

Florida Atlantic University

Solid Waste Authority of Valley County

80% Recycling Goal By 2035



OWL ENGINEERS:

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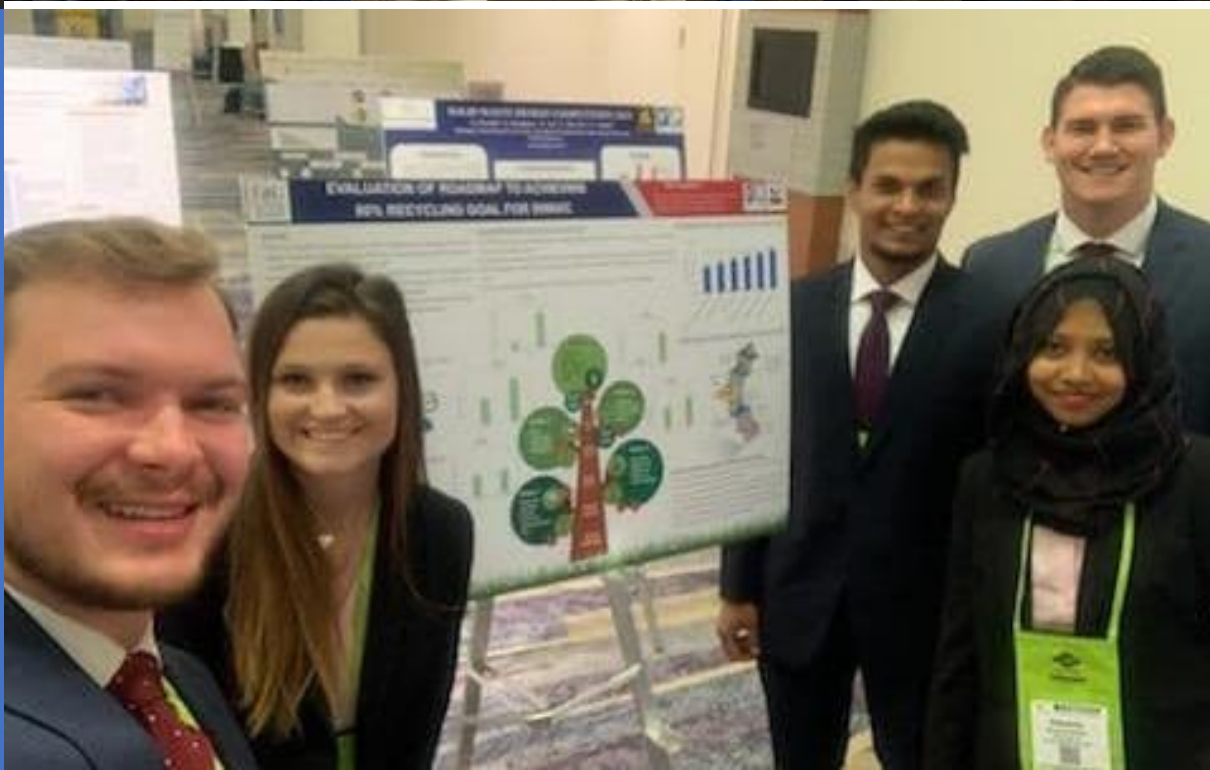
Advised by Dr. Daniel Meeroff



2020 SWANA FL/RFT Joint Summit
January 26-28, 2020



SWANA 2019



Scope of Services



Evaluation

- Four Models
- Recycling Data
- Existing Conditions



Projections

- Population
- Waste Generation



Model Analysis

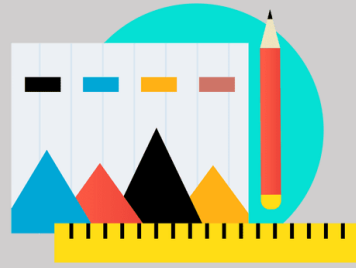
- Assumptions
- Recycling Rate
- Target Materials
- Proposed Changes



Implementation

- Timeline
- WARM Model
- Cost Analysis
- Recommendation

About Valley County



1,200
Square Miles



Population
400,000

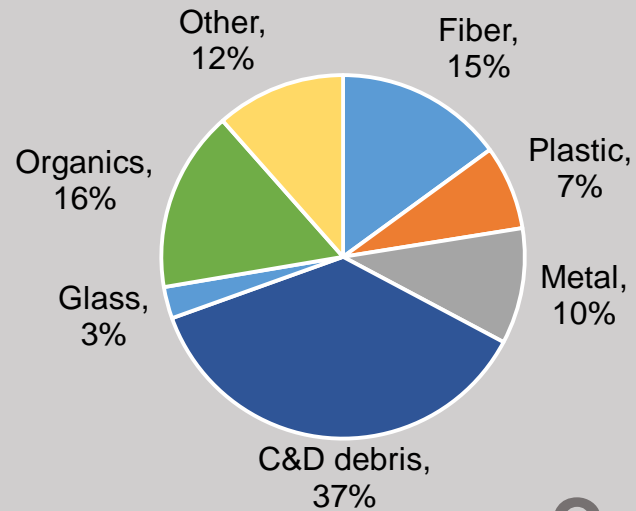


Dual
Recycling
Stream



80% Population
Lives in
Incorporated
Areas

Valley County: Existing Conditions



Waste Composition:

1. C&D Debris (37%)
2. Organics (16%)
3. Fiber (15%)
4. Plastic (7%)



Curbside Collection Availability

- 80% of Single-Family Homes
- 25% of Multi-Family Homes
- 88% of Commercial Buildings

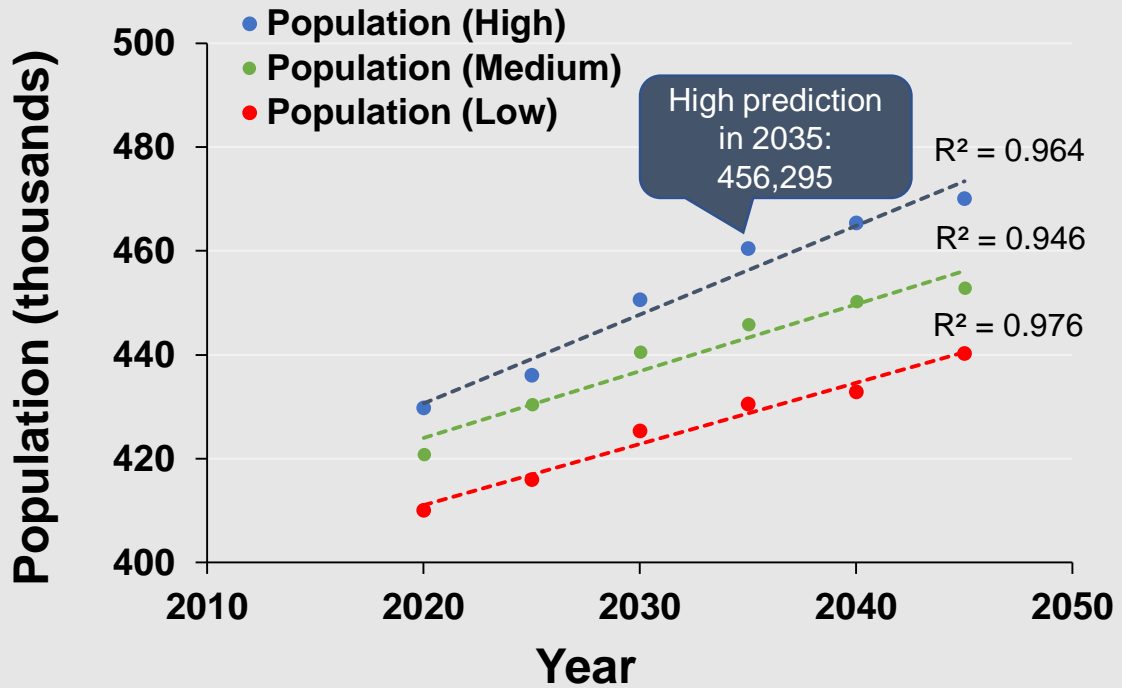
Existing Facilities

- Subtitle D Sanitary Landfill
- C&D Debris Recycling Facilities
- Materials Recovery Facilities (MRF)
- Household Hazardous Waste Facilities (HHW)
- Yard Waste Mulching Program
- Landfill Gas to Energy (LFGTE) Facility

