A Compatibility Study: Recycling and Waste-to-Energy Work in Concert

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EXECUTIVE SUMMARY

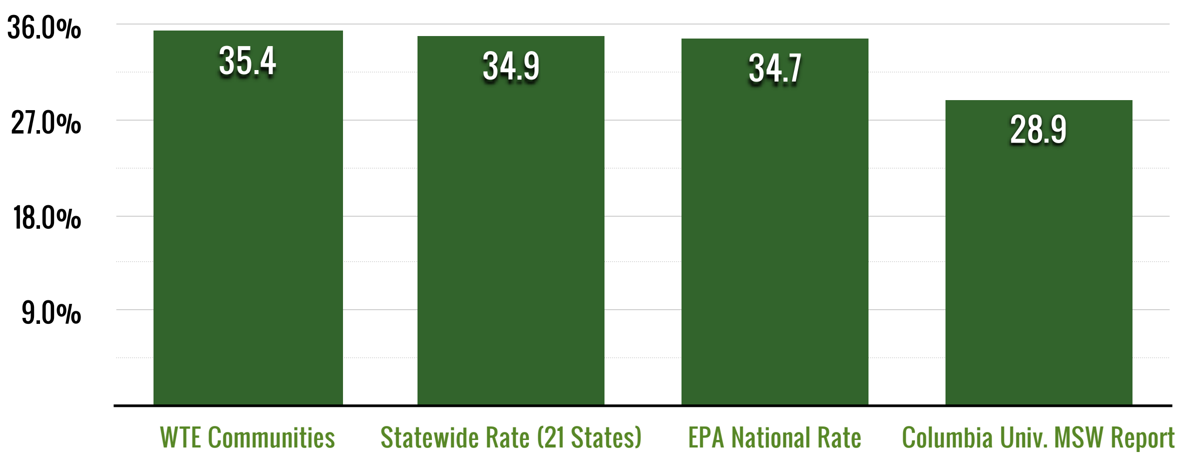
This study updates similar analyses conducted in 2008 and 2009. Their purpose was to answer the question: Does a community's use of a waste-to-energy plant to dispose of its waste impact the level of recycling in that community? The 2008 study answered that question with a resounding no. The means of disposal had no impact on the level of recycling; in fact, many communities which sent their waste to a waste-to-energy plant had higher levels of recycling than averages that prevailed across their state. This current paper, updates the study, using 2012 data as much as possible. In an examination of recycling rates of 700 communities in twenty-one states, which rely on waste-to-energy for their waste disposal, it was again demonstrated that this means of disposal had no impact on recycling. In fact, overall communities using waste-to-energy had a slightly higher level of recycling than that observed across their states and across the nation.

Key Findings:

- The study covers 80 waste-to-energy facilities in 21 states serving about 30% of the population of those states. Recycling data was obtained from 700 local governments, including 601 cities, towns and villages and 98 counties, authorities or districts In addition, statewide data was obtained for each of the 21 states. The population of these states comprises about 56% of the U.S. population.

- As reported by the U.S. EPA the national recycling rate as of 2011 was 34.7%. The recycling rate for communities, using WTE plants is at 35.4%. Interestingly, the average recycling rate for the 21 states surveyed is 34.9%. Figure ES-1 below shows these rates graphically. Only tenths of a percent separate the three averages, indicating that waste-to-energy as a disposal method has no impact on the level of recycling in a community or a state.

