Executive Summary

U.S. Recycling Economic Information Study

Prepared for The National Recycling Coalition
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NATIONAL RECYCLING COALITION INC.

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OVERVIEW

This Executive Summary presents the results of the United States Recycling Economic Information (US REI) Study. The main report provides an additional level of detail beyond that found in this Executive Summary, and thoroughly and completely documents the methodology used in producing the study results.

The goal of the study was to document the size of the recycling and reuse industry by first determining direct economic information for each of twenty-six categories of recycling and reuse establishments. The direct economic values that were measured included:

- Number of establishments;
- Employment;
- Annual payroll;
- Annual receipts; and
- Annual throughput (for recycling categories).

Next, similar information was estimated for four categories of supporting establishments intimately involved in the recycling and reuse industry. Finally, the broader effect of recycling and reuse businesses and their employees on the economy was derived through economic modeling using direct data as inputs. This information included:

- Indirect economic values (inter-industry linkages as measured by purchase of intermediate commodities);
- Induced economic values (personal spending by employees of direct and indirect establishments);
- Multipliers to calculate total economic values (the sum of direct, indirect, and induced) from direct economic values; and
- Tax revenues attributable to the recycling and reuse industry.

INTENDED USES FOR THE STUDY

Recycling and reuse businesses, like other businesses, provide a number of economic benefits, including creating jobs, making investments, and paying taxes. This study and the economic benefit information it contains may be used as a:

- Reference for economic development agencies, entrepreneurs, and financiers to understand and evaluate recycling and reuse businesses;
- Reference for lawmakers to assist them in evaluating legislation that would affect recycling and reuse;
- Tool for recycling advocates to increase understanding of the industry, promote awareness of recycling and reuse, and target resources for growth; and
- Baseline of economic information to document future growth and development of the industry.

SUMMARY OF DIRECT RESULTS

The Study demonstrated that the nation's recycling and reuse industry is highly diverse in terms of which recovered materials are utilized, average establishment size, and which technologies are employed. Twenty-six recycling and reuse industry categories are used in this study and can be grouped into the following sectors based on the general types of activities undertaken:

- Recycling:
  - Collection;
  - Processing;
  - Manufacturing; and
- Reuse and Remanufacturing.

The recycling sector includes long-established sectors like paper and steel making, as well as new entrepreneurial ventures such as composting and plastic and rubber product manufacturers. The reuse and remanufacturing sector encompasses a diverse mix of establishments including wood reuse (e.g. pallet rebuilders, etc.), tire retreaders and electronic appliance demanufacturers.

COMPARISON OF INDUSTRY SECTOR SIZES

Table ES-1 presents estimates of direct economic activity for the recycling and reuse industry by sector. Detailed results for each of the twenty-six categories can be found in the main body of the report.

TABLE ES-1
SUMMARY OF ESTIMATES OF DIRECT ECONOMIC ACTIVITY
ANNUAL PAYROLL AND ESTIMATED RECEIPTS ARE IN $1,000. THROUGHPUT IS IN THOUSANDS OF TONS.

Data Type	Industry Sector				Industry Total
	Recycling Collection	Recycling Processing	Recycling Manufacturing	Reuse and Remanufacturing	
Establishments	9,247	12,051	8,047	26,716	56,061
Employment	32,010	160,865	759,746	169,183	1,121,804
Annual Payroll	956,875	3,826,360	29,181,749	2,747,498	36,712,482
Estimated Receipts	1,974,516	41,753,902	178,390,423	14,182,531	236,301,371
Estimated Throughput [1]	191,082	191,082	157,545	N/A	N/A

As Table ES-1 shows, the United States hosts 56,061 recycling and reuse establishments that employ approximately 1.1 million people, generate an annual payroll of $37 billion, and gross $236 billion in annual revenues.

Insight into the nation's recycling and reuse industry can be obtained by comparing the relative sizes of groups of business categories that are related in terms of materials recycled or sector of the industry that they are in.

