Value Added by Recycling Industries In Massachusetts

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Summary: Manufacturing industries in Massachusetts must import virtually all raw materials except for recycled scrap. While the cost of the raw materials may not be the most important factor for the continued operation of these mills, they must on the whole operate 3 shifts per day, 7 days per week to remain viable. That means that the availability of raw materials is crucial, and shortfalls can lead to crisis. For illustration, the trend for paper mills across North America is to "integrate", or to control their own forest reserves to guarantee enough material to operate at capacity. Since this is not an option for Massachusetts mills, they have turned largely to another domestic supply -- the "urban forests," or waste paper, collected by citizens, or generated by the Commonwealth's massive printing and publishing industries.

In terms of importance to the state economy, the manufacturers which depend on recycled materials dwarf the recyclers, garbage collectors, and incinerator industries which compete for the same portions of the waste stream. These industries have benefitted tremendously from the recent cheap supply of recycled feedstocks, and have responded by investing significant capital into an expanded supply of waste paper and glass product.

The study leads the Department to conclude that recycling is not a losing proposition. Even during years when collection costs are not completely offset by the sale of recycled feedstock, certain industries within the state benefit significantly, and invest accordingly. Expecting mills to invest in recycled capacity before any "gluts" occur is like waiting to build roads until everyone had bought a car. These manufacturing industries are a valuable component of the state economy, and already face hostile circumstances. The value which these industries add to the recyclables which they receive brings hundreds of millions of dollars to Massachusetts. In return, these industries have demonstrated a willingness to re-invest profits in the state, and have more than returned any "subsidy" through cheap recyclables in the form of added capacity and new jobs in the state. We urge the public to view recycling as a project which is extremely friendly, and in fact vital, to the health of industries in the state.

As if to illustrate the point, the lions share of existing capacity, economic contribution, and new plant development belong to the commodity which has been the most maligned by collectors as a "glutted material". Paper processors and manufacturers in the state added over $500 million in value to "worthless" materials last year. Yet the paper glut is mentioned so much more often, that the public perception is at risk of seeing paper recycling as a failure, rather than as the model for glass, plastic, and metals.

As goes the profitability for waste paper, so goes the profitability of the recycling program. The fact that municipalities and businesses must, during some years, pay to have waste paper removed is an important part of the cycle -- a "loss leader" period without which demand could not and would not continue to grow. In 1986, when no gluts existed and most municipalities were earning money for newspaper, the American paper industry invested not a dime in additional recycled capacity. Eight years later, consumers are losing money on collections of paper, and the "market"

is considered glutted. But in North America today, eighteen new newspaper deinking mills are planned, representing an average investment of $30 million apiece. At least four new paper deinking operations are underway in the Northeast. To expect a paper mill to invest $30 million before the supply is demonstrated is akin to waiting to build a railroad until everyone has purchased a ticket.

In the 1970's, recycling was regarded primarily as a way to save trees and energy, and as a way to reduce mining waste. In the 1980's, recycling was regarded mainly as an alternative to other forms of solid waste disposal. This is a "service economy" view of recycling.

Recycling still achieves both of these goals, and collection of recyclables still fits the mold of a service sector industry. Still, the collection of approximately 1,000,000 tons of recyclable waste in Massachusetts occurs each year primarily for economic reasons driven by manufacturing. Recyclables are, first and foremost, a feedstock for important manufacturing industries in the state. The product value of these recycling industries dwarfs the importance of the "avoided disposal costs", even in the best of years. A state with 34 clothing manufacturers would not wring its hands over low cotton prices. Similarly, recycling continues to be good news for Massachusetts. The "service economy" should not drive Massachusetts recycling policy any more than it has driven the recycling industry.

The 34 paper mills in Massachusetts have a choice -- import wood pulp from out of state, or use recycled fiber. A glass mill has the same choice -- import feldspar from Utah, or use recycled cullet. Plastic manufacturers are beginning to consider recycling as an alternative to importing petroleum-derived pellets from Louisiana. The importance of these manufacturing mills lies not in what they consume, but in what they produce with it, and who they employ to produce it. Manufacturers add value to waste, and sell it out of state, or to fulfill needs within the state.

Over the course of several decades, these industries have invested millions of dollars in processing equipment, to pulp, culletize, deink or melt the recycled materials which are made available to them. While plant capacity for paper has decreased overall in New England over the past five years, recycled feedstock manufacturing capacity is growing in Massachusetts, at a rate of 2.5% per year. The state's glass industry is planning an important expansion of recycled glass benification capacity. Several materials recovery facilities are in various states of planning.

