

# **Recycling and Waste-to-Energy: Are They Compatible?**

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## About Governmental Advisory Associates, Inc.

- G.A.A. is a research and consulting firm focusing on solid waste management issues.
- Firm serves as consultant to federal, state and local governments as well as to the private sector.
- Publishes periodic Yearbooks on WTE and Recycling Facilities in the U.S. Most recent publication ***Materials Recycling and Processing in the U.S.: 2007-2008 Yearbook and Directory.***

# Approach to the Presentation

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- Brief Description of Approach
- Discussion of Findings
- Conclusions.

# Purpose of the Study

- The study addresses the question regarding the compatibility of recycling and waste to energy (WTE).
- It examines recycling rates in 500 communities that dispose of their waste at WTE projects and compares these rates to national and statewide rates.

# Study Approach and Methodology

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- Determine an appropriate measure of recycling to be applied on the state and local level
- Delineate communities relying on WTE for disposal and determine their level of recycling
- Obtain national and statewide data on recycling for purposes of comparison

# Data Sources

- Published local and state solid waste reports
- Unpublished local and state solid waste disposal tonnage data
- Recycling facility tonnage data obtained from author's own databases
- Interviews with state and local officials
- Interviews with private MRF operators in selected localities.

# A Discussion About the “Recycling Rate”

- Recycling rate includes only those materials included in the municipal waste stream.
- Recycling Rate = tonnage of materials recycled/tonnage of total materials generated.
- Because of difficulty of obtaining generation numbers the recycling rate is defined as:  
Rate= tonnages recycled/(tonnages recycled +tonnages disposed).

## National Recycling Rates that are Used: EPA Recovery (Recycling) Rate

- EPA rate derived using a materials flow approach.
- EPA divides the waste stream into durable and non-durable goods and further divides these categories into more specific material types.
- Its tonnage data is based mainly on surveys of industry and manufacturing groups to determine how much of the good is produced (generated) and how much of the material is taken back for re-use (recycled). It adjusts for product imports and exports.
- These surveys and estimations are done for the nation as a whole.

## EPA: MSW Generation, Recycling, and Disposal in the U.S: Facts and Figures for 2006.

| Material     | Weight Generated<br>(millions tons) | Weight Recovered<br>(millions tons) | Recovery as % of<br>Generation |
|--------------|-------------------------------------|-------------------------------------|--------------------------------|
| Paper        | 85.3                                | 44.0                                | 51.6%                          |
| Glass        | 13.2                                | 2.9                                 | 21.8%                          |
| Metals       | 19.1                                | 7.0                                 | 36.3%                          |
| Plastics     | 29.5                                | 2.0                                 | 6.9%                           |
| Wood         | 13.9                                | 1.3                                 | 9.4%                           |
| Food         | 31.3                                | .7                                  | 2.2%                           |
| Yard Waste   | 32.4                                | 20.1                                | 62.0%                          |
| Other Waste  | 26.7                                | 3.8                                 | 14.2%                          |
| <b>TOTAL</b> | <b>251.4</b>                        | <b>81.8</b>                         | <b>32.5%</b>                   |

# Looking at EPA Fiber Numbers

| Material            | Weight Generated (Millions) | Weight Recovered (Millions) | Recovery as % of Generation |
|---------------------|-----------------------------|-----------------------------|-----------------------------|
| Newspaper           | 12.4                        | 10.9                        | 87.9%                       |
| Magazines/Books     | 3.7                         | 1.3                         | 35.1%                       |
| Office Paper        | 7.0                         | 4.3                         | 61.4%                       |
| Commercial Printing | 6.6                         | 1.4                         | 21.2%                       |
| Third Class Mail    | 5.9                         | 2.3                         | 40.0%                       |
| Other Non-Packaging | 9.3                         | 0                           | 0%                          |
| OCC                 | 31.4                        | 22.6                        | 72.0%                       |
| Other Types of Pkg. | 9.0                         | 1.2                         | 13.3%                       |
| <b>TOTAL</b>        | <b>85.3</b>                 | <b>44.0</b>                 | <b>51.6%</b>                |

# Issues with Use of the EPA Recovery Rate for Local Comparisons

- National in scope
- Includes large amounts of tonnages, which are often not documented by local or state governments
  - OCC handled through the private sector
  - Commercial printing
  - Types of metals found in C& D waste

## National Recycling Rates that are Used: *BioCycle* Recycling Rate

- *BioCycle* a monthly publication, which periodically publishes a survey “The State of Garbage in America”.
- The national rate is based on aggregating state level recycling and disposal tonnages.
- It data based in part on surveys sent to state officials.

