# A PROJECT TO ENCOURAGE INCREASED RECYCLING OF FOOD RESIDUALS IN NEW JERSEY: MAPPING POTENTIAL NON-RESIDENTIAL GENERATORS AND MARKETS

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## Introduction

Almost since its inception, the Solid Waste Policy Group at Rutgers, the State University of New Jersey (SWPG) has been researching and developing policy options and actions in support of increased food residuals[1] being recycled across the State of New Jersey. Two and a half years ago, the SWPG received grants for two companion projects in support of food residuals recycling. One grant, received from the New Jersey Department of Environmental Protection (NJDEP), originally entailed comprehensive outreach efforts designed to help match food residuals generators with existing and anticipated markets. When several markets went out of business, the NJDEP asked SWPG to refocus its efforts on an examination of reasons why food residuals recycling was not flourishing in New Jersey, a food dense state.

The other grant came from the United States Environmental Protection Agency, Region 2, and initiated the project which is reported on here, which entailed mapping of non-residential generators of food residuals in certain identified categories and mapping of known recycling markets. The effort also entailed creating links for contact and other pertinent data for each generator and market mapped. The ultimate aim of the map and associated contact information was to facilitate matching of generators with markets which could serve them, either existing markets, or those seeking to establish a facility within the state.

The report on the companion project, entitled "Connecting Large Scale Generators and Markets Of Food Residuals: Study Of Success/Failure Factors For Food Residuals Recycling," was presented to the NJDEP on June 30, 2004. Some of the material presented there is also discussed here, since that report threw considerable light

[1] The terms "food waste" and "food residuals" will be used interchangeably in this report.

on the challenges associated with food residuals diversion in the state, and across the country.

**Context for the Report/Description of the Problem**

The SWPG is an initiative that was begun in 1997 at Cook College, Rutgers University, in response to stakeholder requests for assistance with New Jersey's solid waste issues. Early problems identified by stakeholders as requiring attention were the need for increased diversion of end-of-life residential computers, fluorescent light bulbs and mercury-containing devices from the waste stream to recyclers, and the need for increased diversion of non-residential (i.e., from business and other large generators) food residuals to recycling markets.

The need to divert non-residentially generated food residuals was identified in large part because food residuals were, and are, one of the largest, mostly un-recycled segments of the solid waste stream. Moreover, food residuals are characteristically heavy and contain a high moisture content.[2] Food residuals which are disposed in landfills are a significant contributor to the production of methane, one of the most potent of greenhouse gases, and one which many landfills may not be equipped to collect for use of or even for flaring; even those landfills with collection mechanisms are able to capture only a portion of the gas, with a not-insubstantial amount still escaping into the atmosphere. In incinerators, food residuals burn inefficiently, from the point of view of energy production, due to high moisture content. Economically, this may not cause a

[2] Moisture levels in mixed food waste as reported by Envirofeed, a former food waste recycler, are approximately 78%.

problem, since the prime source of revenue is per ton tipping fees, not energy sales, and food residuals tend to contribute substantial tonnage.[3]

Having identified food residuals diversion as a crucial area for work, the SWPG began identifying viable options for food waste recycling for New Jersey, both those that had already established a foothold in the state and those that could be developed here. Existing options discovered included two outdoor composting facilities, a feed pelletization plant being tested as a pilot project, and farms that accepted food waste as "fresh" feed for livestock, chiefly swine. The SWPG established relationships with the composting facilities, the pelletization plant, and several of the animal feeding operations. Relationships were also established with entities or individuals hoping to bring such options as conversion to fuel, anaerobic digestion, vermicomposting, and in-vessel composting into the state. Simultaneously, the group established relationships with generators who were already involved in promoting food waste recycling, such as Wakefern, and other supportive organizations including the New Jersey Food Council (NJFC), and the New Jersey Restaurant Association (NJRA). The SWPG participated in three annual Food Waste Recycling Symposia, sponsored by the Food Recovery and Recycling Association of North America and the New Jersey Department of Agriculture (NJDA), giving presentations at the Symposia and, subsequently, at two conferences sponsored by BioCycle and one sponsored by the National Pollution Prevention Roundtable.