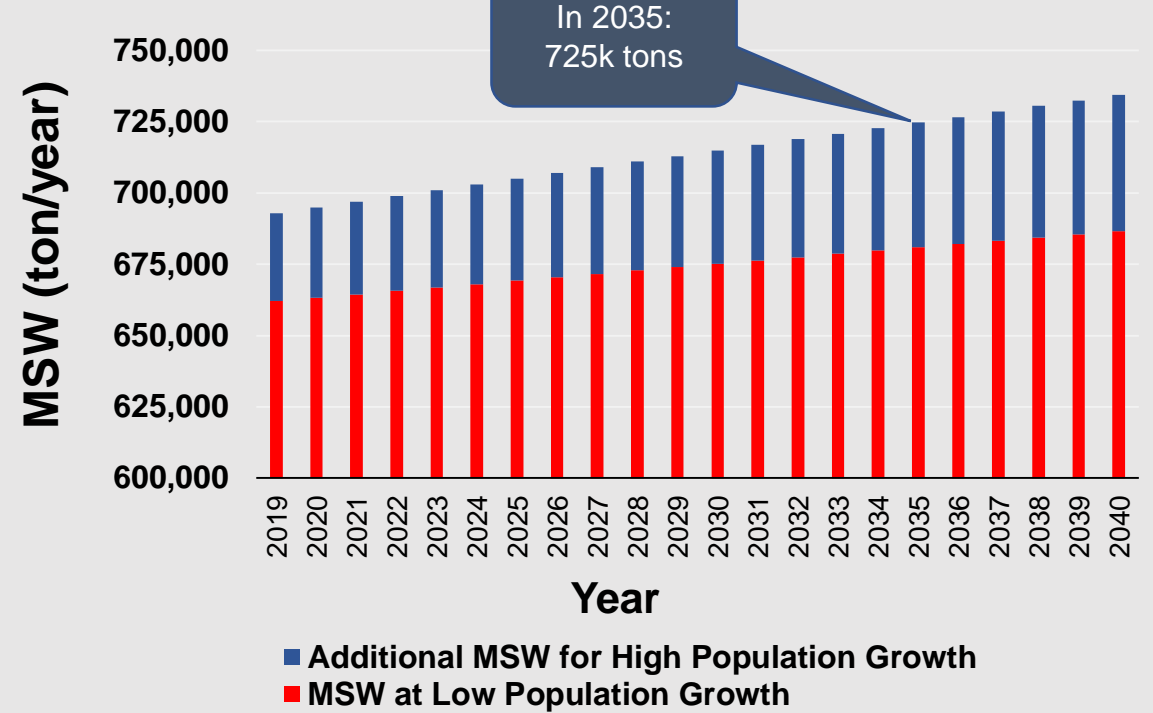


Projections

Population



Waste





Model Analysis



General Assumptions



2016-2018 data used for recycling rate calculations



Analysis based on high population growth and corresponding waste projection



50% newspaper reduction by 2035 due to digital alternatives



No existing WTE facility;
future adoption was not investigated

California Model



Recycling Rate Calculation:

$$1 - \frac{\text{Disposed Waste}}{\text{Total Amount of Waste Produced}}$$



Renewable Energy Credits:

No Credit



Yard Trash Used As Landfill Cover:

Not Counted



Excluded Wastes:

ADC, AIC, Beneficial Reuse, Biomass Conversion,
Waste-Tire-Derived Fuel

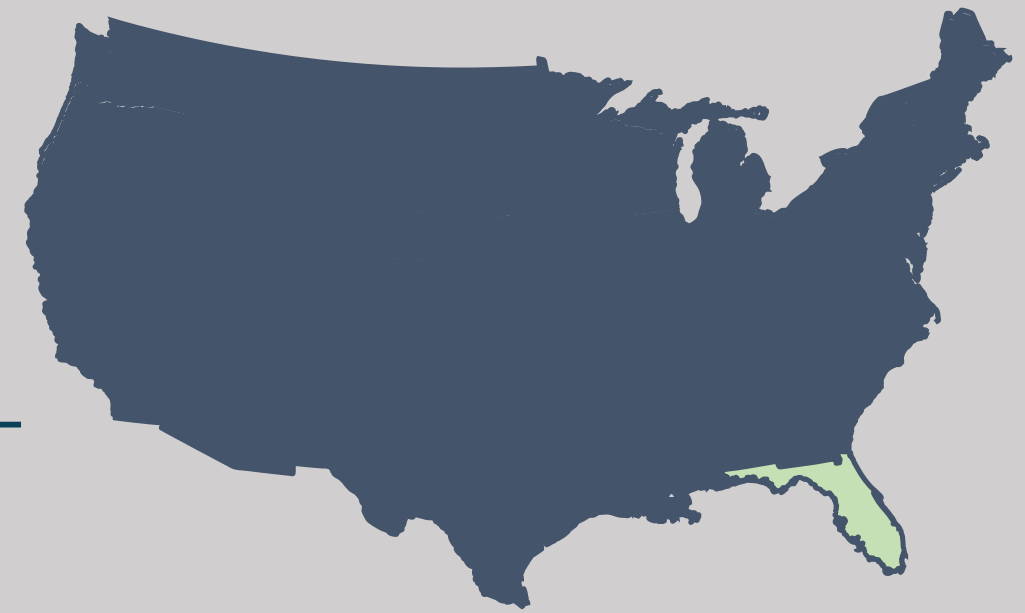


Beneficial Reuse:

Not Counted As Recycling



Florida Model



Recycling Rate Calculation:
Total Amount of MSW Recycled

Total MSW Recycled, Land Disposed, or Combusted



Renewable Energy Credits:
Credit for Renewable Energy Generated
From Solid Waste or LFG As Fuel



Yard Trash Used As Landfill Cover:
Credits Allowed



Excluded Wastes:
Industrial, Mining, Agricultural Operations,
Scrap Metal, Shredder Residue



Beneficial Reuse:
Not Counted as Recycling
(e.g. C&D Debris As Fill)

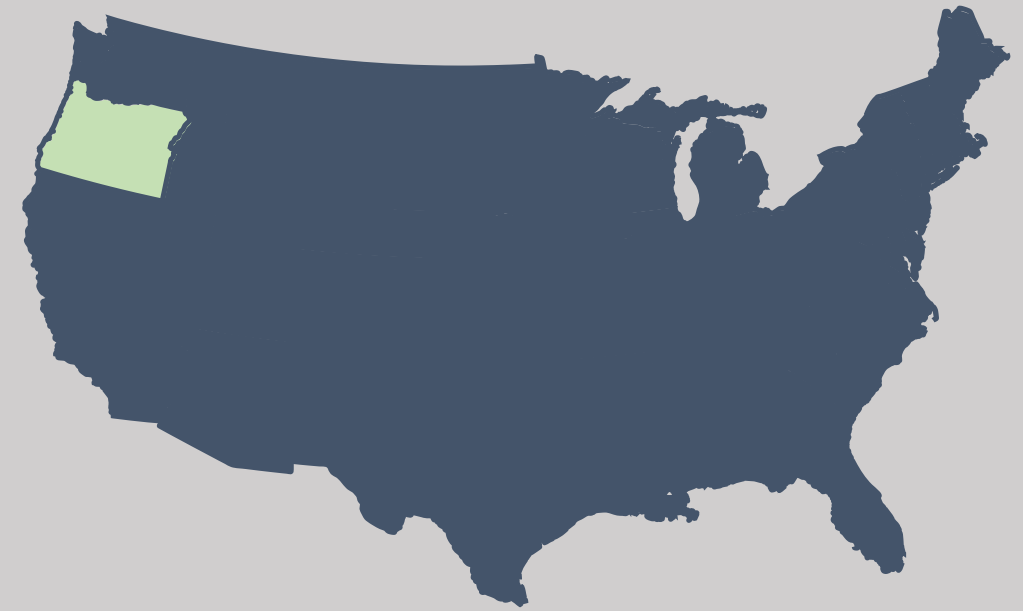
W/O RE Credits



W/ RE Credits



Oregon Model



Recycling Rate Calculation:
Total Recycled + Composted + Recovered for Energy

Total Amount of Waste Produced



Renewable Energy Credits:
No Credit



Yard Trash Used As Landfill Cover:
Not Stated



Excluded Wastes:
**Manufacturing, Industrial, Reconditioned/Reused Materials,
Brick/Concrete, Vehicles**



