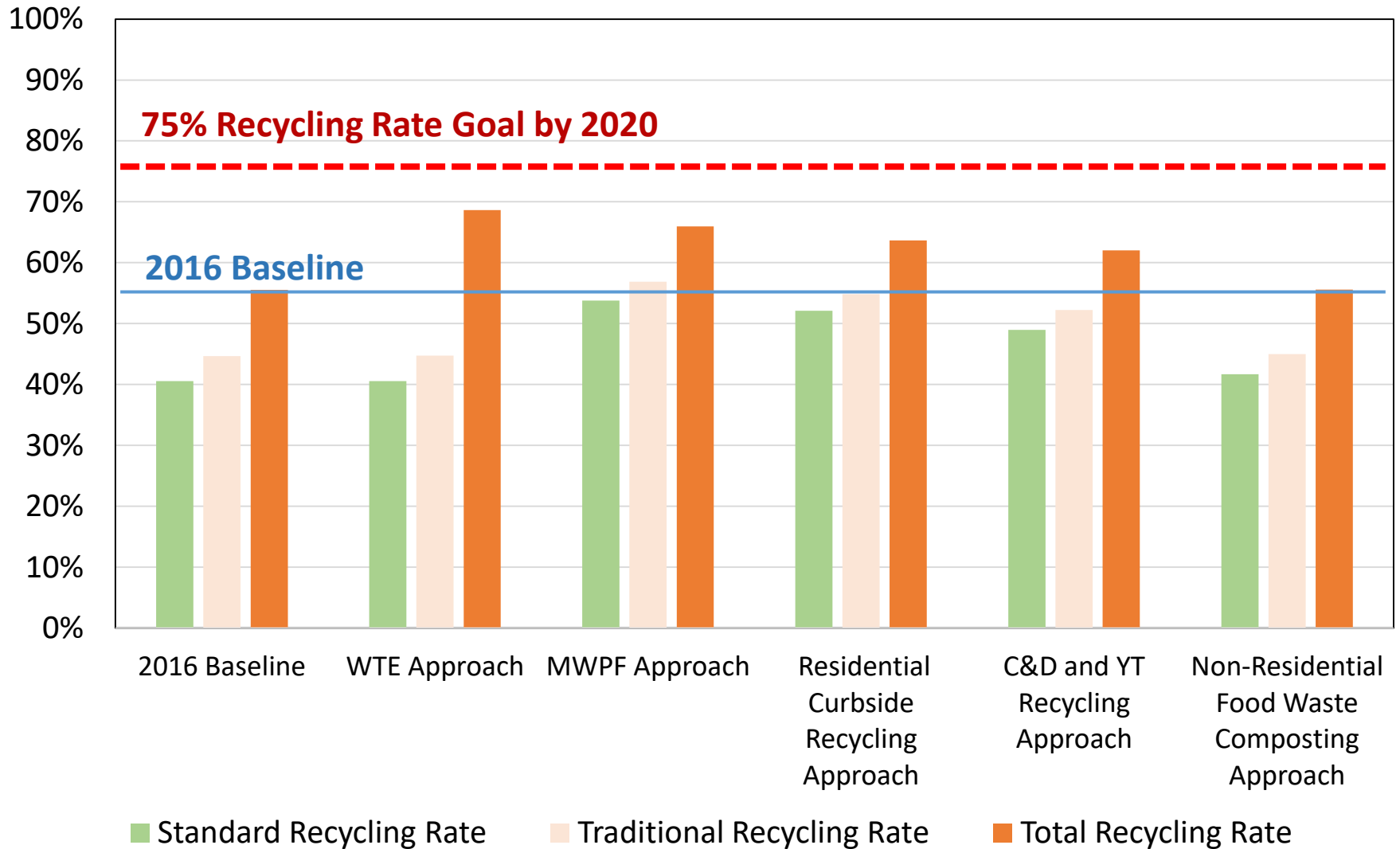


Aerobic Composting for Organics from Mixed Waste System in Gilroy, CA

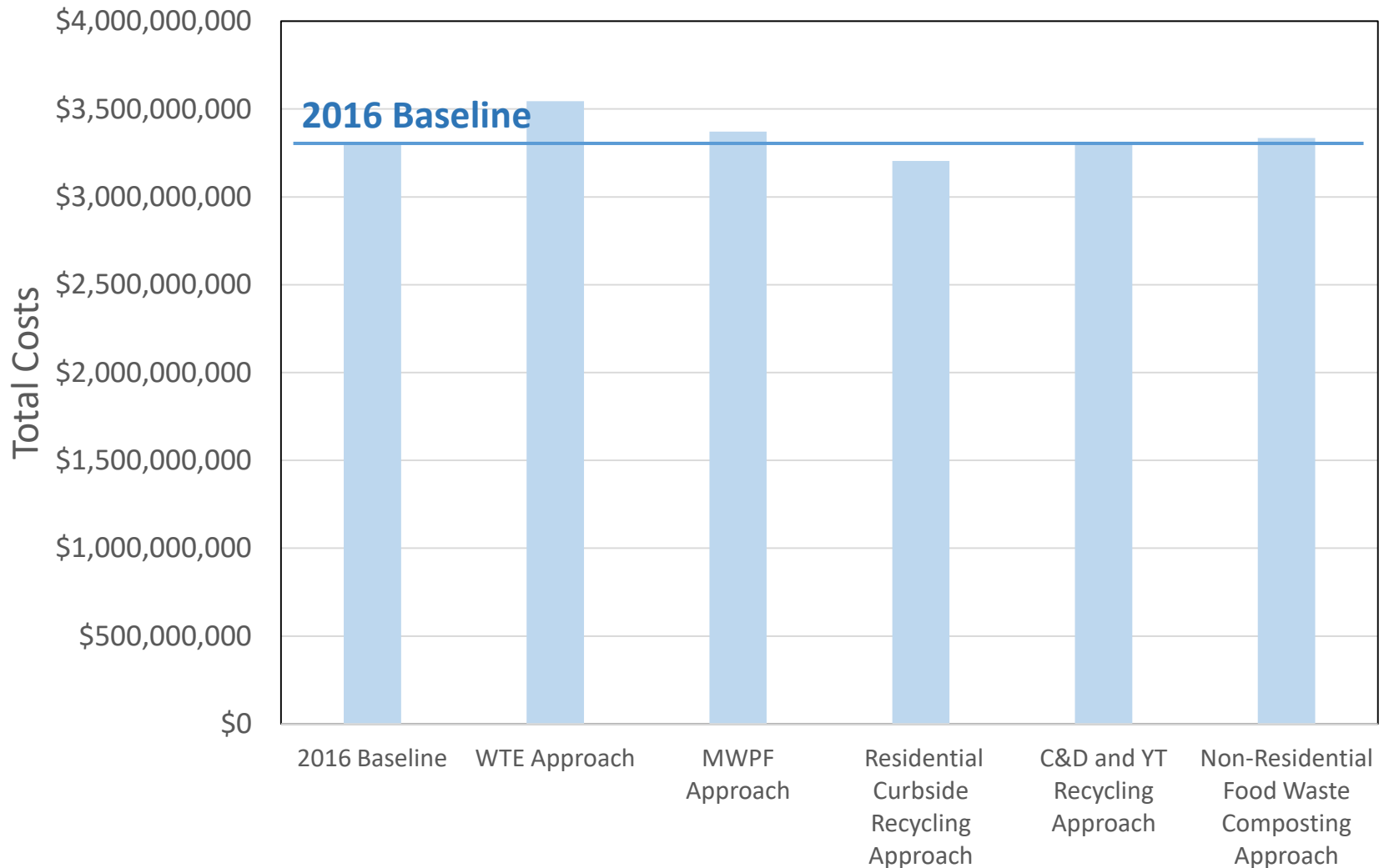
**NOTE: Applied only to counties with populations of 150,000+**



# Approaches Summary



# Approaches Summary



# Where are we now?

## Executive Summary

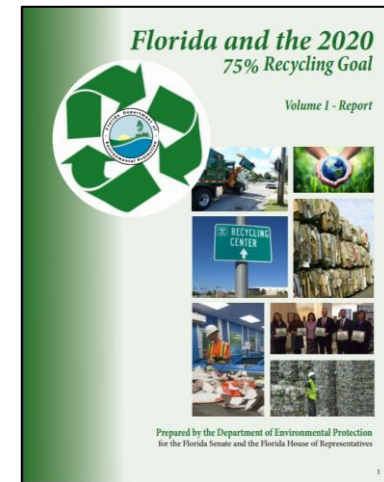
Given these challenges and others detailed in the report, the current practices in Florida are not expected to significantly increase the recycling rate beyond the state's current rate of 56%; causing it to level off. Without significant changes to our current approach, Florida's recycling rate will likely fall short of the 2020 goal of 75%.

