BURNS McDONNELL

# Know What You Throw – Decoding Your Waste and Recyclables

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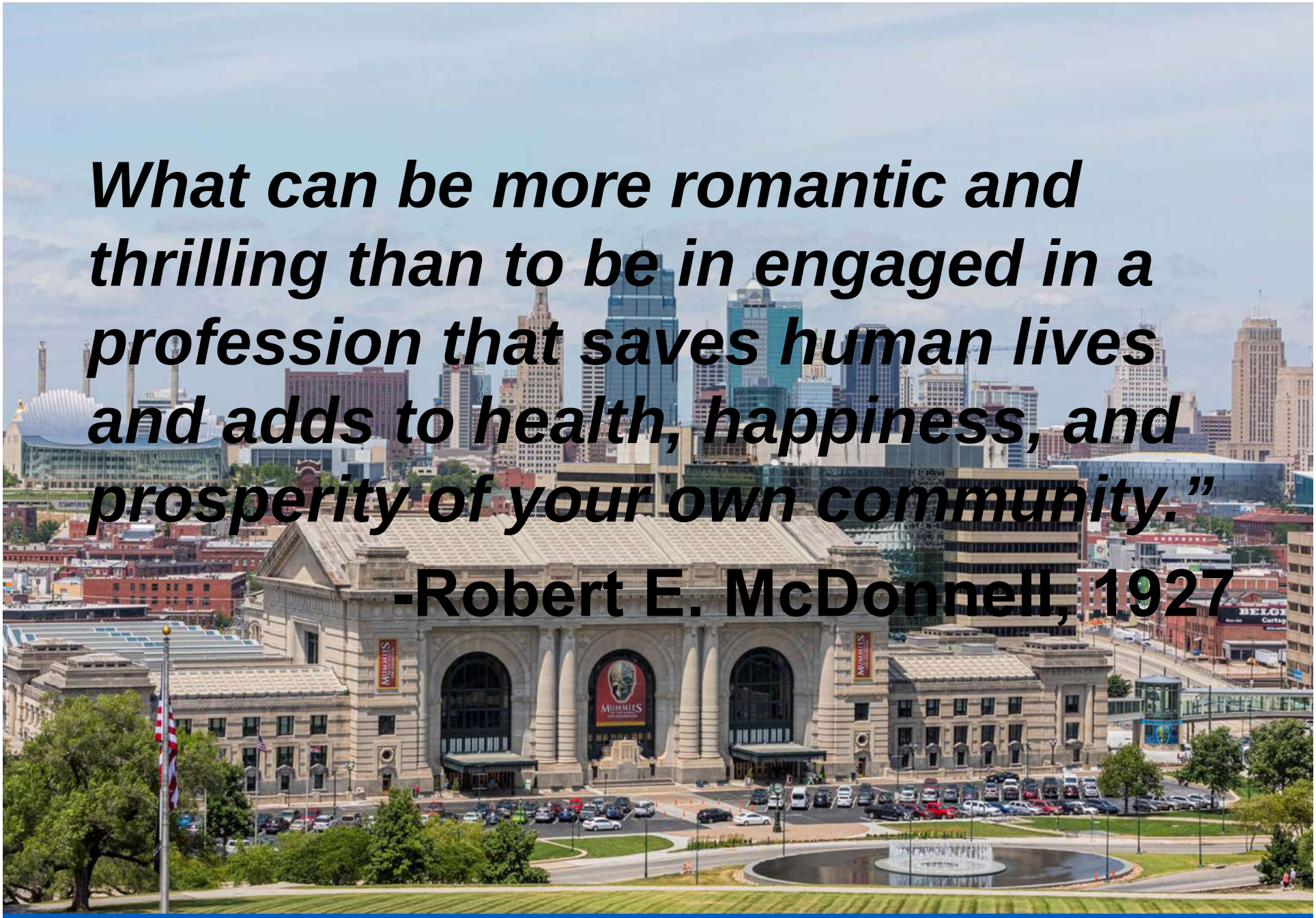
October 1, 2019



***What can be more romantic and thrilling than to be in engaged in a profession that saves human lives and adds to health, happiness, and prosperity of your own community."***

**-Robert E. McDonnell, 1927**

# Agenda

**Audit Types and Process**

**Audit Analysis**

**Recycling Market**

**Case Studies**

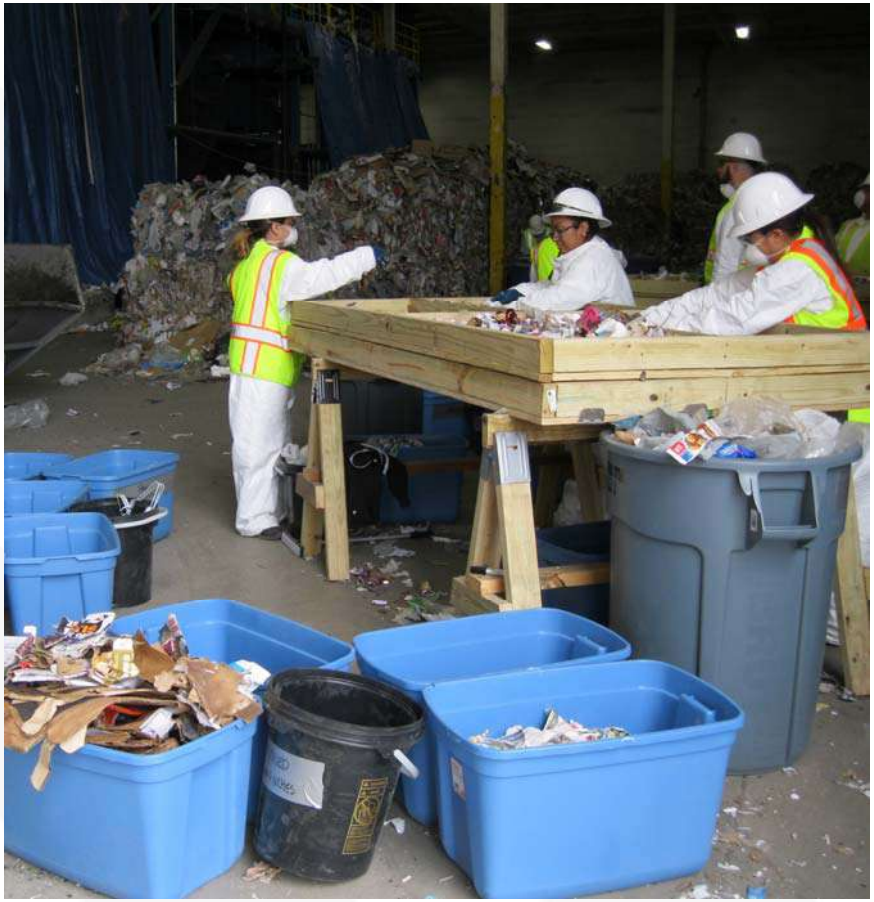
# AUDIT TYPES

# Recycling Audit

- Used to determine % of recoverable commodities
  - Determines revenue share
- Several methodologies
  - Sampling one or more loads
  - Running a certain percent of material through the MRF
- Representative results:
  - Random samples
  - Sufficient quantity of samples
  - Statistical significance

# Residual Audit

- Audit of the MRF residue
- Determine residue composition:
  - Contamination
  - Missed recyclables
  - Recyclable material not recoverable by equipment
- Recovery rate
- Amount and type of contamination



# Commodity Audit

- Audit of a sorted commodity
- Provides information on:
  - Contamination
  - Mischaracterized recyclables
    - Example: plastic bottle captured with the aluminum cans
    - Example: HDPE bottle captured as mixed plastic

# Audits Require Planning

- With private contractor, have parameters defined in contract when possible
- Procedures
  - Method of sampling
  - Sorting methodology / requirements
  - Material categories
  - Quantity of samples
  - Safety / Training
- Costs
  - Personnel
  - Sorting equipment (if applicable)