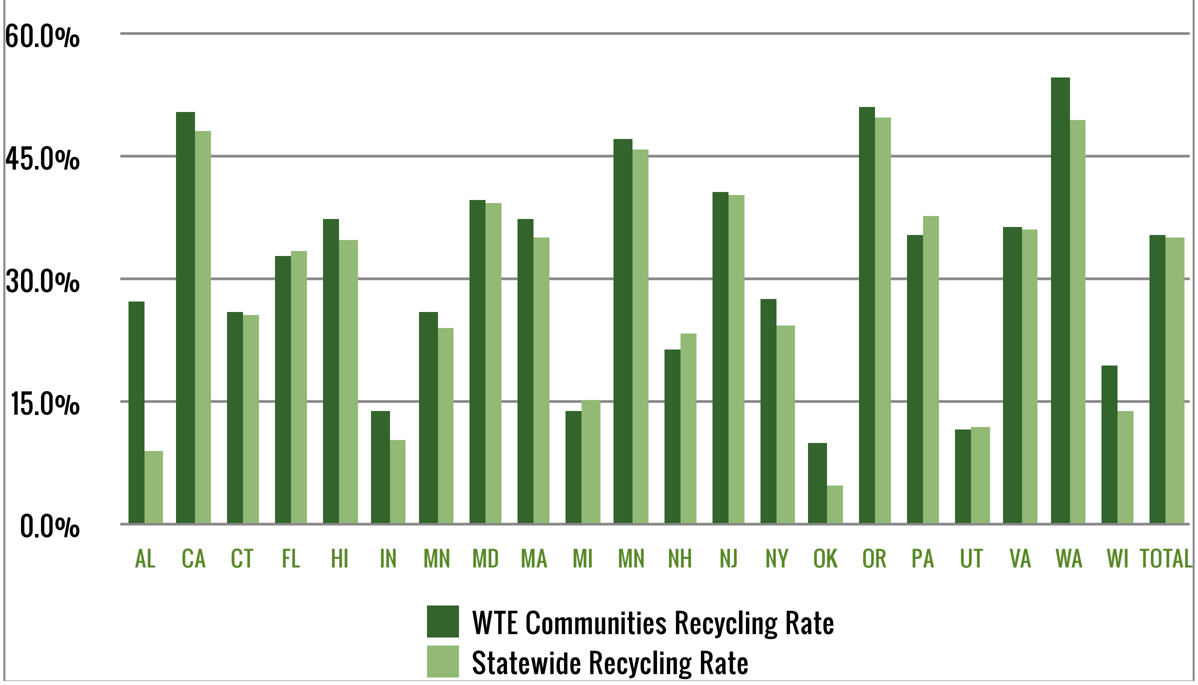
FIGURE ES-1: BENCHMARK COMPARISONS



- All communities using waste-to-energy provide their residents an opportunity to recycle and most have curbside collection of recyclables. In fact, some of these communities are leaders in the adoption of innovative recycling programs, such as single stream collection and food waste collection and composting. The coincident nature of recycling programs and waste-to-energy in each community is evidence that these two waste management strategies easily exist side by side. They often complement each other, in that a waste-to-energy plant is often the largest recycler of post-consumer metal in the state.

- In most cases, recycling rates in waste-to-energy communities closely track the statewide recycling rate in the state where they are located as shown in Figure ES-2. State solid waste policies and programs, not whether a community relies on waste-to-energy as a disposal option, are a key influence on local recycling behaviors and rates.

FIGURE ES-2: RECYCLING RATES
FOR WTE COMMUNITIES AND STATES



- In conjunction with the graph above, Table ES-1 below indicates how individual community recycling rates mirror the overall state rate. In 16 of the 21 states which rely on waste-to-energy facilities, individual communities using these facilities have a slightly higher recycling rate than the overall state average. In total, rates have risen since 2009, with additional communities adopting single stream curbside recycling and more communities moving to curbside organics collection.

Table ES-1: Statewide and WTE Communities' Recycling Rates				
State	Number of WTE Plants*	WTE Localities Surveyed	Statewide Recycling Rate	WTE Communities Recycling Rate
Alabama	1	2	9.0%	27.2%
California	3	5	48.3%	50.5%
Connecticut	6	155	25.7%	25.9%
Florida	11	11	33.3%	32.7%
Hawaii	1	1	34.8%	37.2%
Indiana	1	2	10.3%	13.8%
Maine**	3	180	24.1%	25.8%
Maryland	3	4	39.2%	39.7%
Massachusetts**	7	168	35.1%	37.3%
Michigan	2	2	15.0%	13.7%
Minnesota	8	35	45.8%	47.2%
New Hampshire**	2	42	23.3%	21.2%
New Jersey	5	5	40.2%	40.7%
New York	10	16	24.3%	27.6%
Oklahoma	1	1	4.6%	9.8%
Oregon	1	1	49.7%	51.2%
Pennsylvania	6	20	37.8%	35.5%
Utah	1	1	11.9%	11.7%
Virginia	5	6	36.2%	36.2%
Washington	1	1	49.6%	54.7%
Wisconsin	2	42	13.9%	19.4%
TOTAL	**80**	**700**	**34.9%**	**35.4%**

*Two RDF Boilers in Minnesota excluded to avoid double counting. Ames IA, which mainly uses coal as a fuel was also excluded.
** Only residential tonnage included in both disposal and recycling tonnage

A Compatibility Study: Recycling and Waste-to-Energy Work in Concert, 2014 Update

Eileen Brettler Berenyi, Ph.D[1]

INTRODUCTION

Recycling is a cornerstone of solid waste policy across the United States. Residents, institutions and businesses in every urbanized area of the country, as well as in many rural areas, have the opportunity to recycle. In addition, localities in 21 states rely on waste-to-energy (WTE) as part of an integrated waste management strategy. These plants not only offer a secure disposal option, but also provide a locally based source of energy for scores of homes and public and private sector enterprises. In the current era of unstable energy and commodity prices, recycling and waste-to-energy are complementary policies, supporting sustainability and long-term resource conservation.