## Conclusion

It is important to note that the weight-based goals, as described in the legislation, are aspirational. Dr. Townsend's research suggests that, even if many of the options presented in Table 1 were implemented, the 75% goal may not be achieved. Further, there is a developing consensus in other states and at the federal level that suggest using a weight-based goal may not result in efficient or effective recycling; rather, incorporation of source reduction and sustainable materials management concepts into a comprehensive statewide recycling program may be needed.

FDEP Report to the Legislature (Dec. 2017)

<https://floridadep.gov/waste/waste-reduction/documents/florida-and-2020-75-recycling-goal>



# Problems with Recycling Rates as Targets for Waste Management System Progress

Current approach focuses on chasing tons, problems with this approach...

## Accounting

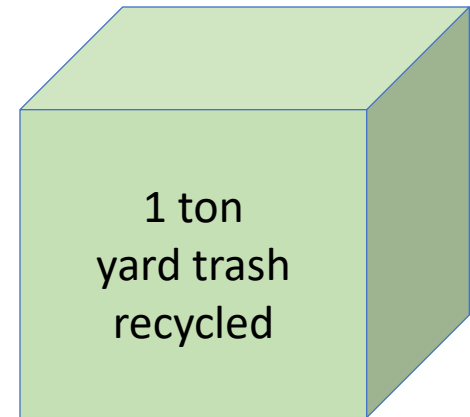
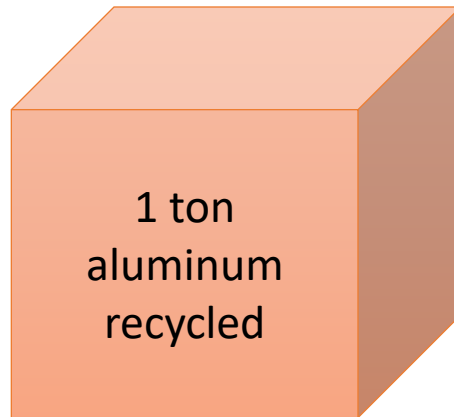
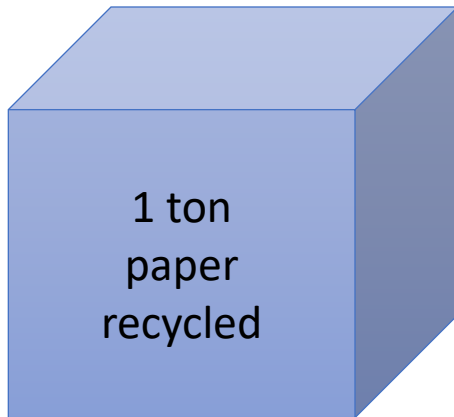
- What counts?
  - Alternative daily cover (ADC) at landfills
  - WTE
  - Landfill gas to energy
  - Concrete and asphalt recycling
  - Utility and industrial waste recycling
- Creative Accounting
  - How good are the numbers?
  - How do you avoid cherry picking or double-counting?
- Total or per capita?

## Substance

- Does not reflect source reduction (if you reduce the numerator, you also reduce the denominator).
- Treats all materials the same. We know materials have differing impacts with regard to environmental burdens, economics and landfill capacity consumption.

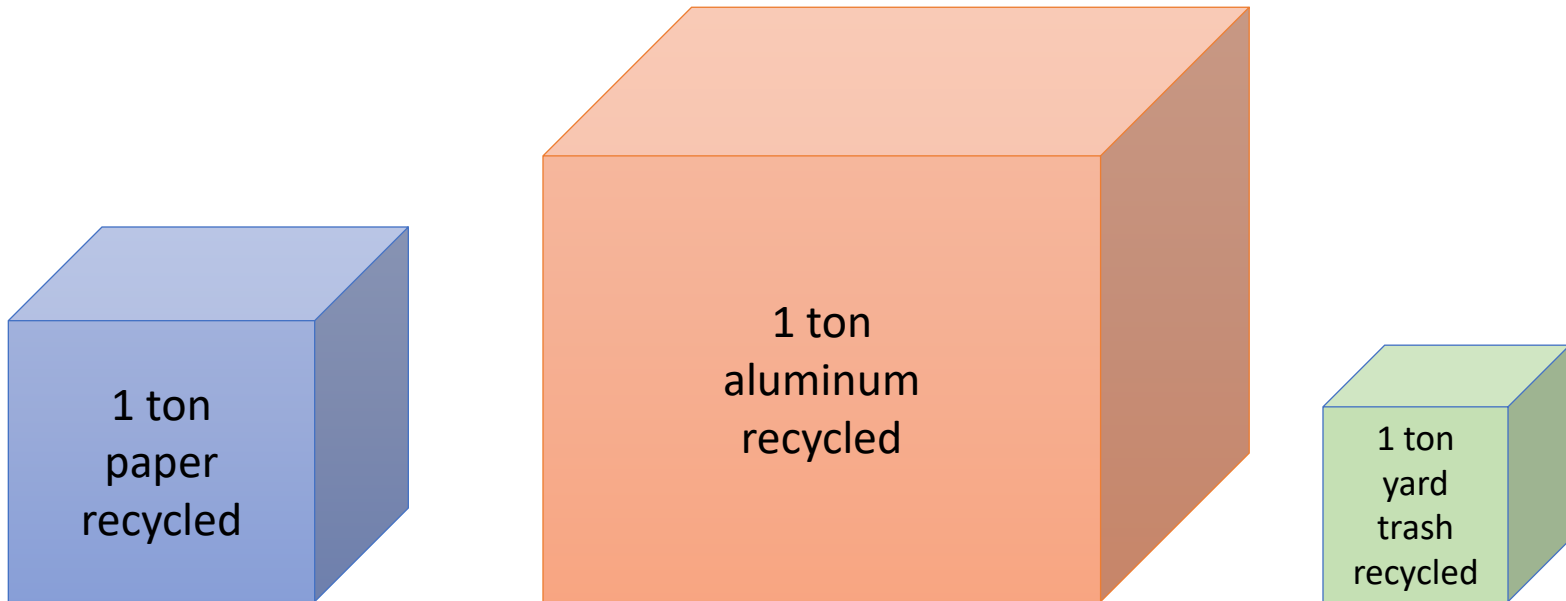
# The Fallacy of Solely Chasing after Tons

*All materials are treated the same*



# The Fallacy of Solely Chasing after Tons

*Different materials result in different outcomes*



# Metrics to Track Progress Besides Tons

- Greenhouse gas emissions
- Energy production/consumption
- Impact on air
- Impact on water
- Resource consumption
- Human toxicity
- Landfill capacity
- Jobs
- Costs

# Waste Reduction Model (WARM)

EPA created the Waste Reduction Model (WARM) to help solid waste planners and organizations track and voluntarily report greenhouse gas (GHG) emissions reductions from several different waste management practices. WARM calculates and totals GHG emissions of baseline and alternative waste management practices—source reduction, recycling, anaerobic digestion, combustion, composting and landfilling.