## Approach to Recycling Rates Used in this Study

- Obtained both specific community level and statewide recycling data.
- Data obtained from annual reports, budget and financial reports and interviews.
- Study did not use generation data, but actual disposal information.

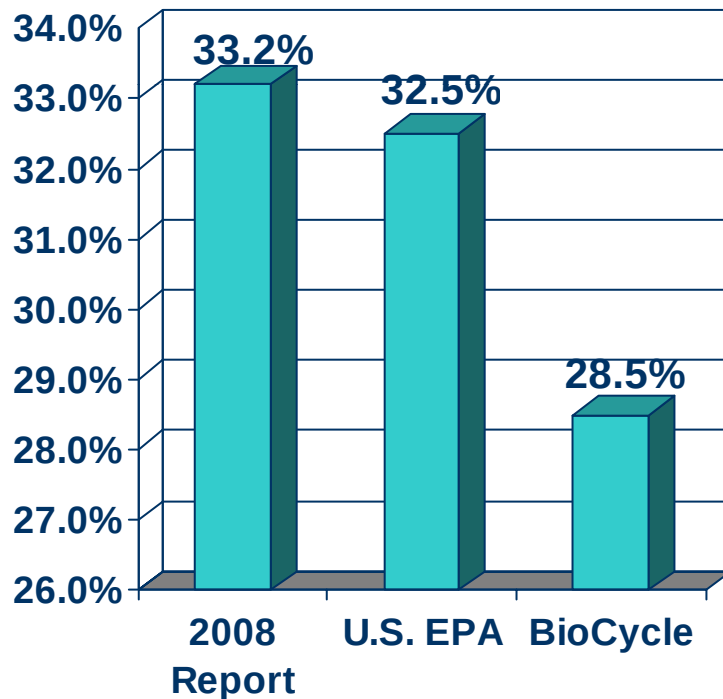
**Table 1: Number of Facilities, Local Governments and Population Included in Study**

|                                                                                                                                                                                                                                                                            |           |            |                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------|-------------------|
| Alabama                                                                                                                                                                                                                                                                    | 1         | 2          | 298,192           |
| California                                                                                                                                                                                                                                                                 | 3         | 5          | 2,082,069         |
| Connecticut                                                                                                                                                                                                                                                                | 6         | 184        | 3,081,621         |
| Florida                                                                                                                                                                                                                                                                    | 11        | 10         | 8,494,222         |
| Hawaii                                                                                                                                                                                                                                                                     | 1         | 1          | 899,593           |
| Indiana                                                                                                                                                                                                                                                                    | 1         | 1          | 860,454           |
| Maine                                                                                                                                                                                                                                                                      | 4         | 58         | 630,669           |
| Maryland                                                                                                                                                                                                                                                                   | 3         | 4          | 1,952,955         |
| Massachusetts                                                                                                                                                                                                                                                              | 7         | 158        | 3,239,216         |
| Michigan                                                                                                                                                                                                                                                                   | 1         | 1          | 596,666           |
| Minnesota                                                                                                                                                                                                                                                                  | 9         | 27         | 3,376,057         |
| New Hampshire                                                                                                                                                                                                                                                              | 2         | 34         | 199,312           |
| New Jersey                                                                                                                                                                                                                                                                 | 5         | 5          | 2,182,216         |
| New York                                                                                                                                                                                                                                                                   | 10        | 14         | 4,275,024         |
| North Carolina                                                                                                                                                                                                                                                             | 1         | 2          | 179,553           |
| Oregon                                                                                                                                                                                                                                                                     | 1         | 1          | 305,265           |
| Pennsylvania                                                                                                                                                                                                                                                               | 6         | 7          | 4,869,512         |
| South Carolina                                                                                                                                                                                                                                                             | 1         | 1          | 331,917           |
| Utah                                                                                                                                                                                                                                                                       | 1         | 1          | 268,187           |
| Virginia                                                                                                                                                                                                                                                                   | 5         | 13         | 2,659,944         |
| Washington                                                                                                                                                                                                                                                                 | 1         | 1          | 440,706           |
| Wisconsin**                                                                                                                                                                                                                                                                | 2         | 35         | 250,275           |
| <b>TOTAL</b>                                                                                                                                                                                                                                                               | <b>82</b> | <b>567</b> | <b>41,473,625</b> |
| <p>* Three plants are excluded due to unavailability of recycling data. If the RDF and waste combustion facilities are separate, only RDF plant included. ** Data from two Minnesota counties sending waste to a waste-to-energy plant are included in Wisconsin data.</p> |           |            |                   |