[3]As stated in an April 19, 2001 email from John Londres, Deputy Director, Pollution Control Financing Authority of Camden County: "Food waste generally has a lower heating value than average household waste, but a typical existing incinerator makes out much better with low heating values. The reason is that tipping fees provide more revenue than energy, and an incinerator can process more waste the lower the heating value goes (within limits)."

The SWPG began working with the new Food Policy Institute (FPI), a regional entity with its offices at Rutgers University, in part because participants at its Food Summit, held in June 1998, had identified solid waste as one of the three major roadblock areas they faced when dealing with state regulations.[4] Working with FPI and within its own organization, the SWPG tried to identify trends that would affect the nature and complexion of non-residential food waste, such as the greater move towards prepared foods for consumer take-out, including bagged salads.

A section of the SWPG website (http://www.swpg.rutgers.edu) is devoted to food residuals diversion. The website includes a range of articles and background materials, and lists of known markets for food waste recycling.

In New Jersey, while the food industry and various food waste generators have long and often vocally supported food residuals recycling, the number and success of recycling operations has only declined over time. Moreover, such operations as American Soils Inc. and Woodhue have experienced considerable hurdles to initiating and maintaining food waste composting operations.

Using information supplied in municipal solid waste/recycling tonnage reports, the NJDEP website contains data on amount of waste disposed and recycled, in totality and by segment of the waste stream, including food waste. The following chart shows calculations of food waste generated and recycled. Using population data for the same

[4] Adelaja, Adesoji O., Editor. Proceedings of The New Jersey Food Industry Summit: Forging Industry, Government and University Partnerships for Sustainable Economic Development. June 10, 1998. At pp. 51-2 of the proceedings, it was noted that supermarkets already practice a substantial amount of recycling and composting. However, there is a lack of infrastructure to transport organic material to compost sites. Smaller stores and restaurants cannot afford to transport their organic waste to these sites. Government representatives noted that recycling is county-based but monitored by the state. Industry representatives noted that in many cases recycling is not cost effective.

years, the chart shows calculations of the average amount of food waste disposed per individual living in New Jersey.

| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|
| **Municipal Solid Waste (MSW) Disposed of/ Recycled** | 8,059,168 | 7,849,254 | 7,985,333 | 8,083,947 | 8,692,137 | 9,181,578 |
| **Food Waste Generated (tons)** | 815,735 | 823,044 | 823,465 | 763,345 | 1,271,467 | 1,306,260 |
| **% of MSW Waste Stream** | 10.12% | 10.48% | 10.31% | 9.44% | 14.62% | 14.22% |
| **Food Waste Generated By Individual (lbs. Annually).**[5] | 204.81 lbs. | 205.51 lbs. | 204.48 lbs. | 188.58 lbs. | 312.26 lbs. | 310.48 lbs. |

**Figure 1.**

As noted, it is also crucial to predict the growth in food waste generation that can be expected for New Jersey for the foreseeable future. Projections for New Jersey's future population, according to the United States Census are:

| 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|
| 8,741,700 | 9,062,800 | 9,400,900 | 9,780,900 |

**Figure 6.**[6]

The obvious conclusion is that the amount of food purchased, eaten and waste disposed of in New Jersey, will also rise. If it is assumed that the generated amount of food waste per person can be expected to remain at least 300 pounds per year (See Figure 7), then simply with population growth alone, the state will see the following additional totals for tonnage generated over 2000 generation rates.