Figures ES-1 and ES-2 graphically portray the information found in Table ES-1. As Figures ES-1 and ES-2 show, the economic size of the recycling manufacturing sector far exceeds the recycling collection, recycling processing, and reuse sectors.

[1] Throughput is amount of recovered material recycled and includes manufacturing scrap sent for recycling. It excludes materials prepared for fuel use and in-house process scrap returned to the manufacturing process. Throughput estimates are not summed to avoid triple counting at collection, processing, and manufacturing stages.

FIGURE ES-1
EMPLOYMENT BY INDUSTRY SECTOR

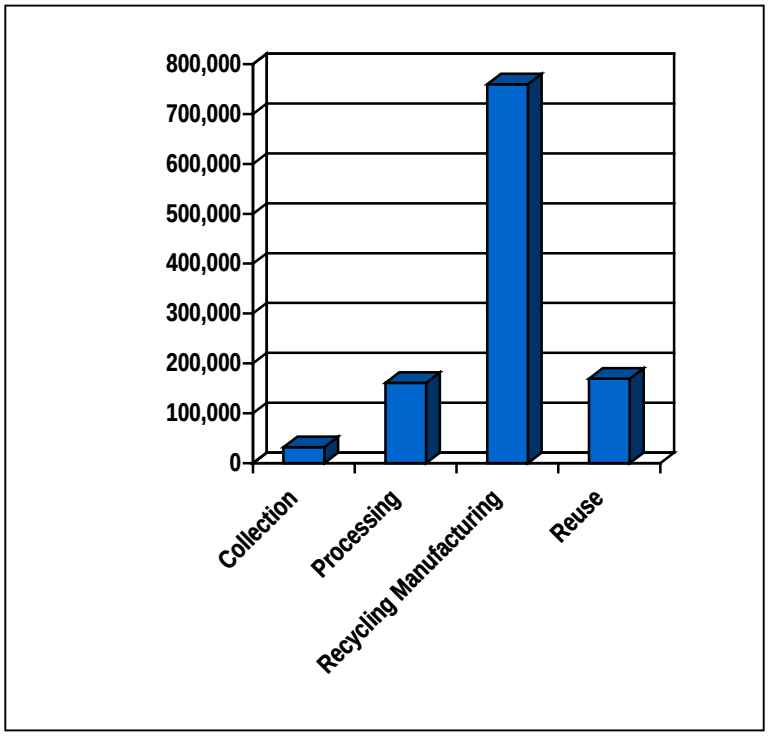
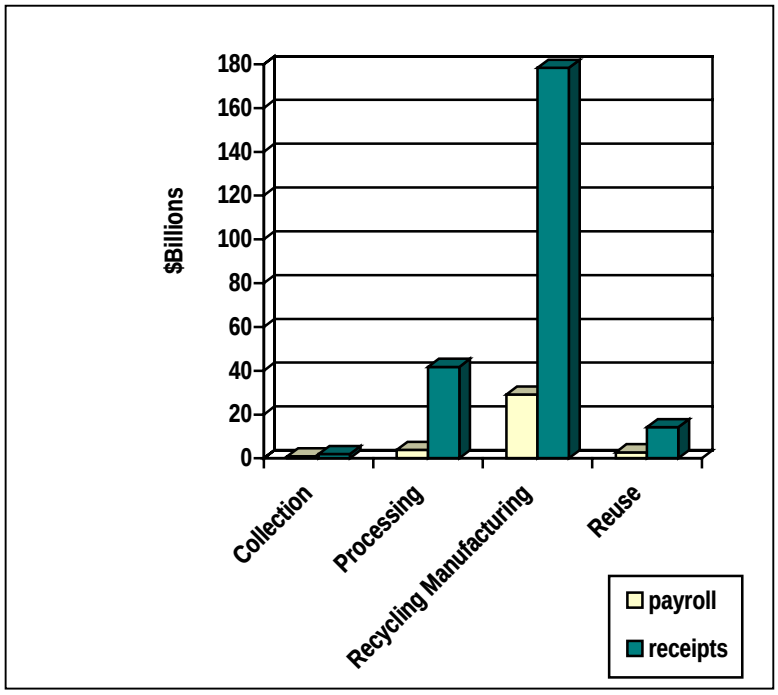


