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

2009 Update

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EXECUTIVE SUMMARY

The purpose of this study is to answer the question of whether recycling and waste-to-energy are compatible waste management strategies. Critics of waste-to-energy have argued the presence of a waste combustion facility in an area inhibits recycling and is an obstacle to communities' efforts to implement active recycling programs. As this study will show, this contention has no basis in fact. In an examination of recycling rates of more than 500 communities in twenty-two states, which rely on waste-to-energy for their waste disposal, it is demonstrated that these communities recycle at a rate higher than the national average. Many of these areas have recycling rates at least three to five percentage points above the national average and in some cases are leading the country in recycling. The study concludes that recycling and waste-to-energy are compatible waste management strategies, which are part of an integrated waste management approach in many communities across the United States.

Key Findings:

- The study covers 82 waste-to-energy facilities in 22 states. Recycling data was obtained from 567 local governments, including 495 cities, towns and villages and 72 counties, authorities or districts. In addition, statewide data was obtained for each of the 22 states.

- Communities nationwide using waste-to-energy have an aggregate recycling rate **at least 5 percentage points** above the national average.

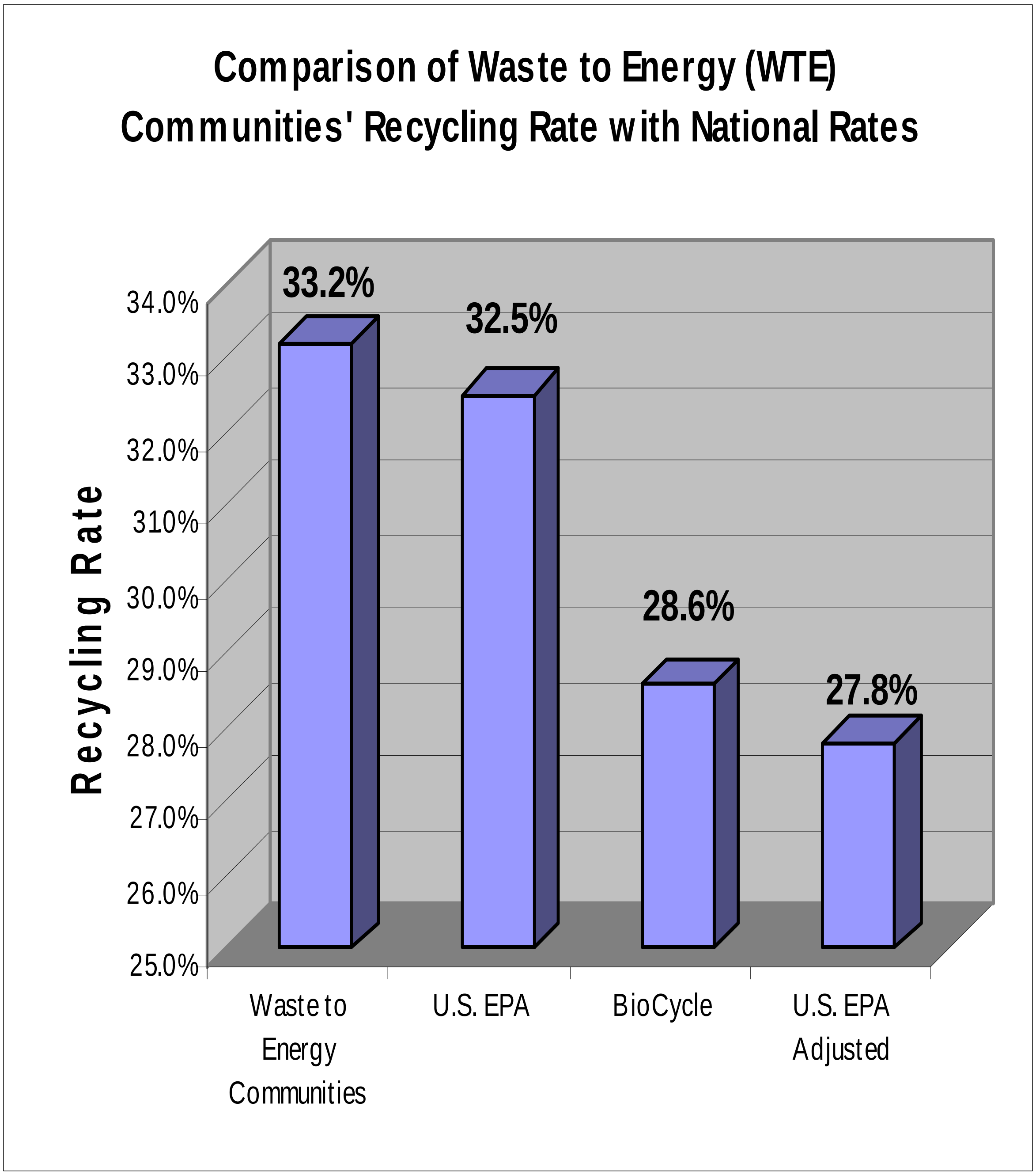
- Communities using waste-to-energy for disposal are recycling at about 33.3%, which is higher than the national rate, no matter how the national rate is calculated as shown in Figure ES-1.