**Table 2: Recycling Rates in Communities Using WTE Facilities Aggregated by State**

| State          | Recycling Rate | Tons Recycled     | MSW Disposed      | Number of Plants |
|----------------|----------------|-------------------|-------------------|------------------|
| Alabama        | 34.2%          | 65,100            | 125,000           | 1                |
| California     | 44.6%          | 1,694,873         | 2,107,444         | 3                |
| Connecticut    | 27.2%          | 907,213           | 2,422,708         | 6                |
| Florida        | 26.2%          | 3,184,586         | 8,978,107         | 11               |
| Hawaii         | 31.3%          | 415,372           | 910,817           | 1                |
| Indiana        | 34.7%          | 163,450           | 308,199           | 1                |
| Maine          | 26.6%          | 96,788            | 266,984           | 4                |
| Maryland       | 43.0%          | 1,614,668         | 2,139,967         | 3                |
| Massachusetts  | 33.6%          | 1,607,923         | 3,184,527         | 7                |
| Michigan       | 25.2%          | 245,360           | 730,000           | 1                |
| Minnesota      | 43.1%          | 1,685,268         | 2,220,804         | 9                |
| New Hampshire  | 10.4%          | 18,068            | 154,974           | 2                |
| New Jersey     | 35.4%          | 922,143           | 1,682,033         | 5                |
| New York       | 36.1%          | 1,874,923         | 3,185,184         | 10               |
| North Carolina | 24.3%          | 27,629            | 86,100            | 1                |
| Oregon         | 54.4%          | 259,438           | 477,137           | 1                |
| Pennsylvania   | 30.0%          | 1,863,423         | 4,348,366         | 6                |
| South Carolina | 29.5%          | 132,008           | 314,812           | 1                |
| Utah           | 3.4%           | 8,917             | 265,138           | 1                |
| Virginia       | 34.2%          | 1,119,532         | 2,150,031         | 5                |
| Washington     | 43.0%          | 258,810           | 340,533           | 1                |
| Wisconsin      | 30.8%          | 35,436            | 79,494            | 2                |
| <b>TOTAL</b>   | <b>33.2%</b>   | <b>18,200,927</b> | <b>36,611,984</b> | <b>82</b>        |