FIGURE ES-2
PAYROLL AND RECEIPTS BY INDUSTRY SECTOR



The ultimate value of a good or service is represented by the sale price of that good or service. Sales revenues, in turn, are used to employ persons and pay their wages, make

payments on equipment, provide a return to owners and investors, and pay upstream supplier establishments for the value of their goods or services. The cost in terms of labor, equipment, etc. of performing a particular process is a measure of the value that is added by that particular process.

The progression in size from recycling collection to recycling processing to recycling manufacturing follows from the fact that those sectors are part of a chain where increasingly more value is added to the recovered material as it moves through the recycling chain. Initially, a relatively small amount of value is added by consolidation (collection). Processors invest significantly more expense (value) in the recovered material by sorting and densification. However, no transformation of the recovered material has yet occurred – the material has simply been concentrated. The greatest value is added in manufacturing where relatively useless raw materials of little value are made into useful products of considerable value.

Reuse and remanufacturing differ slightly in that they focus on consolidation and refurbishing of products (not raw materials) that still have significant value; however, the value reuse adds cannot exceed the value inherent in a new product made from raw materials – otherwise people would buy the new product. This limits the amount of value that can be added, and thus the size of the reuse sector compared to the manufacturing sector.

COMPARISON OF THE RECYCLING SECTORS TO THE REUSE SECTOR

A noticeable distinction exists between the recycling sectors as a group (collection, processing, and manufacturing) and the reuse sector in terms of the size of establishments and average annual payroll. The recycling establishments have an average of 33 employees each, with an average annual payroll per employee of $36,000. Alternatively, the reuse sector is made up of smaller establishments – an average of 6 employees per establishment – with an average annual payroll of $16,000 per employee. Although the reuse and remanufacturing sector comprises 48 percent of total establishments, it makes up only 15 percent of total employees, 8 percent of payroll, and 6 percent of receipts.[2]

It is assumed that differences in employee pay between recycling sector and reuse sector establishments closely follow the level of skill and training required of employees. Recycling manufacturing, which contributes heavily to the overall recycling statistics, generally requires employees of higher skill and training than is normally required of employees of reuse establishments. Employees of higher skill and training are paid more than employees of lesser skill and training. It should be noted that remanufacturing jobs, which were not well-characterized by this study, are more likely to have similar skill and training requirements to recycling manufacturing jobs and would pay higher wages than the average reuse sector job.

The difference in average employees per establishment between the recycling and reuse sectors can come from several sources, although two are most likely: (1) whether continuous production processes are employed; and (2) whether economies of scale produce improved production efficiency. Continuous production processes are normally employed to save energy, avoid production startup/shutdown inefficiencies, or cover high monthly fixed costs (such as capital equipment finance costs) by increasing daily production and revenues. Establishments that operate three shifts per day employ more persons than establishments of similar hourly production capacity that operate one shift per day. Processes where economies

[2] These reuse and remanufacturing figures are thought to represent the minimum amount of economic activity captured by the methodology because remanufacturing activities are often included with traditional manufacturing industries that were not included in this study. Several years ago Boston University estimated remanufacturing activities on the national level (Professor Robert T. Lund, *The Remanufacturing Industry: Hidden Giant,* 1996). That study suggested that reuse and remanufacturing categories may be as much as three times larger than that characterized by this study's methodology.

of scale reduce unit costs apply to those instances where overhead costs are significantly streamlined or where larger-sized capital equipment is more efficient than smaller-sized equipment. Because the capital equipment and processes employed in recycling manufacturing favor continuous production and economies of scale, it is not unexpected that recycling establishments are on average larger than reuse sector establishments (which rely more heavily on manual labor).