- The unadjusted U.S. EPA computed national recycling rate is computed using a waste stream model and includes certain commercial/industrial components and yard waste. These materials are often excluded in individual state and local recycling tonnages. Therefore Figure ES-1also includes an adjusted EPA rate, which excludes these tonnages, adjusting the rate downwards. Table ES-1 shows aggregated state specific recycling rates of waste-to-energy communities.

- Almost 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 are compatible.

- 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, appear to be a key determinant of local recycling behaviors and rates.

FIGURE ES–1



Comparison of Waste to Energy (WTE)
Communities' Recycling Rate with National Rates
Recycling Rate
34.0%
33.0%
32.0%
310%
30.0%
29.0%
28.0%
27.0%
26.0%
25.0%
33.2%
32.5%
28.6%
27.8%
Waste to Energy Communities
U.S. EPA
BioCycle
U.S. EPA Adjusted

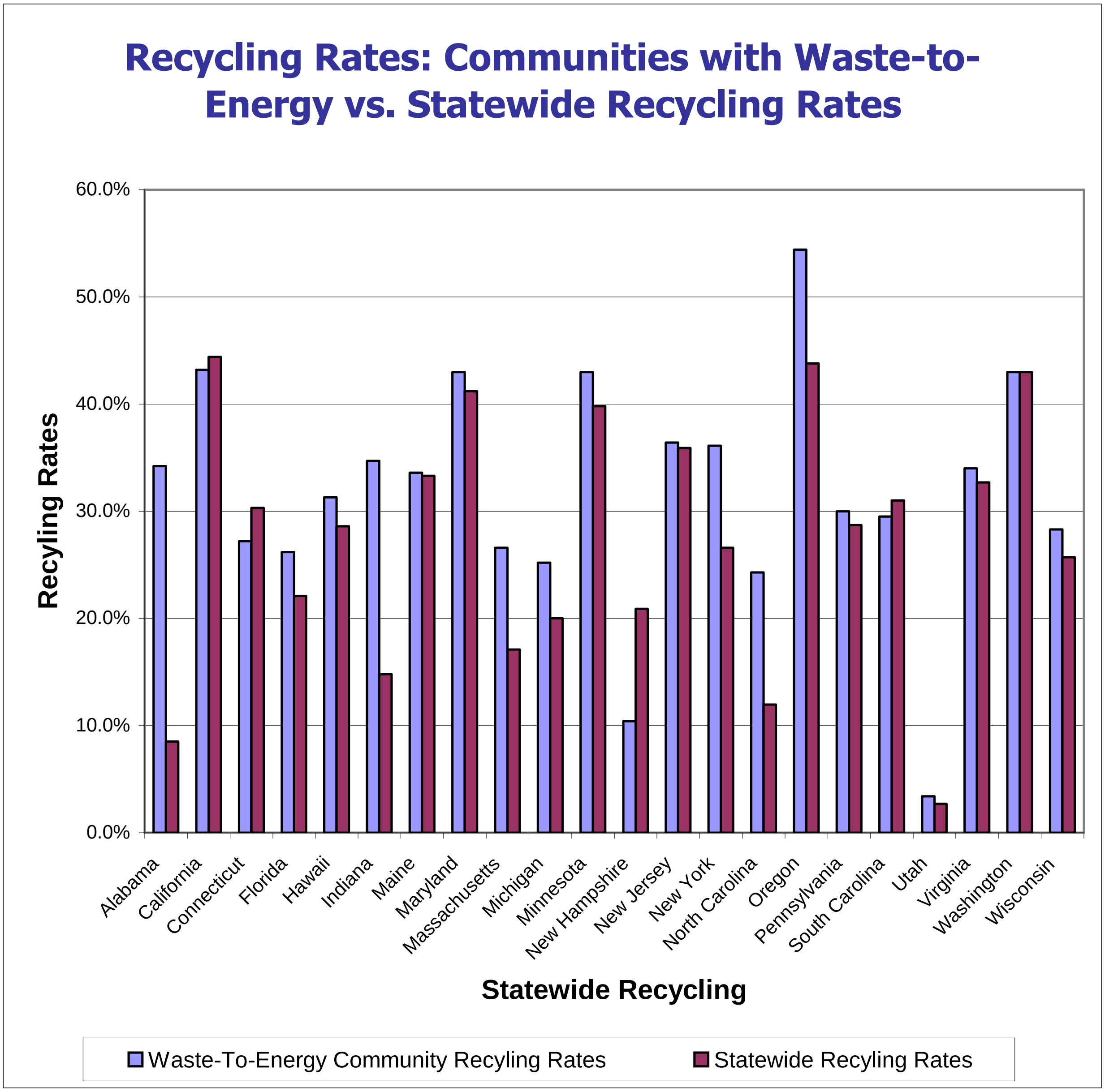
TABLE ES–1

Recycling Rates in Communities Using Waste-to-Energy Facilities by State

State	Recycling Rate*	Number of Plants**
Alabama	34.2%	1
California	44.6%	3
Connecticut	27.2%	6
Florida	26.2%	11
Hawaii	31.3%	1
Indiana	34.7%	1
Maine	26.6%	4
Maryland	43.0%	3
Massachusetts	33.6%	7
Michigan	25.2%	1
Minnesota	43.1%	9
New Hampshire	10.4%	2
New Jersey	35.4%	5
New York	36.1%	10
North Carolina	24.3%	1
Oregon	54.4%	1
Pennsylvania	30.0%	6
South Carolina	29.5%	1
Utah	3.4%	1
Virginia	34.2%	5
Washington	43.0%	1
Wisconsin***	30.8%	2
TOTAL	**33.2%**	**82**

* New Hampshire, New York, North Carolina, Utah and Wisconsin have no commercial tonnages included due to lack of local data. In other States, commercial data is uneven. ** 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.

FIGURE ES–2



Recycling Rates: Communities with Waste-to-Energy vs. Statewide Recycling Rates
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Recyling Rates
Alabama
California
Connecticut
Florida
Hawaii
Indiana
Maine
Maryland
Massachusetts
Michigan
Minnesota
New Hampshire
New Jersey
New York
North Carolina
Oregon
Pennsylvania
South Carolina
Utah
Virginia
Washington
Wisconsin
Statewide Recycling
Waste-To-Energy Community Recyling Rates
Statewide Recyling Rates

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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 25 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.

However, despite the exponential growth of residential and commercial recycling programs over the last decade in all areas of the country, critics of waste-to-energy have argued that a waste-to-energy plant in a given region thwarts or inhibits recycling efforts, since waste is needed to "feed" the plant. These critics argue that, due to the need for waste, there is little incentive for localities using these plants to invest in recycling, thereby diverting waste away from the WTE plant

This study examines the relationship between recycling and the use of waste-to-energy by a local government. If the critics are correct, then communities using waste-to-energy facilities should have lower recycling rates than those that do not and should perform below national averages with respect to recycling. To address this question, the study surveyed communities relying on waste-to-energy plants for disposal and also obtained statewide and national recycling data.

STUDY APPROACH AND METHODOLOGY