# AUDIT ANALYSIS

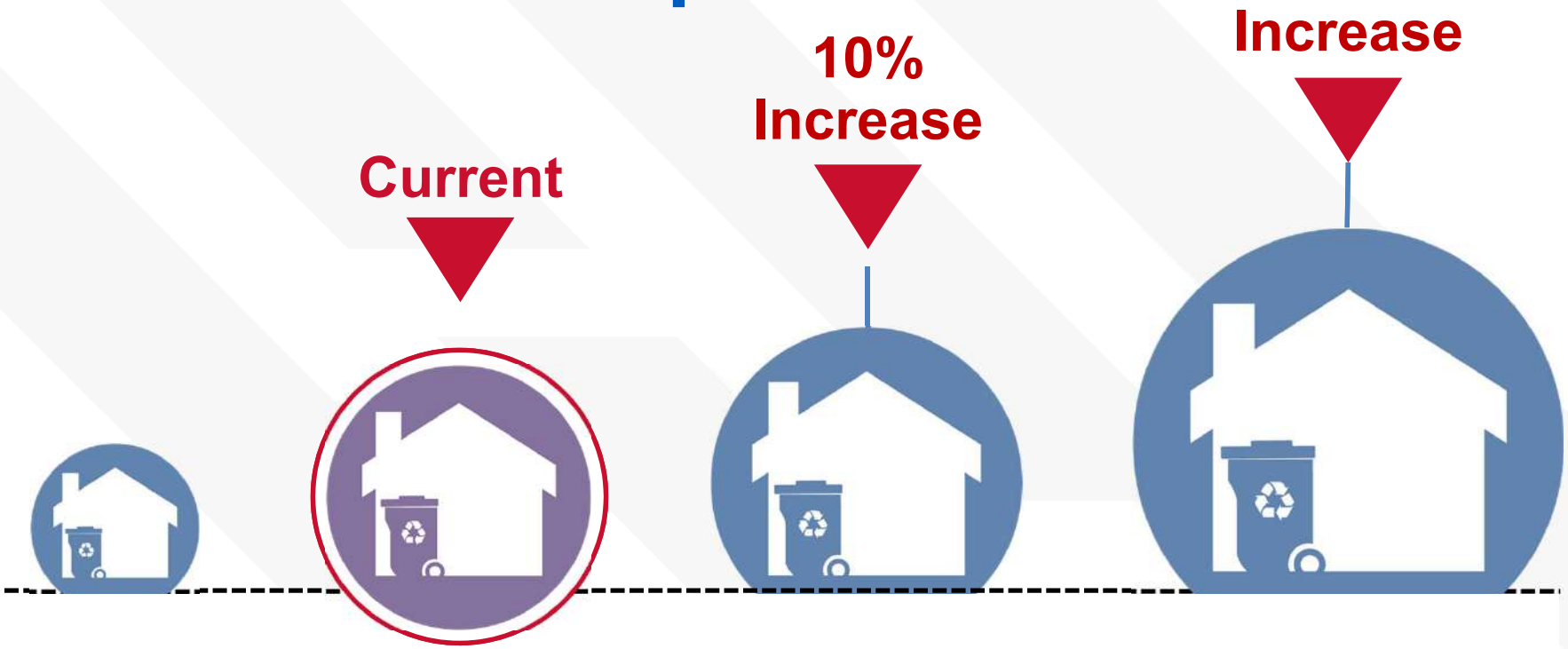
# Recycling Measurement

$$\% \text{ Recycling Rate} = \left[\frac{Total\ Recycled}{Total\ Recycled + Total\ Disposed}\right] * 100$$

## Measurement Alternatives:

- Capture rate
- Disposal rate
- Participation rate
- Life-cycle analysis
- Greenhouse gases

# Single Family Pounds per Household per Year




| 200 | 322 | 357 | 450 |
|---|---|---|---|
| **lb/hh/yr** | **lb/hh/yr** | **lb/hh/yr** | **lb/hh/yr** |
| Bins | NCTCOG 2018 Study | Natl Avg Curbside | Natl Avg Carts, accept glass |

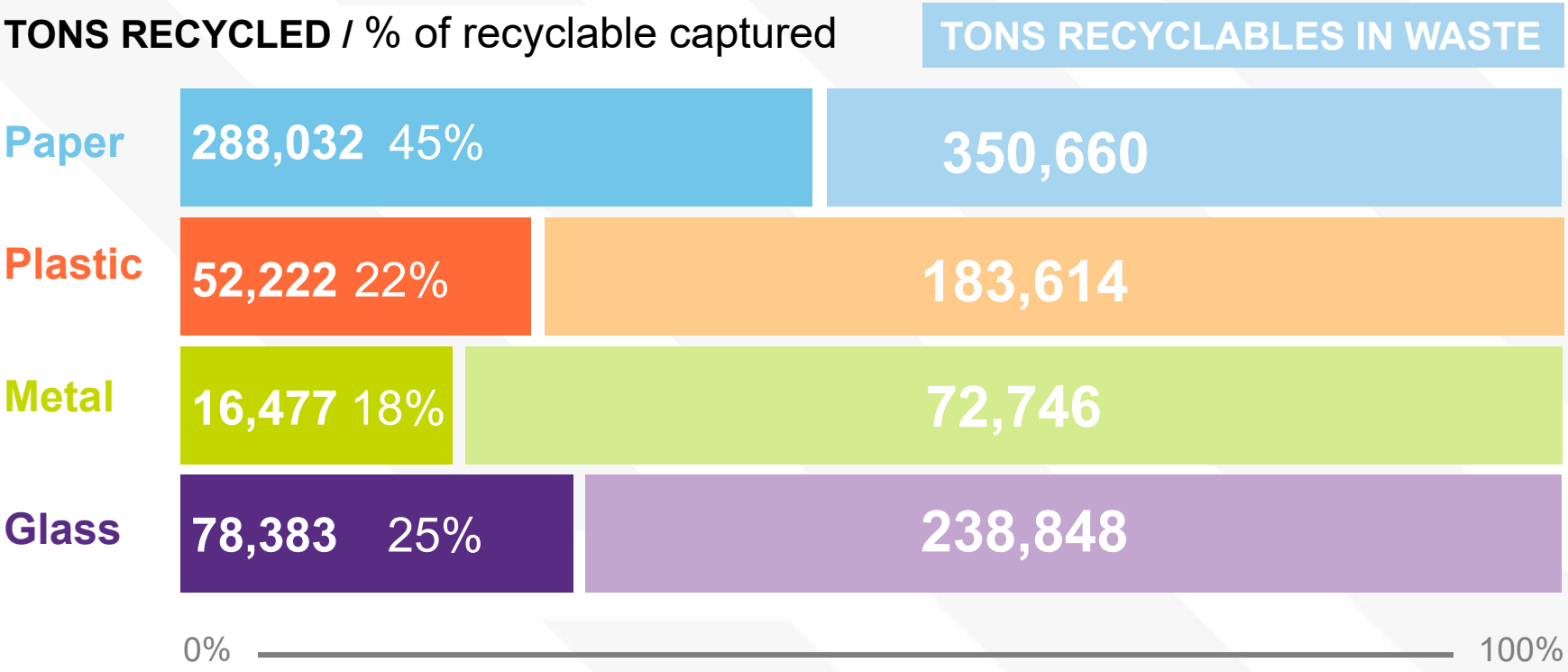
*Data from 2018-2019 NCTCOG Regional Recycling Education and Campaign and Recycling Partnership State of Curbside Report*

# Capture Rate Formula

Capture Rate provides an understanding of how effectively a curbside recycling program operates