COMPARISON OF RECYCLING COLLECTION AND PROCESSING TO RECYCLING MANUFACTURING

Recycling categories that are focused locally on recovering materials from commercial, industrial, and residential waste streams include establishments that collect and process recyclables for shipment to the recycling manufacturing industry. These local collection and processing establishments include:

- Government staffed residential curbside collection;
- Privately-staffed residential curbside collection;
- Compost and miscellaneous organics products producers;
- Materials recovery facilities; and
- Recyclable material wholesalers.

Alternatively, establishments in the recycling manufacturing sector are considered to be downstream consumers of recovered materials who rely on local collectors and processors for their supply of materials. When the two groups are compared, local collection and processing make up approximately 20 percent of total recycling employment and receipts, whereas downstream manufacturing makes up the remaining 80 percent of employment and receipts. This suggests that public policy to encourage recycling and discourage disposal, and public and private investment in local recyclables collection and processing infrastructure pays great dividends in supporting significant downstream private recycling economic activity.

LARGEST CONTRIBUTORS

As has been noted, the economic size of the recycling manufacturing sector greatly exceeds that of the other recycling and reuse sectors. Upon closer examination, over half of the economic activity for the entire recycling and reuse industry is accounted for by the following four recycling manufacturing sector categories:

- Paper, paperboard, and deinked market pulp mills, which employ 139,375 people and gross nearly $49 billion in estimated annual receipts;
- Steel mills, which employ 118,544 people and gross $46 billion in estimated annual receipts;
- Plastics converters, which employ 178,700 people and gross nearly $28 billion in estimated annual receipts; and
- Iron and steel foundries, which employ 126,313 people and gross over $16 billion in annual estimated receipts.

These four categories alone account for 50 percent of all employees, 62 percent of wages, and 59 percent of total receipts. Figures ES-3 and ES-4 place this information into further perspective by showing how the size of the nation's major recyclable materials manufacturing industries compare to each other. As the Figures show, ferrous metals recycling manufacturing leads the other material groups.