The purpose of the study is to determine whether there is a relationship between levels of recycling and reliance on waste-to-energy for disposal. In order to answer this question, one first has to select a measure of recycling and then, using this measure, compare specific communities using waste-to-energy to regional or state and national levels of recycling.

Thus, the study had three main steps:

1) Determine an appropriate measure of recycling to be applied on the state and local level;
2) Delineate communities using waste-to-energy and determine their level of recycling; and
3) Obtain statewide and national recycling levels for purposes of comparison.

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

What is a Recycling Rate?

This study uses the recycling rate as a measure of the level of recycling in a community. There are various definitions of a recycling or recovery rate[2].

As used in this paper, the recycling rate encompasses only those materials found in municipal solid waste stream. It is defined as the percentage of tonnage recycled of the total tonnage of materials generated in the municipal waste stream. Because a measure of waste generation is often difficult to obtain, this study uses the sum of the tonnage disposed plus tonnage recycled or recovered as the "tons generated."

The recycling rate is calculated by totaling the tons of materials recycled across individual communities and dividing this total by the sum of tons of materials recycled plus tons disposed by these communities, i.e., recycling rate = tons recycled/ (tons disposed + tons recycled). The rates used in this paper are based on tonnages of materials that are actually recycled or disposed and do not as include credits for material reuse or reduction.[3]

There are two national recycling rates that are often used for purposes of comparison. They are the U.S. Environmental Protection Agency (EPA) rate and a rate that is periodically calculated by *BioCycle Magazine*, based on a nationwide survey of states.

The EPA Recovery (Recycling) Rate[4]

The EPA national rate is derived using a materials flow model and does not solely rely on direct tonnage measurements. It includes waste and recyclables from residential, commercial and institutional sources. Thus, for example, fiber generated and recovered from print companies or direct mail companies as well as corrugated cardboard recovered at the source and sent directly to fiber mills for reuse in the manufacturing process is captured in the EPA rate. Furthermore, the EPA rate includes metals found in appliances, furniture, tires, batteries as well as wood waste recycled from various sources. Finally, the EPA rate includes yard waste, food and other organics. Explicitly excluded from EPA calculations are construction and demolition (C&D) waste recovery and disposal. To the extent possible, this study follows the EPA definition of waste categories to be included in the calculation of a recycling rate.

However, because EPA is focused on deriving a national recycling rate from a materials flow perspective, it is able to derive total tonnages by calculating the production quantities of various materials found in the municipal waste stream and the amounts of these materials that are recovered. Dividing materials into durable and non-durable goods, EPA obtains much of its data from surveys of national manufacturing and trade associations specializing in particular materials, both in terms of production and recovery statistics.