## Basic Information about WARM



- [What is WARM?](#)
- [WARM Tool](#)

## Documentation

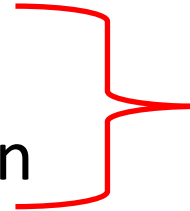


- [Documentation for Greenhouse Gas Emission and Energy Factors Used in WARM](#)



# Metrics to Track Progress Besides Tons

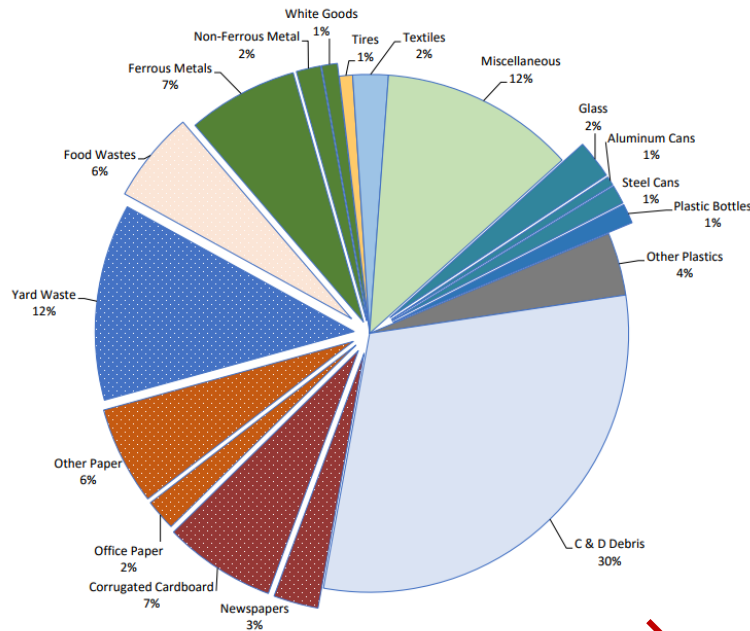
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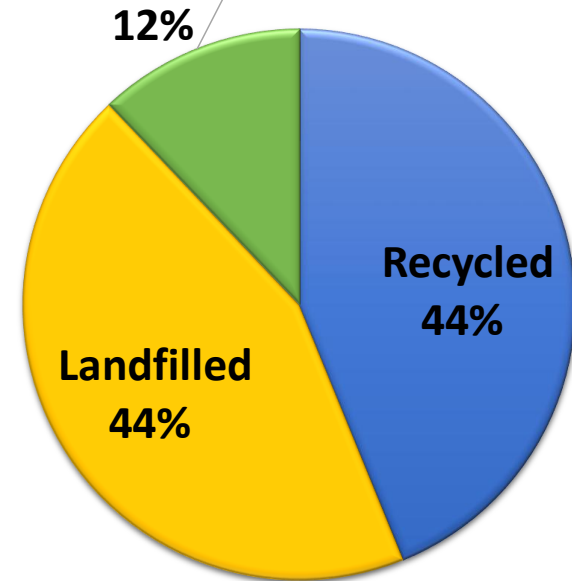
*US EPA's  
WARM*

# Florida's Energy and Greenhouse Gas Footprints Associated with 2016 Waste Management

**Florida Municipal Solid Waste Collected (2016)**  
(37.4 million tons)



**Combusted**



WARM

Energy Footprint = -12,900 MJ/person  
GHG Footprint = -1.08 tCO<sub>2</sub>eq./person

# Equivalent Current Environmental Impact

2016 GHG  
Emissions  
Footprint:

=

**4.7 million**



**Vehicles  
Taken off  
Road for One  
Year**

**1.1 million**



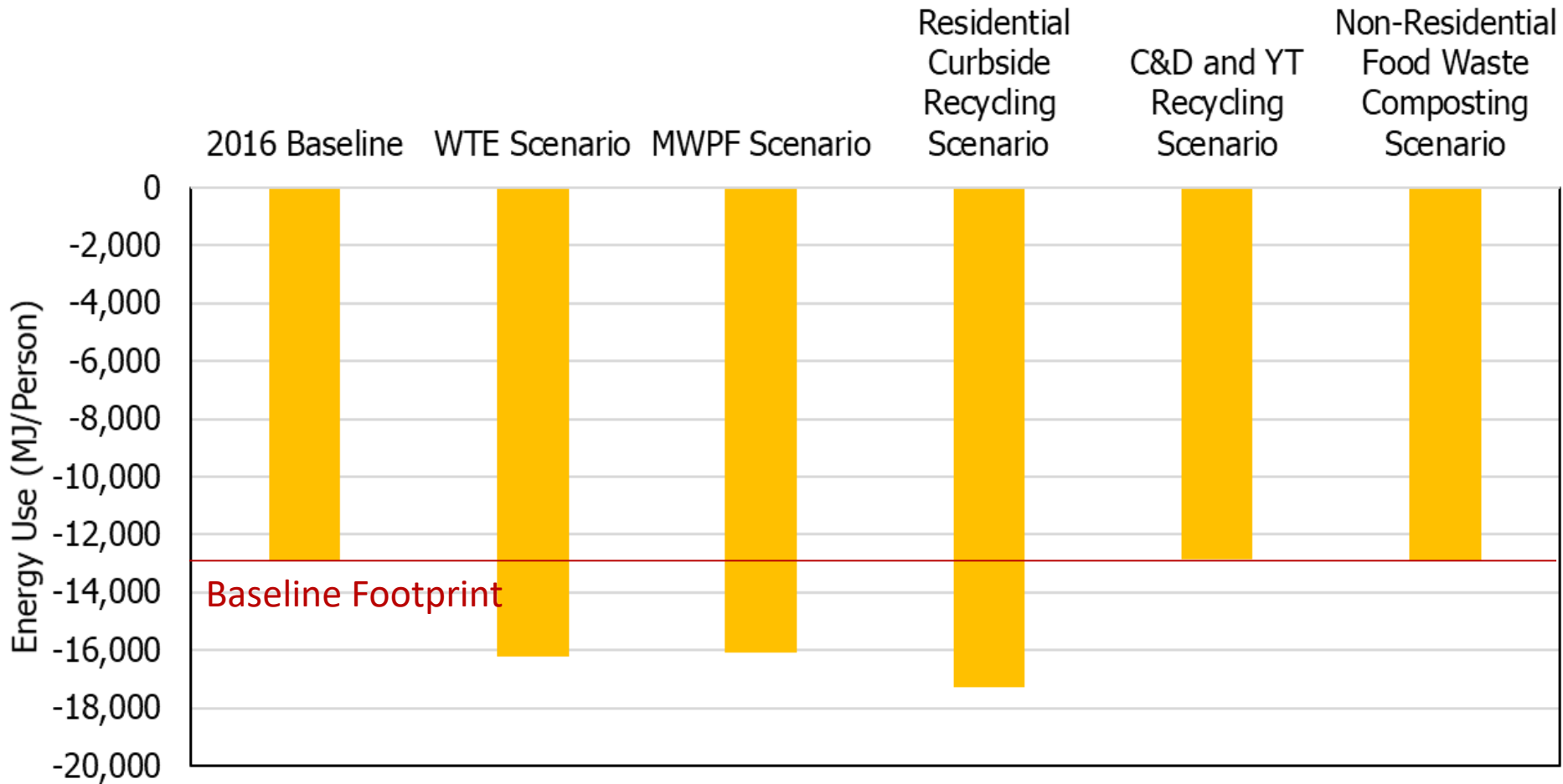
**Garbage  
Trucks of  
Waste  
Recycled  
Instead of  
Landfilled**

