

RECYCLING — ECONOMIC FACTS AND PERFORMANCE

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ABSTRACT

As the recycling ethic takes hold at the state and municipal level, municipal officials and private contractors are working together to formulate and implement recycling programs. The questions—What is to be recycled? How should recyclables be separated and collected? Is intermediate processing beneficial? How can recyclables best be marketed? Should the public or private sector perform the service? What are the true costs?—are being addressed. Answers, however, are often different for large and small municipalities and regional versus individual municipal programs. While no one approach will be suitable for all applications, one can learn from the experiences of operating programs.

The paper to be presented will describe two operating, recycling programs that are public and private cooperative efforts: one regional (11 communities in Bucks County, Pennsylvania); and one municipal (Quincy, Massachusetts). Information will be presented describing the recycling programs, economics, and performance.

INTRODUCTION

Recycling has emerged as a preferred means to reduce waste disposal; however, debate continues as to

the quantity of waste that can be recycled, the viability of markets, and actual costs. In many states, and currently being proposed on the national level, are goals to reduce and recycle anywhere from 25% to 50% of the waste stream. Numerous states now mandate that recycling be integrated into municipal waste disposal plans. Connecticut has mandated that certain recyclable materials will not be acceptable for disposal at resource recovery facilities or landfills after January 1, 1991. Only one state (of which the author is aware), Vermont, sets a recycling goal with a provision for considering economics. Vermont is seeking to recycle 40% of its waste by the year 2000; however, if the cost of recycling exceeds the cost of alternative disposal by 10%, waste need not be recycled.

Comprehensive data from operating recycling programs is now becoming available and it is possible to document participation rates, performance (tons recycled), and program costs (revenues). This information will be of value not only to municipalities establishing recycling programs, but also to policy makers setting recycling goals. The paper will present data for two operating programs: the first a curbside, newspaper program in Quincy, Massachusetts, and the second, a curbside program for newspaper, clear glass and aluminum for eleven communities in Bucks County, Pennsylvania. Topics included are a description of the programs, economics, and performance.

DESCRIPTION OF RECYCLING PROGRAMS

Quincy, Massachusetts

The City of Quincy, located just south of Boston, has a population of approximately 90,000. It is a combination of urban and suburban land uses. Municipal waste is collected weekly by the City under private contract from all residential buildings with four or fewer dwelling units, approximately 28,000 households. Waste is taken to a landfill in the southeastern part of the state. Massachusetts is a bottle bill state.

In June of 1988, the city completed a feasibility study to assess the economic viability of reducing high waste disposal costs (on the order of \$90/ton for transport and disposal) by implementing a recycling program. The feasibility study addressed recycling of newspaper, glass, plastic, aluminum, and metal as well as composting of yard waste, i.e., leaves.

The city elected to initially implement recycling of newspaper and the composting of leaves, since these materials represented the greatest volume of recyclables in the waste stream, and hence, the greatest potential of reducing waste disposal costs. In addition, newspaper is relatively easy for the homeowner to recycle (bundle and tie or place in brown paper bags at curbside), represented a simple means to introduce people to recycling, and was the least expensive of the recycling options to implement.

In the feasibility study it was estimated that with a mandatory program 10% of the municipal waste stream (4000 tons, 3636 t) could be recovered as newspaper and magazines. This was based on operating history from other newspaper recycling programs in Massachusetts. It represents a 75% participation rate coupled with recovery of 90% of the available news and magazines. The proposed recycling program provided for curbside pickup of news every two weeks.

Continuing its practice of private waste collection, the city solicited private bids for collection of newsprint and for marketing the collected material. Bids were evaluated in January 1989 and a contractor selected in February. The program was officially announced by the city in March followed by an intensive public education in March and April. Curbside collection was initiated on May 1, 1989, under a voluntary program. The contractor uses a 15 cu yd packer truck for collection.

The contract between the city and the private contractor is a fixed price, lump-sum contract for one year. It includes the cost of news collection, delivery and sale to a local broker. The newspaper is baled and shipped overseas to Italy where it is used to make tissue paper.

Central Bucks County, Pennsylvania

In 1984-85 a group of eleven communities joined together in Central Bucks County, Pennsylvania, to develop a solid waste management plan. The combined population is approximately 80,000. The communities include both rural and suburban land uses with populations ranging from less than 2000 to 10,000. There are approximately 20,000 households in the region. Pennsylvania is not a bottle bill state.

