

Background

We respond to these types of questions by comparing against our history or someone else's history



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Background

That is to say... we measure differences and then make conclusions



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Background

There are lots of ways to measure things. Each method designed to produce specific results for analysis



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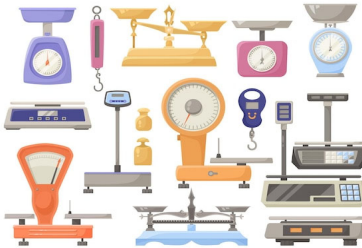


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Background

- The same is true for our waste (resource) management programs
- How can one improve if there is no way to measure improvement?
- What is improvement without a goal?



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Background

- In 1990, Missouri established a statewide waste diversion goal of 40% by 1998.
- Many other states were adopting waste diversion goals with various calculation methods and incentives.
- Missouri Department of Natural Resources (MDNR) was tasked with developing methods to collect information and calculate diversion.

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Calculation Method (1990 – 1999):

Annual tonnage of waste collected in Missouri for disposal

Total tons of materials estimated to have been generated in Missouri
(fixed number of 1.47 tons per person per year)

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Calculation Method (1999 - 2016):

- Annual material generation calculations
- “Credit” for waste reduction efforts

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Calculation Method (1999 - 2016):

- Variable Generation Rate (EPA Method)
 - Personal Consumption Expenditures (PCE) developed by US Bureau of Economic Analysis (BEA)
 - PCE measures consumer spending on good and services
 - PCE used to estimate amount of material generated
- Tons Disposed

Tons Disposed = Waste Disposed in MO Landfills – Imported Waste + Exported Waste

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Calculation Method (1999 - 2016):

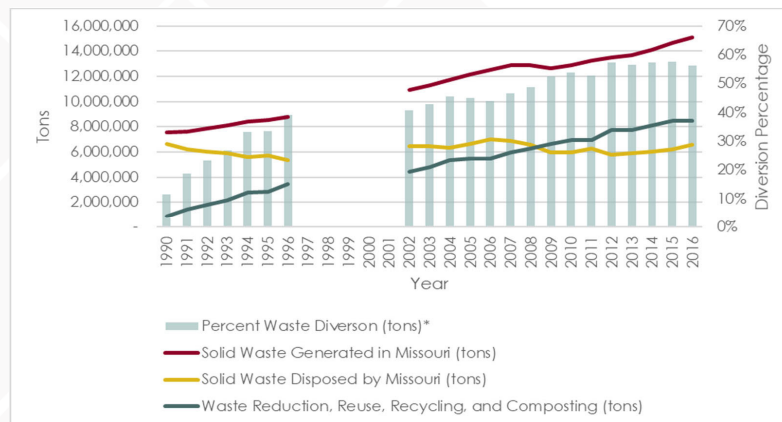
- Waste Diverted
 - Recycling is not tracked in Missouri statewide
 - MDNR estimates waste diverted (reduction, reuse, recycling, composting)

$$\text{Waste Diverted} = \text{Tons Disposed} - \text{Waste Generated}$$

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Background

Calculation Method (1999 - 2016):



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Background

Calculation Method (1999 - 2016):

- Initial and continued suspicion concerning measurement methods based on the results



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Background

Calculation Challenges

- Data Collection
 - Reliability of import/Export tonnage data
 - Reliability and quality of reported data
- Estimated Waste Generation
 - Increased PCE may not correlate with goods that generate increased volumes of materials
 - Lightweighting of materials and packaging
 - EPA data shows that MSW to PCE ratio has been decreasing over time

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Calculation Challenges

- Explainability
- Usability for Localized Area
- Comparison to Other Systems

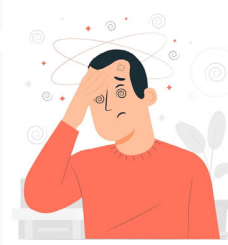


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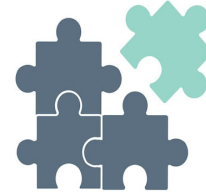


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1999:
24% Diversion (old)
vs.
36% Diversion (new)

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Research

2021: Research and evaluate current and emerging methods used in other states. Purpose is to better understand these methods and to assess the feasibility of potentially using these methods in Missouri.