This study looks once again at the relationship between recycling and the use of waste-to-energy by a local government. Despite previous studies to the contrary, critics of waste –to-energy raise the argument that reliance on waste-to-energy impedes recycling. As shown in earlier studies, communities that use waste-to-energy facilities have recycling rates higher than the national average, and often higher than rates for their state as a whole.[2] This current study revisits the question, seeking to determine how localities and states have fared after 2010. To address the question, the study surveyed those communities which dispose of their waste at waste-to-energy plants and compared their level of recycling to both obtained statewide and national data.

STUDY APPROACH AND METHODOLOGY

In order to establish a basis of comparison, aggregated recycling rates of individual communities were compared to the statewide rate of recycling to ascertain whether waste-to-energy as a disposal option was putting a significant damper on efforts to recycle. The purpose of the study was to compare groups of localities within a state to the particular statewide rate, not to compare rates across states.

WHAT IS A RECYCLING RATE?

As a measure of the level of recycling in a community, this study uses the recycling rate, defined as the percentage of materials recycled (measured in tons) of total waste generated. Total waste generated is the sum of tons of waste disposed plus tons of waste recycled. The recycling rate encompasses only those materials found in municipal solid waste stream,

[1] The author is president of Governmental Advisory Associates, Inc., Westport, CT. This work was partially funded by the Energy Recovery Council, Washington DC.

2 See Eileen Brettler Berenyi. “A Compatibility Study: Recycling and Waste-to-Energy Work in Concert” (Energy Recovery Council: Washington DC 2008). With 2009 Update

excluding agricultural and industrial sectors. In most cases, this study uses the sum of waste disposed and recycled, since measures of actual waste generation are difficult to obtain.

The recycling rate for a community, which could be a village, city, town, county or public authority is calculated by totaling the tons of materials recycled and dividing this total by the sum of tons of materials recycled plus tons disposed by the community, i.e., recycling rate = tons recycled/ (tons disposed + tons recycled). The rates used in this paper are based on tonnage of materials actually recycled or disposed and do not include credits for material reuse or source reduction.[3]

On a national basis, the U.S. Environmental Protection Agency (EPA), calculates a recovery rate, using a different approach[4]. It derives its rate from a materials flow model which estimates tons of waste generated and recycled by various material categories. The data for its model comes from national industry estimates of quantities of specific materials produced and recovered. Thus for example it uses industry surveys of newsprint or corrugated cardboard production facilities to ascertain how much is produced and to what degree a recovered feedstock is used. It supplements industry wide data with additional information from recycling processing plants and other statewide data sources.

This data is national in scope and cannot be disaggregated into state and local components. It provides a national benchmark, but includes data that is often not available to state and local governments. In contrast to the EPA approach, when states and local governments calculate waste generation, disposal and recycling, they rely mainly on tonnage data obtained from disposal sites and other waste facilities within their states. They may not capture the breadth of materials included in the EPA analysis. Thus, the EPA's approach to measurement of recycling cannot be applied to state and local programs.

CALCULATING THE RECYCLING RATE

In this study, the local and statewide recycling rates are calculated from actual tonnages provided by governmental entities, private waste hauling firms and recycling processors. The array of local communities relying on waste-to-energy is drawn from the author's own database of waste-to-energy facilities, as well as state and local reports, which may list disposal sites used by communities.[5] Appendix 1 describes specific approaches used in each state to obtain and derive disposal and recycling data.

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[3] Certain states in calculating recycling rates give tonnage or percentage credits for waste re-use, waste transformation, or the existence of certain types of recycling programs.

[4] U. S. Environmental Protection Agency, Solid Waste and Emergency Response. *Methodology for MSW Characterization Numbers* http://www.epa.gov/waste/nonhaz/municipal/pubs/06numbers.pdf

[5] Eileen Brettler Berenyi, **Municipal Waste Combustion in the United States: 2012-2013 Yearbook and Directory** (Westport, CT: Governmental Advisory Associates, Inc. 2013). Specific reports for each state are listed in the reference section.

Community Specific Data[6]

This study goes beyond other surveys in that it includes specific disposal and recycling tonnage data for those localities, counties or districts which rely on waste-to-energy for disposal for all or a portion of their municipal waste stream. All municipal waste disposal tonnage is included for each community. Similar to disposal tonnages, actual recycling tonnage is obtained on a community-level basis. Based on disposal and recycling amounts, a recycling rate is calculated for each locality. Further, tonnage is aggregated to calculate a recycling rate for the group of localities or counties using a particular waste-to-energy facility. Where a state has multiple waste-to-energy facilities, disposal and recycling tonnages are aggregated to a state level to determine the recycling rate for those communities using waste-to-energy facilities.