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[2] The two main national rates cited are those of the U.S. Environmental Protection Agency and one calculated by *BioCycle* Magazine. Individual states use variations of the site-specific method.

[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/epaoswer/non-hw/muncpl/msw99.htm

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. Many local governments do not track commercial or industrial recycling. Even if they do attempt to extract tonnage data from commercial enterprises, data collection may be incomplete or sporadic. In particular, business-to-business recycling is difficult for governmental agencies to measure. For example, corrugated cardboard may be separated at various retail or wholesale locations, picked up by a private hauler and sent directly to a port for export or to a mill, circumventing any processing facilities. Often the local jurisdiction will have no record of this type of recycling, despite the large amount of tonnage, such recycling involves.

In contrast to the EPA approach, when states and local governments calculate their data on waste generation, disposal and recycling, they rely 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. According to the EPA data, the commercial sector has shown very high rates of recycling, particularly with respect to corrugated cardboard. However, state and local government reporting systems may not capture these recycling efforts. Thus, recycling tonnages may be underreported. In addition, many states do not separate wood wastes and bulky wastes from their construction and demolition waste category. While these recoverable waste streams are included in the national EPA recovery rate, they are not broken out on a state and local level. Finally, many states and localities are not yet tracking yard waste composting tonnage. Again, such tonnage may be missing from specific rates calculated within this report, further depressing the recycling rates given the high tonnages and rate of recovery of organics reported on a national basis.

Thus, the EPA approach to measurement of recycling cannot be applied to state and local programs. Rather, in order to obtain data on recycling, one must rely on site-specific tonnage data.

Adjusted EPA Recycling Rate

For the purposes of comparison, an attempt is made to adjust the EPA rate in order that it more closely matches the recycling data that is collected by state and local solid waste agencies. Two adjustments to the rate are made. First, the recovered tonnage represented by non-retail corrugated cardboard, included in the EPA rate, is reduced. Second the recovered tonnage of durable metals, found in commercial/industrial streams is reduced. The remaining tonnages are totaled and divided by EPA's calculated waste generation number and an adjusted recovery rate is derived. Using this approach, the adjusted EPA rate is 27.8%.

More specifically, according to the EPA data, approximately 44 million tons out of the 81.8 million tons recovered in 2006 or 54% is made up of paper and paperboard.[5] Of that 44 million tons of fiber products, about 23 million tons are corrugated boxes.[6] A good portion of these corrugated boxes go back to manufacturers or fiber mills in a closed loop process, bypassing any state of local record keeping. According to the American Forest and Paper Association, which assists the U.S. EPA in the compilation of these paper and paperboard statistics, about

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[5] U.S. Environmental Protection Agency. "MSW Generation, Recycling, and Disposal in the U.S.: Facts and Figures. http://www.epa.gov/osw/nonhaz/municipal/pubs/msw06.pdf., p.6

[6] U.S. Environmental Protection Agency: "Municipal Waste Characterization-2006 Report: 2006 Data Tables. http://www.epa.gov/osw/nonhaz/municipal/pubs/06data.pdf. Table 4.

75% of the corrugated cardboard produced in the United States is directly recycled at the mill, factory, wholesale level or retail level.[7] Thus, only 25% of the recycled corrugated would be managed through the municipal waste stream. Using the more conservative estimate that 50% of the corrugated cardboard tonnage reported by EPA is recovered as part of the municipal waste system, EPA recovered tonnage totals are reduced accordingly and 11.3 million tons are subtracted from the total amount recovered. In addition, 10% of the tons of ferrous and non-ferrous metals found in durable goods are also subtracted from the EPA recovered totals, since it is conservatively estimated that this percentage represents waste that is recovered from industrial or commercial sources and normally outside the municipal waste stream. In making these two modifications, the EPA categories more closely match those that are reported by state and local governments. The new adjusted rate provides a benchmark, which more closely tracks the waste under state and local record keeping management.

The BioCycle Recycling Rate[8]

A second national recycling rate that is periodically published is the rate compiled by *BioCycle* Magazine**.** Calculations are based on specific state level data. *BioCycle's* rate is developed from responses to surveys sent to state level officials, in which aggregated statewide data is obtained The national rate is calculated by summing the waste generation and recycling tonnage, respectively, for all states. *BioCycle* also focuses only on the municipal waste stream, excluding C&D waste. However, in contrast to the EPA analysis, the *BioCycle* survey does not rely on production data, but uses state level waste stream and recycling data.

This study follows the *BioCycle* approach and uses actual state and local waste disposal and recycling tonnage. The specifics of the methodology are discussed below.

CALCULATING THE RECYCLING RATE

In this study, the local and statewide recycling rates are derived 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.[9]

Community Specific Data[10]

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 tonnages 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. In the case, where a state has

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[7] Interview, Stan Lancey, Chief Economist, American Forest and Paper Association, September 2008.