FIGURE ES-3
RECYCLING MANUFACTURING INDUSTRY EMPLOYMENT BY MAJOR MATERIAL GROUP

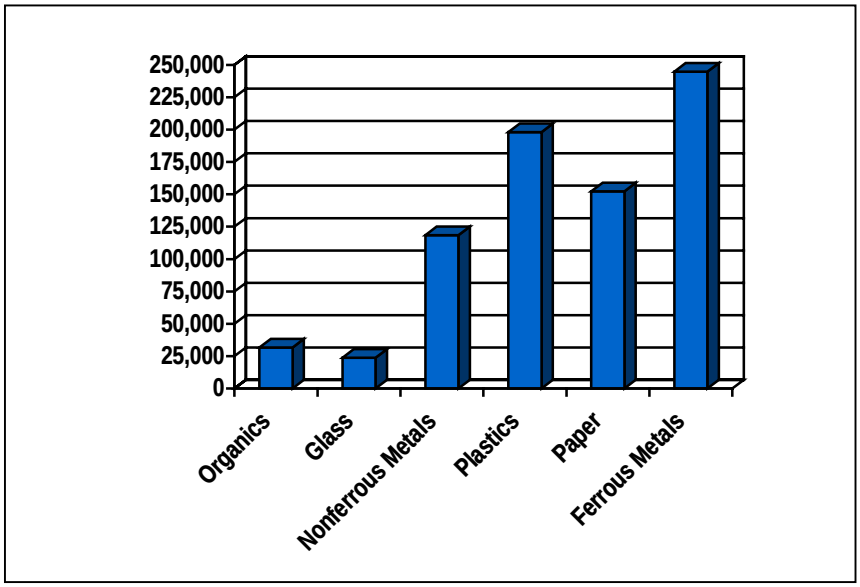
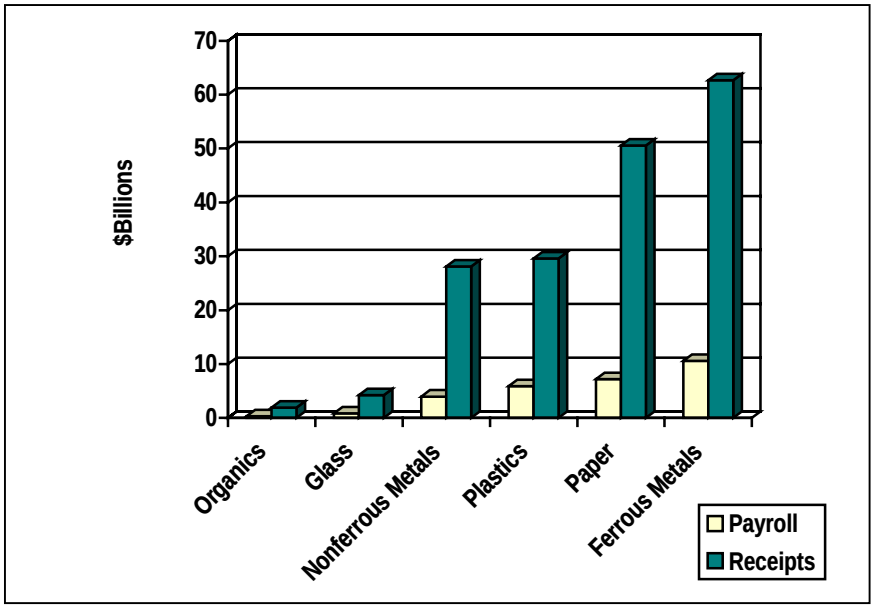


FIGURE ES-4
RECYCLING MANUFACTURING INDUSTRY PAYROLL AND RECEIPTS BY MAJOR MATERIAL GROUP



The amount of materials recycled, in combination with the underlying value of each raw material, help explain why some major material groups shown in Figures ES-3 and ES-4 rank higher than others. When large quantities of a high-value commodity are returned to the stream of commerce, the large amount of intrinsic value returned to the economy can support more jobs and economic activity than if a lesser amount or lower value commodity is returned to the stream of commerce. Plastics and non-ferrous metals are at the top end of the value scale, ferrous metals and paper are in the middle, and glass and compost are at the low end of the value scale. Major material group recycling amounts as estimated by this study are:

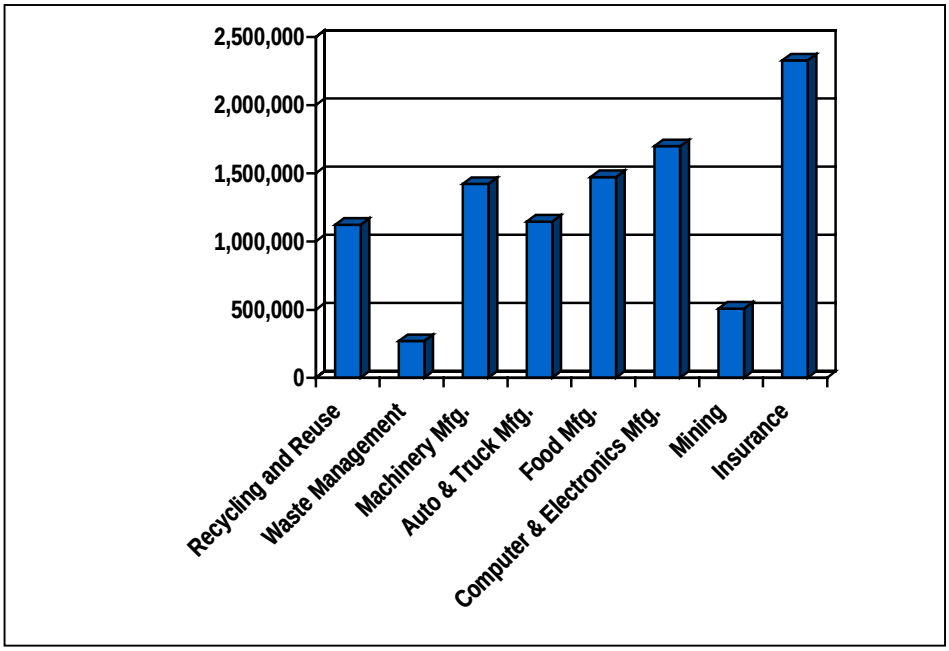
- Yard waste – 65 million tons (recycling of other organic materials is negligable);
- Glass – 3 million tons;
- Nonferrous metals – 7 million tons;
- Plastics – 3 million tons;
- Paper – 37 million tons; and
- Ferrous metals – 59 million tons.