In each case, tonnage data is obtained directly from the state, county, district or locality. State and local recycling reports as well annual financial reports or budgets are used. Key state and local personnel were contacted and interviewed to gain access to unpublished local level data or to secure specific explanations of existing information. Additional sources, including reports and interviews with private recycling firms and data from recycling processing facilities are used [7]. In conjunction with state and local solid waste officials, efforts are made to follow the EPA definition in terms of types of wastes included.

Statewide Data

Statewide data is obtained largely from published annual reports provided by state agencies. In some cases, multiple sources of data are used in order to segregate waste stream categories to be included in calculations. As with the local level data, there is great variation in the coverage of statewide data. In one case, no current state information could be found, and data published in a news report was used. In almost every state, data is aggregated from annual reports submitted by local reporting units. Sources used in each state to arrive at tonnage data are listed in the reference section at the end of the report.

The number of plants, communities and populations included are shown in Table 1. Overall, communities using 80 waste-to-energy plants in 21 states were surveyed. In total, disposal and

WTE Supports High Quality Jobs

The waste-to-energy sector provides significant economic value in the communities in which these facilities operate. In addition to the revenues generated by the sector, waste-to-energy facilities provide stable, long-term, well-paying jobs, while simultaneously pumping dollars into local economies through the purchase of local goods and services and the payment of fees and taxes. In addition to the opportunities to provide baseload renewable electric generation, recover metals for recycling, and reduce greenhouse gas emissions, these facilities significantly contribute to the green economy in the communities in which they operate.

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[6] All data is from the most recent year available, which in most cases is 2012-2013. If 2012 data did not exist, tonnage counts from the most recent year were used.

[7] Eileen Brettler Berenyi, **Materials Recovery and Processing in the United States: 2007-2008 Yearbook and Directory** (Westport, CT: Governmental Advisory Associates, Inc. 20008).

recycling data were obtained from a total of 600 municipal authorities, including 91 counties or solid waste districts and 609 cities, towns and villages. Total population covered by these communities is 51 million people. Total state population is 177 million people. From Table 1, one can see that significant portions of the populations of Connecticut, Hawaii, Maine, Massachusetts, Pennsylvania, Virginia rely on waste-to-energy as a disposal option.

Table 1: Number of WTE Plants with Statewide and Community Populations

State	Number of WTE Plants*	WTE Localities Surveyed	Population WTE Communities in Study	State Population	Percent Population Using WTE
Alabama	1	2	343,080	4,822,023	7.1%
California	3	5	4,939,229	38,051,430	13.0%
Connecticut	6	155	3,353,454	3,590,347	93.4%
Florida	11	11	9,520,992	19,317,568	49.3%
Hawaii	1	1	976,371	1,392,313	70.1%
Indiana	1	2	918,977	6,537,334	14.1%
Maine**	3	180	805,425	1,329,192	60.6%
Maryland	3	4	2,070,786	5,884,563	35.2%
Massachusetts**	7	168	3,765,187	6,646,144	56.7%
Michigan	2	2	2,406,827	9,883,360	24.4%
Minnesota	8	35	3,965,807	5,379,139	73.7%
New Hampshire**	2	42	263,141	1,320,718	19.9%
New Jersey	5	5	2,231,015	8,864,590	25.2%
New York	10	16	4,826,830	19,570,261	24.7%
Oklahoma	1	1	393,987	3,814,820	10.3%
Oregon	1	1	319,985	3,899,353	8.2%
Pennsylvania	6	20	5,407,839	12,763,536	42.4%
Utah	1	1	325,630	2,855,287	11.4%
Virginia	5	6	3,112,504	8,185,867	38.0%
Washington	1	1	475,735	6,897,012	6.9%
Wisconsin	2	42	223,661	5,726,398	3.9%
TOTAL	**80**	**700**	**50,646,462**	**176,731,255**	**28.7%**

*2 RDF Boilers in Minnesota excluded to avoid double counting. Ames IA, which mainly uses coal as a fuel was also excluded.
**Only residential tonnage included in both disposal and recycling tonnage

FINDINGS

Comparison of WTE Communities and States

Recycling rates for communities using waste-to-energy facilities and the statewide rate are shown in Table 2. What is immediately evident is that in most cases the rate at which waste-to-energy communities recycle is nearly identical to the statewide rate. In aggregate, it appears that localities using waste-to-energy do recycle at a higher rate than do populations in their states overall, but by a slight margin. In 16 states, communities which use waste-to-energy recycle at a higher rate than the state as a whole; in five the statewide rate is slightly higher than that found in WTE localities.