When recyclables are buried or burned, some energy may be produced, but largely it is the end of the road for the material. When recyclers earn money for a load of processed recyclables, however, the value which was added to the material continues to work its way through the economy. Eventually, the recycled feedstock is sold - in the form of a box, a bottle, or a roll of tissue paper - for several times the amount of trash disposal. The VALUE ADDED to our one million tons of recycled feedstocks amounts to $588 million dollars per year. The department estimates that the value of retail sale of the materials, of collection service, of new plant construction, and of related recycling equipment manufacture and sale brings the yearly figure up to at least $700 million.

The state tax revenues on the recycled feedstock economy, by itself, will more than offset any difference in trash disposal costs due to recycling. So long as an industry exists to process the material in state, any reduction in feedstock price is passed along to thy neighbor. In fact, recycling may support or create as many as 10,000 jobs in the state of Massachusetts alone. Unlike the jobs "created" through US Forest Service subsidies, these jobs are sustainable... we can mine the urban forests for as long as we produce recyclable materials.

As you examine the following exhibits, imagine the results to the Massachusetts economy if recycling stopped, or if all of the wastes generated in the state were burned and buried. Our primary glass manufacturer might survive, by importing more feedstock from the western United

States. Ten of our 34 paper mills would close. The longshoremen would lose the state's two largest exports -- waste paper and scrap metal.

For these reasons, the Department of Environmental Protection has decided to refine and publish the results from a study initially performed for the Department of Revenue, in trying to determine the size of a tax credit for use of recycled feedstocks. For each recycled commodity, the "value added" process begins at zero (the study does not consider the avoided disposal value of the recyclables). For answers to questions about the study, please contact Robin Ingenthron, Director of Recycling Programs, Department of Environmental Protection, at 617-292-5962.

In the coming months, the DEP proposes further investigation of the value of recycling services, of container and equipment manufacture, of retail sale of recyclables, and of recycling-related construction. Rough preliminary estimates of these contributions to the state economy are attached in the attached pages.

Estimated Annual Use of Recycled Feedstocks in Massachusetts

TONNAGE:	Tons Processed	Tons Manufactured
Paper	657,000	656,370
Plastic	11,826	60
Glass	41,181	87,000
Metals	256,445	15
Compost	80,000	40,000
Total Recycled Tonnage:	**1,046,452**	**783,445**

VALUE ADDED:	Processed Value	Manufactured Value
Paper	$42,909,000	$475,307,000
Plastic	$2,891,000	$58,000
Glass	$2,429,000	$20,010,000
Metals	$44,022,000	$3,000
Compost	$0	$400,000

Total Value Added by Manufacturing Sectors: $588,029,000

Preliminary Estimate - Retail and Front-End Collection Value: $77,500,000
Preliminary Estimate - Construction and Equipment Value: $35,000,000

Estimated gross value of recycling industry: $700,529,000

* Estimates do not include semi-precious or precious metals, auto scrap, mill scrap portion of tonnage from non-recycled materials, or value added after manufacture (e.g. intellectual property, paperboard made into games, etc.)

No "avoided disposal costs" figured into this analysis!

Estimates provided by Massachusetts Department of Environmental Protection, Division of Solid Waste Management, Willa S. Kuh Director. Study by Robin Ingenthron, Recycling Director (July 1992).

APPENDIX A: Fallacy worksheet

The study of recycled feedstocks lends itself to many debates. For better consideration of the record, DEP has put together the following attachment to aid constructive debate on the recycling economy.

1. No precious or semi-precious metals are considered, or should be considered, in the analysis. Scrap automobiles should not be included because their weight would greatly cloud our understanding of the tonnage diverted from the municipal solid waste stream. However, these materials should not be taken for granted -- their disposal is problematic, and should be the focus of future studies.

2. Only by-products after the conversion of raw material (paper, glass, plastic, metal into rolls, bottles, bottles, cans, etc.) should be considered "recyclables". This report does not consider mill broke, sawdust, scrap cloth, extruded plastic scrap, industrial metal cuttings, etc. among its considerations.

3. Weights and costs of non-recycled feedstock components have been removed prior to cost computation (e.g. bottle labels, paper cartons, etc.).

4. The study demonstrates the success of industries which have made long-standing investments in recycled feedstock use. One cannot assume immediate payback from new or R&D type investments. Each additional ton of new material recycled will not necessarily reflect the average value of the tons recycled to date. In fact, to a large degree, the free market will tend to concentrate on valuable recyclables first.