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Research

Preliminary Evaluation of Known Measurement Systems

California	Arkansas	Colorado	Florida
Indiana	Kansas	Illinois	Maryland
Massachusetts	Minnesota	Ohio	Tennessee
Wisconsin	Maine	North Carolina	New York

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Research

MDNR Waste Diversion Potential Uses

- Evaluate historical data
- Promote ongoing waste diversion efforts and results
- Highlight efforts and successes of Missouri SWMDs
- Guide future policy and financial discussions



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Research

MDNR Preferred Waste Diversion Metric Characteristics

- Data
 - Consistent, reliable, easily obtainable, defensible
- Representative
 - Accurately representative of diversion activities and results
- Promotes Action
 - Data can help promote waste diversion actions
- Establishes Metric
 - Per capita disposal rates

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Targeted Research

States	Consistent & reliable use of data	Data easy to obtain	Represents diversion activities	Promote waste diversion effort	Establishes per capita generation rates
Tennessee	+/-	+	+	+/-	+
Colorado	-	+/-	+/-	+	-
Massachusetts	-	+	+	+	-
North Carolina	+/-	-	-	+	+
Maine	-	+	-	+	+

+ meets criteria. +/- somewhat meets criteria, - does not meet criteria

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Targeted Research



- Tennessee**
- Waste Reduction and Recycling Goals
 - 25% Disposal Reduction by 2025
 - Per capita
 - 40% of Total Generated Tons Recycled by 2025

- Maine**
- Waste Reduction Goals – Pounds Disposed per Capita per Day
 - 0.55 Tons per Capita by 2019 and an Additional 5% Reduction Every 5-Years
 - Recycling Goal
 - Recycle 50% of Total Materials Generated

- North Carolina**
- Goal of Decreasing Waste Disposal Compared to an Established Base Year
 - 40% Reduction by 2001

- Massachusetts**
- Waste Reduction – Total Tons Disposed Compared to Base Year
 - 30% Disposal Reduction by 2020
 - 90% Disposal Reduction by 2030

- Colorado**
- MSW Diversion Goal
 - 28% MSW Diversion by 2021 up to 45% by 2036
 - Statewide
 - Front Range

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Targeted Research



Tennessee Department of Environmental Conservation (TDEC)

$$\text{Waste Generation Per Capita} = \frac{\text{Total Disposed in MSW Landfill} + (\text{exported waste} - \text{imported waste})}{\text{Statewide Population}}$$

$$\text{Recycling Rate} = \frac{\text{Tons of Material from MSW Recycled (includes mulched yard trimmings and composted food scraps)}}{\text{Tons of MSW Generated (excludes materials incinerated for energy)}}$$

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Targeted Research



Tennessee Department of Environmental Conservation (TDEC)

- 2018 Per Capita Disposal Rate: 5.0 lbs/person/day
 - (3.25 lbs/person/day goal by 2025)
- Straightforward data collection
 - Re-TRAC Connect™ database
- Tennessee Department of Environmental Conservation (TDEC) positions to collect, analyze, utilize data, and develop annual progress reports
- Municipal Solid Waste Planning Regions assist with data collection
- Calculations performed on collected data

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Targeted Research



Maine Department of Environmental Protection (MDEP)

$$\text{Per Capita Generation Rate} = \frac{\text{Total MSW (landfills + incinerated + recycling)}}{\text{Statewide Population}}$$

$$\text{MSW Recycling Rate} = \frac{\text{Total Amount of MSW Recycled}}{\text{Total Reported In-State Generated MSW}}$$

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Targeted Research



Maine Department of Environmental Protection (MDEP)