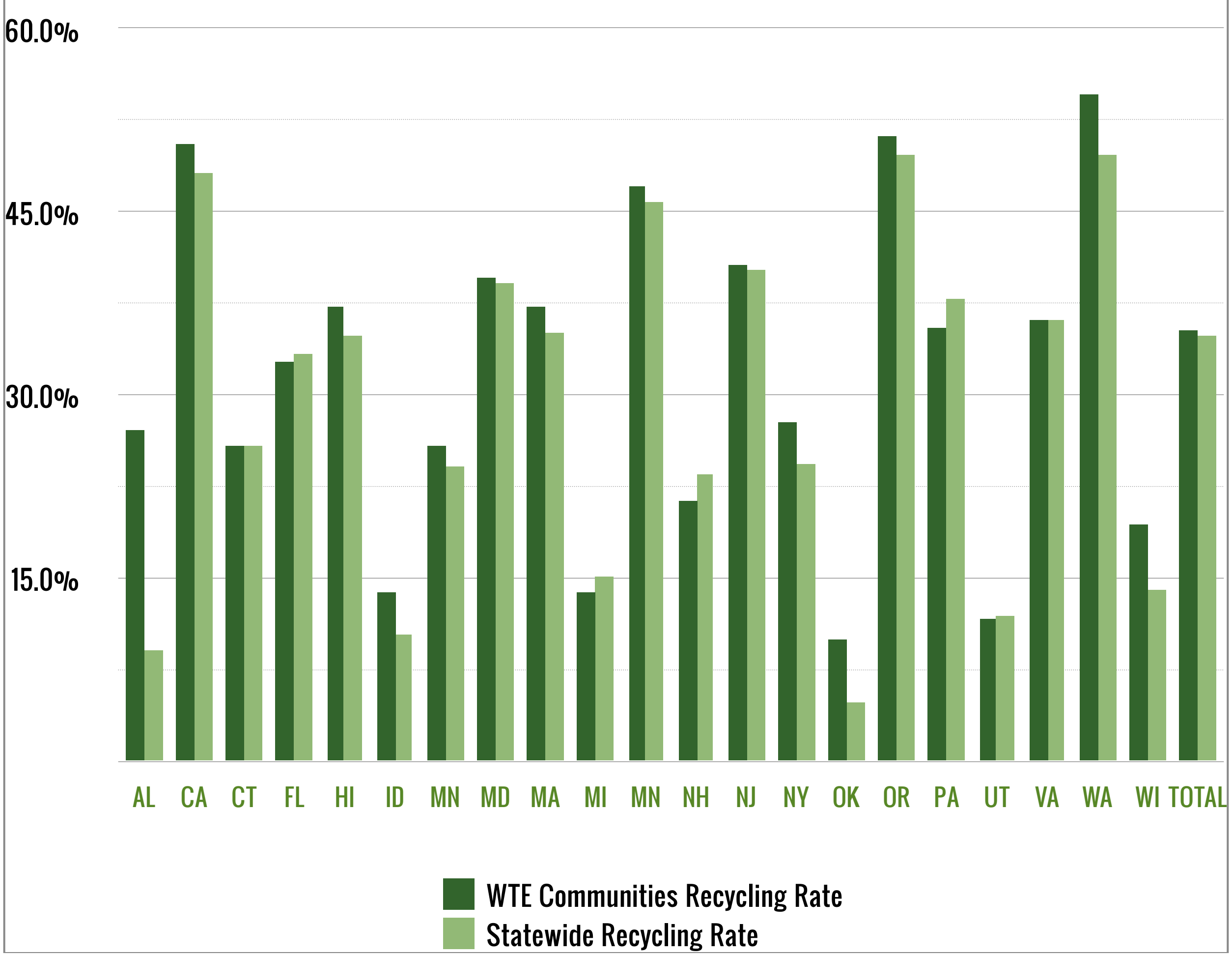
Table 2: Statewide and WTE Communities' Recycling Rates

State	WTE Communities Recycling Rate	Statewide Recycling Rate	Difference WTE vs. Statewide Rate
Alabama	27.2%	9.0%	18.2%
California	50.5%	48.3%	2.3%
Connecticut	25.9%	25.7%	0.2%
Florida	32.7%	33.3%	-0.5%
Hawaii	37.2%	34.8%	2.4%
Indiana	13.8%	10.3%	3.5%
Maine**	25.8%	24.1%	1.7%
Maryland	39.7%	39.2%	0.5%
Massachusetts**	37.3%	35.1%	2.1%
Michigan	13.7%	15.0%	-1.3%
Minnesota	47.2%	45.8%	1.3%
New Hampshire**	21.2%	23.3%	-2.1%
New Jersey	40.7%	40.2%	0.5%
New York	27.6%	24.3%	3.4%
Oklahoma	9.8%	4.6%	5.2%
Oregon	51.2%	49.7%	1.4%
Pennsylvania	35.5%	37.8%	-2.3%
Utah	11.7%	11.9%	-0.2%
Virginia	36.2%	36.2%	0.0%