# Comparison of Recycling Rates: WTE Communities and National Rates

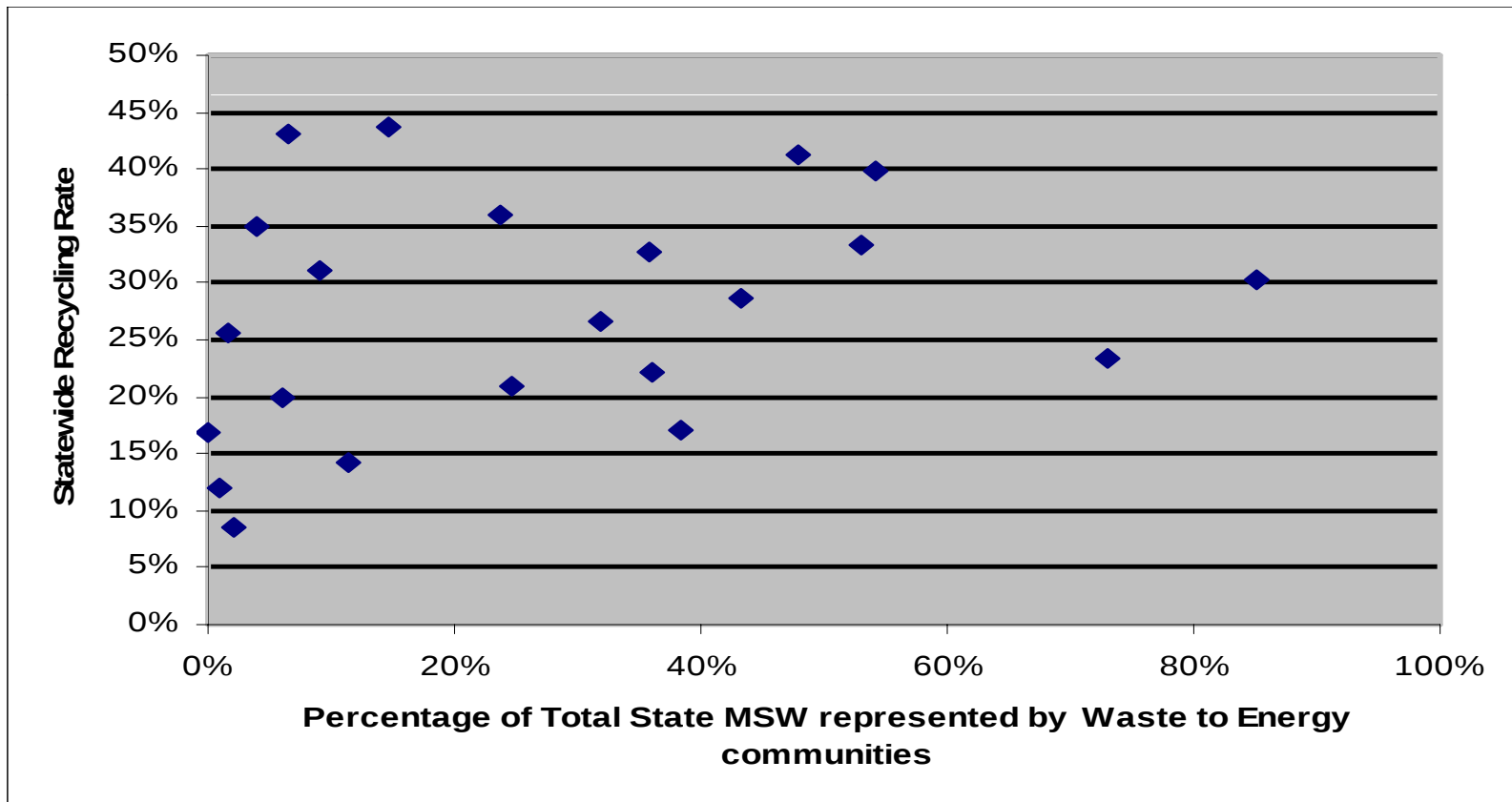


- All rates are quite close
- WTE Communities perform slightly better with respect to national rates
- Most appropriate measure is the BioCycle rate, since methodology is similar to that used in current study.

# WTE and State Recycling Rates

- One can look further at the impact that WTE facilities might have on community recycling rates.
- If WTE does have a negative impact on recycling, one would expect that those states which have a high reliance on WTE for disposal would have lower statewide recycling rates, than those states which have a low reliance on WTE.
- By the same reasoning, states which do not rely on waste to energy may find themselves in the higher range with respect to recycling rates.