**3.3 million**

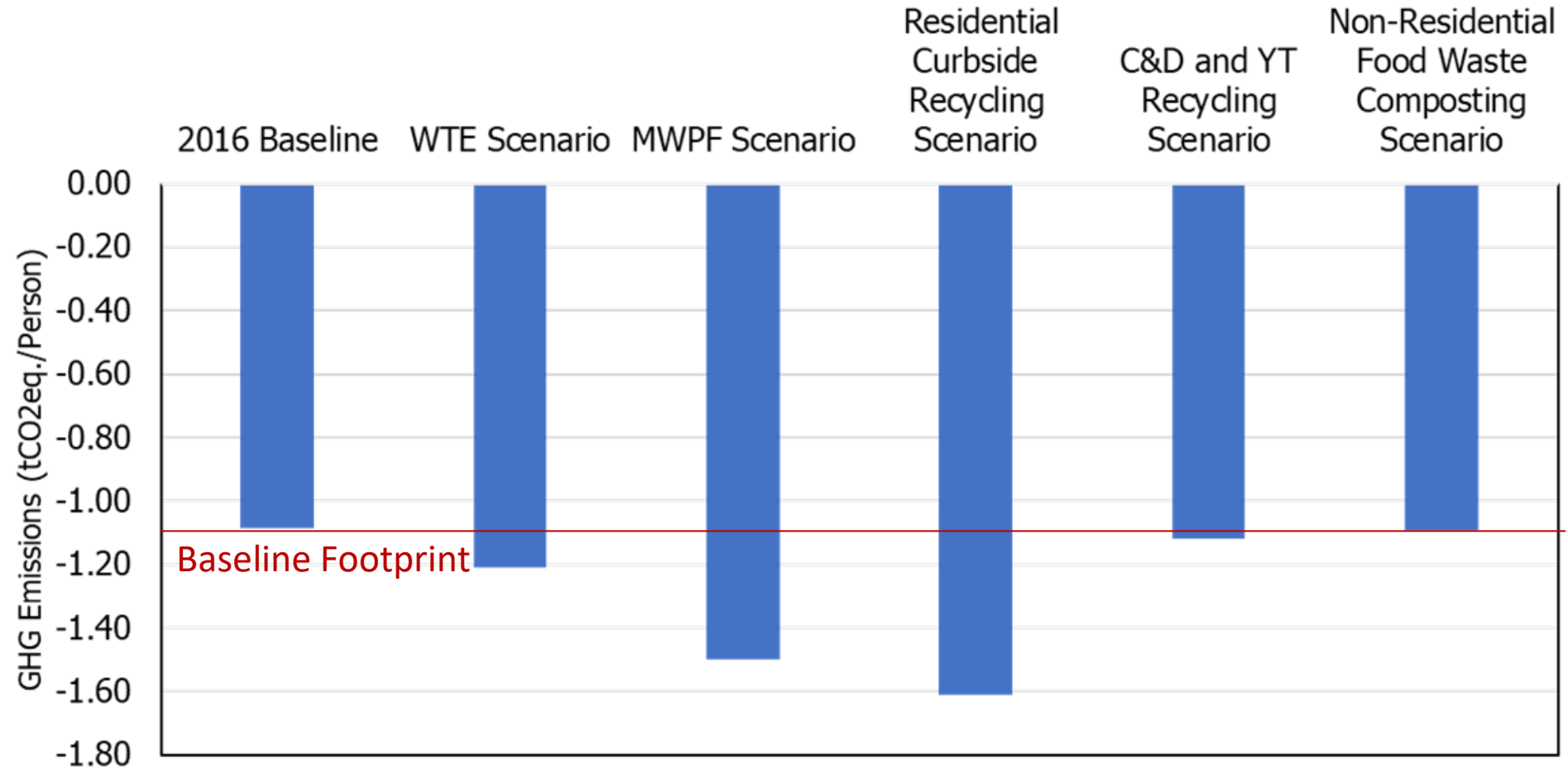


**Homes  
Powered for  
One Year**

# Statewide Alternatives Energy Use Footprint

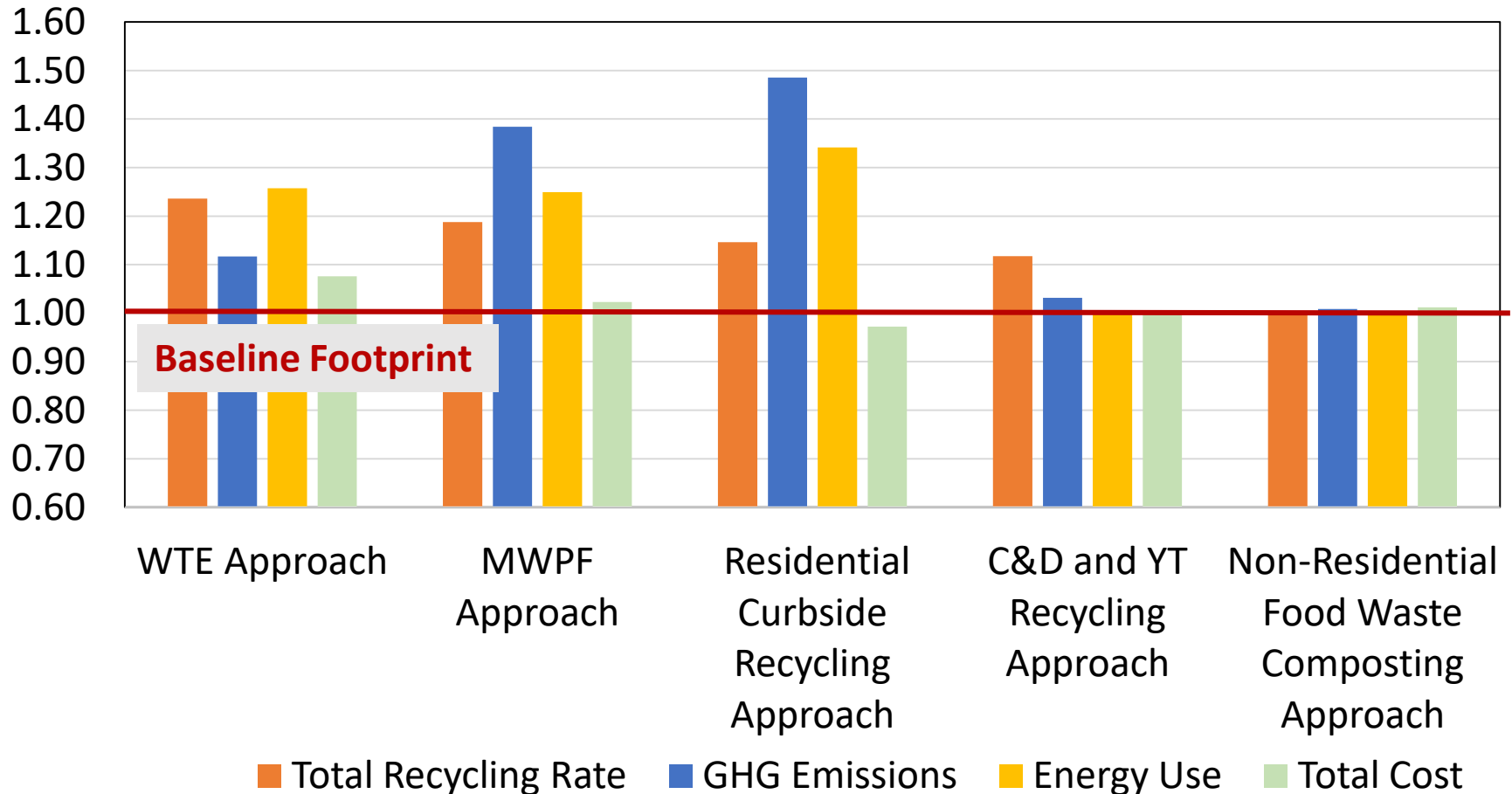


# Statewide Alternatives GHG Emission Footprint



# Approach Comparison Using SMM

Where 1 is equal to the baseline total recycling rate, total footprint, and total cost



# Integrating SMM

- We are not on track to reach 75%
- Strategies do exist to increase our recycling rate, but no single strategy is going to get us there. Multiple approaches would need to be employed. These come with a cost.
- Tools exist to relate waste management to outcomes such as energy savings and GHG avoidance.
- How can this be integrated into statewide policy making?