Beneficial Reuse:
Filling A Clean Fill = Not Recycling



European Union (UK) Model



Recycling Rate Calculation:

Recycled Amt. of Household Wastes

Total Household Waste Amt. (Excluding Certain Categories)



Renewable Energy Credits:

No Credit



Yard Trash Used As Landfill Cover:

Not Stated



Excluded Wastes:

Energy Recovery, Reprocessing into Materials Used as Fuels or Backfilling Operations



Beneficial Reuse:

Counted As Disposal



Model Application: No Program Change in 2035 Change in 2035 (Status Quo)



FL

RE
Recycling Rate:
2018 → 2035
58% → 53%



OR

Recycling Rate:
2018 → 2035
48% → 46%



CA

Recycling Rate:
2018 → 2035
55% → 46%



EU(UK)

Recycling Rate:
2018 → 2035
49% → 45%

Recycling Rate:
2018 → 2035
51% → 48%

**Highest recycling rate
for FL RE**

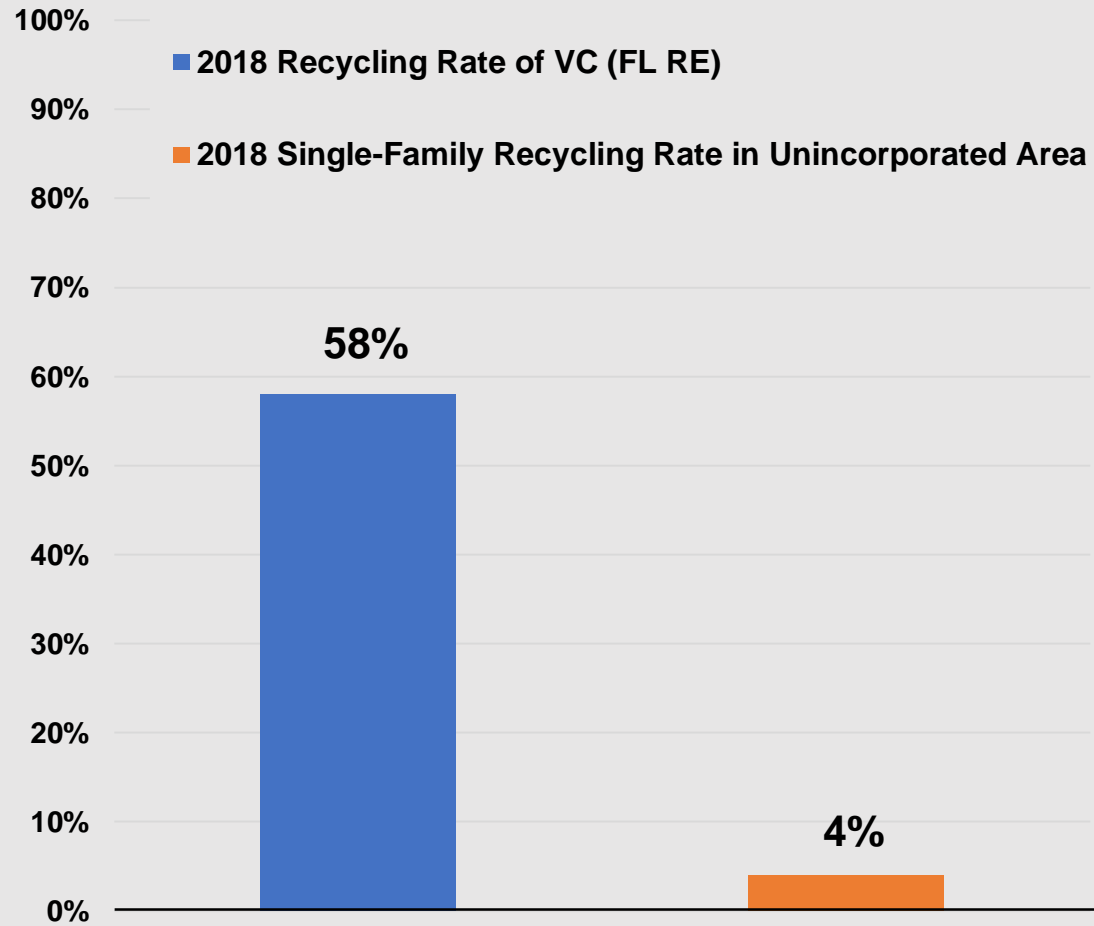


Implementation Plan

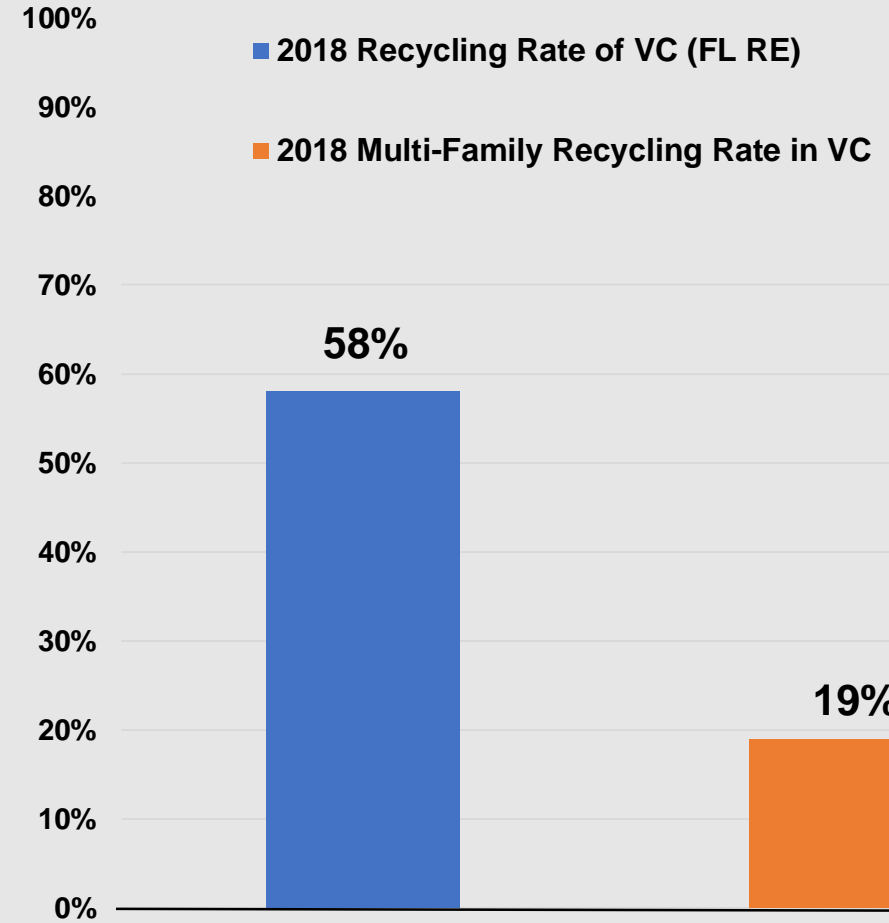


Residential Recycling

Unincorporated Single-Family

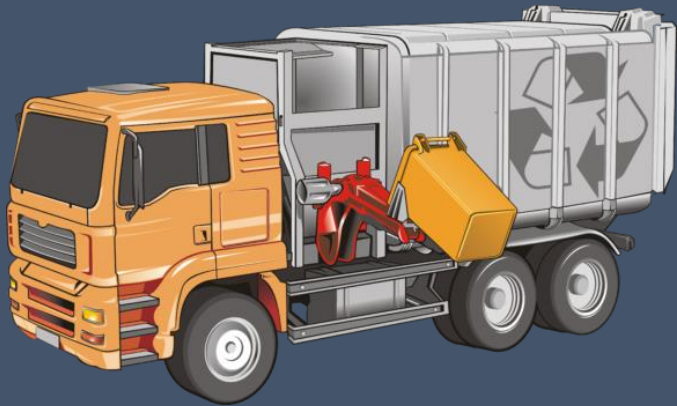


Multi-Family



Challenge: Low recycling availability to residences

Extend Pickup Service



Solution:



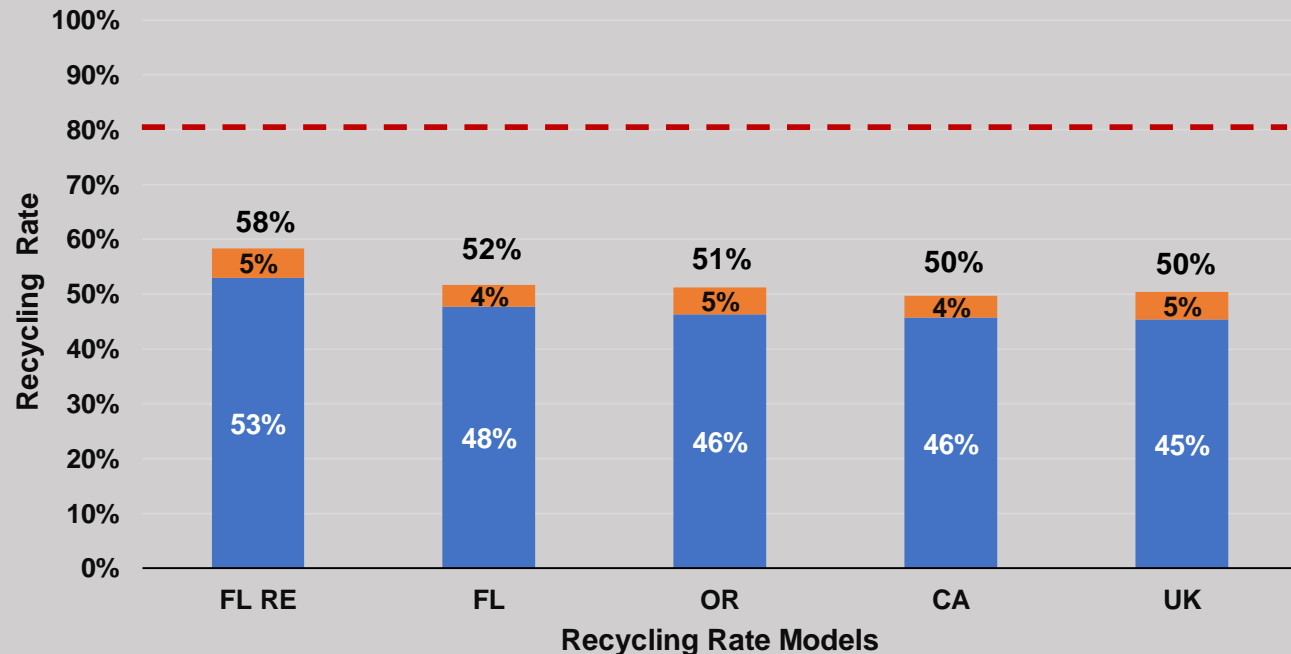
Single-Family Homes in Unincorporated Areas

- Extend curbside recycling pickup
- Requires new bins & 32 additional trucks

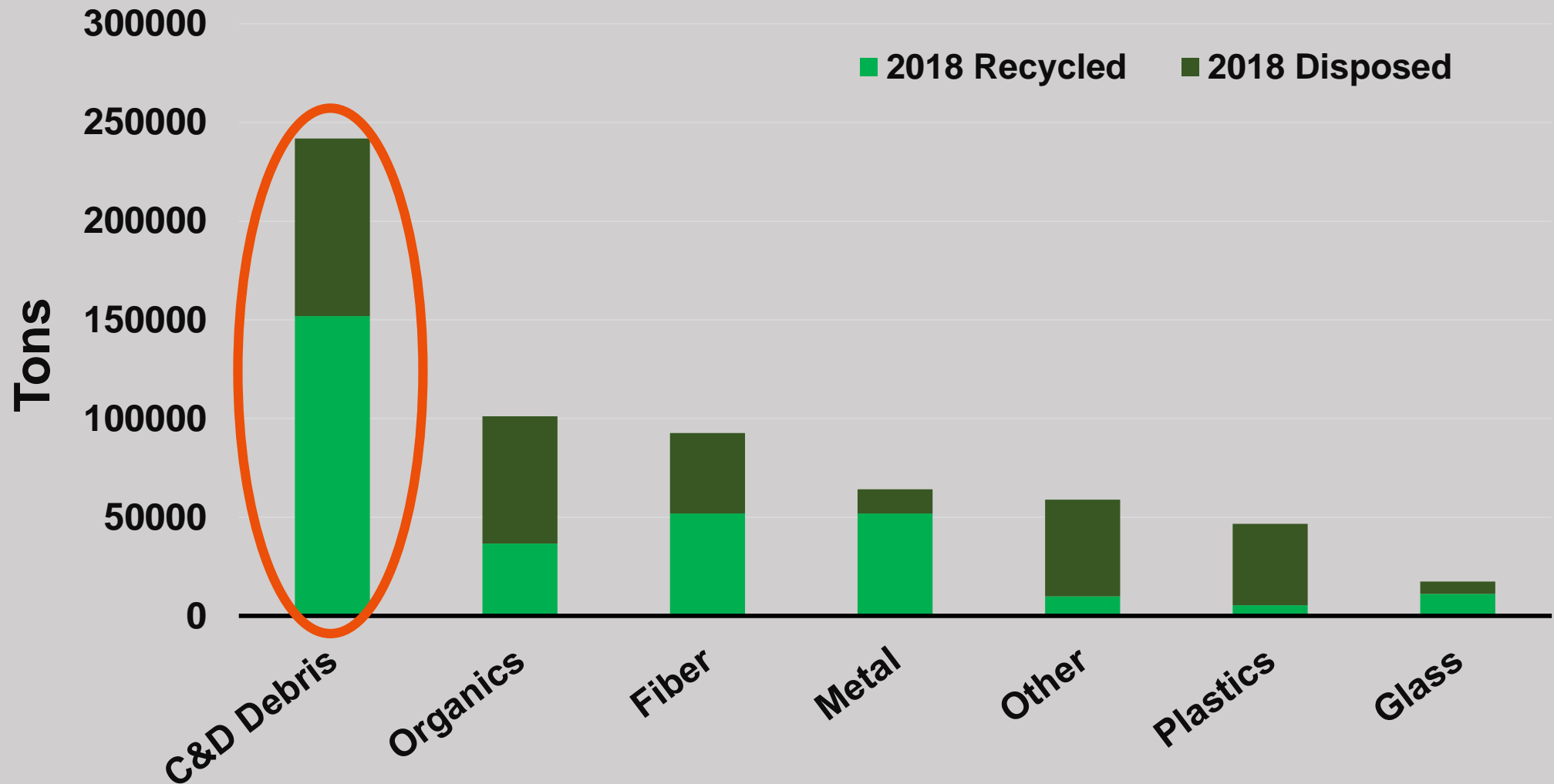


Hauled Container System for Multi-Family

- Contract with commercial haulers
- Managed by property owners



Targeting Specific Materials



Challenge: Large amount of unrecycled C&D debris

Solution:

Two Sources of C&D Debris

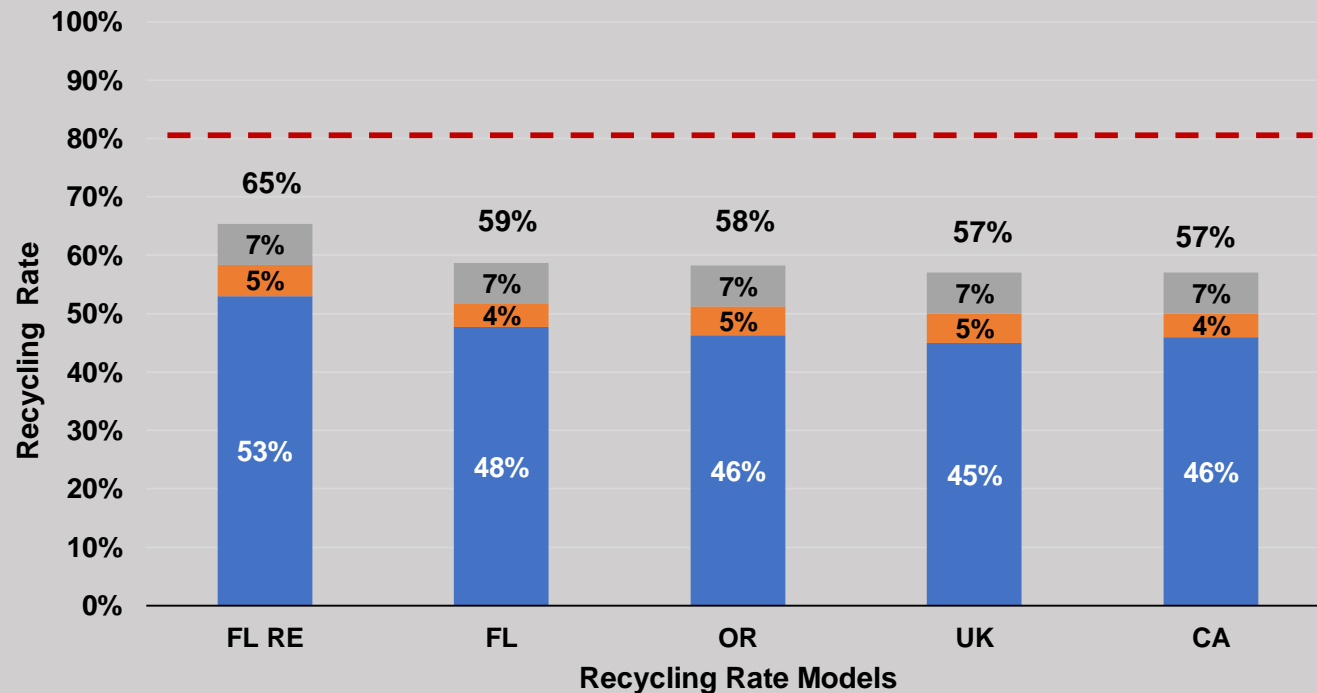
- Commercial & Residential
 - New Construction & Renovation