[5] These numbers derived from NJDEP data and estimated population statistics from 1995 to 1999 (for 2000 U.S. census data was used). New Jersey Department of Labor "Estimates of Resident Population by State: 1990 to 1999." http://www.wnjpin.net/OneStopCareerCenter/LaborMarketInformation/lmi02/stpest99.htm

[6] Date taken from http://eire.census.gov/popest/estimates.php

| 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|
| 49,102.5 tons | 97,267.50 tons | 147,982.5 tons | 204,982.50 tons |

**Figure 7.**

These additional tons of food residuals will need to be dealt with by the state. New Jersey has no choice but to be a leader in the area of food waste recycling given the large amounts of waste that are and will be generated.

The most current document regarding New Jersey's plan for food waste recycling is the *Draft Statewide Solid Waste Management Plan for 2003*. The plan contains a hierarchy of practices regarding solid waste management[7]. The tier of the hierarchy states that New Jersey should focus its resources towards "Composting of source separated leaves, grass and food waste to reduce the volume of waste to be disposed of in the system."[8] The draft Solid Waste Management Plan gives directives for each county to adopt solid waste plans that incorporate the hierarchy of practices as defined by the state. As a result "each county shall be directed to address the composting of food waste, and other organics outside the yard waste stream." Furthermore, the draft plan asserts "In light of the fact that the tonnage of food waste generated per year in New Jersey is greater than the combined tonnage of old newspapers, glass containers and aluminum cans, food waste recycling represents a great opportunity for achieving recycling gains in this state." Other recommendations of the draft Solid Waste Management Plan include:

- Partner with NJIT or Rutgers to increase food composting with restaurants.
- Encourage food waste recycling in supermarkets, grocery stores, bakeries and other institutions, such as hospitals and universities.
- Support food waste recycling/composting through a tax credit program.

[7] This is located in the Executive Summary, section A-1.
[8] Draft of New Jersey Statewide Solid Waste Management Plan, 2003.

- Reduce the 1000-foot buffer requirement for composting facilities receiving food waste.
- Require environmental monitoring in lieu of impervious pads at composting facilities accepting vegetative food waste.

These provisions of the draft Solid Waste Management Plan evidence a strong commitment to food waste recycling and composting, and a recognition of their importance to increasing overall recycling rates for the state.

The benefits of the two food waste recycling options studied are described. The benefits of composting include reduced greenhouse gas production, carbon sequestration, and soil benefits. The latter include healthier soil, counteracting of the effects of compaction and erosion, reduced drought effects, etc. The benefits of conversion of food residuals to feed include being a substitute for corn or other feeds, reduction of landfill problems ranging from odors and rodents to greenhouse gas production, economic benefits to the generator, and landfill life extension.

The economic benefits of composting to the state, while not yet well quantified, include the value of the services provided by compost in greenhouse gas reduction, carbon sequestration, as a soil amendment that helps with erosion, compaction, drought, nutrient reduction, and water quality improvement.

The policy issues identified are:

- Diverting food waste away from landfills to either composting or anaerobic digestion reduces anthropogenic greenhouse gases emitted, and assists the state in meeting its greenhouse gas reduction goals.
- Conversion of food waste to fuel via anaerobic digestion or other processes such as those involved in making P-Series Fuels can reduce dependency on foreign oil and produce decentralized sources of energy, less susceptible to large terror strikes
- Encouraging food waste recycling markets within New Jersey can reduce the costs and effects, including air pollution and greenhouse gas contributions, of

transporting heavy, wet food waste. Additionally, this can reduce the costs of disposing of waste for the food industry, which has close profit margins.

- Composting, and to a lesser degree, anaerobic digestion, produce organic soil amendments vital to good soil health. Good soil health, in turn, is vital to
    - Plant development and especially reducing inputs of pesticides and fertilizers
    - Reducing soil compaction and promoting soil health to allow adequate groundwater recharge and water filtering properties of soil, avoiding later costs of water purification and the cost of overstripping our water supplies
- Much of the future of New Jersey's agriculture lies in its position as primary provider of landscape plants to the Mid-Atlantic region and catering to growing niche markets such as the demand for organic produce. For the latter, especially, inputs of acceptable fertilizers and pesticides are becoming increasingly cost-prohibitive. The organic soil amendments produced by composting or anaerobic digestion can help reduce other necessary costly inputs.
- Similarly, compost and compost tea could help the state's schools achieve their new requirements for Integrated Pest Management on school property.