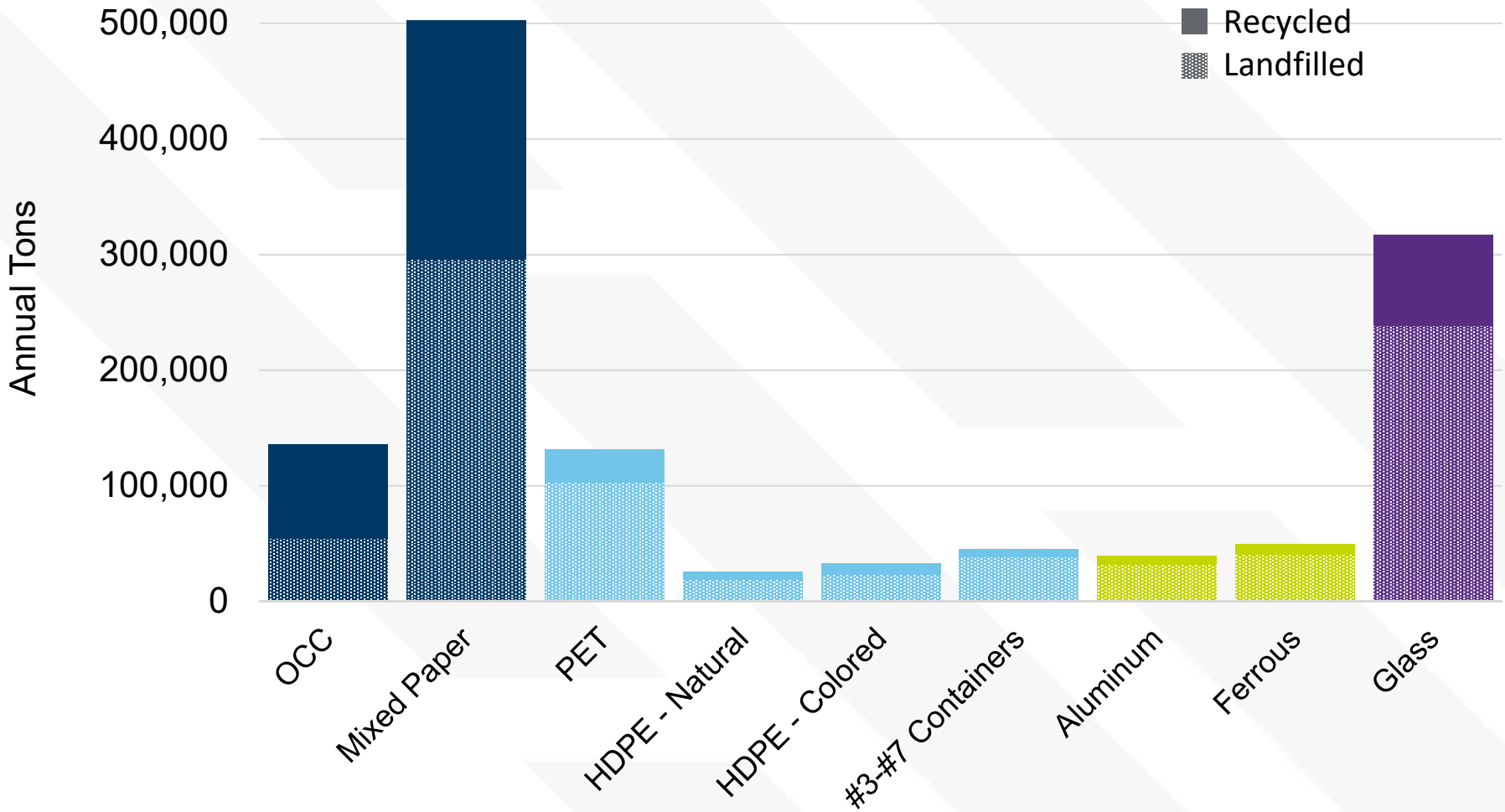
# Overall Capture Rate Results

## What percent of available materials are captured?




*Data from 2018-2019 NCTCOG Regional Recycling Education and Campaign*

# Individual Materials Capture Rate Results

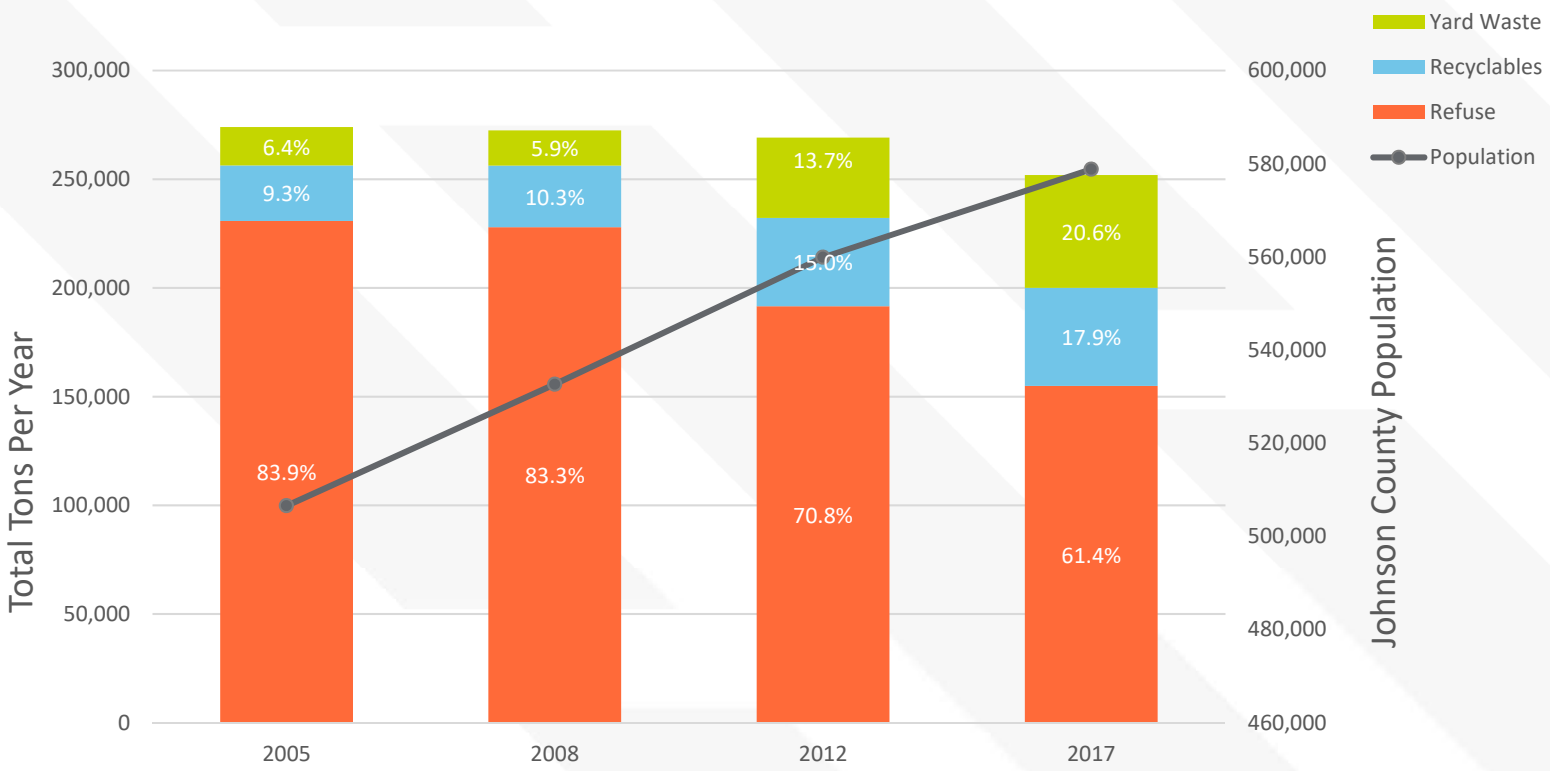



*Data from 2018-2019 NCTCOG Regional Recycling Education and Campaign*

# Disposal Rate

Tons/Person/Year

| 2005 | 2008 | 2012 | 2017 |
|---|---|---|---|
| 0.54 | 0.51 | 0.48 | 0.44 |



# REYCYCLING MARKET

# The Economy of Recycling

- Recycling is the process of converting materials into new materials that otherwise would have been discarded as waste
- Manufacturing feedstock that competes with other raw materials