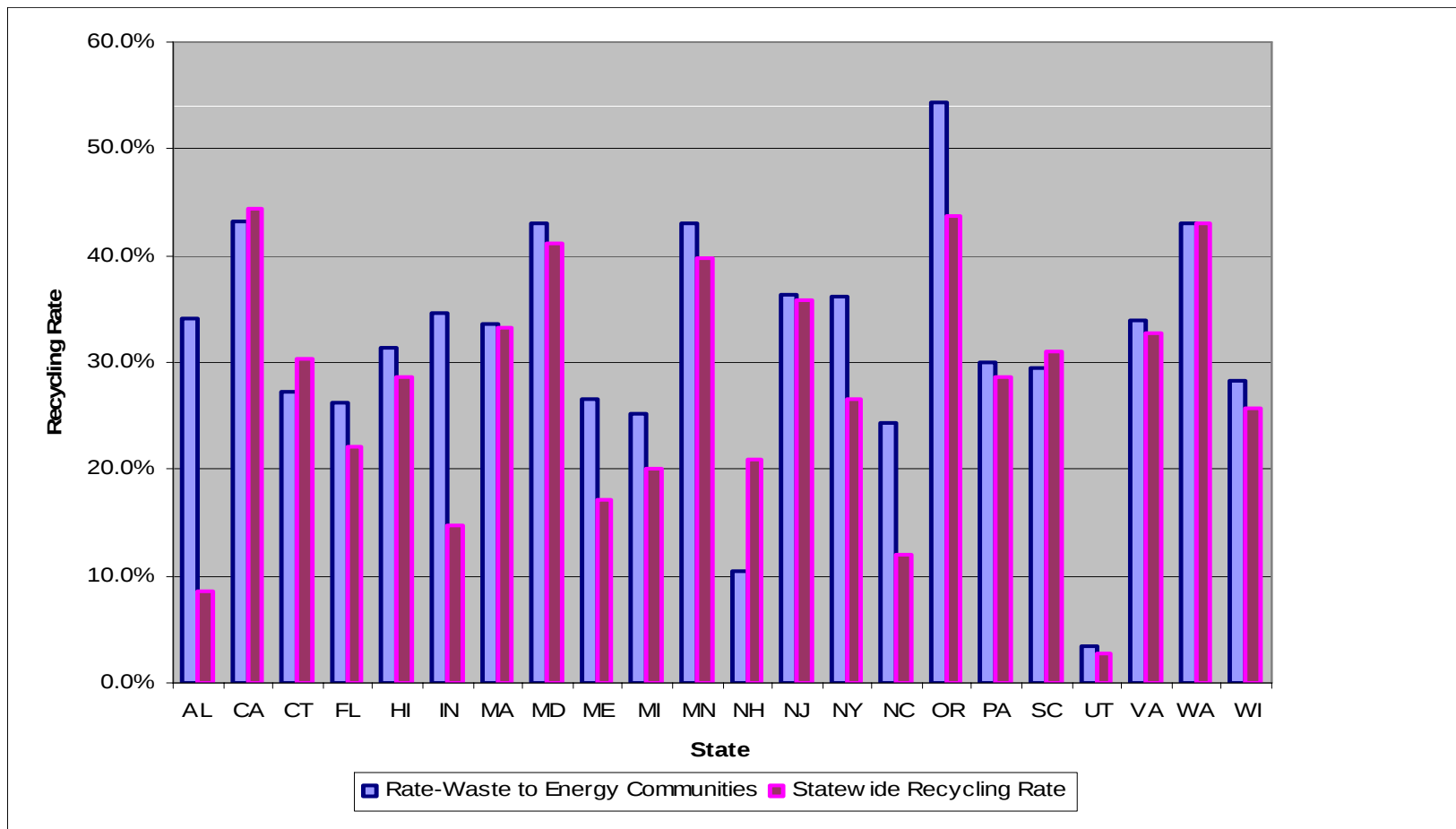
# Relationship of Statewide Recycling Rates and Reliance on WTE



## Comparison of Recycling Rates: WTE Communities and Statewide Rates

- To further examine the patterns of recycling across WTE communities, the aggregated recycling rate of WTE communities in each state was compared to the overall recycling rate in the individual state.
- If critics are correct, then recycling rates in WTE communities should lag behind statewide rates.
- The following figure shows that recycling rates in WTE communities appear to be closely linked to those of all communities across the state.