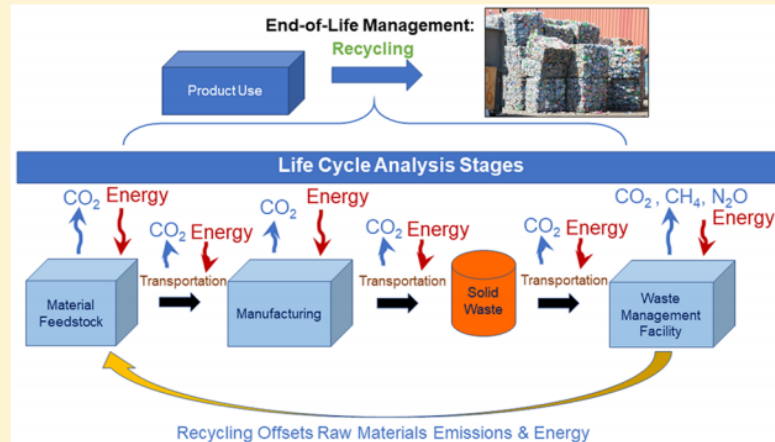
## Replacing Recycling Rates with Life-Cycle Metrics as Government Materials Management Targets

Malak Anshassi, Steven Laux, and Timothy G. Townsend\*<sup>1</sup>

Department of Environmental Engineering Sciences, Engineering School of Sustainable Infrastructure and Environment, University of Florida, 333 New Engineering Building, P.O. Box 116450, Gainesville, Florida 32611-6450, United States

### Supporting Information

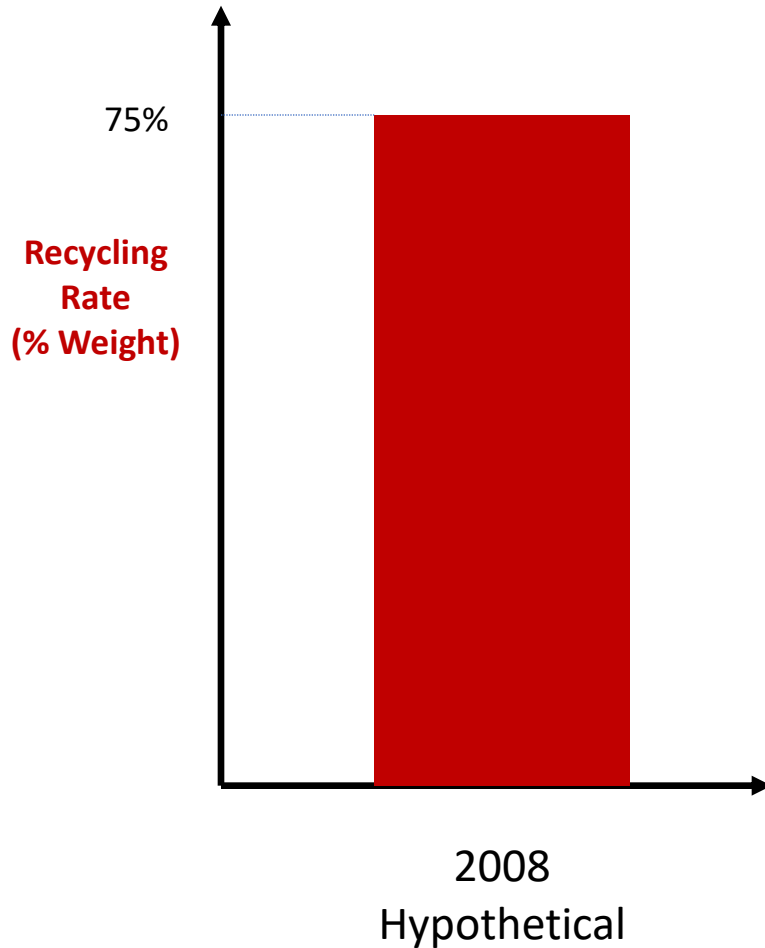
**ABSTRACT:** In Florida, the passing of the Energy, Climate Change, and Economic Security Act of 2008 established a statewide mass-based municipal solid waste recycling rate goal of 75% by 2020. In this study, we describe an alternative approach to tracking performance of materials management systems that incorporates life-cycle thinking. Using both greenhouse gas (GHG) emissions and energy use as life-cycle indicators, we create two different materials management baselines based on a hypothetical 75% recycling rate in Florida in 2008. GHG emission and energy use footprints resulting from various 2020 materials management strategies are compared to these baselines, with the results normalized to the same mass-based 75% recycling rate. For most scenarios,



LCI-normalized recycling rates are greater than mass-based recycling rates. Materials management strategies that include recycling of curbside-collected materials such as metal, paper, and plastic result in the largest GHG- and energy-normalized recycling rates. Waste prevention or increase, determined as the net difference in per-person mass discard rate for individual materials, is a major contributor to the life-cycle-normalized recycling rates. The methodology outlined here provides policy makers with one means of transitioning to life-cycle thinking in state and local waste management goal setting and planning.