USGBC LEED Inspiration & Expedited Permit

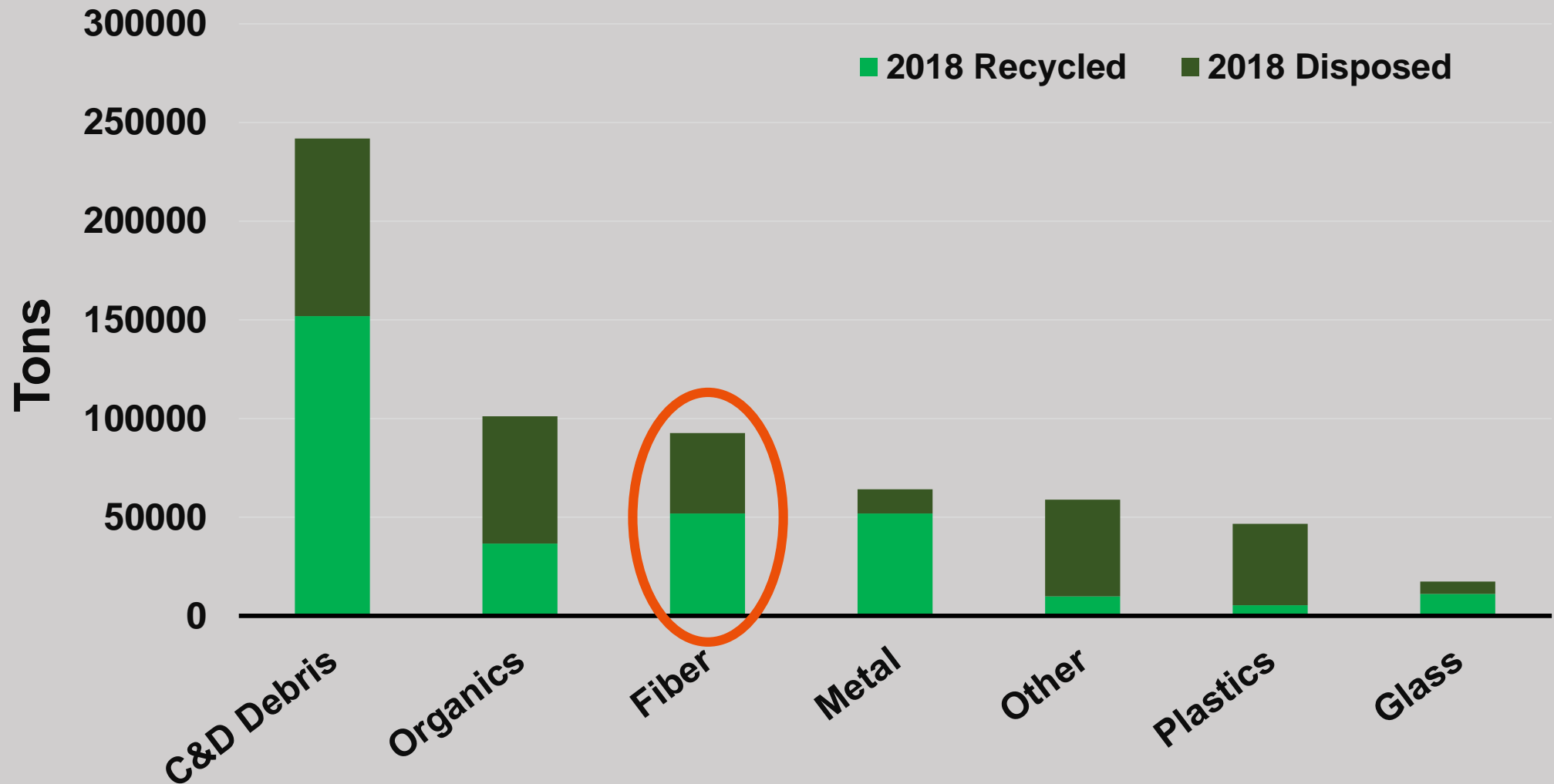
- Reasonable to achieve 50%, 75%, 90% recycling