Municipal waste is collected by private contract, predominantly with private contracts between collection companies and individual homeowners. As a result, some communities are served by several collection contractors. One community licenses only one private collector for collection of the entire municipality. All waste collected is landfilled; landfill disposal fees are approximately \$55 per ton. This does not include the cost of collection or transport to the landfill. Homeowners pay as much as \$225/household on an annual basis for waste collection, transport and disposal.

The draft solid waste plan was completed in late 1986. It recommended curbside collection of newspaper, glass, aluminum and metal. Collected materials were to be taken to a marshalling area for storage and direct sale to end users. In 1987 the County announced a plan to initiate a recycling program by establishing satellite marshalling areas (minimal processing: aluminum beverage cans are briquetted, clear glass and newspaper are loaded loose without processing on larger transfer vehicles for shipment to market) that would transfer materials to an intermediate processing center. The County marshalling facility was to be operated by a private contractor who also would be responsible for marketing the recyclables. The Central Bucks communities decided to participate in the County program, thereby taking advantage of the satellite marshalling yard that was to be established in the Central Bucks area. Negotiations between the communities and the County were concluded in 1988. Intermunicipal agreements were signed between the eleven communities with one community serving as the lead contracting party and administrator. Mandatory recycling ordinances were passed in each community. Bids were solicited for private collection of newspaper, clear glass and aluminum (beverage containers) from each household, every two weeks. One private contractor collects recyclables from all eleven communities. A comprehensive public education program was initiated in November of 1988. Pickup commenced on May 1, 1989.

Each household was given two 5 gal containers, one for clear glass and one for aluminum. Newspaper is bundled (tied or bagged) and placed alongside the

TABLE 1 TARGET PROGRAM ECONOMICS,* QUINCY, MASSACHUSETTS (Newspaper Recycling)

COSTS	
Collection and marketing of recyclables (contract, fixed price)**	\$249,500
Public education	15,000
Monitoring	<u>15,000</u>
Total	\$279,500
Cost per household per year	\$ 9.98
Cost per household per month	\$.83
AVOIDED DISPOSAL COSTS (4,000 tons*** @ \$91/ton)	\$364,000
SAVINGS	\$ 84,500

- * Estimate based on one year program and target tonnages - for actual performance see Table 7.
- ** Figure of \$249,500 includes a market cost of (\$15/ton) for newspaper.
- *** Target is 4,000 tons U.S. (3,636 tons metric); break-even tonnage is 3,070 tons U.S. (2,791 tons metric).

containers. A matching state grant was obtained for purchase of collection vehicles (three pickup trucks and compartment-type Eager Beaver trailers), collection buckets, and public education programs. The collection vehicles and trailers are leased to the private collection contractor.

The contractor picks up the recyclables and delivers them to the County marshalling yard. The collection contract is a lump-sum, fixed price contract. It is a three year contract with price adjustments on an annual basis. The communities share in the revenues resulting from sale of the recyclables by the County. Recyclable revenues are pegged to recognized indices.

The quantities of recyclables targeted for recovery are as follows:

Aluminum	150 tons	(136 t)
Clear glass	950 tons	(864 t)
Newspaper	<u>1500 tons</u>	<u>(1364 t)</u>
	2600 tons	(2364 t)

These estimates are conservative, representing approximately 8% of the waste stream.

PROGRAM ECONOMICS

Tables 1 and 2 present a summary of program economics for Quincy and Bucks County. The economics are based on a one year program and targeted tonnages. Tables 7 and 8, depict program economics based on performance data from the operating programs.

TABLE 2 PROGRAM ECONOMICS,* CENTRAL BUCKS COUNTY, PENNSYLVANIA (Newspaper, Clear Glass, Aluminum)

COSTS	
Collection service (contract, fixed price)	\$239,500
Collection vehicles (three 1-ton pickup trucks, three goose-neck trailers)	79,306
Collection buckets (45,000 5-gallon buckets)	80,550
Public education	25,000
Monitoring	15,000
Administration by lead agency	<u>10,000</u>
Total cost	\$449,356
Cost per household per year	22.46
Cost per household per month	1.87

ESTIMATED REVENUES FROM SALE OF RECYCLABLES

Newspaper (1,500 tons U.S. @ \$0.0/ton)	\$ 0
Clear glass (950 tons U.S. @ \$29.60/ton)	28,120
Aluminum (150 tons U.S. @ \$924.00/ton)	<u>138,600</u>
Total Revenue	\$166,720
AVOIDED DISPOSAL COSTS (2,600 tons U.S. @ \$55/ton)	\$143,000
NET COSTS (costs less revenues and avoided disposal costs)	\$139,636
STATE GRANT	\$229,276
SAVINGS	\$ 89,640

- * Estimate based on one year program and targeted tonnages - for actual performance see Table 8.