5. "No markets" should literally mean no place to receive the material -- NOT low prices for the material. Low prices may in fact be a sign that investment in new capacity is occurring... response to low waste paper prices has been overwhelming.

6. A conservative approach to jobs and economic contribution suggests that service sector activities (charges for collection, avoided disposal costs) should not be used in the industry analysis. Public yodeling, for example, would generate a price tag but contribute no extended value to the economy. The figures in this report are by and large confined to value added to the physical material, through processing and manufacture.

7. Value added does not include "intellectual property" or goodwill value. The manufacturers of board games, for example, add exponentially to the value by weight of the paperboard that the games are printed on. A publisher who prints on recycled paper should not credit manufacturers with the value of the book.

8. A temptation to draw a direct line between processors and in-state manufacturers would be problematic. Processed scrap moves quickly and in large volumes across state lines. A waste paper dealer in western Massachusetts, for example, will probably send paper to New York or Connecticut, while a paperboard manufacturer in eastern Massachusetts will readily use newspaper or cardboard baled in New Hampshire. At the same time, the processing tonnage cannot be added to the manufactured tonnage, since a great deal of raw material generated in the state is also used in the state. The "value" analysis, however, is easily controlled in both columns, by accounting for the cost of goods sold (regardless of origin).

APPENDIX B: Methodology for determination of top 3 components of Value Added analysis.

1. Paper Manufacturing Statistics: $ 475,307,000 per year

10 using exclusively recycled paper
22 using some form of recycled paper
656,370 tons per year out

Thirty-four paper mills and insulation manufacturers were located in the state. Most of these mills were surveyed in 1990 by a group of DEP interns from the Harvard Business School. The results of the survey showed the use of post-consumer paper, pre-consumer waste paper, industrial (mill broke) waste paper, and virgin pulp in tons per day. We assumed two weeks of "down time" or maintenance for the mills, and computed a yearly recycled output of 656,370 tons per year. A similar study by Jaako Poiry consultants shows a generation of 643,000 tons per year (a difference of less than 2%). In both cases, the tonnage reflects the product (not the input -- a certain percentage of waste is lost in sludge process).

Pre-consumer paper was used since it consists of paper which did in fact leave the site of the paper mill, and was cut or printed on at another site. Mill broke, sawdust, and waste cloth was not considered in the analysis.

The mills (and their corresponding tonnage) were broken into four groups; printing and writing papers, tissue and hygenic papers, paperboard, and other waste paper uses. These categories are mostly differentiated by their use of high grade or low grade stock, and the values of their finished products. One mill from each group was used as an indicator for values - costs of goods sold and wholesale price of product. Within each group, waste paper usage was divided into two sections, for the average of any low or high grades used in the manufacturing process. For example, paperboard mills have one section for finish papers (the outside print coating on a cereal box, for example), and another for low grades (the ONP or OCC which makes up the other 90% of the product. Tissue paper use was divided into deinking and non-deinking grades. In the instance of printing and writing paper, the post-consumer grade is CPO, which is very valuable and virtually indistinguishable from the pre-consumer grades. The Cost of Goods sold (subtracted from the wholesale value of each product), was computed equal to the value of the baled materials sold by processors, thus eliminating the risk of "double counting" any single commodity.

A separate spreadsheet, showing the assumed wholesale cost of retailed products, is attached. We attempted to factor out any weight attributable to anything other than recycled fiber (for example, 40¢ per lb. is far below the average wholesale cost for many hygenic papers, but we assumed that these paper also have more weight in plastic).

2. Paper Baling Statistics: $ 42,909,000 per year

63 Waste Paper Collectors (not including SMRF, retail stores)
45 Waste Paper Balers
657,000 tons per year baled in Massachusetts

Using a directory of paper recycling services, we began with 64 waste paper collectors, and narrowed the list to 45 waste paper dealers with baling services (assuming other collectors bring their paper to these facilities for baling). A census sample of 25 of these baling operations yeilds an average 11.4 employees per operation - this was extrapolated to yield 680 employees processing paper in the state. From my own paper handling experience, I calculated that the operators needed to handle four tons of waste paper per employee to maintain viability. These

estimates were then checked at random over several of the largest waste paper handlers, and proved accurate. Fifty weeks per year leads to an estimate of 607,000 tons. An additional 50,000 tons per year was added as a conservative estimate of the effect of the Springfield MRF and retail stores which bale their own paper.