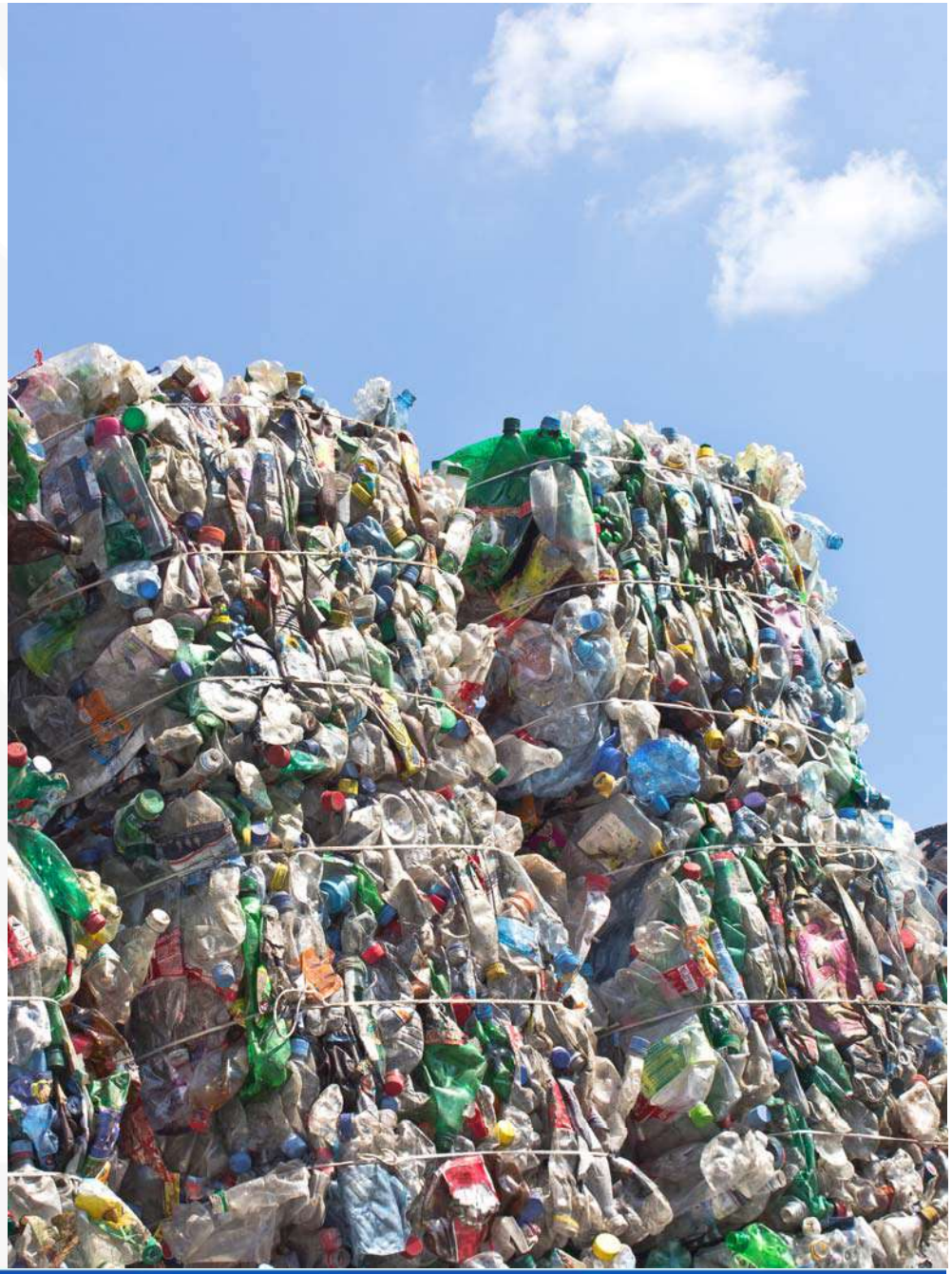

Collection

Processing

Material Ready for Sale

# Commodities

- Recyclables are commodities
- Sold to combination of domestic and international markets
- Values constantly fluctuate



# Factors That Impact Commodity Values

- Value of the US Dollar
- Value of Related Commoditie s (e.g. oil)
- Market Demand
- Export Restrictions

# 2008 – 2009 Market Crash

- Commodity values plummeted from all time highs to historic lows in a matter of weeks
- Crisis drove recycling processors to reconsider their financial approach to allocate more risk to local governments
- Financial benefits to local governments have decreased due to lower trending commodity values and higher processing fees
- As municipal recycling contracts expire, many cities are facing increased pricing for recycling

# Unstable Materials Market

# Costs & Revenues for Recycling Processing

Financial terms often include a processing fee and revenue share

- **Processing fees increasing:** compensate processors for cost to provide service, current typical range of $60–90 per ton; compared to $30–40 prior to 2008
- **Revenue share increasing:** Based on market prices for recyclable materials, typical range of 40–90 percent; but values typically less than in 2008

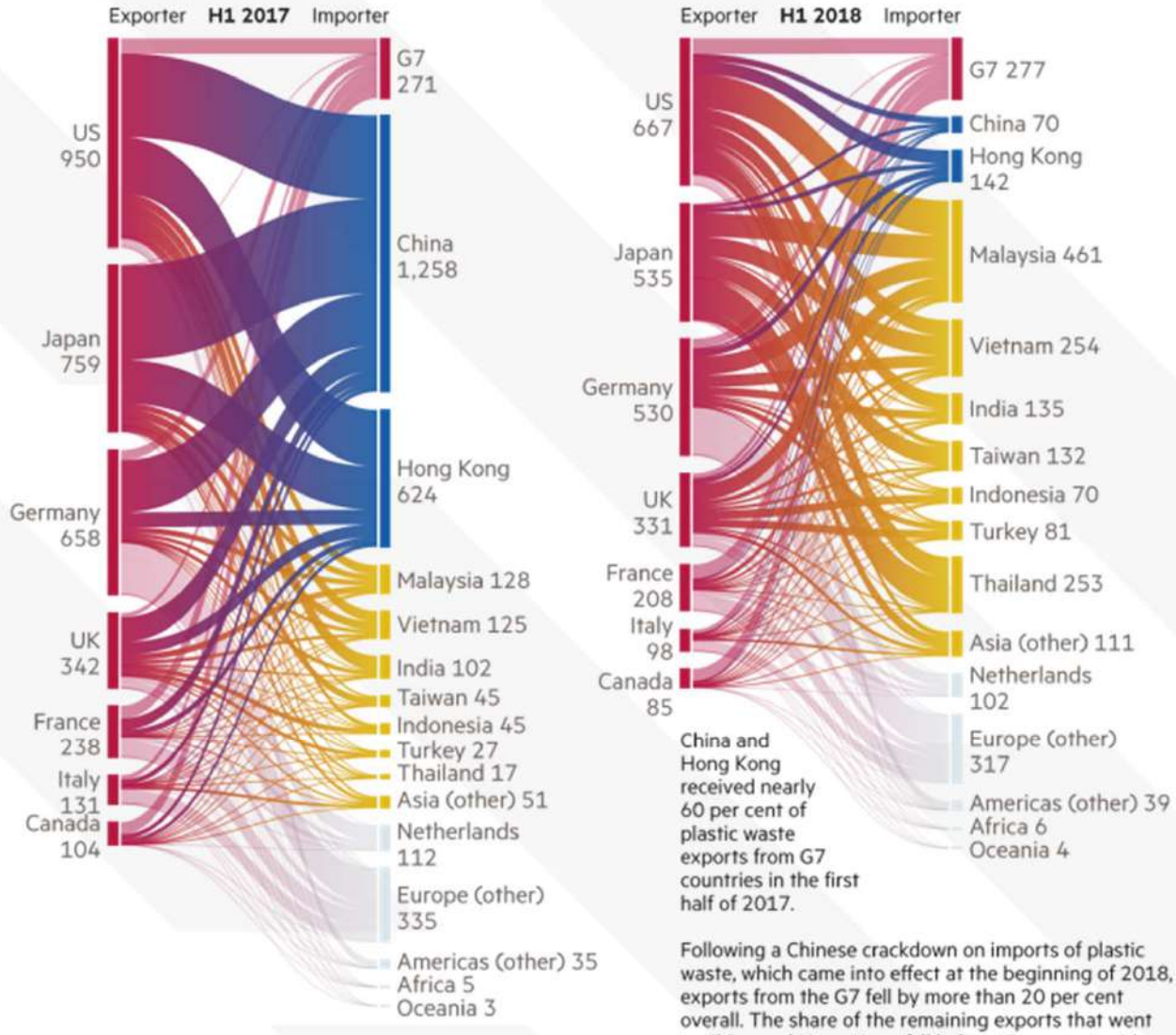
# What is happening in China?

- National Sword
  - China banned 4 categories and 24 material types on December 31, 2017
  - 0.5% contamination threshold for processed material
- Issued compounded by tariffs in 2018
- Materials diverted to lower tier countries who are now restricting import

# 2017 - 2018

## How the global river of plastic waste changed course in just 12 months

Exports of plastic waste, parings and scrap from G7 countries ('000 tonnes)




China and Hong Kong received nearly 60 per cent of plastic waste exports from G7 countries in the first half of 2017.

Following a Chinese crackdown on imports of plastic waste, which came into effect at the beginning of 2018, exports from the G7 fell by more than 20 per cent overall. The share of the remaining exports that went to China and Hong Kong fell below 10 per cent, with other Asian countries – particularly Malaysia – making up much of the shortfall.

Region groupings from UN Statistics Division M49 standard
Data accessed Sep 19-Oct 1, 2018
Sources: US Census Bureau; Japan e-Stat; Eurostat; Statistics Canada
Visual journalism: David Blood, Liz Faunce, Aendrew Rininsland