- 2019 Per Capita Disposal Rate: 0.63 tons/capita
 - (0.55 tons/capita goal)
- 2019 Recycling Rate: 36.46%
 - (50% goal)
- Landfills, transfer stations, compost facilities, and recycling material brokers are permitted and required to provide data
 - Commercial recycling processors submit data voluntarily
- MDEP staff collect, analyze, and utilize data – staff shortages and difficulty in tracking down data for incomplete reports

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Targeted Research



North Carolina Department of Environmental Quality (NCDEQ)

$$\text{Per Capita Disposal} = \frac{\text{Total MSW and C\&D Disposed}}{\text{Statewide Population}}$$

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Targeted Research



North Carolina Department of Environmental Quality (NCDEQ)

- 2019 Per Capita Disposal Decrease: 24% in 2019
 - (40% by 2001 goal)
- Statute requiring calculation was allowed to expire as it was determined they would not be able to achieve a 40% reduction
- NCDEQ staff collect, analyze, and utilize data
- Landfills, transfer stations, and compost facilities are permitted and required to provide data (annual e-doc forms)
- Calculations performed on collected data

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Targeted Research



Massachusetts – Massachusetts Department of Environmental Protection (MassDEP)

$$\text{Disposed Diversion} = \frac{\text{Baseline Disposal Tons} - \text{Current Year Disposal Tons}}{\text{Baseline Disposal}}$$

- Baseline is 2008

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Targeted Research



Massachusetts – Massachusetts Department of Environmental Protection (MassDEP)

- Straightforward data collection
 - Re-TRAC Connect™ database
- MassDEP staff collect, analyze, and utilize data
- Landfills and transfer stations are permitted and required to provide data
- Imported waste is excluded from calculations
- Calculations performed on collected data



Targeted Research



Colorado – Colorado Department of Public Health (CDPHE)

$$\text{MSW Diversion Rate} = \frac{(MSW\ Recycled + MSW\ Composted)}{(MSW\ Recycled + MSW\ Composted + MSW\ Disposed)}$$

$$\text{Total Diversion Rate} = \frac{(MSW\ Recycled + MSW\ Composted + Non\ MSW\ Materials\ Diverted)}{(MSW\ Recycled + MSW\ Composted + MSW\ Disposed + Non\ MSW\ Materials\ Diverted + MSW\ Materials\ Disposed)}$$



Targeted Research



Colorado – Colorado Department of Public Health (CDPHE)

Statewide Goal

- 15.3% MSW Diversion Rate 2020
- 28% MSW Diversion Rate by 2021
- 35% MSW Diversion Rate by 2026
- 45% MSW Diversion Rate by 2036

Front Range Region Goal

- 16.2% MSW Diversion Rate 2020
- 32% MSW Diversion Rate by 2021
- 39% MSW Diversion Rate by 2026
- 51% MSW Diversion Rate by 2036

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Targeted Research



Colorado – Colorado Department of Public Health (CDPHE)

- 2019 MSW Diversion: 15.9%
 - (28% goal)
- 2019 Total Diversion Rate: 33.0%
 - (32% goal)
- Straightforward data collection
- CDPHE position to collect, analyze, utilize data, and develop annual progress reports
- Landfills, transfer stations, compost facilities, recycling processing facilities are permitted and required to provide data
- Calculations performed on collected data

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Recommendations

Review Data
Analysis
Pros/Cons
SWAB Feedback
MDNR Feedback



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Recommendations

Developed Two Recommendations:

- Meet MDNR Preferred Waste Diversion Metric Characteristics
 - Data
 - Consistent, reliable, easily obtainable, defensible
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 - Accurately representative of diversion activities and results
 - Promotes Action
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 - Per capita disposal rates