The SWPG developed recommendations (See section 8.2) that will contribute to the development of a successful and widespread food waste recycling industry, including composting industry, in New Jersey. It is crucial that these recommendations be acted on in a timely and comprehensive manner, because of the pressing policy reasons, other than simply raising the recycling rate, for food waste diversion. These recommendations are summarized in the following table:

| | |
|---|---|
| **Recommendation 1** | Develop a standard method of measuring and documenting the generation of food waste. |
| **Recommendation 2** | Establish a standard method of measuring and documenting food waste recycling. |
| **Recommendation 3** | With urgency, show the commitment of the state to a policy in favor of recycling food waste by creating a firm vision of food waste recycling for the state, created cooperatively by NJDEP, SWPG, leadership of the food industry, counties/municipalities, waste industry, recycling industry, representatives of generator sectors, and representatives and of users of the compost, compost tea and energy producedand affected agencies. |
| **Recommendation 4** | Revise the existing food waste composting regulations to allow for a flexible multi-tiered permitting approach to regulation. |
| **Recommendation 5** | Address water quality permitting issues by creating new rules that clearly distinguish between green waste composters and facilities subjected to NPDES permits such as landfills, wastewater treatment facilities and industrial sites. Use California's flexible "reverse" approach to permitting, where the permittee submits a compliance plan for approval. |
| **Recommendation 6** | Assist the SWPG to find the necessary resources to allow it to be a full- |

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|---|---|
| | service support organization, which could provide the combination of training, problem solving, and marketing resources which contributes so much to the success of food waste composting facilities. |
| **Recommendation 7** | Utilize the existing framework, with the coordination of the SWPG and Rutgers, to create a hands-on composting course. |
| **Recommendation 8** | Create a system to encourage and allow food waste pilot projects. |
| **Recommendation 9** | Create a system to encourage and allow small-scale food waste recycling systems. |
| **Recommendation 10** | Create economic incentives, either in the form of grants or tax incentives, for food waste recycling activities. Include detailed methods for giving greenhouse gas credits. |
| **Recommendation 11** | Take the steps necessary to create the ultimate incentive for food waste recycling, by banning the introduction of food waste, at least from commercial sources, destined for the landfill or incinerator. Alternately, examine the possibility of a substantial disposal tax. |
| **Recommendation 12** | Create a market development campaign for the final product of food waste composting. |
| **Recommendation 13** | Find resources and entities to do identified further research on economics, vermicomposting, and compost tea benefits. |

**Conduct of the Project**

Various students and other SWPG personnel worked to collect data on individual food waste generators, including Timothy Kenyon, William Landesman, Daniel Hayes-Patterson, James Manning, LaToya Stevens, Ellen Vastola and Priscilla Hayes. Additionally, Brian Schilling and Lucas Marxen of the Food Policy Institute collected data for specific sectors of food waste generators.

For each sector surveyed, general results are noted, below:

- Higher education institutions

Using lists from the New Jersey Higher Education Partnership for Sustainability (NJHEPS) and other lists found online, higher education institutions in the state were contacted, with mixed receptivity.

- Hospitals/health care facilities

Hospitals and nursing homes were contacted based using lists found online, again with mixed results.

- Large corporate offices/campuses (major employers)

We started with the list of the top 100 corporations found in the state as published by the Newark Star Ledger/Trenton Times and added names of other corporations from web and other research. We were unable to produce results from this sector for mapping. There was no uniform department which was appropriate for contact, and we were unable to reach those with useful information in spite of repeated efforts at each identified corporation. Essentially, it became clear that corporations whose business was not directly related to the food industry had given no consideration to the food waste they might be generating as something potentially recyclable.

- Supermarkets

Through our partnership with the Food Policy Institute and their partnership with the New Jersey Food Council, which represents supermarkets throughout the state, we were able to get county based information on many supermarkets throughout the state.