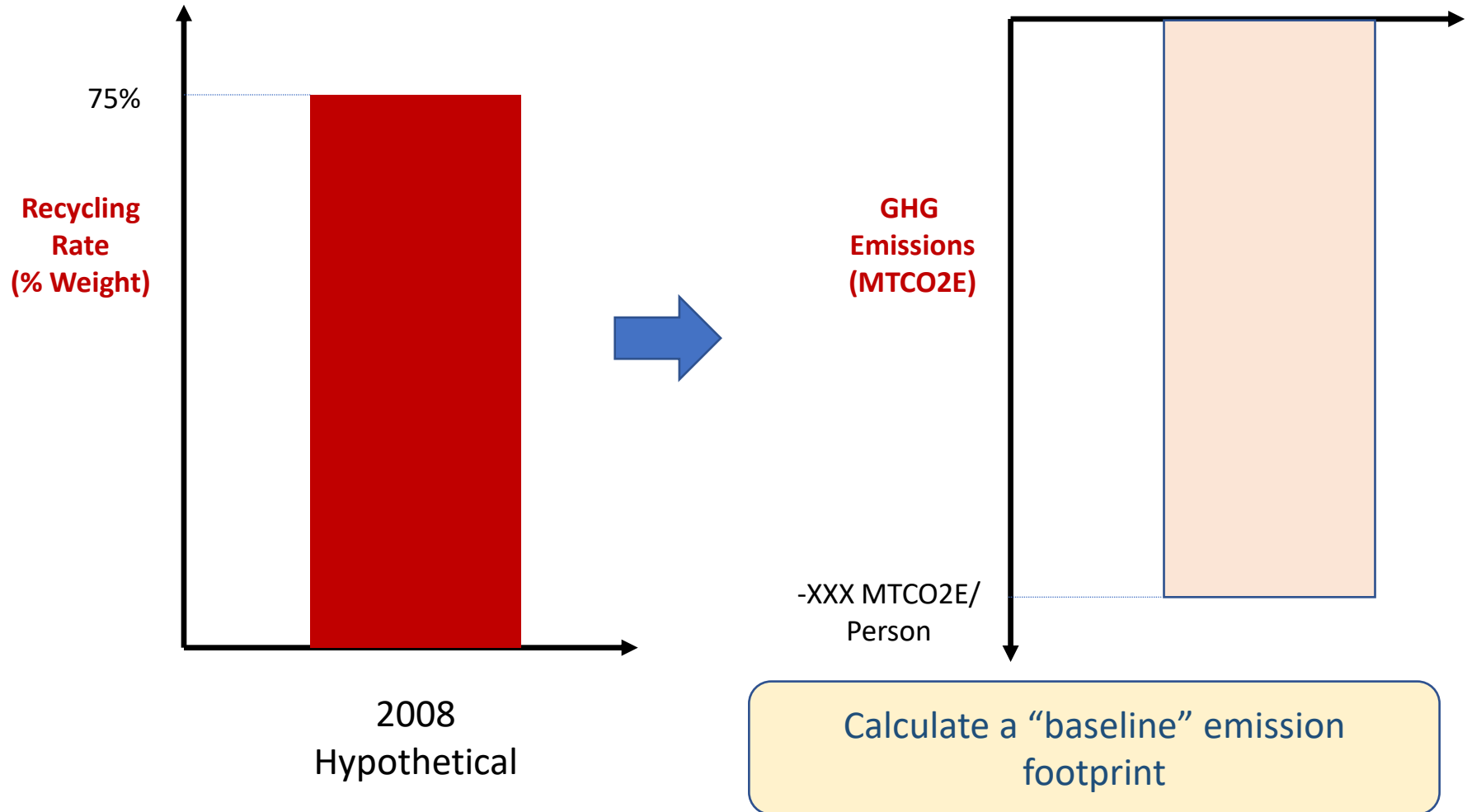


# Examining Life-Cycle Based Management Goals in Florida

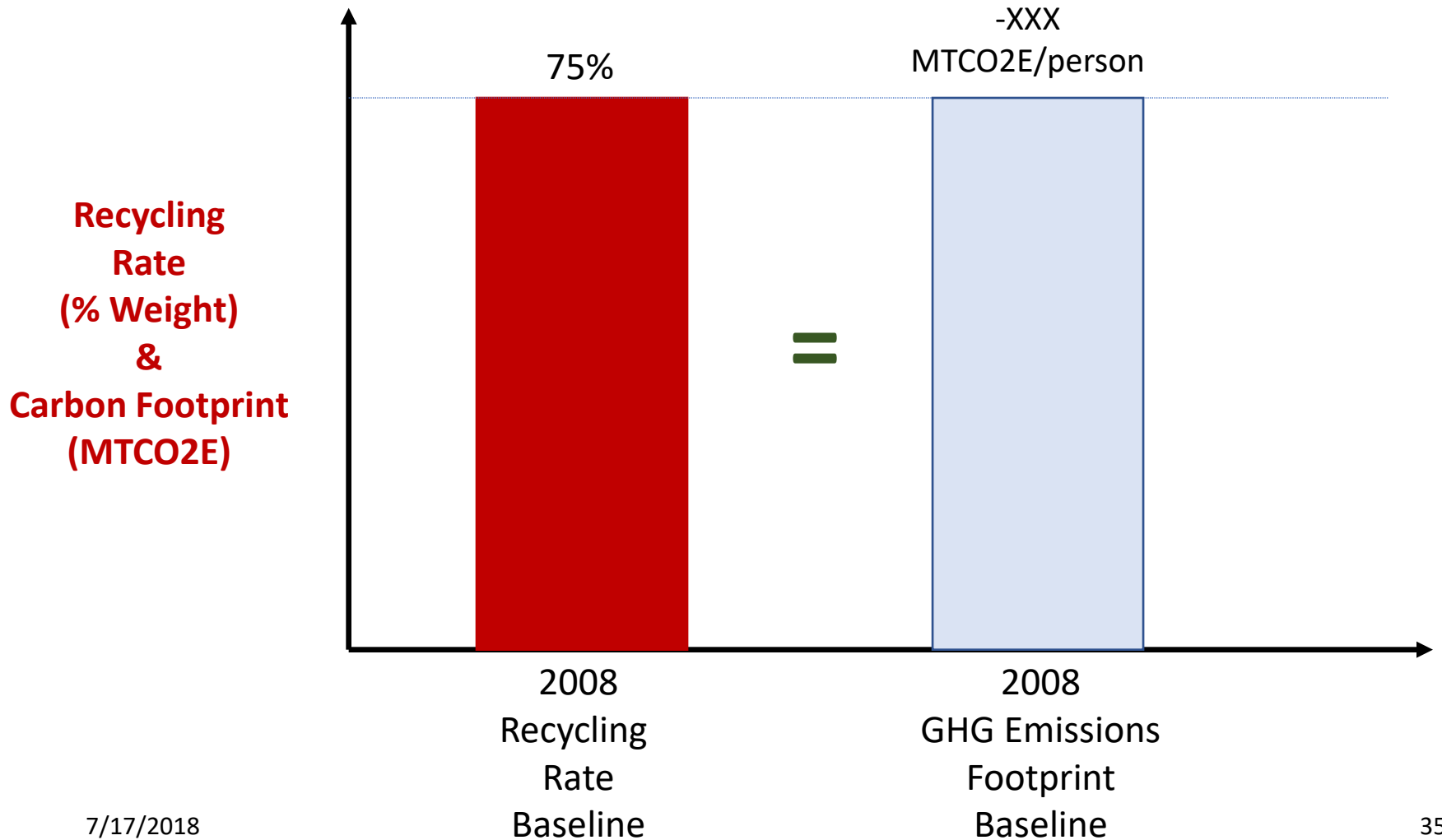


Calculate a “baseline” emission footprint

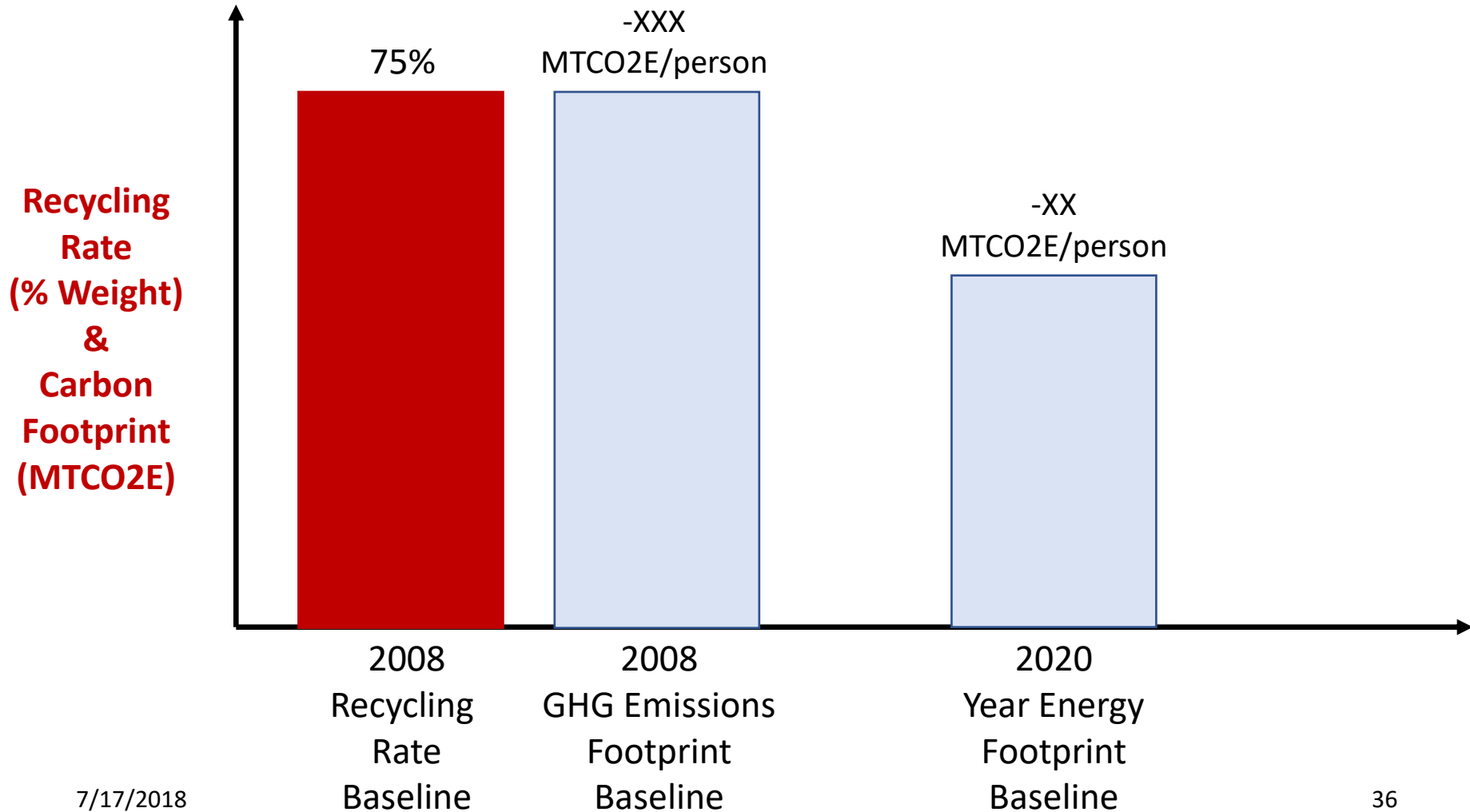