C&D Recycling Ordinance



Targeting Specific Materials



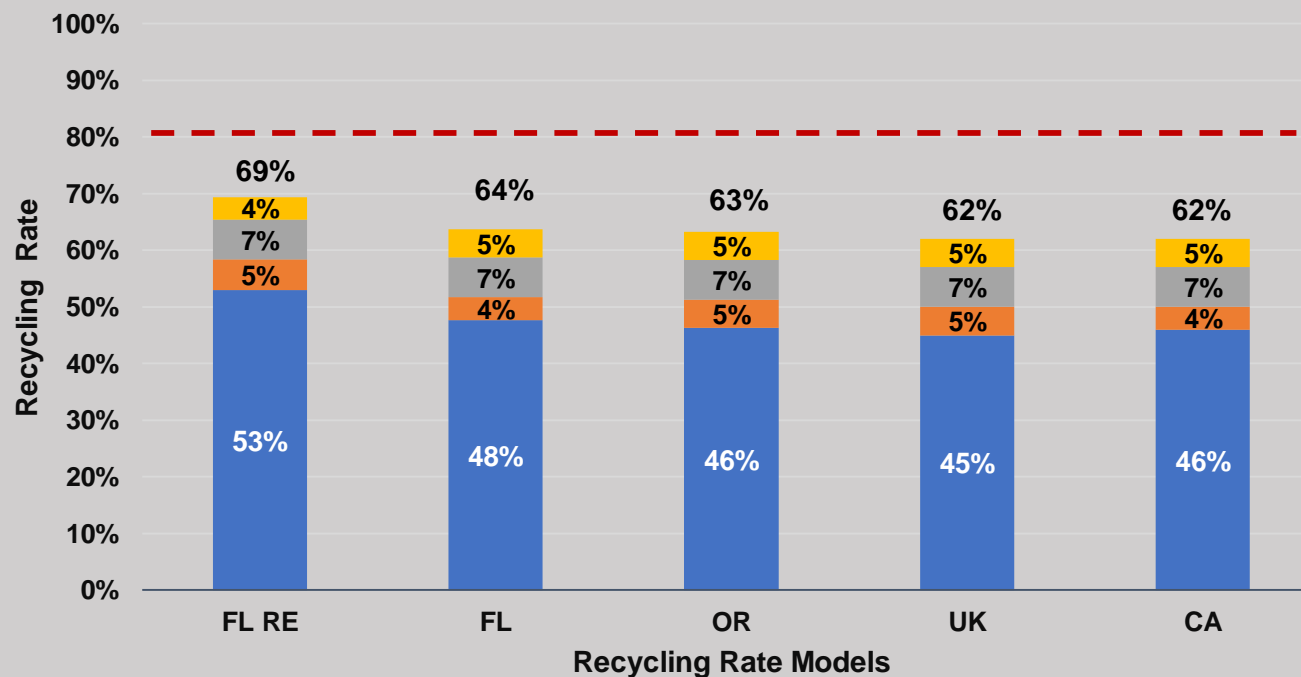
Fiber Education Campaign



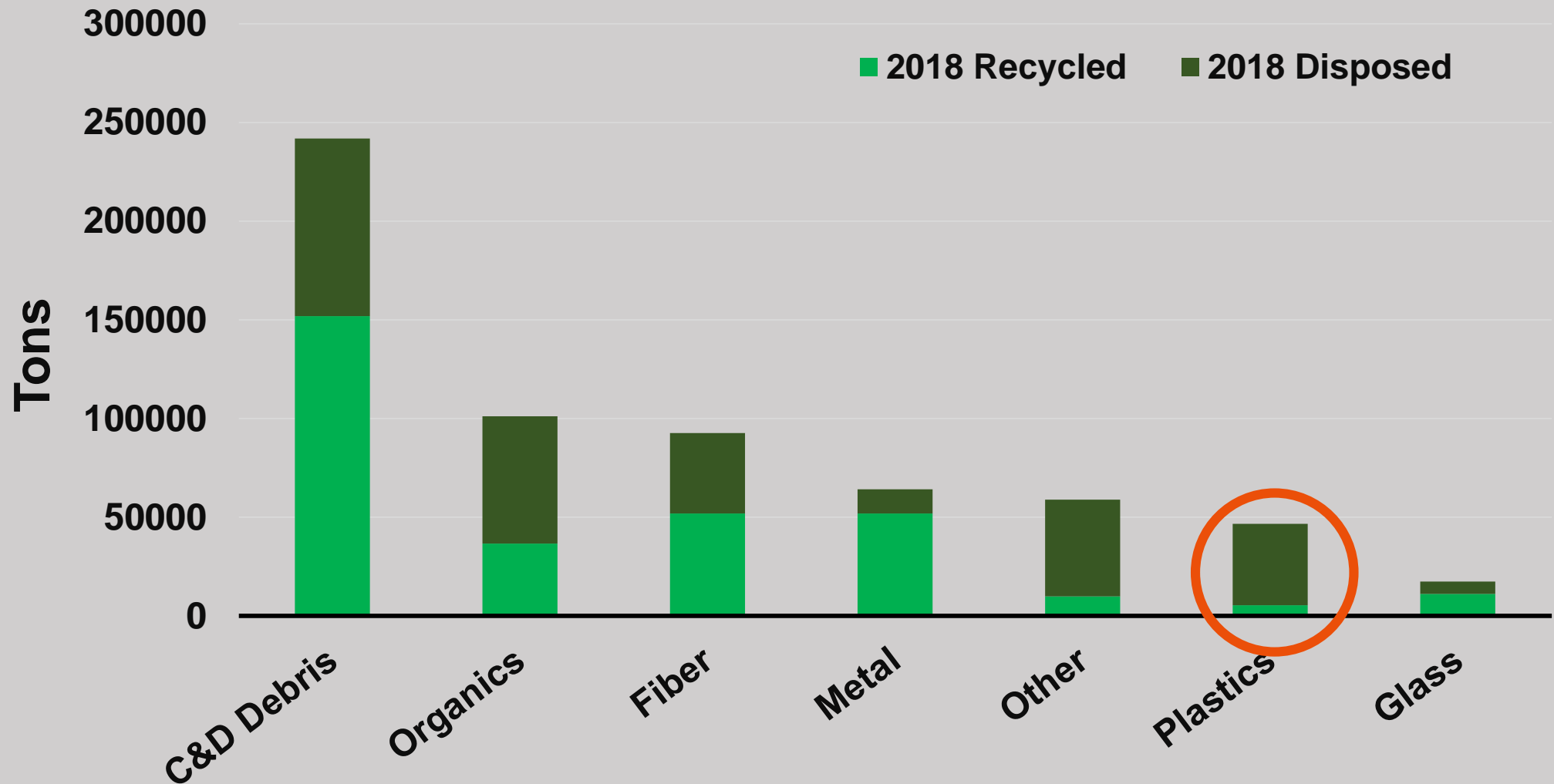
Solution:

Educational Program

- Materials such as flyers, posters, TV ads, webpage upgrades, social medial and bin stickers
- Educational cost increase to \$1.10/household
- Compliance bin-tagging similar to Orange County, FL



Targeting Specific Materials



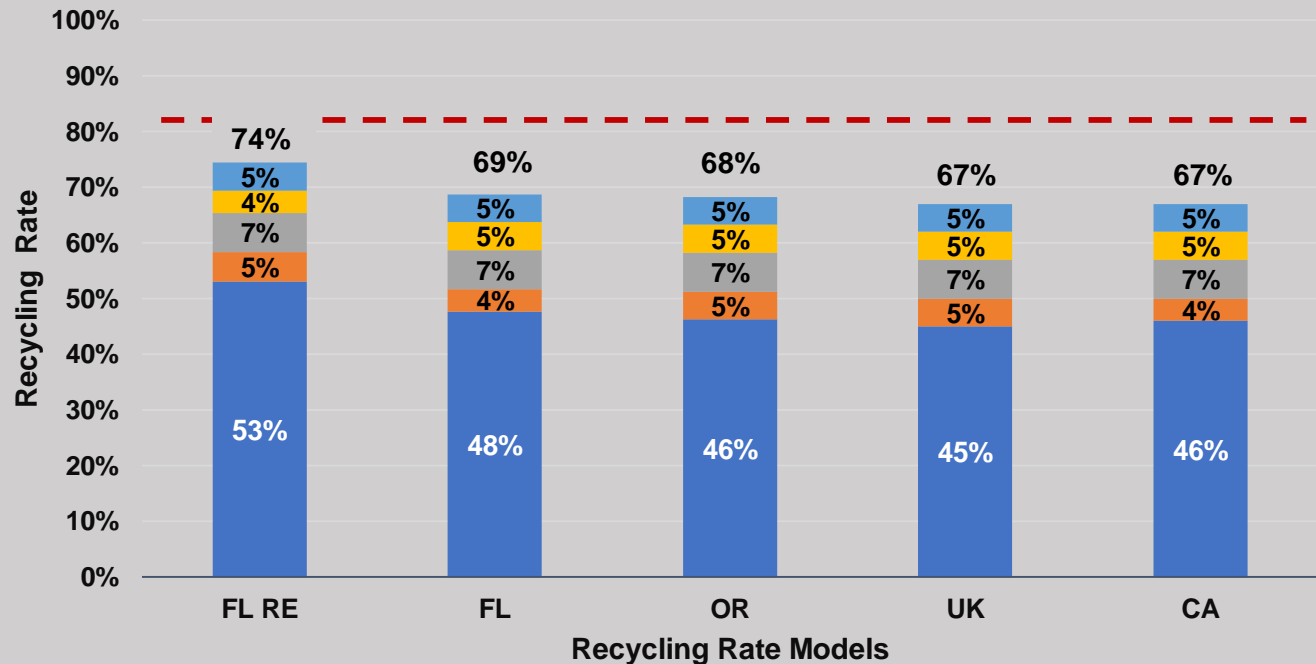
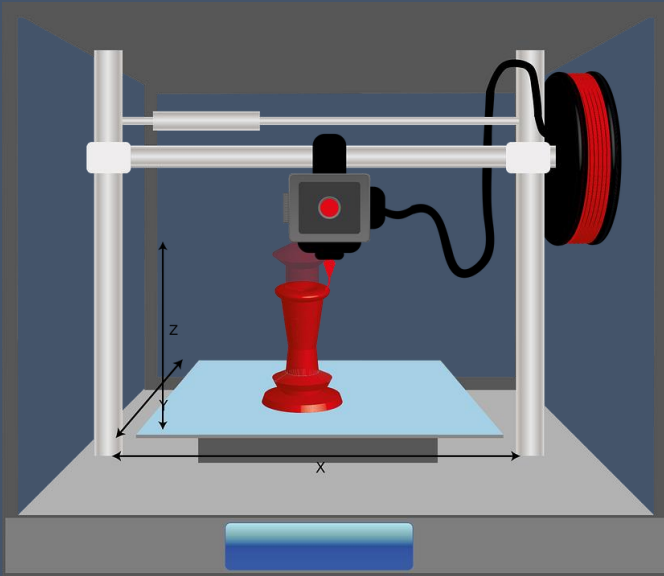
Plastic Substitution