# WTE Communities' Recycling Rate vs. Statewide Rates



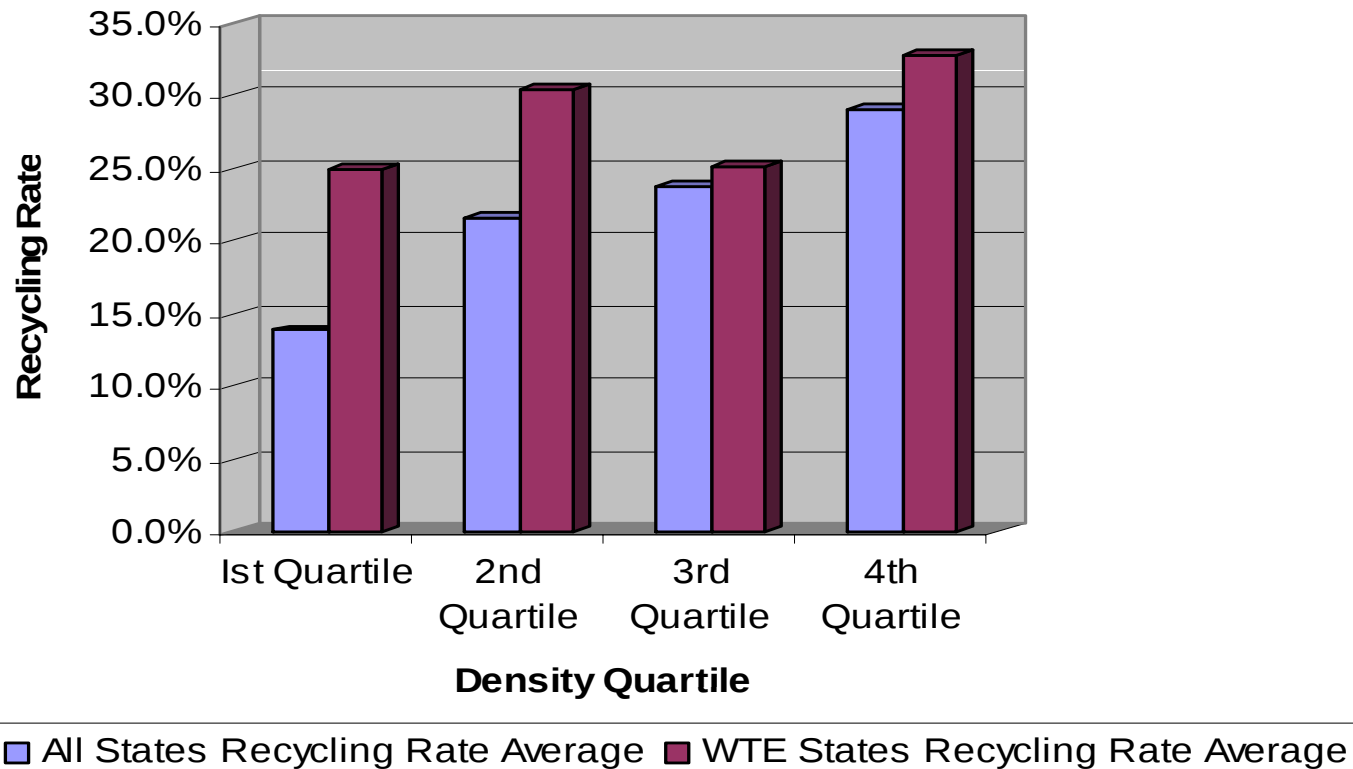
## **Possible factors determining recycling rates on the state and community level?**

- Population Density
- Median Family Income
- Statewide Recycling Mandates

# State Population Density and State Recycling Rates

- When statewide recycling rates were plotted against average population density, there was a slight positive relationship. Higher recycling rates were associated with higher densities.
- The graph groups states into density quartiles, from lowest to highest. One can observe the impact of population density.

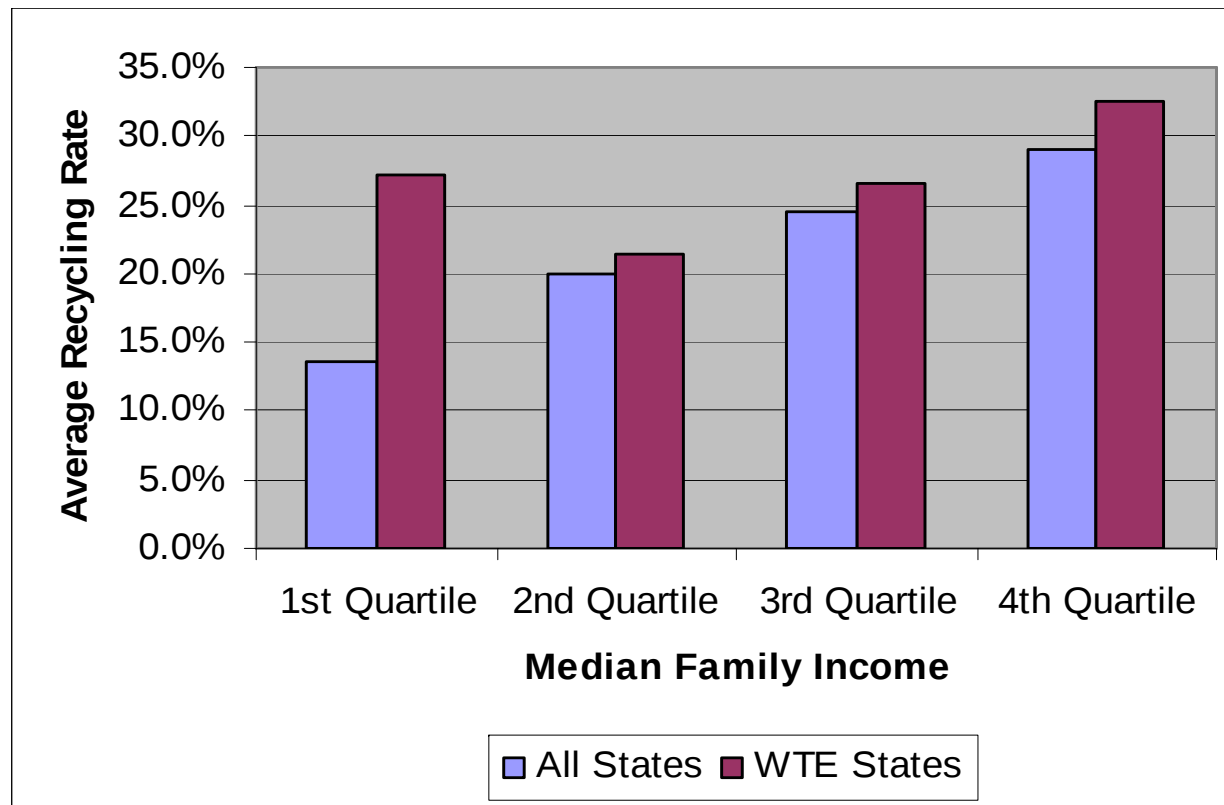
# Average Recycling Rate by Density Quartile: All States and WTE States