# Moving Forward

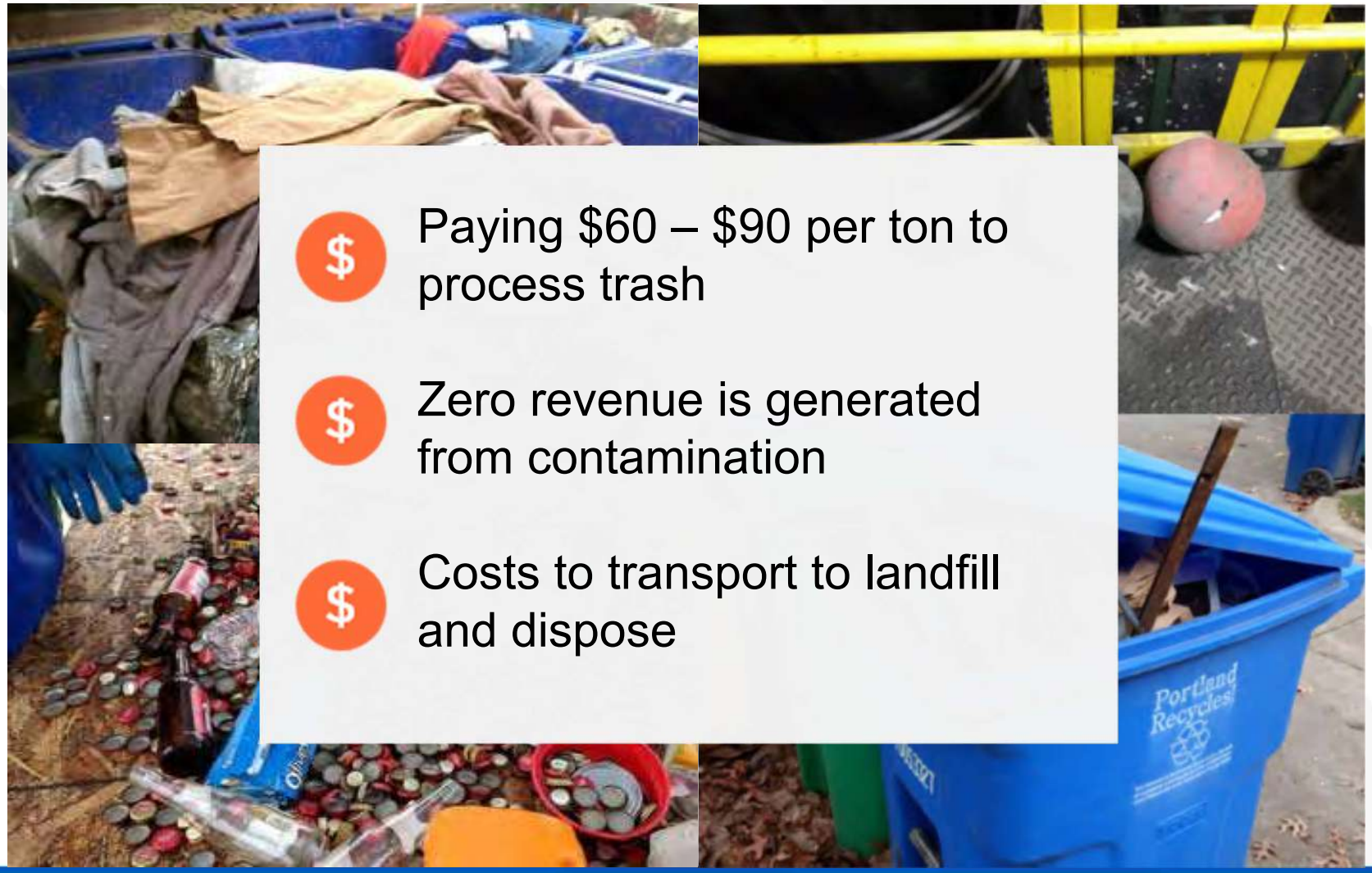
- Reset financial expectations
- Focus on reducing contamination
- Recycle materials with highest value
- Grow existing or potential domestic markets (17 new paper facilities coming on-line in the U.S.)
- Incentivize new manufacturing facilities in U.S. to use commodities
  and close loop

# Recyclable Materials with Highest Value



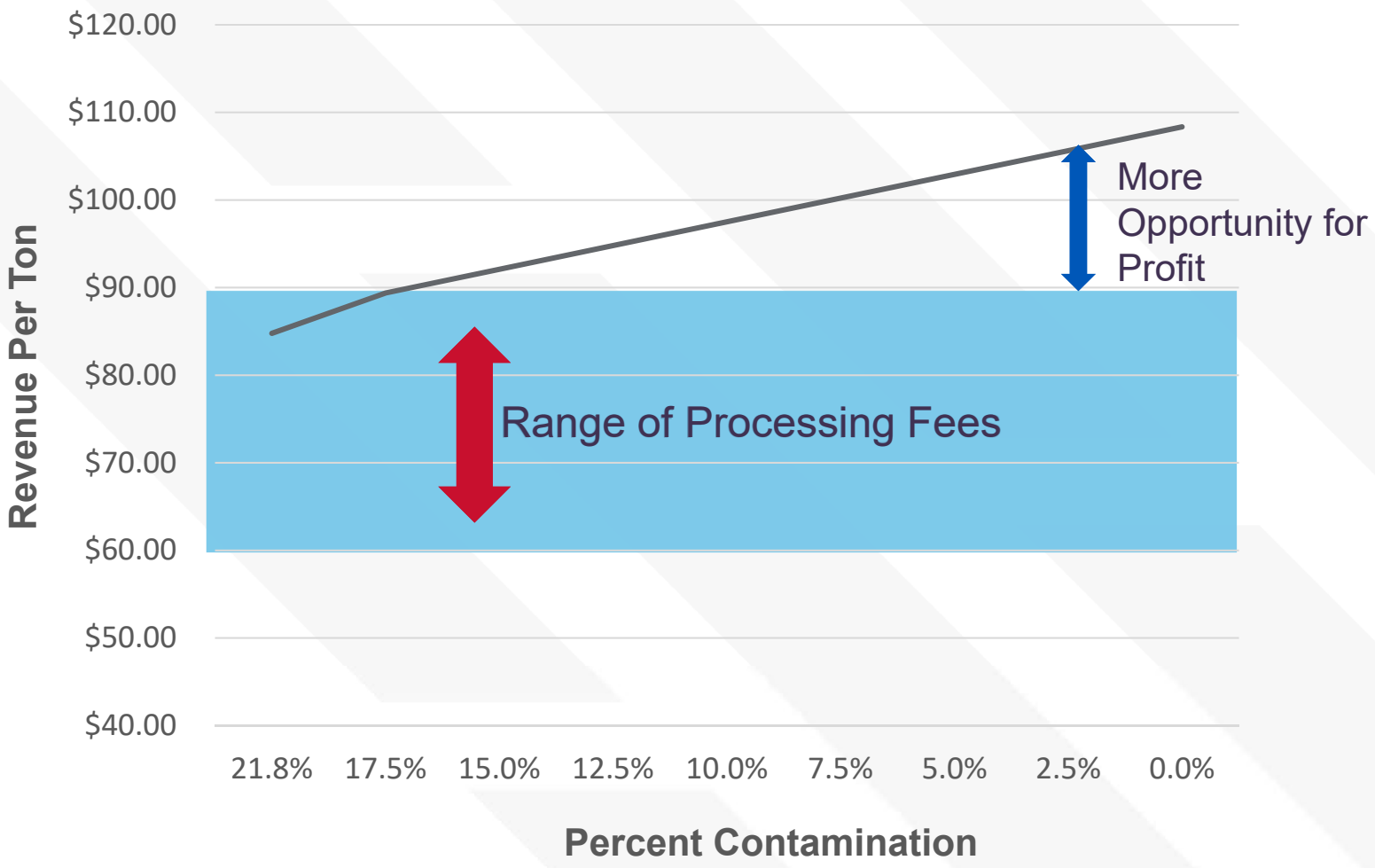



# Contamination is Expensive




- Paying $60 – $90 per ton to process trash
- Zero revenue is generated from contamination
- Costs to transport to landfill and dispose

# Impact of Contamination on Average Revenue



# Reducing Contamination

- Public education
  - Direct messaging
  - Regional cooperation
- Better understanding specific contaminants
- Inspections and enforcement
- Targeted ad campaigns
- Collaboration (e.g., The Recycling Partnership)

# Multiple Reasons to Recycle

- Financial value
- Minimize disposal
- Environmental benefits
- Policy/diversion goals