When both amount recycled and value are considered together, the relative sizes of the various material groups can be explained. Similarly, estimates can be made of the economic impact that results from increased diversion of various materials.

THE RECYCLING AND REUSE INDUSTRY IN PERSPECTIVE

Figures ES-5, ES-6, and ES-7 show how the nation's recycling and reuse industry compares to other select national industries.[3] These industries were chosen because they present alternatives to recycling and reuse (i.e., waste management and mining) or because they are considered to be important or preferred industries that are often targeted for support by economic developers.

FIGURE ES-5
COMPARISON OF INDUSTRY EMPLOYMENT



[3] Comparative industry information comes from the 1997 Economic Census (U.S. Census Bureau) for the following industries: waste management – NAICS 562 waste management and remediation services minus 56292 materials recovery facilities; auto and truck manufacturing – NAICS 336 transportation equipment manufacturing; insurance – NAICS 524 insurance carriers and related activities; mining – NAICS 21; food manufacturing – NAICS 311; machinery manufacturing – NAICS 333.

FIGURE ES-6
COMPARISON OF ANNUAL WAGES PER JOB

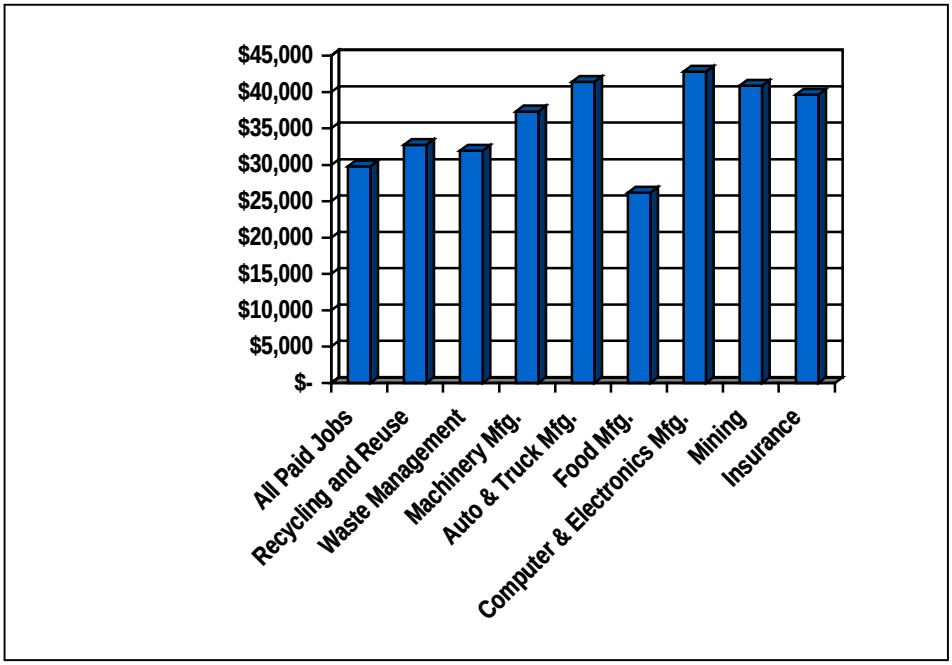
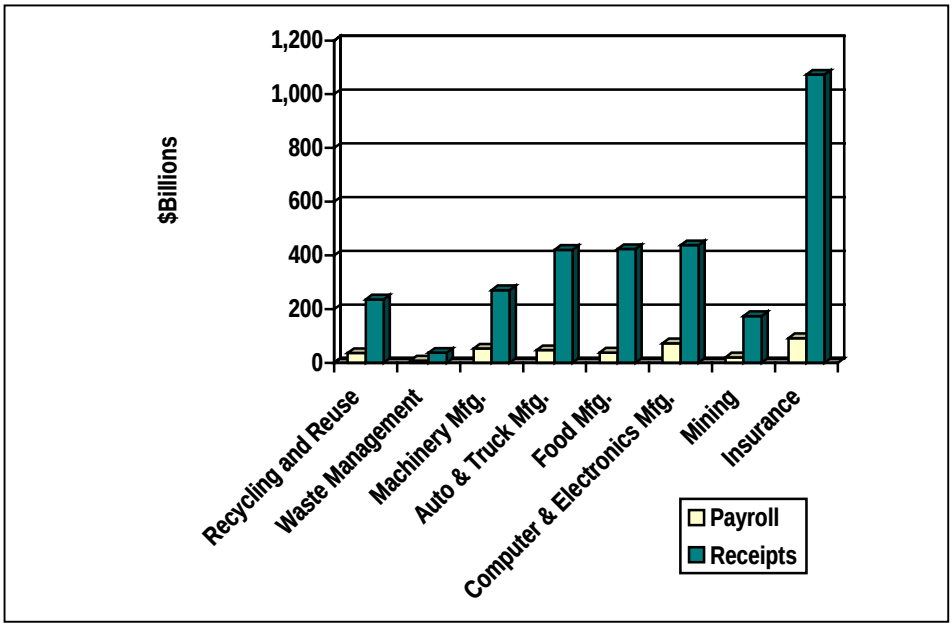


FIGURE ES-7
COMPARISON OF TOTAL WAGES AND SALES



As the figures show, the recycling and reuse industry is a significant industry as compared to other major industries. It provides large numbers of jobs that, on average, pay above the average national wage.