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Recommendations

Option #1

- Pounds disposed per capita

Option #2

- Total waste disposed per year

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Recommendations

Option #1

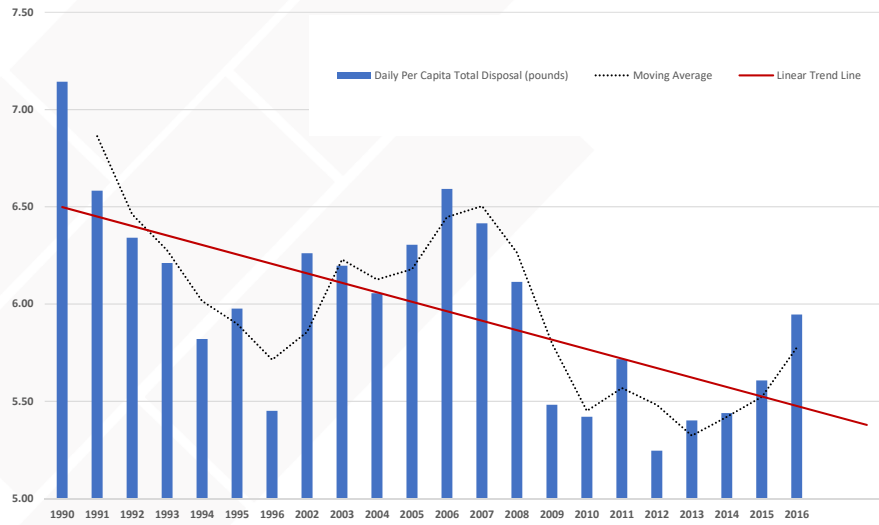
- Pounds disposed per capita

Annual Waste Disposed	=	Waste Disposed in MO Landfills	-	Waste Imported from Other States	+	Waste Exported by MO to Other States
<hr style="width: 50%; margin: 0 auto;"/>						
Population						

- Establish disposal per capita goals
- Establish disposal percentage goals

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Recommendations



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Recommendations

Option #2

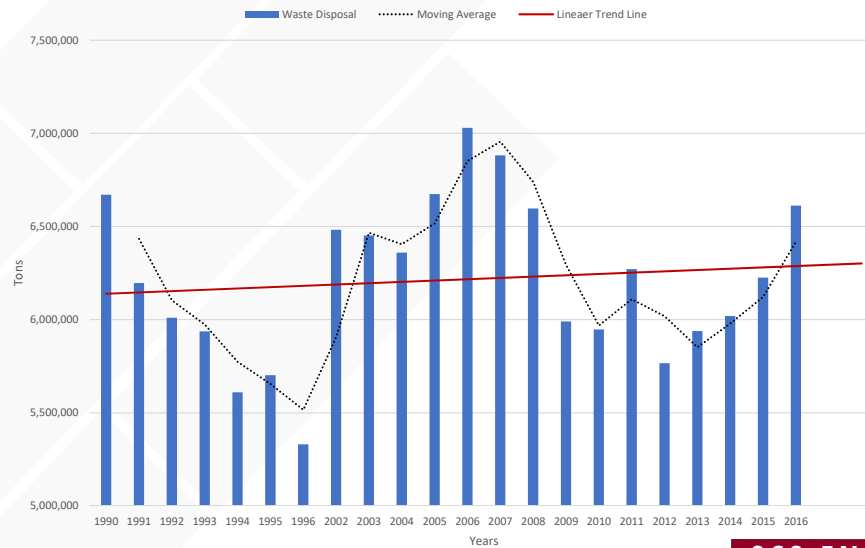
- Total waste collected for disposal in Missouri

Annual Waste Disposed

- Establish total tonnage or percentage decrease goals

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Recommendations



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Recommendations

Implementation – What If...

- Missouri established a 40% waste diversion goal...
- Select a base year to perform per capita or total waste disposal change calculations
- Per Capita (Option #1) Assume Base Year of 1990:
 - Per Capita was 7.14 lbs
 - 2016 Per Capita was 5.95 lbs (40% Reduction would be 4.29 lbs)
- Total Disposed Tons (Option #2) Assume Base Year of 1990:
 - 2016 total disposed tons was 6.6 million (40% Reduction would be 4 million disposed tons)

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 **Thank You**

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