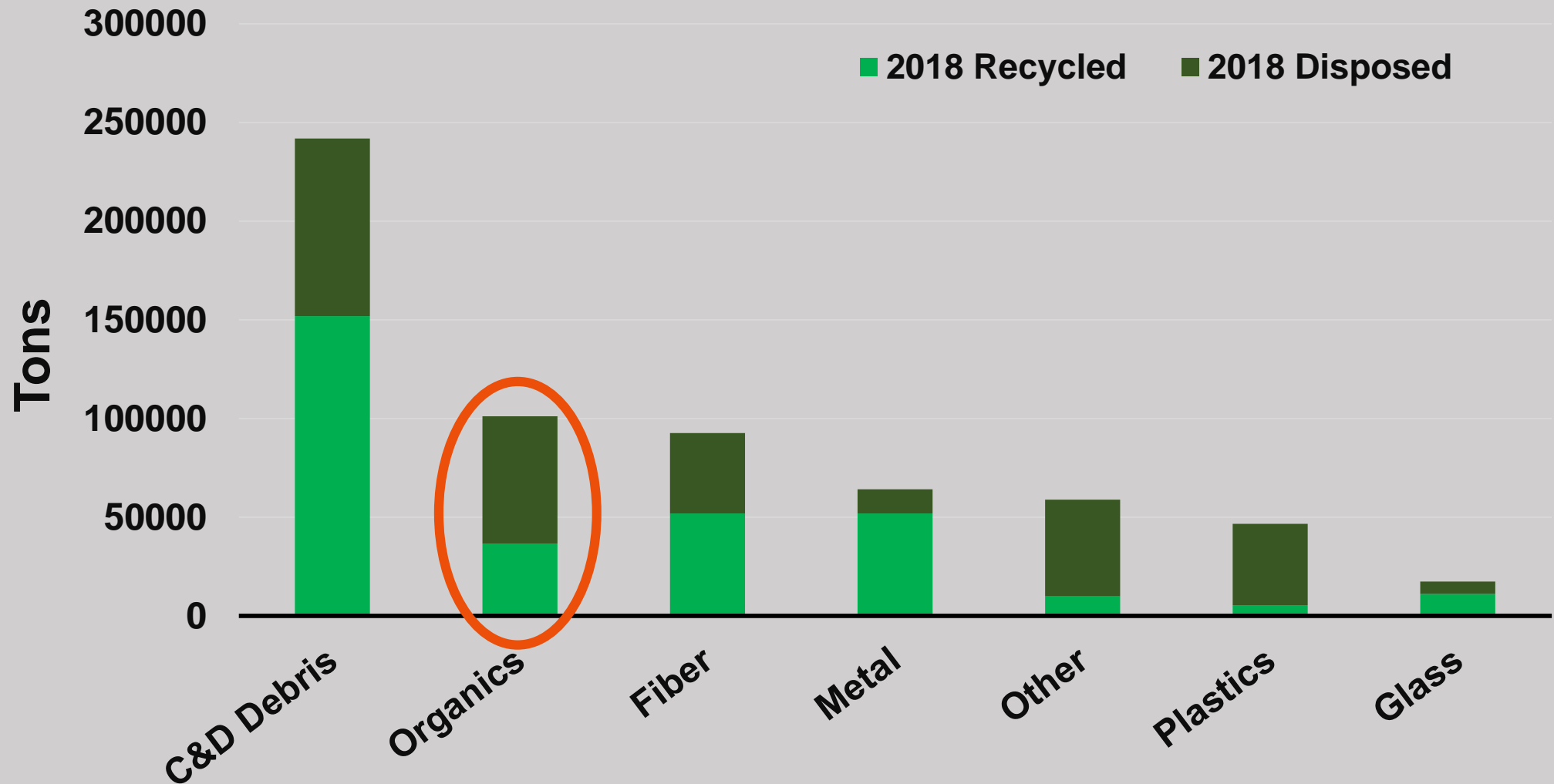
Solution:

Market for 3D printing alternative filament

- Polylactic Acid (PLA)
 - Recyclable and compostable plastic
 - Used as 3D printer filament
- Viable substitute for:
 - Polyethylene/PE, Polystyrene/PS, Polypropylene/PP
- PET bottle bill implementation



Targeting Specific Materials



Challenge: Improve recycling of organics

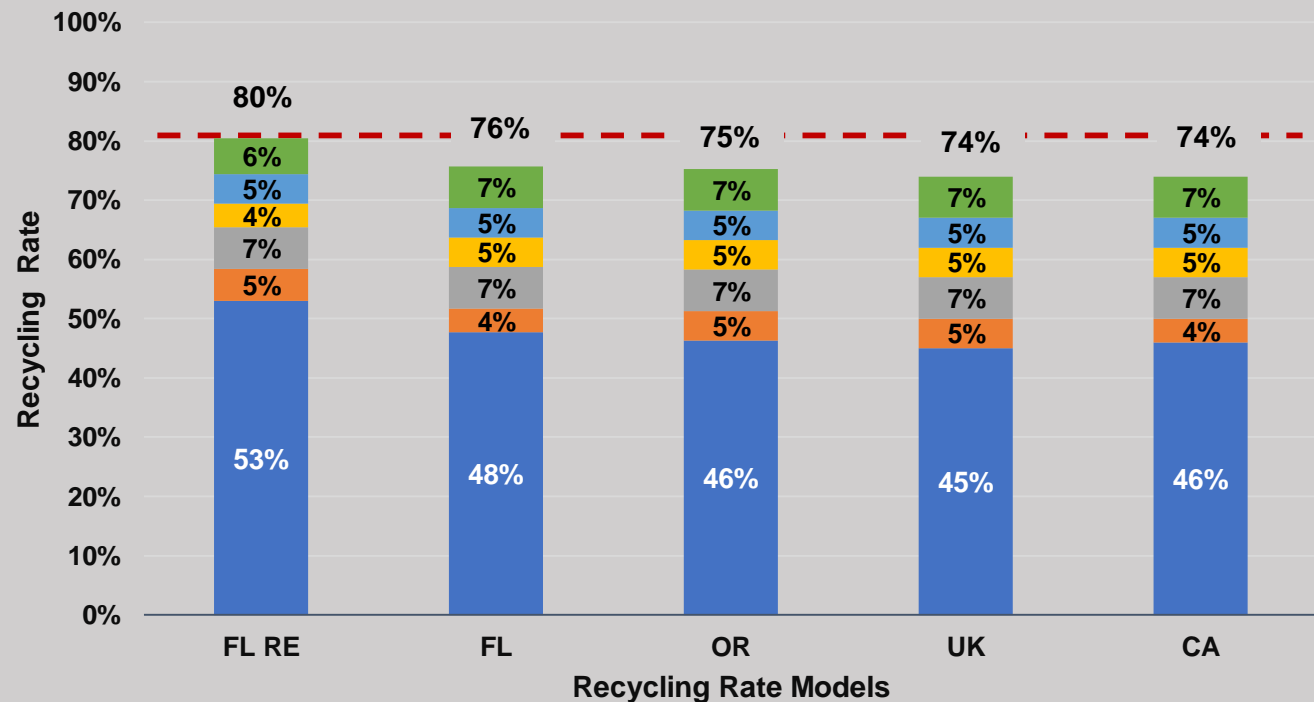
Solution:

Collection & processing of organic wastes

- Requires new bins & 10 specialized trucks
- Waste collected is sent to existing WWTP
 - Installation of liquefiers
 - Renewable energy generation
 - Beneficial soil amendment product