[8] Ljupka Arsova, Rob van Haaren, Nora Goldstein, Scott M. Kaufman, Nickolas J. Themelis. "The State of Garbage in America". *BioCycl*e, December 2008, vol. 49, no.12, p.22.

[9] Eileen Brettler Berenyi, Municipal Waste Combustion in the United States: 2005-2006 Yearbook and Directory (Westport, CT: Governmental Advisory Associates, Inc. 2006). Two facilities in temporary closure at time of study are not included. Specific reports for each state are listed in the reference section.

[10] All data is from 2006 as this is the last year for which the *BioCycle* data is available. If 2006 data did not exist, tonnages from the most recent year were used.

multiple waste-to-energy facilities, disposal and recycling tonnages are aggregated to a state level.

In each case, tonnage 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. In conjunction with state and local solid waste officials, efforts are made to follow the EPA definition in terms of types of wastes included. Finally, using interviews, published reports, or web sites, the study notes the types of recycling programs in each area, i.e. curbside collection of recyclables, yard waste collection, or recycling center access.

Statewide Data

Statewide data is obtained largely from published annual reports provided by state agencies. Attention is paid to ensure that similar waste stream definitions are used across all states. 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 the published *BioCycle* data was used. In almost every state, data is aggregated from annual reports submitted by local reporting units.

FINDINGS

Overall, communities using 82 waste-to-energy plants in 22 states were surveyed. In total, disposal and recycling data were obtained from a total of 567 municipal authorities, including 72 counties or solid waste districts and 495 cities, towns and villages. Total population covered by the study was 41.5 million people. Two facilities in Michigan and a facility in Iowa are excluded from the study due to insufficient data.

Table 1 breaks down number of plants, number of local governments serviced by these plants and populations included in the study by state. Efforts were made to include all communities using a plant, but in certain cases communities were excluded due to insufficient data. As can be seen, Florida, New York, Pennsylvania and Connecticut are states that have made a significant commitment to waste-to-energy as a disposal alternative. However, even in areas where there is a waste-to-energy facility, landfills are relied upon to handle excess waste or as a back-up disposal option. Thus in very few instances do localities represented rely entirely on waste-to-energy for disposal.

TABLE 1 Number of Facilities, Local Government and Population Included in Study			
State	**Number of WTE Plants Included***	**Included Localities with WTE facility**	**Population of localities included in survey**
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
TOTAL	**82**	**567**	**41,473,625**

***** 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.

Comparison of WTE Community Recycling Rates to National Recycling Rates

For WTE communities, recycling rates and the tonnage upon which they are based are aggregated to state level as shown in Table 2. The overall recycling rate for waste-to-energy communities shown at the bottom of the table is 33.2%. However, it must be reiterated that depending on the state or locality, tonnages shown on Table 2 may not include any commercial recycling or yard waste composting. Based on national averages, both of these types of recycling constitute large quantities with high rates of recovery and would certainly add to overall recycling rates. With these amounts included in all local and state calculations, overall recycling rates in the communities shown might rise as much as five to seven percentage points.

TABLE 2
Recycling Rates in Communities Using Waste-to-Energy Facilities

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
TOTAL	**33.2%**	**18,200,927**	**36,611,984**	**82**

* New Hampshire, New York, North Carolina, Utah and Wisconsin have no commercial tonnages included due to lack of local data. In other states, commercial data is uneven. ** Three plants are excluded due to unavailability of recycling data. If the RDF and waste combustion facility are separate, only RDF plant included. *** Data from two Minnesota counties sending waste to waste-to-energy plant included in Wisconsin data.