Washington	54.7%	49.6%	5.1%
Wisconsin**	19.4%	13.9%	5.5%
TOTAL	**35.4%**	**34.9%**	**0.5%**
** Only residential tonnage included in both disposal and recycling tonnage			

The same data is portrayed graphically in Figure 1 below. There is very little difference between statewide recycling behavior and the behavior of communities sending their waste to an energy recovery facility. These communities are like their counterparts across the state, influenced by state policies and regulations, rather than by the specific mode of refuse disposal that they use. Communities in states with high rates of recycling reflect similarly high rates. Oppositely, communities in states with lesser recycling involvement reflect that effort as well.

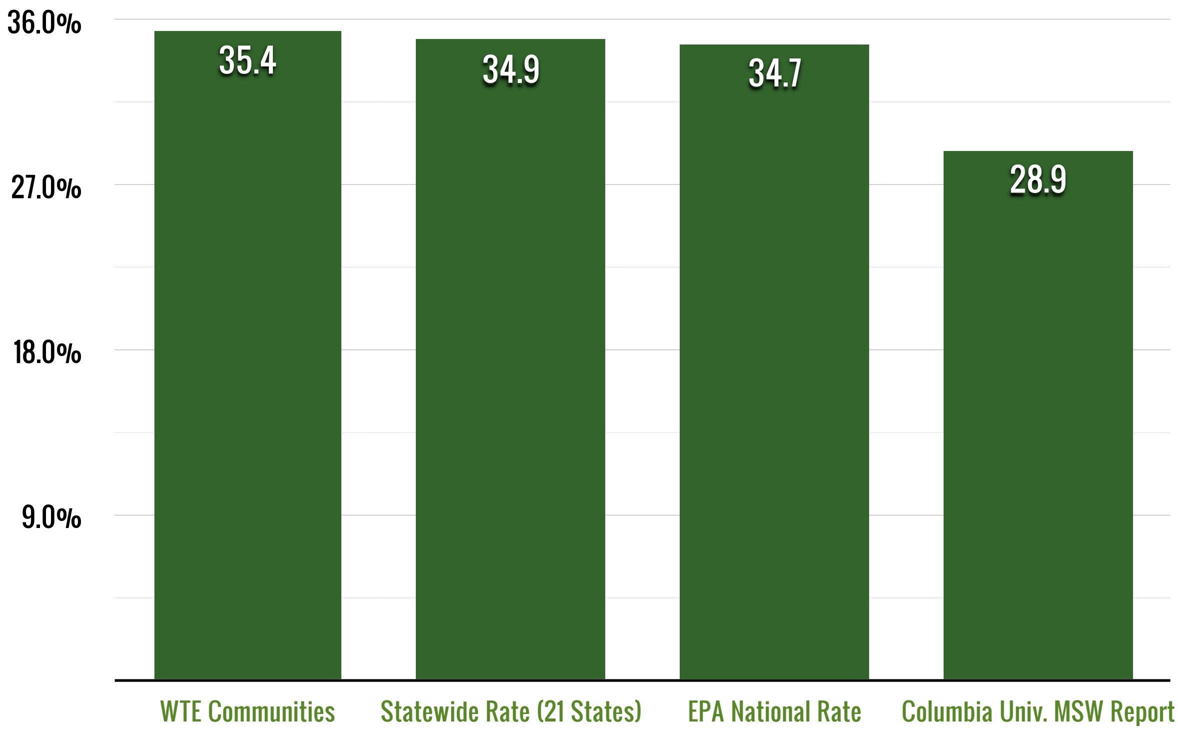
Figure 1: Recycling Rates for WTE Communities and States



Comparison of WTE Communities to National Recycling Rate

Figure 1 graphically compares the recycling percentage of WTE communities to the U. S. EPA's nationwide recycling rate.[8] The closeness of the three rates is quite interesting, especially, since the EPA rate was developed using a different methodology. Again the results show that the means of waste disposal appears to have no influence on the level of recycling. Communities using waste-to-energy look extremely similar to the United States as a whole. Only tenths of a percentage point separate the three rates.

FIGURE 2: BENCHMARK COMPARISONS



CONCLUSION

As shown by the data, waste-to-energy does not have an adverse impact on recycling rates. The most influential factors that affect these rates appear to be state policies and the proactive stance of a municipality. Communities using waste-to-energy have recycling rates that are slightly above the national average and above the aggregate recycling rate of the states in which they operate. Therefore, it can be concluded that recycling and waste-to-energy are compatible waste management strategies. They form part of a successful, integrated waste management approach in many communities across the United States.