Organic Waste Anaerobic Digestion





Environmental Impact

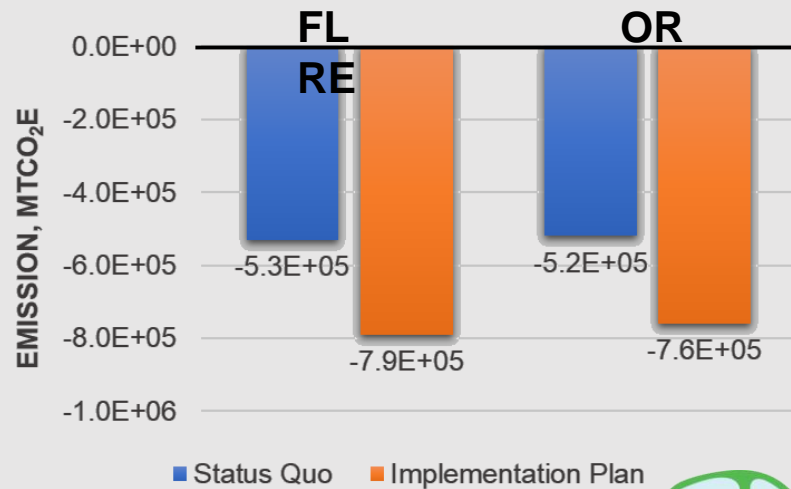


WARM Model

Florida RE & Oregon Models

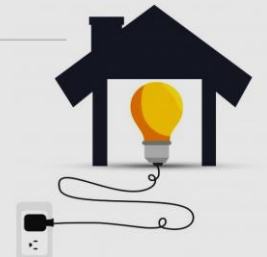
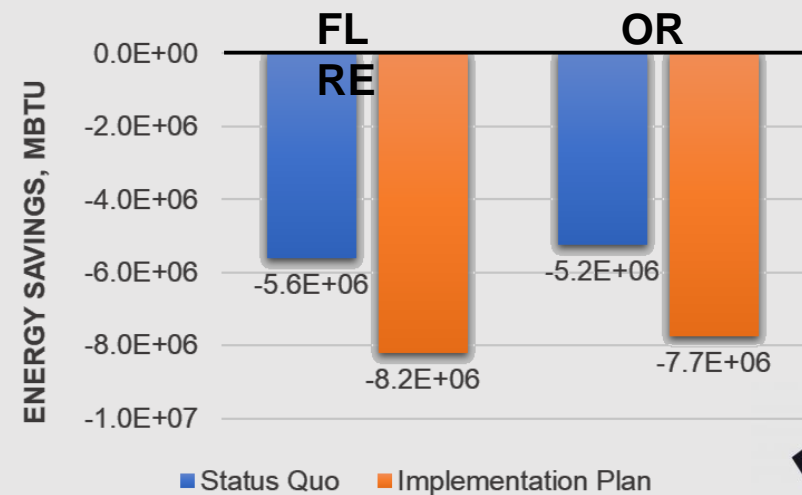
GHG Emissions Reduction

260,000 MTCO₂E
(\approx 55,000 passenger cars)



Conservation of Energy

2.6x10¹² BTU
(\approx 28,000 household's)



Implementation and Financial Analysis



C&D Recycling Ordinance



Plastic Substitution



\$12.40/unit

\$14.40/unit

53%

2020~2023

58%

2023~2025

65%

2025~2027

69%

2028~2030

74%

2030~2035

80%

\$11.70/unit

\$13.50/unit

\$27.20/unit



Curbside Pickup



Fiber Education Campaign



Anaerobic Digestion

Summary



Evaluation

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- Recycling Data
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FAU Poster



EVALUATION OF ROADMAP TO ACHIEVING 80% RECYCLING GOAL FOR SWAVC

OWL Engineers

Bishow Shaha, Joshua Tronnier, Kaitlyn Luck, Sharmily Rahman, Zachary Smierciak
Faculty Advisor: Dr. Daniel E. Meeroff



SCOPE

- The FAU student consulting team (OWL Engineers) is assisting the Solid Waste Authority of Valley County (SWAVC) in developing a plan to achieve its 80% recycling rate goal by the year 2035
- Four recycling models (CA, FL, OR, & EU-based UK model) were analyzed
- Future waste projections for 2019-2040 with recycling rate for 2035 was calculated with no system changes (status quo condition)
- To meet the 80% goal, new policies and strategies were recommended along with detailed cost analysis and timelines for targeted materials

RECYCLING RATE MODELS



- Weight-based recycling model
- Recycling rate = $\frac{MSW\ recycled}{Total\ MSW\ generated}$
- Credits for renewable energy from MSW (FL RE)

- Weight-based recycling model

$$Recycling\ rate = 1 - \frac{Disposed\ Waste}{Generated\ Waste}$$

- Source reduction counted as recycling



- Weight-based recycling model
- Recycling rate = $\frac{MSW\ recycled}{Total\ MSW\ generated\ (excludes\ certain\ waste)}$
- No additional credits from MSW

- Weight-based recycling model with EPA WARM model used to calculate GHGs emission

$$Recovery\ rate = \frac{MSW\ recycled, composted\ or\ recovered\ for\ energy}{Waste\ recycled + Waste\ disposed}$$

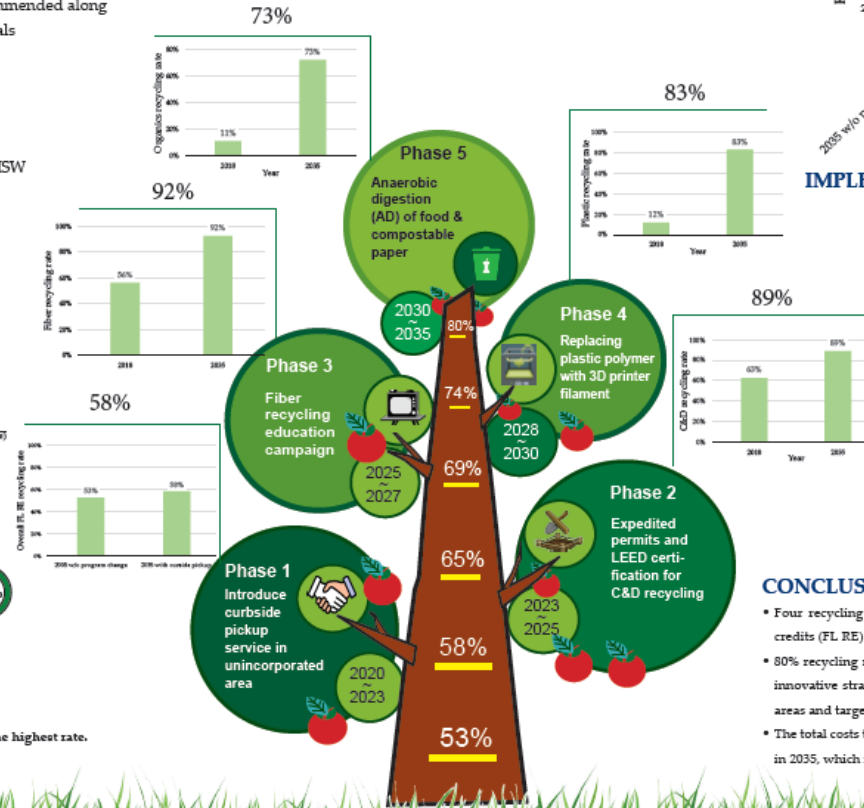
- Energy recovery from a number of materials counted directly as recycling

■ 2019 recycled ■ 2019 disposed

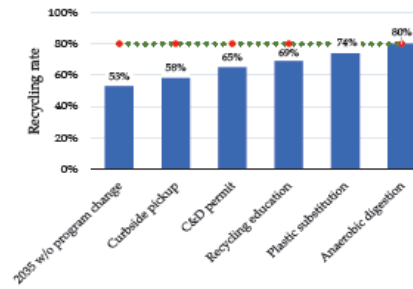
Policies implemented are shown based on FL RE model, since it gives the highest rate.

ASSUMPTIONS & DATA ANALYSIS

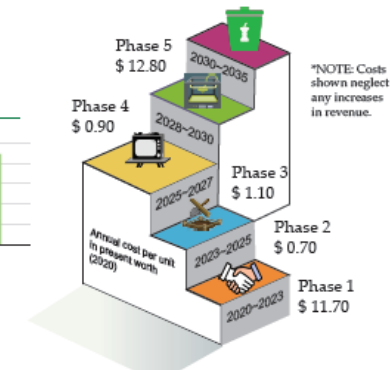
- For 2035 recycling rate calculations, data provided from 2016-2018 was used since the trends are more recent and uniform
- Conservative waste projections were made based on high population growth (worst case scenario)
- 50% newspaper reduction was assumed by 2035 since people increasingly turn to digital alternatives
- Since no existing WTE facilities currently exist, future adoption was not investigated



INCREMENTAL RECYCLING RATE FOR FL RE



IMPLEMENTATION SCHEDULE WITH COSTS*



CONCLUSION & RECOMMENDATIONS

- Four recycling models were analyzed. The FL model with renewable energy credits (FL RE) results in the highest recycling rate
- 80% recycling rate is achievable by 2035 through a combination of policies and innovative strategies focused on extending curbside pickup to unincorporated areas and targetting specific materials (C&D, fiber, plastics, and organics)
- The total costs to implement these strategies increases the customer fee by \$27.20 in 2035, which is less than 20% of the current fee structure



Thank You...