FIGURE 1

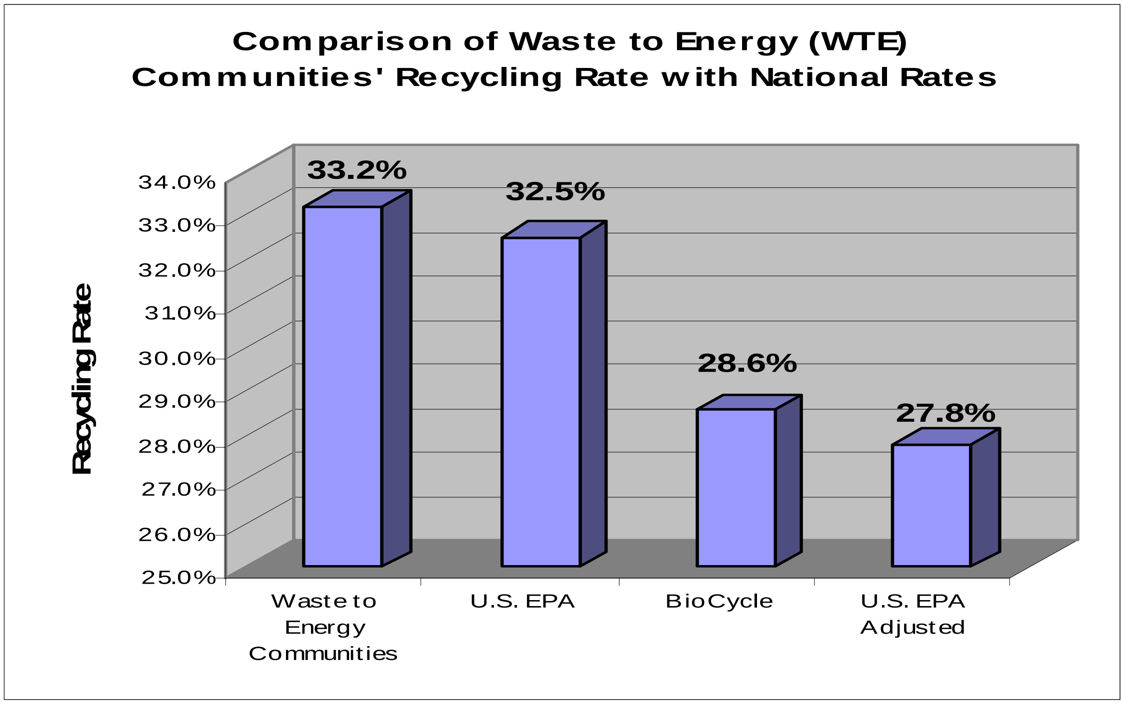


Figure 1 graphically compares the recycling percentage of WTE communities to the U. S. EPA's unadjusted and adjusted nationwide recycling rate as well as to the *BioCycle's measure*. One observes that the WTE communities' recycling rate exceeds both the EPA and *BioCycle* national percentages, which are 32.5% and 28.6% respectively. While the unadjusted EPA rate is provided for comparison purposes, the adjusted EPA rate, also shown on the figure, more closely reflects the municipal waste stream. Interestingly, at 27.8%, it closely corresponds to the rate reported by *BioCycle*, using state based tonnage. However the *BioCycle* rate remains the more appropriate measure, since it is obtained using a similar methodology to that employed in this study.

Waste-to-energy communities have a recycling rate which exceeds the EPA rate despite the fact that the rate shown for these communities does not include significant commercial recycling tonnages. **Downwardly adjusting the EPA rate to account for commercial/industrial tonnage, one observes that WTE communities have an average rate that is 5.4 percentage points greater than the EPA rate.** Similarly, waste-to-energy communities have an aggregated recycling rate nearly five percentage points above the national average reported by *BioCycle*. On an aggregate basis communities relying on waste-to-energy are recycling at higher rates than the national averages, no matter how these averages are calculated. In addition, on a state-by-state basis many individual communities are recycling at rates well above the national averages.

Impact of Waste-to-Energy on Statewide Recycling Rates

In order to further examine the question of how the existence of a waste-to-energy plant in a given region may impact levels of recycling, a statewide recycling rate for all communities in the state was calculated for those states in which the waste-to-energy facilities are located. If waste-to-energy does depress recycling rates, than one would expect that states which have a high reliance on waste-to-energy would have lower recycling rates than those states which have lower percentages of their MSW disposed by communities using waste-to-energy plants.

Table 3 shows the percentage of statewide MSW disposed by the waste-to-energy communities within the state as well as the statewide recycling rate for all communities across the state. States are listed in order of their statewide recycling rate with the states having the highest recycling rates at the top, and those with the lowest at the bottom. If reliance on waste-to-energy has an impact on recycling rates, than the states near the top of the list, which have the highest recycling rates, should have the lowest percentage of the waste going to waste-to-energy facilities, while those states towards the bottom of the list with lower recycling rates, should have a higher percentage of their waste disposed by communities using waste-to-energy. A quick perusal of the table shows that this is not the case. Both Maryland and Minnesota have over 40% of their MSW disposed by communities relying on waste-to-energy, but also have among the highest recycling rates of the 22 states. Similarly, states with minimal reliance on waste-to-energy have low recycling rates.

TABLE 3
Ranking of Statewide Recycling Rates with Percentage of Statewide MSW Represented by Waste-to-Energy Communities

State	% State MSW Disposal Disposed by WTE Communities in Study*	Statewide Recycling Rate for All Communities
California	4.5%	44.4%
Oregon	14.8%	43.8%
Washington	6.5%	43.0%
Maryland	47.8%	41.2%
Minnesota	54.2%	39.8%
New Jersey	23.7%	35.9%
Indiana	3.9%	35.0%
Massachusetts	52.9%	33.3%
Virginia	35.8%	32.7%
South Carolina	9.1%	31.0%
Connecticut	85.0%	30.3%
Pennsylvania	43.3%	28.7%
New York	31.9%	26.6%

Wisconsin	1.6%	25.7%
Hawaii	72.9%	23.4%
Florida	36.0%	22.1%
New Hampshire	24.7%	20.9%
Michigan	6.1%	20.0%
Maine	38.4%	17.1%
Utah	11.3%	14.2%
North Carolina	1.0%	12.0%
Alabama	2.0%	8.5%

*Includes all MSW disposed by selected communities.