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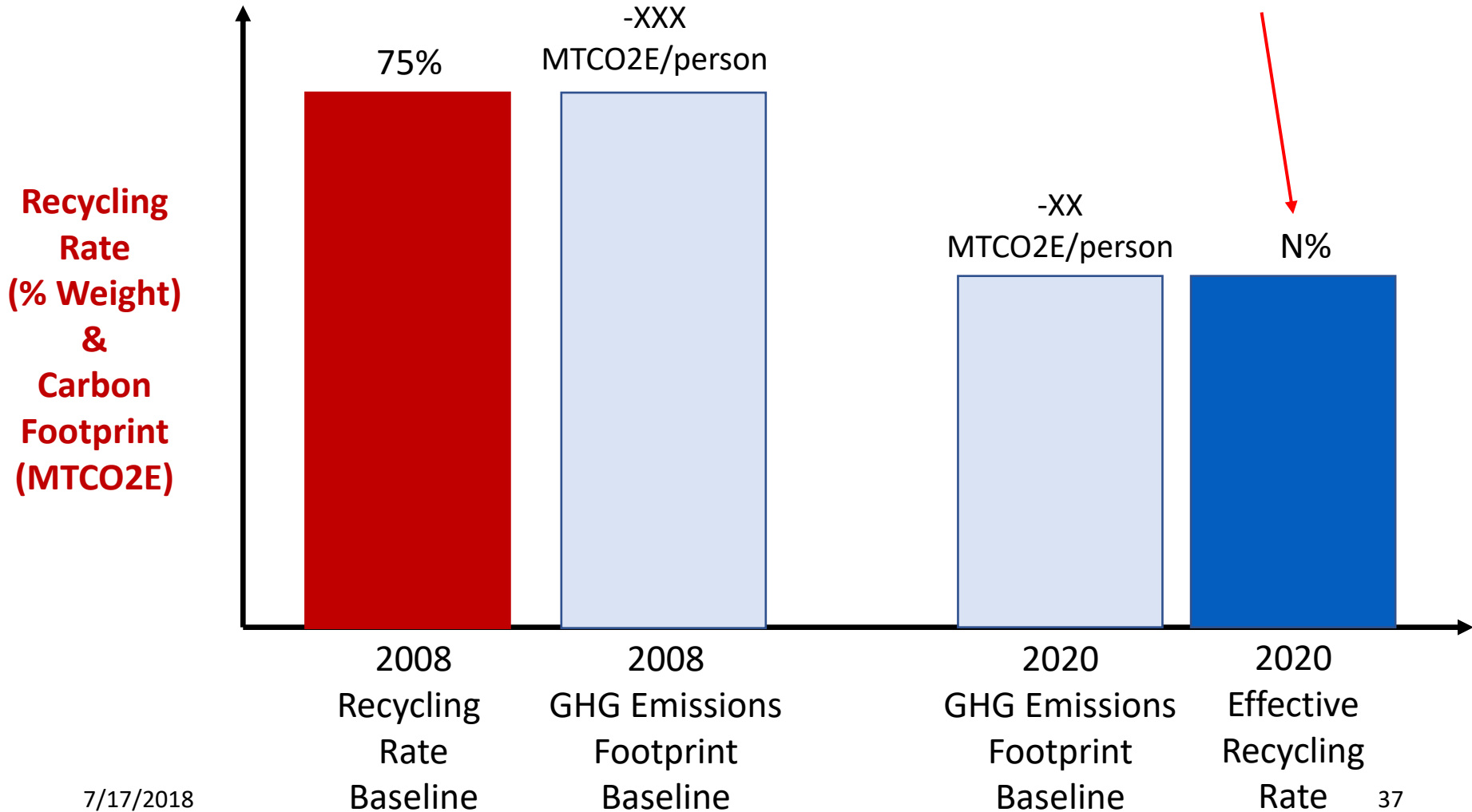


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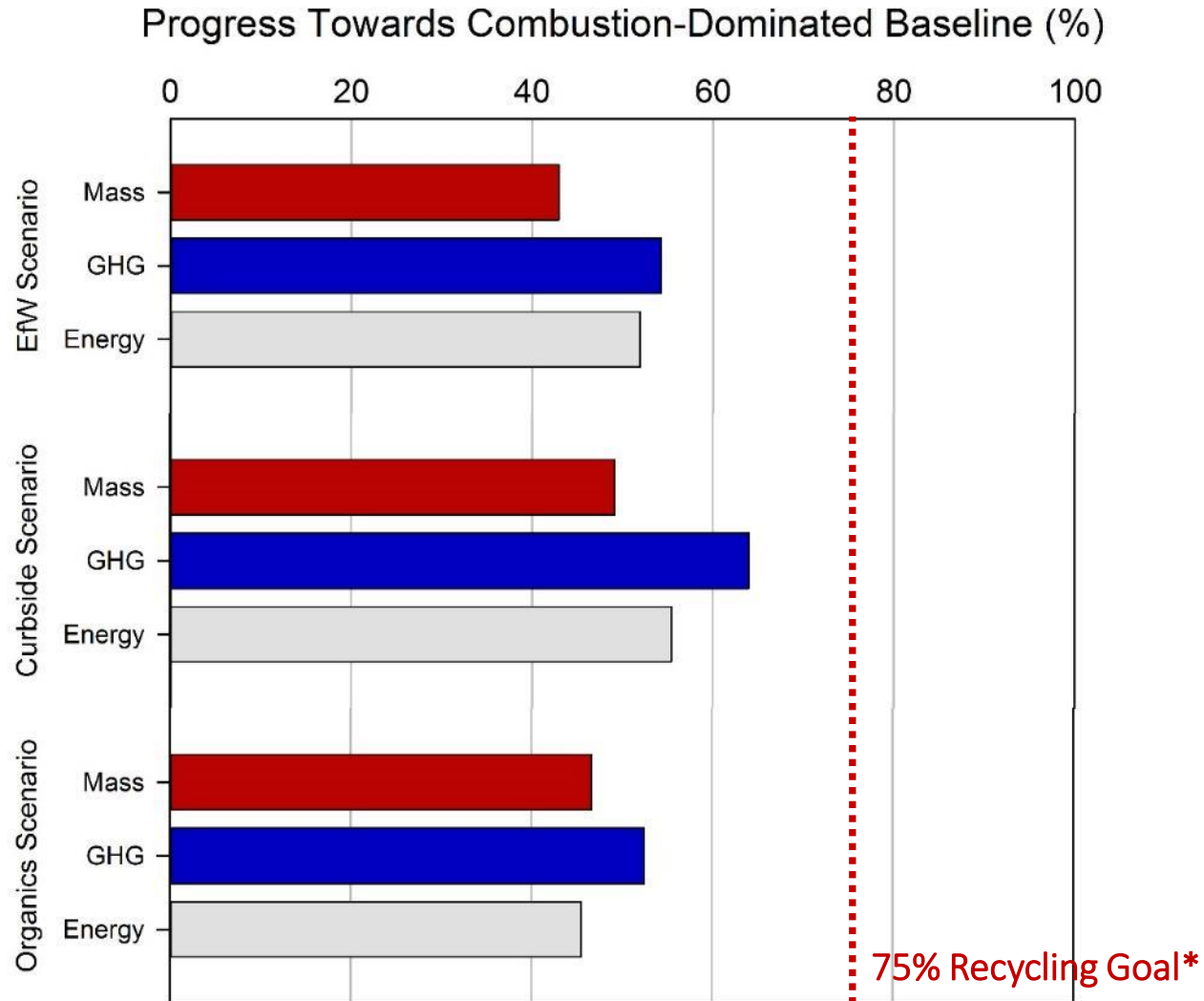