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[8] U.S. Environmental Protection Agency, Solid Waste and Emergency Response. **Municipal Solid Waste Generation. Recycling and Disposal in the United State: Facts and Figures for 2011.** May 2013. www.epa.gov/wastes.

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Appendix 1: Methodology and Data Collection by State

Information was collected directly from each state and local government. To the extent possible, data was obtained from published reports or unpublished worksheets, compiled by the state and individual locality. In those instances where data did not exist, secondary sources such as newspaper reports or studies were used. In addition, state and local environmental or public works agency officials were interviewed to obtain their best estimates. Finally, data was abstracted from the databases on waste-to-energy plants and recycling facilities developed and maintained by Governmental Advisory Associates, Inc. (GAA). A discussion of how data was collected and compiled presented below by individual state:

Alabama

Due to the dearth of state level data, state level recycling rates were obtained from newspaper and interviews with environmental officials. Local data was obtained directly from the Huntsville Solid Waste Management District. Additional recycling tons were obtained from GAA's data base on MRFs (Materials Recovery Facilities).

California

California has changed its approach to recycling data, emphasizing a per capita disposal rate, rather than a diversion rate. Thus, while there is excellent data on disposal tons, there is less available data on recycled tons, both on the state and local level. In addition, since the emphasis is on overall waste diversion, the state does not make a distinction between MSW and inerts, or C&D waste. Thus, to make data comparable to other states, C&D tonnage had to be estimated both for the disposed and the recycled stream and removed. State level data was obtained from published state reports. Local data was obtained from state databases (disposal tons) and local reports and studies (recycled tons).

Connecticut

Data was obtained from state level reports on disposal and recycling by town. Towns were then grouped by the Waste-to-energy facility to which they send their waste and tonnages aggregated. Statewide data was for FY 2011. Town data was for 2010. For the statewide data, the assumption was made that 30,391 tons of recycled metals from combustion as was included in the recycling totals. As GAA Inc. pre and post combustion metals recycling numbers were higher, the difference between the two metals totals was taken and reflected in the statewide totals.

Florida

The state Department of Environmental Protection collects and publishes state and county data on disposal and recycling. However data includes C&D tonnage and recycling tons include credits for waste-to-energy and other processed fuel. Furthermore, the Florida waste-to-energy tonnage does not include ash, which is included in landfill numbers. Thus, to make data comparable, C&D tonnage and recycling credits were deducted from total recycled tons and ash tons were deducted from waste combustion tons. In the instance of Broward County and Hillsborough County, which each have two waste-to-energy facilities, it was not possible to disaggregate the data by plant. Thus, only the county-wide data is shown and assumed to encompass both plants.

Hawaii

State level data in Hawaii includes both C&D in its disposed and recycled tonnage. Both for Honolulu and the state, auto scrap is included in recycled tons. C&D tonnage was deducted from state totals using the proportions given in Honolulu data, which does breaks out C&D metal tons separately. Auto scrap tons were removed from the ferrous metal totals both in the state and local numbers. These were reduced by applying the percentage of auto scrap in the ferrous metal stream obtained from New Jersey data, which breaks out these categories in its state and local data. The assumption was made that auto scrap as a percentage of total ferrous metals would not vary from state to state.

Indiana

The state collects data on disposal tons and the source of disposed waste at each disposal site. In addition, each Solid Waste Management District is supposed to submit a SB 131 form to the state, which details disposed and recycled tons. To obtain statewide recycling data each SB131 form was examined. Out of the 53 solid waste districts, 29 had submitted SB131 reports. For the 24 districts without information, a per capita recycling ton average was derived based on the 29 districts with data and applied. Recycling tons were then totaled. In addition, certain adjustments were made to the recycling tonnage. It was surmised that the SB131 reports did not extend to commercial recycling and those tons were added. For Indianapolis data, data included in the 2012 Sustainability Report as well as the GAA database of MRFs were used. To avoid double counting, SB131 data was not used for Marion or Allen Counties, since it was assumed recycled tonnage would be included in MRF data.

Maine

Maine collects data on residential recycling and disposal by town. The disposal site or Waste-to-energy site to which each town sends its waste had to be determined. Then, both disposal and recycling tons were aggregated by site. While ecomaine has detailed recycling data both from the residential and commercial sector, this is not the case for the state as a whole or for most other localities. Thus, to be consistent, only residential tons are included.