FIGURE 2
Impact of Waste-to-Energy on Statewide Recycling Rates

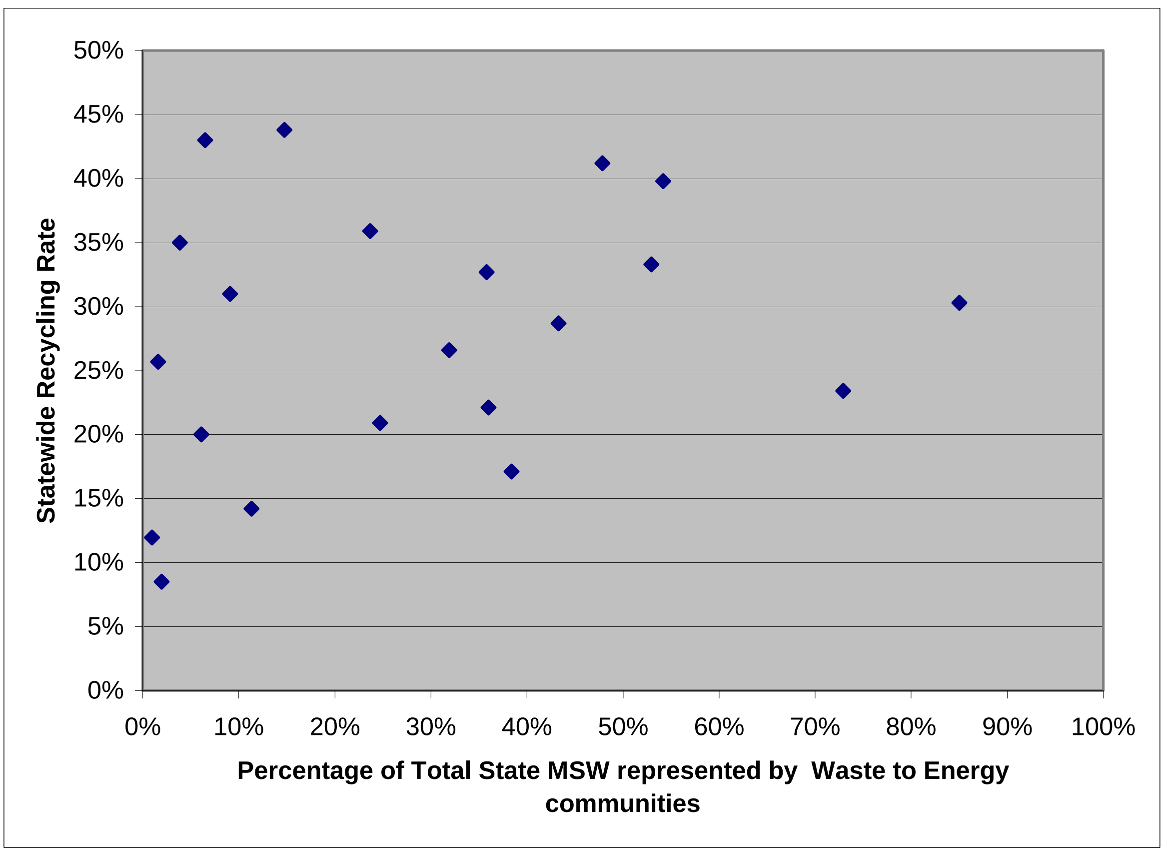


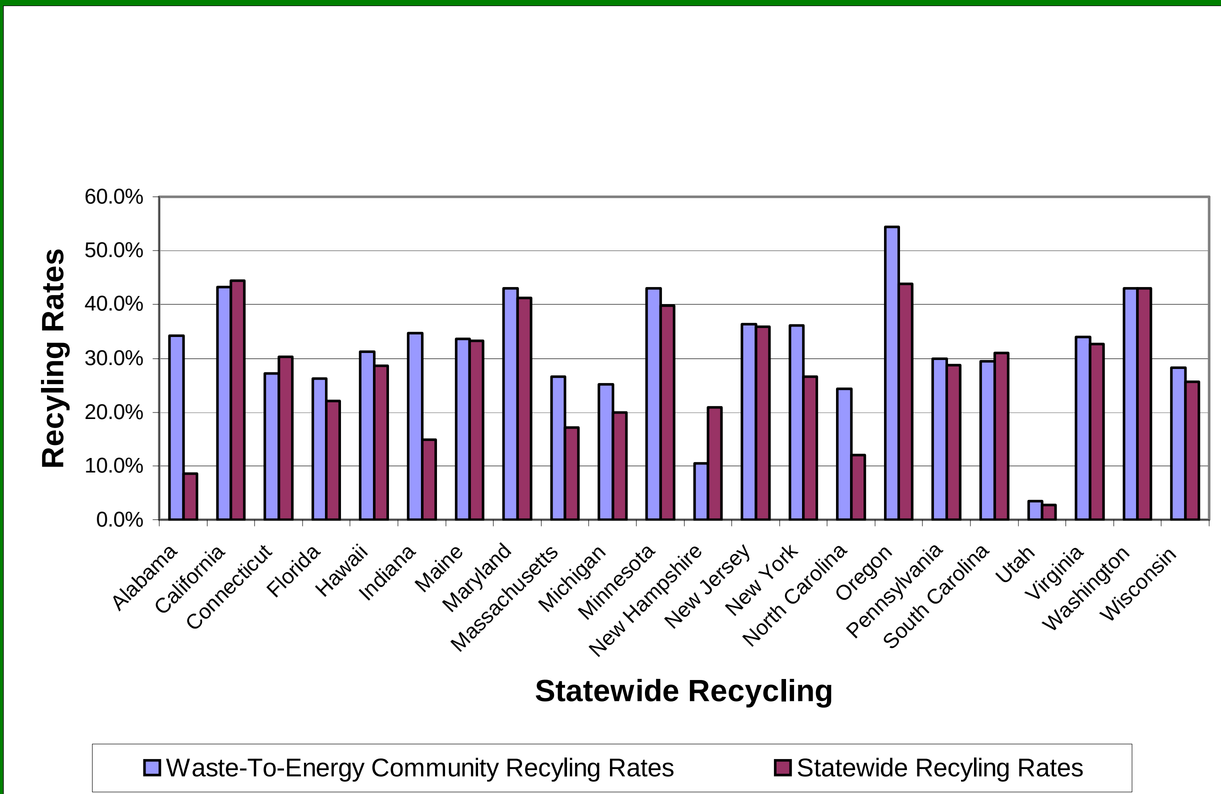
Figure 2 graphs the same data that is shown in tabular form. The percentages along the bottom of the table depict the percentages of state MSW handled by waste-to-energy communities within the state. The vertical percentages are the statewide recycling rates. Each point is the state recycling rate and the percentage of statewide MSW represented by waste-to-energy communities in the state. If critics of waste-to-energy are correct, than states with high recycling rates should be found in the upper left of the graph, which represent states that rely on little or no WTE for disposal, while states with low recycling rates should be found in the lower right portion of the graph, which represents states that dispose of a high percentage of their waste through WTE. The data should be falling along a line sloping downward from the upper left to the lower right of the figure. The information simply does not bear out this conclusion. As one moves horizontally across the graph, there are various recycling rates represented in each category, with little discernible pattern. Reliance on waste-to-energy appears to have no impact on statewide recycling behavior. In fact, some of the states with the lowest level of recycling also have only a small portion of their waste going to WTE facilities.

Comparison of State Recycling Rates to Recycling rates of WTE Communities

While reliance on waste-to-energy has no impact on the level of recycling within a state, are there any patterns in recycling behavior which do emerge among communities which rely on waste-to-energy? One method by which to address the question is to compare recycling rates of communities using waste-to-energy in a particular state with the aggregate statewide recycling rate of communities across the state. Again if critics are correct, than recycling rates for communities relying on waste-to-energy within a state should be below the statewide rate, which represents the aggregate of all communities within the state. Figure 3 graphs this comparison. This figure points to the conclusion that with few exceptions, recycling rates in waste-to-energy communities are similar to the statewide rate.