# State Median Family Income and State Recycling Rates

- Graph shows average state recycling rates for states grouped by median family income quartiles.
- There seems to be a relationship between median family income in a state and recycling rates.
- As statewide median family income increases, state recycling rates increase.

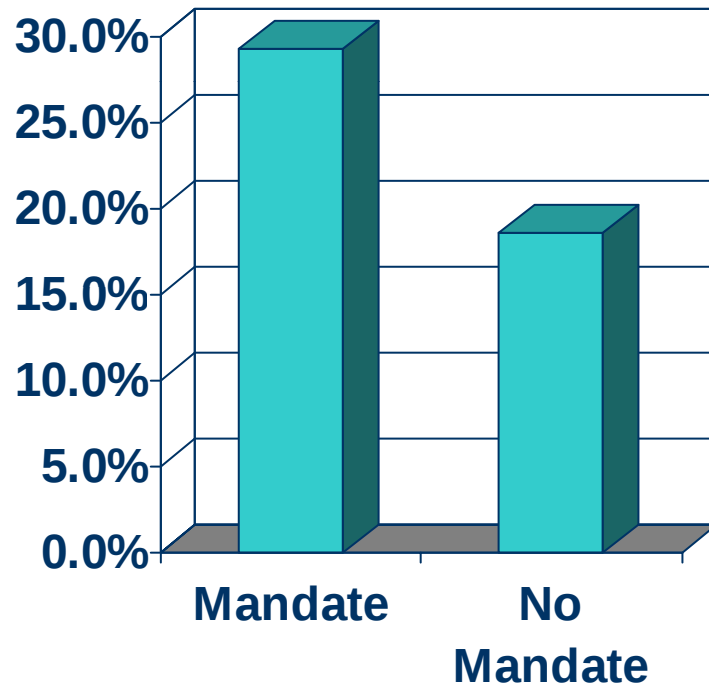
# Average Recycling Rate by Median Family Income Quartile: All States and WTE States



# State Regulatory Framework and Recycling

- If the data is to be believed, than all communities in a state tend to have the same level of recycling, whether or not they rely on WTE.
- Another possible reason for variations across states are state and local policies.
- The following figure shows a comparison of recycling rates in states with recycling mandates, and those without such mandates.

# Average Statewide Recycling Rates by Type of Regulatory Framework



- 16 States have mandates, some with and some without penalties. (AF&PA survey)
- Of 16 states with mandates, 14 have WTE facilities within them.
- Several states that contain WTE without recycling mandates have grant and other incentive programs to encourage recycling.

# Conclusion

- Based on national and statewide averages, WTE as a disposal alternative does not appear to impact recycling rates.
- Communities which have WTE seem to behave very similarly to all communities within their state with respect to recycling.
- Differences in recycling rates are more likely related to specific community attributes such as population density and median family income as well as state and local policies which mandate or provide incentives for recycling.

# A Word about Recycling Data

- Data on both the state and local level has improved greatly over the last decade.
- Particularly on the state level there have been serious attempts to account for recycling tonnages.
- However, there is still lack of consistency over the way the rate is calculated by state.

# Additional Data Issues

- The EPA rate complicates the picture.
- Diversion mandates, such as in California, politicize the data and make comparisons “treacherous”.
- Many states are not fully tracking commercial recycling tonnages.
- There are issues with waste classification, such as inclusion of bulky waste with C&D with MSW.