- Restaurants

Representatives of the Food Policy Institute contacted restaurants using a list provided by the New Jersey Restaurant Association.

- Food manufacturing/processing operations

These operations were among the most responsive, with among the most food waste available for current or potential recycling.

- Distributors/wholesalers

Contacts with this sector revealed that waste was sent back to suppliers, and that therefore, no food waste was available for current or potential recycling; accordingly this sector is not represented on the map.

During the mapping process, generators in each of the sectors listed were identified by circles of various sizes in the color assigned to that particular sector:

This project is has produce GIS-based maps which would be made accessible on the New Jersey Solid Waste Policy Group website. The maps will plot generators of food waste over certain thresholds for which data can be collected. This mapping will allow a recycling market to determine where there might be a cluster of generators and the proximity of each generator to major transportation routes, as well as proximity to itself, the market. The maps will also plot all known markets, with links to contact information, types of materials accepted, and other details which can help a generator choose a potential recycling market. Thus, the maps will facilitate "matches" between generators of food waste and recyclers, from both sides of any potential transaction.

The project entails the following sets of tasks, still ongoing: 1) determining availability of data and determining relevant thresholds for different classes of generators, based on numbers of generators and mapping logistics; 2) identifying and collecting relevant data on the generators to be mapped, including approximate food residuals generation and current waste arrangements; 3) determining street address location of each generator to be mapped; 4) identifying all recycling markets and collecting information on location, materials accepted, etc.; 5) creating the maps, to allow zooming to various different resolutions; 6) providing links for each plotted generator to more specific information, such as contact person, current waste arrangement, nature of waste generated, etc.; 7) providing links for each plotted recycling market to more specific information, such as contact person, materials accepted, means of collection, etc. Upon completion of the maps, a publicity campaign will be done to generators and markets, to encourage use of the maps to produce matches.

**DATA COLLECTION:**

We have collected data in each of the following sectors.

Data collection has been slow and laborious, with numerous personal contacts required to get data on food waste generation (type and amount) and other identifying data necessary for mapping of data. Data sets are completed (as nearly as possible) for higher education, hospitals and health care facilities, large corporations (disappointing response), food manufacturing/processing operations, and distributors/wholesalers. In the area of distributors and wholesalers, it was discovered that minimal food waste is available for collection, the food waste being generated at other stages of the food cycle. Supermarket and restaurant data collection is still in progress.

**GIS PLOTTING OF COLLECTED DATA:**

We have begun to plot our collected data onto GIS maps. Using GIS software, addresses are converted into geographic coordinates. We expected this to be a predominantly automated process; for each unique address and zip code, there is a unique geographic coordinate. Differences between addresses reported by the respondent must match with an address in the database.

Approximately 50% of all addresses automatically matched with the GIS database. The remaining addresses did not match for a variety of reasons. In many cases, slight differences in spelling, or street type (ie,55 Appletree Road vs 55 Appletree Avenue) prevented exact matches. It is possible that private roads of universities or corporations are not available in GIS databases. These discrepancies can be rectified using a manual address matching process. The time required for manual address coding was greater than initially expected.

In some cases, address coding will not be accurate to the building number. Street-level accuracy can be expected for practically all addresses, and this level of accuracy is sufficient for the project. Street-level accuracy will allow for error no greater than the length of the street. In practically all cases, this means an error of no more than a few hundred meters, although in very limited situations, errors of up to several miles are possible. Since the data will be used to optimize routes and determine proximity to recycling facilities, even errors of a few miles are negligible. It should be stressed, however, that even this negligible degree of error will only apply to a very small number of respondents.

**WORK REMAINING:**

As the description above makes clear, the remaining work is additional data collection in selected sector areas, with considerable plotting of data and checking of the resultant maps, as well as posting the maps to the NJSWPG website. There is also a need to publicize the map and encourage its use among the generator and recycling sectors, on completion.