It appears that the implementation of statewide recycling policies is closely associated with local recycling levels, whether or not these communities are sending their waste to a waste-to-energy facility or to a landfill or transfer station. Waste to energy is one component of an integrated waste management strategy. Statewide recycling mandates, grant and loan programs, landfill diversion regulations appear to influence all communities, no matter what mode of waste disposal is used.

FIGURE 3
Recycling Rates: Communities with Waste-to-Energy vs. Statewide Recycling Rates



Curbside Collection and Processing Facilities in WTE Communities

With the exception of certain small communities included in this study, all localities have access to recycling programs. Some of these programs may be voluntary, provided by public sector, non–profit agencies, or the private sector by subscription. Even if curbside collection is voluntary or unavailable, the local government provides drop off locations for residents and businesses. Other communities in the sample have been leaders in recycling and have been early adopters of curbside collection and most recently, single stream recycling. These efforts have been undertaken in conjunction with state policies, which have mandated landfill diversion rates, implemented landfill bans on certain materials, and provided recycling incentive programs through grants, loans and technical assistance.

Finally, the extent to which recycling is an integrated part of the solid waste program in certain of these communities can be demonstrated by the fact twenty-four of the 82 facilities or about 30% have a materials recovery facility (MRF), which is co-located with the waste-to-energy facility or owned by a public entity, which is also responsible for the waste-to-energy facility. It is doubtful that a local government, district or authority would invest in the construction of a processing facility for recyclables, if there was a lack of material to process.

CONCLUSION

On a nationwide basis, waste-to-energy does not have an adverse impact on recycle rates. The most influential factors that affect local recycling rates appear to be state policies and the proactive stance of a municipality. Communities using waste-to-energy have recycling rates that **are five percentage points or more** above the national average, whether these communities are compared to adjusted EPA or *BioCycle* data.

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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