Financial value of materials is only one of several reasons to recycle

# CASE STUDIES

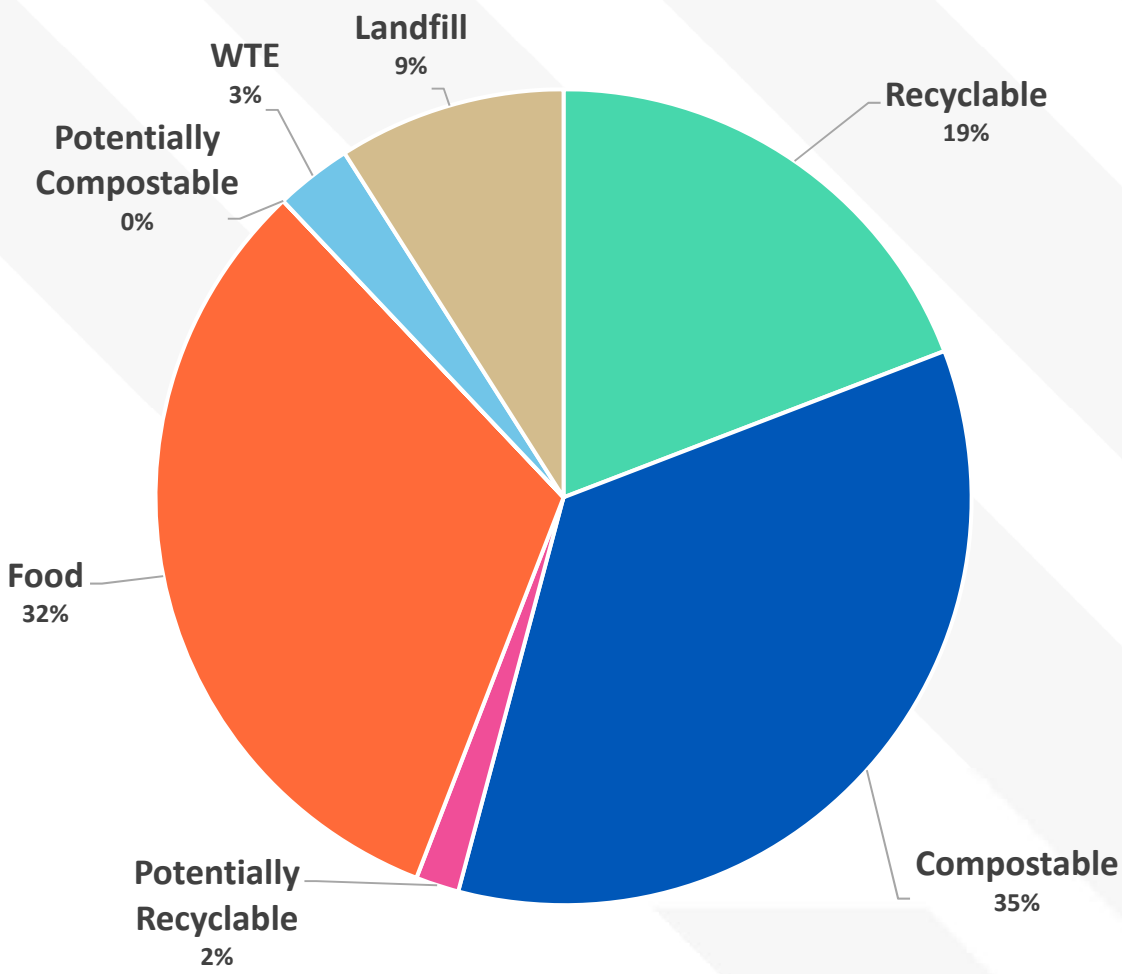
**Emory University**
**Johnson County, KS**
**NCTCOG**
**Burns & McDonnell**

# Emory University Materials Management Plan

Existing Goals:

- 95% diversion from landfill
- Plastic bottle ban
- Zero landfill waste at all university events
- Support culture change towards a “reduce, repair, restore, and reuse” mentality and “cradle-to-cradle” purchasing

# Emory Material Fate




About 67% of the landfill stream is **compostable** (food and other compostable material)

Over 20% of the landfill stream is **recyclable** or **potentially recyclable**

**Less than 10% of the landfill stream actually belongs in the landfill**

# Emory Generator Takeaways

**LANDFILL**

- Over 75% of Dining waste could be composted.
- Less than 3% of the Research & Facilities landfill materials actually belongs in the landfill.

**RECYCLING**

- Less than 1% of the Administrative and Research recycling materials were non-recyclable.
- Over 40% of the Dining recycling stream is compostable.
- Single-stream recycling in Residential areas is highly contaminated (>65%)

**COMPOST**

- Administrative and Dining areas had less than 5% contamination in the compost.
- Academic, Public Areas, and Research areas all had greater than 15% contamination in the compost.

# Emory Projected Waste Diversion

**2017**
Exterior collection data and general improvements (start soon with new metrics; roll out tech in 1 to 2 years)

**2017**
Confirm optimal separation scheme

**2017**
Binventory

**2017**
Agree on campus standard(s) for collection containers and signage

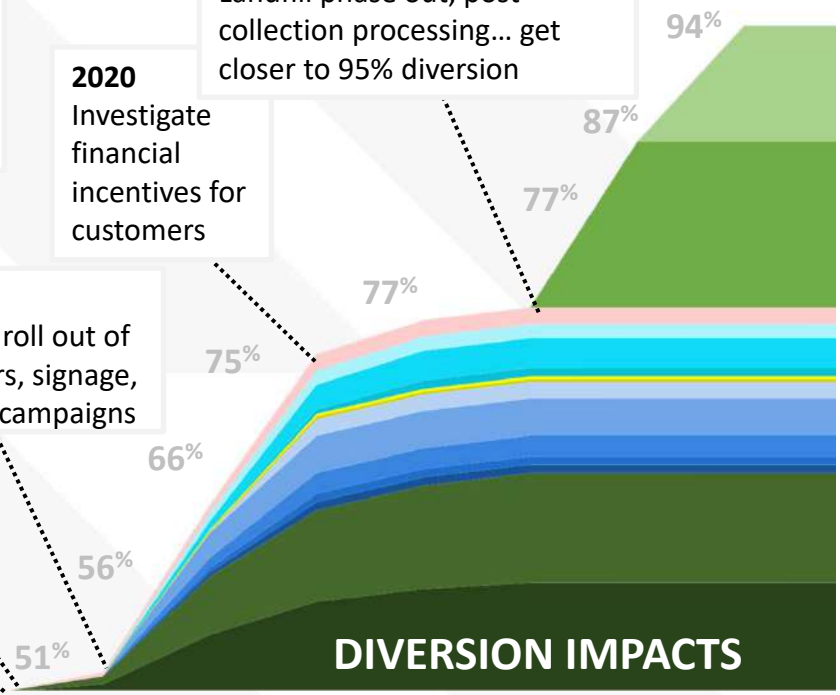
**2018**
Release RFP to procure new containers

**2018**
Start development of education campaigns, and initiate trainings for staff handling materials

**2018**
Campus-wide roll out of new containers, signage, and outreach campaigns

**2020**
Investigate financial incentives for customers

**After 2022**
Landfill phase out, post-collection processing… get closer to 95% diversion



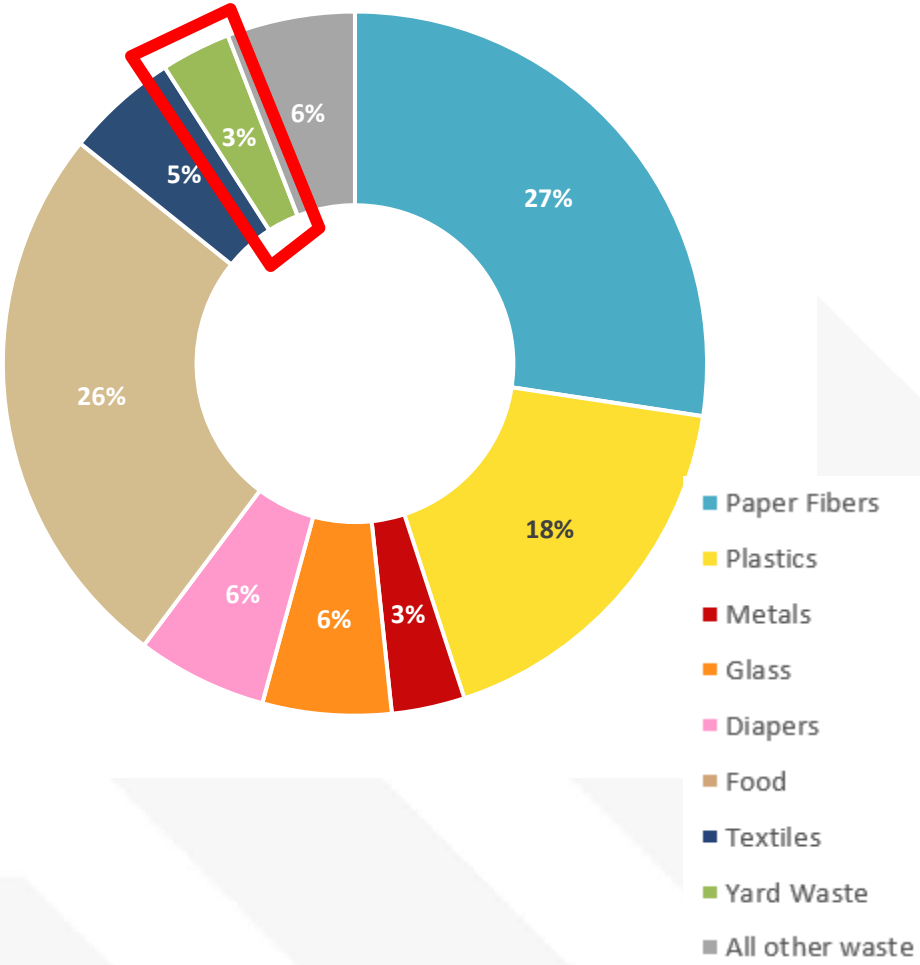

$ *Financial investment is anticipated to be most significant in 2018/19, with purchase of new collection bins and development of education campaigns.*