# Examining Life-Cycle Based Management Goals in Florida

$$GHG \text{ Recycling Rate} = \frac{2008 \text{ Emissions}}{2020 \text{ Emissions}} (\text{Recycling Rate Target}) = N\% \quad \text{Eq. 1}$$

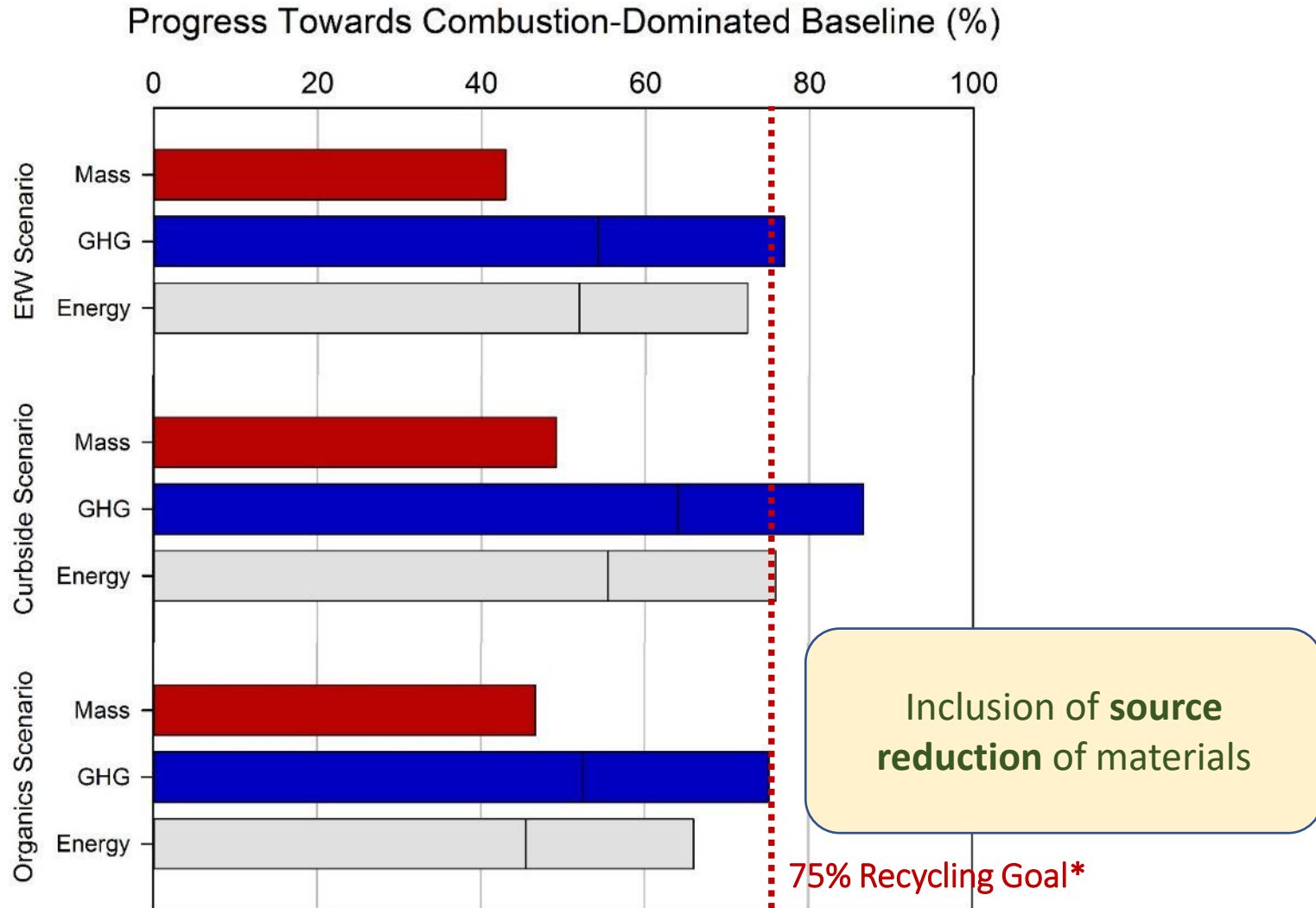


# Examining Life-Cycle Based Management Goals in Florida



\*Equivalent to a 75% mass-based recycling rate, and represents the target GHG emissions and energy use of the combustion-dominated baseline

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\*Equivalent to a 75% mass-based recycling rate, and represents the target GHG emissions and energy use of the combustion-dominated baseline

# Next Steps for Research Team

- Continue exploring methods for integrating SMM into decision making options
- Go beyond GHG and energy as outcomes to evaluate the State's solid waste management
- Develop a tool that can be used by counties to track their SMM footprint or recycling rate



# Current Tool

## Florida

Department of Environmental Protection



### Objective:

Develop a tool that can be used by counties to track their SMM footprint or recycling rate

### WasteCalc:

FDEP managed online tool that determines a county's collected MSW composition

[DEP Home](#) | [Contact DEP](#) | [Search](#) | [DEP Site Map](#)  
[Waste Management Home](#) | [Contact Us](#)



Estimate your county's waste composition data online

Welcome to the Florida **Waste** Composition **Calculation** Model (**WasteCalc**), a user-friendly tool to estimate the composition of municipal solid waste generated in Florida counties. The composition data generated by **WasteCalc** should prove useful for annual reporting purposes, as well as solid waste and recycling program planning.

**WasteCalc** was developed through a Florida Department of Environmental Protection (DEP) Innovative Recycling Grant to Pinellas County. Project partners also included Highlands, Indian River, and Levy Counties. Waste composition studies and model development were conducted by Kessler Consulting, Inc., of Tampa, Florida, and Franklin Associates, Ltd., of Prairie Village, Kansas.

**WasteCalc** was developed using demographic and socio-economic factors (for example, population and employment in select SIC codes) that are specific to each county. It integrates the latest national municipal solid waste (MSW) research done for the U.S. Environmental Protection Agency, along with the most recent MSW and construction and demolition debris data for Florida.

**WasteCalc** also relies on waste composition sampling studies conducted in the four counties that participated in the project. In addition, recent sampling studies conducted in ten other Florida counties were consulted.

Should you have questions or comments about **WasteCalc**, please contact: Shannan Reynolds, Recycling Program, at [Shannan.Reynolds@dep.state.fl.us](mailto:Shannan.Reynolds@dep.state.fl.us).

Click below to begin using **WasteCalc**.

WasteCalc

# WasteCalc Updates

- Research Team tasked by FDEP to update the current WasteCalc system
- New Hinkley Center project focused on developing a tool that uses other impact categories and estimates effective recycling rates
- Collaboration between FDEP WasteCalc update project and new Hinkley Center project to develop a spreadsheet or online based tool for counties

## Florida Solid Waste Management: State of the State

As new methods for the management of solid wastes are developed and refined, questions are often posed about the economic and environmental merits of these strategies. Finding the most suitable processes to answer these questions are still at large. In order to find solutions, a comprehensive analysis on the economic assessment of the available strategies and technologies for solid waste management in Florida, along with an evaluation of the environmental footprints of these approaches must be conducted. This research aims to uncover this information to achieve an estimate for the current material flow for the Florida solid waste stream, and develop a database of current and historic waste commodity prices. This project is funded by the Hinkley Center for Solid and Hazardous Waste Management. Project Scope: [HC16Scope](#)

## Progress Reports

Progress Report 1: [HC16PR01](#)

Progress Report 2: [HC16PR02](#)

Progress Report 3: [HC16PR03](#)

Progress Report 4: [HC16PR04](#)

## TAG Meeting Presentations

January 2017 TAG Meeting: [HC16STAKEHOLDERFEB10](#)

October 2017 TAG Meeting: [HC16STAKEHOLDEROCT05](#)

# Thank You for Your Time!

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