Despite the fact that more discards are disposed than recycled, it is not surprising that the recycling and reuse industry is larger than the waste management industry. This is because recycling and reuse are inherently value-adding, whereas disposal is not, and value-adding processes support jobs and economic activity.

SUMMARY OF OTHER ECONOMIC ACTIVITY PRODUCED

The study also estimated other economic activity produced in the United States economy that, while not directly part of the recycling and reuse industry, is attributable to the industry. Economic modeling was used to help estimate the level of this additional economic activity.

ECONOMIC ACTIVITY SUPPORTED BY INDUSTRY ESTABLISHMENTS

In addition to the economic activity of the recycling and reuse industry itself, other economic activity is supported because the industry purchases goods and services from other types of establishments (such as office supply companies, accounting firms, legal firms, building and landscape maintenance firms, etc.).

Economic modeling estimated that nearly 1.4 million jobs are maintained in support businesses because of the recycling and reuse industry. These jobs have a payroll of $52 billion and produce $173 billion in receipts.

ECONOMIC ACTIVITY SUPPORTED BY EMPLOYEES

Employees of the recycling and reuse industry (and employees in other businesses that support the industry) also support another round of economic activity when they spend their wages in the economy. Economic modeling estimated that employee personal spending supports 1.5 million jobs with a payroll of $41 billion, and produces receipts of $146 billion.