# Johnson County Yard Waste

2010 Update to Solid Waste Management Code:

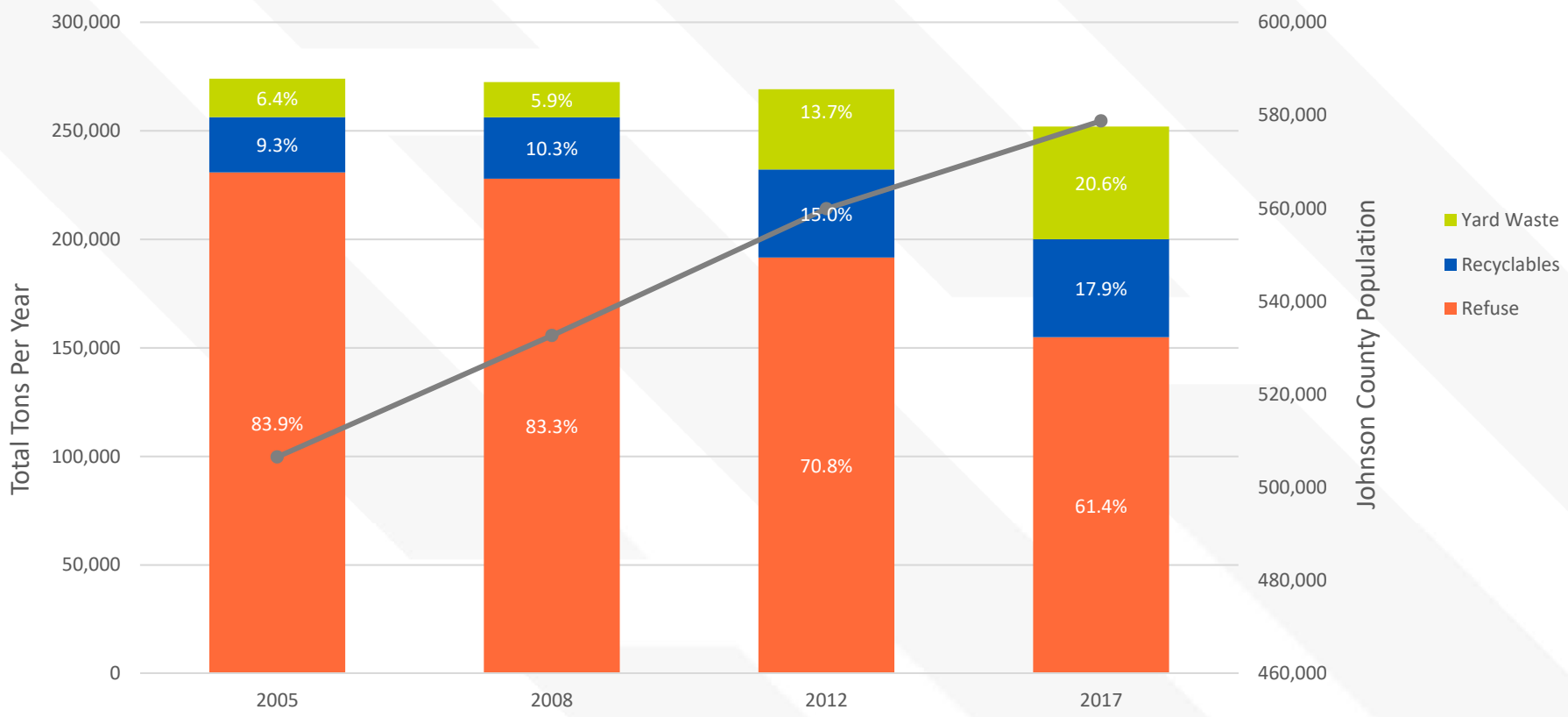
- Yard waste prohibited from disposal in the landfill
- Yard waste collection included in residential curbside collection
- Extend remaining life of landfill
- In 2007 audit, 17% JoCo residential waste was yard waste

2017 JoCo Residential Waste



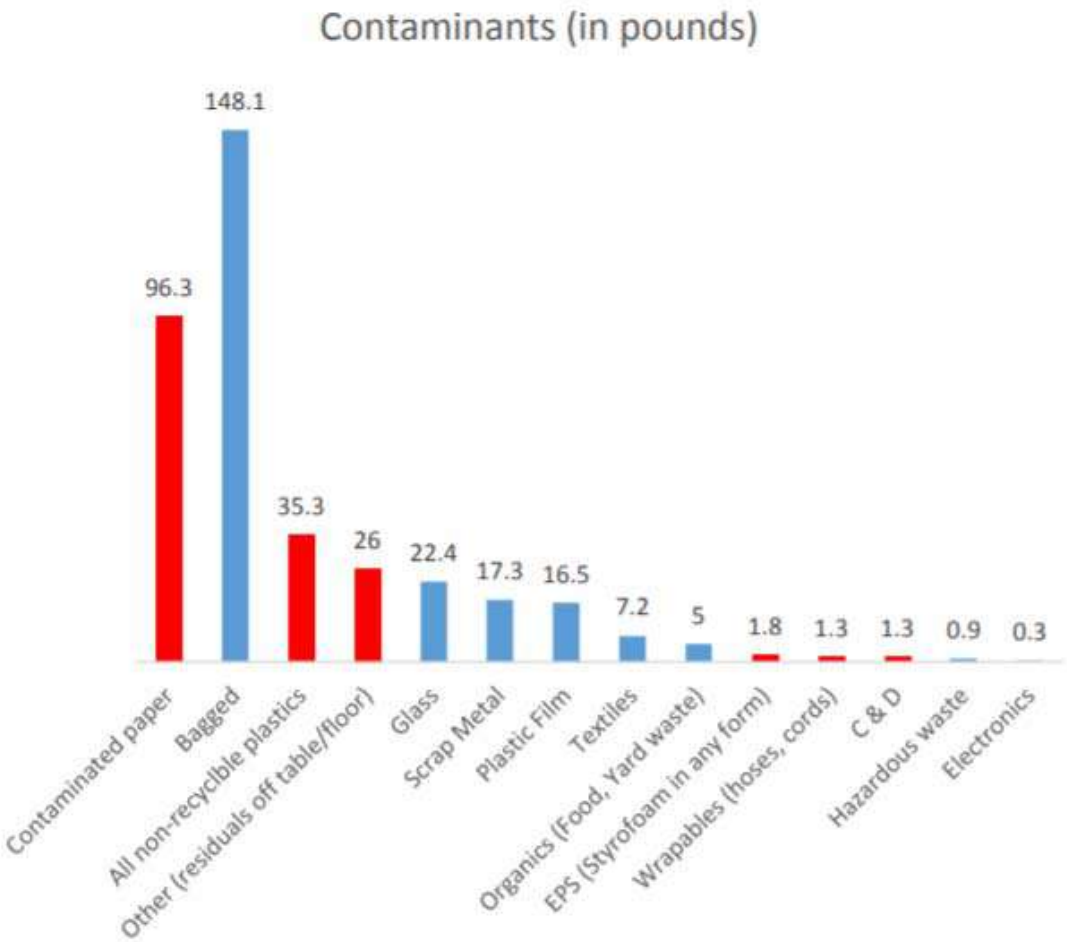
# Johnson County, KS Diversion Success

| 15.7% | 16.2% | 28.7% | 38.5% | Total Diversion |
|---|---|---|---|---|



# Johnson County Ditch the Bag Campaign

- MRF audit conducted in Fall 2018 by Bridging the Gap
- Bagged recyclables the highest contaminants



# Johnson County Ditch the Bag Campaign


- Bin inspection of approximately 1,000 homes across the County
- Many residents bagging recyclables
- 7-week campaign funded through KDHE grant
- Recent bin inspection of same homes showed 50% decrease in bagged recyclables
- https://www.kmbc.com/article/johnson-county-encouraging-people-to-ditch-the-bag-for-recycling-program/23573936

# NCTCOG Project Overview

| Analysis | Findings |
| --- | --- |
| ▸ Composition analysis of recycling and landfill material from 10 cities<br>▸ Interviews with all MRFs in the region<br>▸ Acceptable and problematic materials MRF mapping<br>▸ Multiple workshops and focus groups | ▸ Capture rates<br>▸ Prioritization of problematic and preferred materials<br>▸ Economic value of material recycled and landfilled<br>▸ Strategies to develop a regional campaign |