TABLE 3 COLLECTED TONNAGE, QUINCY AND CENTRAL BUCKS PROGRAMS (May 1, 1989 - July 31, 1989)

Program	Newspaper	Clear Glass	Aluminum Beverage Containers
Quincy	700 (636)*	--	--
Central Bucks	835 (759)	250 (227)	29 (26)

*() metric tons

PERFORMANCE

At the point of preparation of this paper, three months of performance data were available from the Quincy and Central Bucks County programs. See Tables 3-8.

**TABLE 4 COMPARISON OF COLLECTED TONNAGE*
TO TARGETED TONNAGE**

Program	Newspaper		Clear Glass		Aluminum Beverage Containers	
	Collection*	Target	Collection*	Target	Collection*	Target
Quincy	2800 (2545)**	4000 (3636)	--	--	--	--
Central Bucks	3340 (3036)	1500 (1364)	1000 (909)	950 (864)	116 (105)	150 (136)

* Three-month collection figures projected to annual figures by multiplication by four.

** () metric tons

**TABLE 5 PARTICIPATION RATES (Percent)* May
1989 - July 1989**

	May	June	July	Average
Quincy	29	27	24	27
Central Bucks	46	52	51	50

* Number of households participating divided by total households served

**TABLE 6 PROJECTED PERCENTAGE OF WASTE
STREAM RECOVERED***

Program	Newspaper	Clear Glass	Aluminum Beverage Containers
Quincy	7%	--	--
Central Bucks	8.4%	2.5%	0.3%

* These figures represent the percentage of the total waste stream recovered in the recycling programs. They are based on collection data for May-July 1989 multiplied by four; annual waste generated estimated at 40,000 tons (36,364 tons metric).

**TABLE 7 PROGRAM ECONOMICS*, QUINCY,
MASSACHUSETTS
(Newspaper Recycling)**

COSTS	
Collection and marketing of recyclables (contract, fixed price)	\$249,500
Public education	15,000
Monitoring	15,000
Total	\$279,500
Cost per household per year	\$ 9.98
Cost per household per month	\$.83
AVOIDED DISPOSAL COSTS (2,800 tons U.S. @ \$91/ton)	\$254,800
SAVINGS (Loss)	(\$ 24,700)

* Estimate based on results of three months of data (May-July 1989) projected to a one year program

**TABLE 8 PROGRAM ECONOMICS*, CENTRAL BUCKS
COUNTY, PENNSYLVANIA
(Newspaper, Clear Glass, Aluminum)**

COSTS	
Collection service (contract, fixed price)	\$239,500
Collection vehicles (three 1-ton pickup trucks, three goose-neck trailers)	79,306
Collection buckets (45,000 5-gallon buckets)	80,550
Public education	25,000
Monitoring	15,000
Administration by lead agency	10,000
Total cost	\$449,356
Cost per household per year	22.46
Cost per household per month	1.87
ESTIMATED REVENUES FROM SALE OF RECYCLABLES	
Newspaper (3,196 tons U.S. @ \$0.0/ton) (144 tons U.S. @ \$1.16/ton)	\$ 167
Clear glass (1,000 tons U.S. @ \$29.70/ton)	29,700
Aluminum (116 tons U.S. @ \$825.00/ton)	95,700
Total Revenue	\$125,567
AVOIDED DISPOSAL COSTS (4,456 tons U.S. @ \$55/ton)	\$245,080
NET COSTS (costs less revenues and avoided disposal costs)	\$ 78,709
STATE GRANT	\$229,276
SAVINGS	\$150,567

* Estimate based on results of data (May-July 1989) projected to a one year program

CONCLUSIONS

The following conclusions can be drawn from the results to date:

(a) Recycling can be implemented with significant reductions in the quantity of waste needing disposal.

(b) Revenues from sale of recyclables in themselves do not offset the cost of a recycling program. Additional savings resulting from avoided disposal costs can result in waste disposal savings to a community. At current recovery rates in Central Bucks, this occurs when disposal costs are in the \$60/ton range (not crediting state grant). At current recovery rates, a

disposal fee of \$90/ton will be required for an economic break-even in Quincy.

(c) Improved participation will be required for the Quincy program for savings to occur. The same is true for the Central Bucks program if the state grant were not considered.

(d) Public education is crucial to program success. The author will provide (at the conference) revised tables to this paper to reflect a full year of program results.

Key Words: Economics; Market(s); Performance; Source Separation