The estimate of 657,000 tons per year was given peer review by three established waste paper dealers. Each felt that the estimate was probably low, because paper dealers specializing in low grades tend to process paper at a much higher rate than 4 tons per employee. The amount of OCC was also felt to be low. To rationalize this error, we might consider that many of these dealers handle waste paper from out of state.

Rather than try to survey individual waste paper handlers to determine the mix of paper grades processed in the state, I used national statistics (supplied by American Paper Institute) to break up the 657,000 tons into basic categories. For simplicity, the categories were aligne

3. Scrap Metal Processing Statistics: $ 44,022,000

91 non-redemption used beverage/food can collectors
500 beverage container distributors/redeemers
256,445 tons of non-automotive, non-precious metal processed

The single largest component of the scrap metal industry study (and for PETE plastic, and for glass) was the Massachusetts Dept. of Revenue's Figures on redeemed containers, and the breakdown of redeemables by glass, plastic, and aluminum by various beverage industry associations. Only the actual scrap metal value of the redeemed used beverage containers (UBC's) was used in this study, computed by ton of aluminum processed at $950 per baled ton. Other portions of the scrap aluminum stream were computed as a percentage of the redeemed containers, reflecting national percentages.

The recycled steel component was more difficult to estimate, especially as a sum net of scrap automobiles. We referred to a 1991 census of Massachusetts municipal recycling centers to estimate the amount of steel cans recovered, and also performed a census study of steel and aluminum collectors listed in the Recycling Services Directory. To cross-check the assumed total (756,000 tons minus 500,000 automotive scrap), we consulted with the Massport Trade Development Office. Overseas exports of scrap metal alone, through Massachusetts ports only (not including metals shipped overseas via New York or Connecticut) were 397,000 tons in 1991 and 477,000 tons in 1990. According to ISRI and the Aluminum Association, the lion's share of scrap metal is used domestically.

Major Sources:

1. American Paper Institute, domestic uses of waste paper. Quoted from Claudia Thompson's Recycled Papers: The Essential Guide, 1992.

2. Aluminum Association. Breakdown of aluminum scrap by source (used beverage cans, auto scrap, other consumer scrap, industrial scrap), used to estimate other consumer scrap.

3. Massport Authority, tons of waste paper and tons of scrap metal exported in 1990 and 1991. Used as a cross reference for assumed exports of waste paper.

4. Mass. Dept. of Environmental Protection, Recycling Services Directory, 1992. Used to provide census and samples to indicate levels of commercial recycling in the state. Also, DEP records of municipal recycling programs were consulted where commercial recycling of the material is insignificant (e.g. HDPE plastic).

5. Glass Packaging Institute.

6. Steel Can Recycling Institute.

7. Mass. Dept. of Revenue.

8. Waste Dynamics, commodity price lists, June 1992.

INDUSTRY TONNAGES	DENSIFICATION	PRE-PROCESSING	MANUFACTURING	SHEET #1 - TONNAGE
PAPER	TONS	TONS	TONS	Comments:
Tissue stock 1	32,850	n/a	31,590	Gross baled tonnage established
Tissue stock 2 (post)	32,850	n/a	50,895	through census of paper balers in the state.
				(sample of 25) and distributed by
Board stock 1	33,507	n/a	22,815	grade according to national data.
Board stock 2&3 (ONP,O	301,563	n/a	303,615	
				Manufactured tonnage established through
Printing/Writing 1	26,280	n/a	148,122	comprehensive census of 34 end-users (30 responses).
Printing/Writing 2	6,570	n/a	92,313	Newspaper and OCC treated together as post-c board stock
Other: High Grades	111,690	n/a	3,510	DEP Est.
Other: Low Grades	111,690	-(export ONP)	3,510	656,370 Jaako-Poory=643,800
PLASTIC	TONS	TONS	TONS	
Deposit	6,826	2,500		Deposit containers established comprehensively through
Non-deposit	5,000	2,476	60	escheatage. Other figures reflect census of municipal programs
GLASS	TONS	TONS	TONS	
Deposit	34,931			
Non-deposit	6,250	35,000	87,000	
METAL	TONS	TONS	TONS	
Ferrous	226,000	n/a	5	Does not include scrap autos, valuable
Wire,Siding,Etc	10,000	n/a	5	metals, or industrial scrap metal.
Alum, Deposit	20,025	n/a		Does not include brass, copper, silver, etc.
Alum, Non-deposit	419	n/a	5	Residential Aluminum Only
COMPOST	TONS	TONS	TONS	
Leaf and Yard Waste	80,000	n/a	40000	
GRAND TOTALS *	966,451	39,976	743,445	