# NCTCOG Opportunity

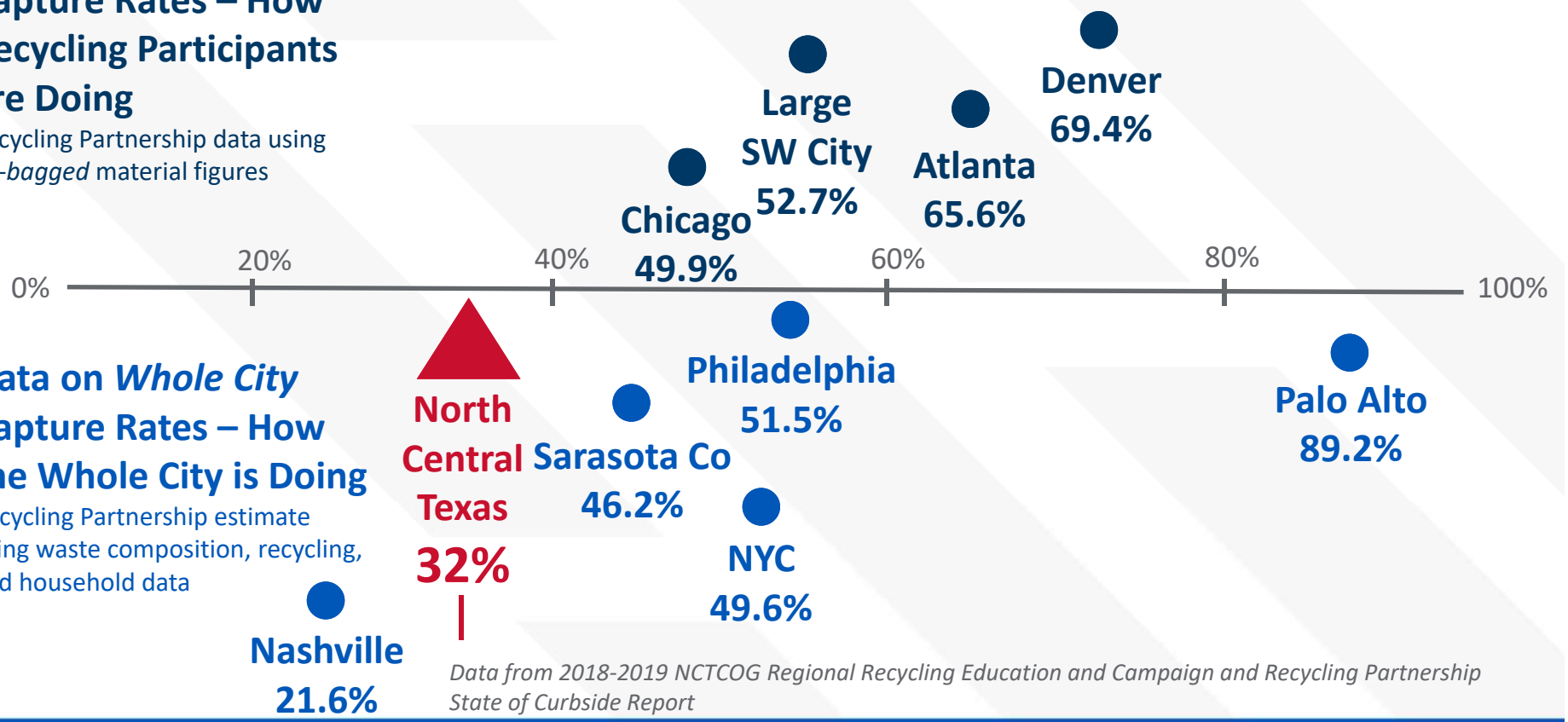
*Capture rates more accurately inform action than recycling rate. Of what is available… what is captured*

**Data on *Participant* Capture Rates – How Recycling Participants are Doing**

Recycling Partnership data using *un-bagged* material figures

**Data on *Whole City* Capture Rates – How the Whole City is Doing**

Recycling Partnership estimate using waste composition, recycling, and household data




*Data from 2018-2019 NCTCOG Regional Recycling Education and Campaign and Recycling Partnership State of Curbside Report*

# NCTCOG Top Prohibited Items


Plastic Bags

Tanglers

Explosives

Sharps

Food Contaminated

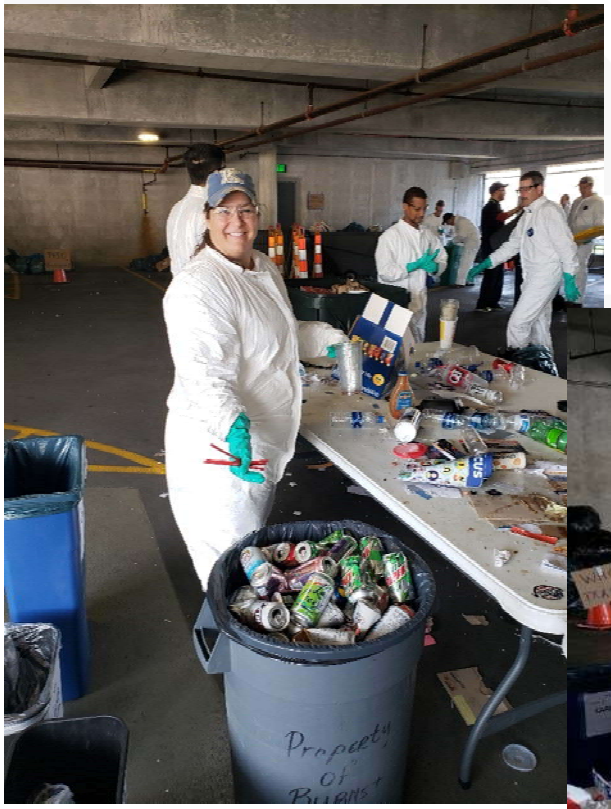
Want to make a positive

ERY

# Burns & McDonnell WHQ Audit

- Self-performed in April 2019
- Approx. 2700 lbs. of refuse, recycling, and compost sorted
- Representative sample of approximately 24-hours worth of generation
- Buildings sorted separately for reporting purposes

# Burns & McDonnell WHQ Audit




# Burns & McDonnell WHQ Audit Findings

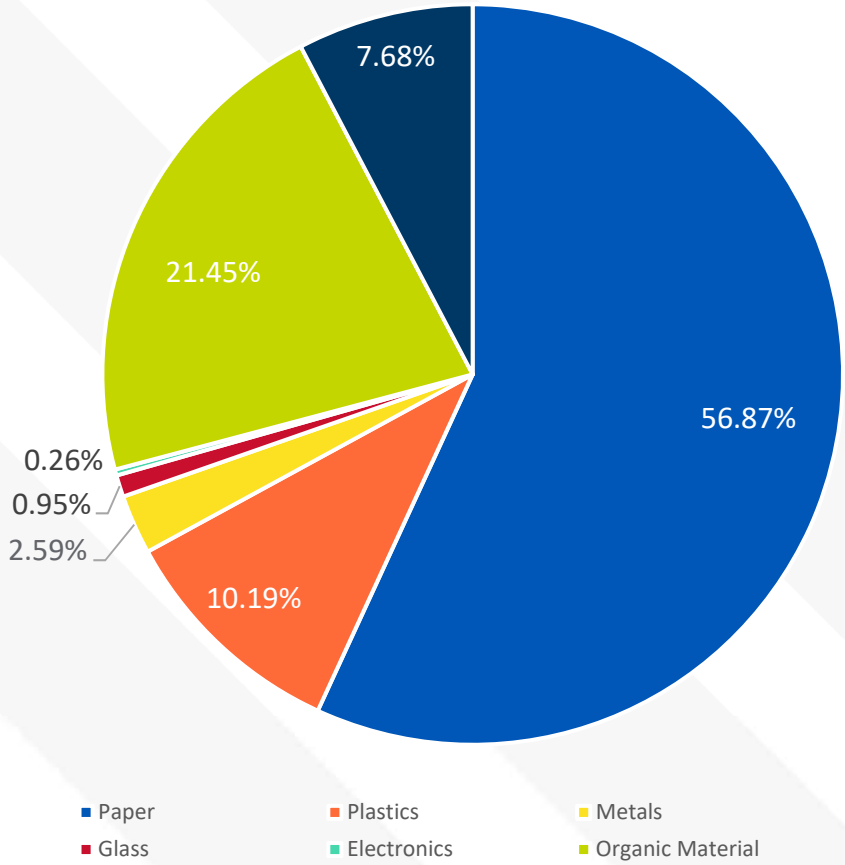

Capture Rates:

- 83% OCC/kraft paper
- 83% recyclable paper
- 66% aluminum cans

Higher for easy to identify items based on current education.

# Burns & McDonnell WHQ Audit Findings

- Largest materials generated:
  - Paper
  - Organic materials
- Much of paper not recycled is compostable (paper towels)
- Compost currently only consists of pre-consumer food scraps



# QUESTIONS

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CREATE AMAZING.