Maryland

Statewide data on tons disposed and recycled were obtained from Maryland Department of Environment's **Solid Waste Management and Diversion Report**. For the City and County of Baltimore recycling tons were adjusted to include commercial fiber recycling done at processing plants within the city and county. These tons were obtained from the GAA database. For Montgomery and Harford counties, tonnages were obtained directly from county annual reports and memoranda.

Massachusetts

Data on recycling and disposal is available by individual locality, but do not include commercial recycling. The disposal site of each town had to be determined and the relevant tonnage allocated to these specific disposal sites. Only residential tonnage was calculated.

Michigan

Michigan collects disposal data by localities. Thus it is possible to obtain total tons disposed statewide as well as by county. The state and localities do not collect recycling data. For both the state and localities, these tons had to be estimated. Statewide tons from MRFs located in Michigan were totaled, using the GAA database. Statewide bottle bill tons were obtained from a consultant's report. Composting tons were provided in an email from a staff member of the state of Michigan's Department of Environmental Quality. For county data, tons from MRFs located in Kent and Wayne County were obtained from the GAA database. Bottle bill and green waste tons were obtained by allocating the statewide reported tonnage by population.

Minnesota

Data came from state reports on disposal and recycling, which is reported by county. Recycling totals were adjusted downward, taking out auto batteries, household hazardous wastes, and other problematic materials to make numbers comparable to other states. Allocation of counties to particular waste-to-energy facilities was done based on state reports and GAA's database of waste-to-energy facilities.

New Hampshire

Raw 2011 waste data by town and waste type were obtained from the New Hampshire Department of Environmental Services. Similarly, recycling tons by material type by town were obtained from NHDES. Only residential tons were used, since for some towns in which landfills or other facilities were located, all commercial tons using the facility were allocated to the single town. Attempts were made to obtain curbside recycling tons. They are included for some towns including Concord and Keene. For other towns, they are probably not included, since neither the state nor individual towns may be tracking that data. This is true particularly if private haulers are picking up curbside materials. If 2011 data was unavailable for a particular city or town, data from NHDES' 2008 Report to the Legislature was used. This report included individual town solid waste and recycling data. For an individual town's Waste-to-energy tons, Wheelabrator's "2010 Annual Report for Claremont" and the Concord Regional Solid Waste Cooperative's "Delivered tons by locality" were used. Attempts were made to include only residential tons to correspond with the data used from the 2011 State Reports.

New Jersey

Recycling and disposal tons came from State of New Jersey, Department of Environmental Protection report "Generation, Disposal and Recycling Rates in New Jersey". Waste-to-energy tons came from GAA database.

New York

Statewide and individual locality data came from spreadsheets developed by New York State Department of Environmental Conservation. NYS conducted a separate waste flow study for Hempstead. Data for Hempstead comes from that report. Catchment areas of WTE facilities come from GAA's waste-to-energy database and New York State Facility Reports.

Oklahoma

There is little statewide data on recycling tonnage. Thus, tons were obtained from three sources: 1) statewide survey of MRFs conducted by Michael Patton, Executive Director, M.E.T. Tulsa OK; 2) GAA's MRF Directory; 3) Interviews with MRF operators. While this approach covered tons processed through MRFs, it excluded recycling tons collected and sent directly to end markets, tons being separated at transfer stations, and organics. These additional tons were estimated based on interviews with local officials.

Oregon

The state report gives both statewide and county data. These were adjusted to pull out recycling credits and C&D type materials.

Pennsylvania

The state provides county recycling data by material. In addition, it provides disposal tonnage by county by disposal site. Various materials categories, including mixed metals (which vary by extreme), asphalt, household hazardous waste, C&D, and auto parts were excluded from totals. In addition, certain metals categories for counties were adjusted downward, using statewide averages, in instances where the specific metals category was more than 50% of all tonnage recycled by the county.

Utah

State level data was obtained by totaling data from individual reports on landfills, recycling facilities, transfer stations, and compost facilities. Wasatch Data comes from their 2013 Integrated Solid Waste Management plan.

Virginia

State data comes from Department of Environmental Quality Recycling Rate Report. Locality specific data was provided in an email from staff member of the Department of Environmental Quality. WTE tonnage comes from GAA database.

Washington

State data comes from published report of Department of Ecology. Data from Spokane comes from unpublished spreadsheet provided by recycling coordinator, City of Spokane.

Wisconsin

State level data on disposal and recycling comes from Department of Natural Resources report, which totals tons by RUs (Responsible Units). Data on localities comes from spread sheets prepared by a staff member of Department of Natural Resources which disaggregated data on an individual RU basis. Data from Houston County in Minnesota are included in the Wisconsin tonnage, since this county sends its waste to the LaCrosse County WTE facility in Wisconsin.