VALUES ADDED BY MASS. INDUSTRIES	Valued Added by Processing	Value Added by Benification	Value Added by: Manufacturing		Notes/Comments
PAPER	Value Baled	Value Deinked	Cost of Goods:	Value Added	New Product Price
Tissue, pre-consumer (b	$4,927,500	n/a	$4,738,500	$64,759,500	$69,498,000
Tissue, post-consumer (b	$2,956,500	n/a	$4,580,550	$107,388,450	$111,969,000
Board, pre-consumer (n	$5,026,050	n/a	$3,422,250	$5,247,450	$8,669,700
Board, post-consumer (o	$5,428,134	n/a	$5,465,070	$109,908,630	$115,373,700
PW, pre-consumer (g	$6,254,640	n/a	$35,253,036	$111,387,744	$146,640,780
PW, post-consumer	$1,563,660	n/a	$21,970,494	$69,419,376	$91,389,870
Other: High Grades	$14,743,080	n/a	$463,320	$3,397,680	$3,861,000
Other: Low Grades	$2,010,420	n/a	$63,180	$3,797,820	$3,861,000
PLASTIC	Value Baled	Value Pelletize	COGS:	Extruders, Molder	
Deposit	$819,120	$1,100,000			Deposit and Non-deposit averaged
Non-deposit	$625,000	$346,640	$15,900	$57,600	
GLASS	Value Crushed	Val Culletized	COGS:	Bottles & Blowers	
Deposit	$873,275				Numbers alternated to present factual totals
Non-deposit	$156,250	$1,400,000	$5,655,000	$20,010,000	without compromising data for single plant
METAL (Non-precious)	Value Baled	Value DeTinned	COGS:	Smelters & Foundr	
Ferrous	$22,600,000	n/a	$500	$1,000	Virtually all metal scrap is exported
Wire,Siding,Etc.	$2,000,000	n/a	$1,000	$0	from Massachusetts.
Alum, Deposit	$19,023,750	n/a	$0	$0	
Alum, Non-deposit	$398,050	n/a	$4,750	$2,000	
COMPOST	Value Ground	n/a	COGS:	LANDSCAPE	
Leaf and Yard Waste	$400,000		$400,000	$200,000	
GRAND TOTAL	$89,405,429	$2,846,640		$495,577,250	$587,829,319 TOTAL VALUE ADDED IN MASS.

ASSUMPTIONS FOR INDUSTRIES	Densification Values/Ton	Pre-Processing Values/Ton	Manufacturing Values/Ton		SHEET #3 - Per Ton Prices Notes/Comments	
PAPER	Baled Value:	N.A.	Cost of Goods:	VALUE ADDED	NEW PRODUCT SALES	
Tissue: Pre/Ledger	$150	n/a	$150	$2,050	$2,200	assumes .35 per roll of toile
Tissue: Post/Ledger	$90	n/a	$90	$2,110	$2,200	avg with $1.15 /lb box or hyg
Board: Pre/Ledger	$150	n/a	$150	$230	$380	Avg paperboard used for rolls
Board: Post/ONP-MIX	$18	n/a	$18	$362	$380	
P&W: Pre/Pulp Sub	$238	n/a	$238	$752	$990	assumes $22/case
P&W: Post/(CPO)	$238	n/a	$238	$752	$990	
Other: High Grades	$132	n/a	$132	$968	$1,100	
Other: Low Grades	$18	n/a	$18	$1,082	$1,100	Average of Post Grades for
PLASTIC	Baled Value:	Pellet Value:	Cost:	Extrude,Mold Valu		
Deposit	$120	$440				Avg price of natural & colore
Non-deposit	$125	$140	265	$960	$1,225	Plastican-2.45/4=price per lb
GLASS	Breaking	Culletizing	COGS:	Bottles		
Deposit	$25	$40	65	$230	$295	- Value net of labels and c
Non-deposit	$25	$40	65	$230	$295	
METAL	Shred& Bale	De-Tinning	COGS:	Foundries		
Ferrous	$100	n/a	$100	$200	All metal scrap is exported	
Wire	$200	n/a	$200		from Massachusetts.	
Alum, Deposit	$950	n/a	$950	$400	Very little foundry work is done with	
Alum, Non-deposit	$950	n/a	$950	$400	Mass. scrap.	
COMPOST	CHIP & GRIND	n/a	COGS:	LANDSCAPE		
Leaf and Yard Waste	$5		$5	$5	10	

baled prices from Waste Age's 'Recycling Times' 7-14-92 except as noted