GOVERNMENT TAX REVENUES

This study estimated government tax revenues arising from the recycling and reuse industry based on income levels and tax rates. Table ES-2 shows the taxes paid directly by recycling and reuse industry establishments and their employees to various levels of government (direct revenues) and total revenues, which includes taxes from additional economic activity as estimated by economic modeling.

TABLE ES-2
SUMMARY OF RECYCLING & REUSE INDUSTRY CONTRIBUTION TO GOVERNMENT REVENUES
(IN $ MILLIONS)

Industry Sector	Direct Revenues				Total Revenues			
	Federal	State	Local	Total	Federal	State	Local	Total
Recycling Collection	200	100	100	400	300	200	100	600
Recycling Processing	700	400	300	1,400	1,700	800	600	3,200
Recycling Manufacturing	5,400	2,600	2,100	10,000	20,500	9,900	7,800	38,200
Reuse/Remanufacturing	600	300	200	1,200	2,100	1,000	800	3,900
Total	6,900	3,400	2,600	12,900	24,600	11,900	9,400	45,800

Note: figures may not add due to rounding.

Table ES-2 shows that U.S. government revenues exceed the combined revenues collected by state and local governments as a result of the recycling and reuse industry's economic activity. Individual federal income tax payments by employees in this industry make up over 70 percent of federal tax revenues, with corporate income taxes making up about half of the remainder. State taxes primarily come from sales and individual income taxes. Local taxes come primarily from property taxes and miscellaneous fees.

A conclusion that can be drawn by comparing the local government revenues in Table ES-2 to local government expenditures on recyclables collection and processing services

(estimated at over $3 billion per year) is that state and federal governments experience significant revenue benefits from local government spending on recycling programs.

INFLATION IN MODELING AND TAX REVENUE TOTALS

It is important to note that some of the results shown in the Other Economic Activity and Tax Revenue sections may be upwardly inflated by as much as 15 percent due to limitations inherent in the modeling process. These limitations cause problems when establishments in an industry are linked as part of a chain, as is the recycling industry. Similar problems would be seen in modeling results for any other industry that is linked in a chain. This inflation is unavoidable if modeling detail is desired for each component of an industry, as was the case for this study.

Economic models estimate and attribute other economic activity to an industry based on the level of purchases that establishments and employees in that industry make. When recycling manufacturers purchase materials from suppliers, modeling estimates the economic activity of those suppliers (e.g., recyclables collectors, recyclables processors, and material reclaimers) and counts it as additional economic activity that is supported. Because the economic activity of collectors, processors, and material reclaimers has already been counted as part of the recycling and reuse industry itself, modeling in effect double-counts their economic activity.

It is important to note that this bias is only found in modeling results for recycling and reuse industry sector subtotals or industry-wide totals. Also, government tax revenue subtotals and totals that are derived from modeling results show the same bias. Alternatively, **economic activity and government tax revenue totals derived only from the recycling and reuse industry itself do not include bias**.

SUMMARY

The recycling and reuse industry is an integrated network where the public and private sectors work together to recover and transform relatively useless discards into useful products of considerable value. Returning commodities to the stream of commerce is a value-adding, job-providing, and economy-spurring activity. The recycling and reuse industry is a significant contributor to the United States economy, providing large numbers of good jobs that pay well as shown by the following statistics:

- The average wage paid by the recycling and reuse industry is $32,700 – approximately $3,000 per year more than the national average wage. [4]
- The recycling and reuse industry supports 3.1 percent of the paid jobs in the United States – 0.9 percent through direct employment, and 2.2 percent (contributed equally) by industry and employee spending in the economy. [5]
- Some 2.7 percent of the US gross domestic product is attributable to the recycling and reuse industry, with 0.7 percent provided directly by the industry. [5]

Investments at the local level in collection and processing of recyclables and public policies that favor recycling and reuse support large private sector investments in downstream processing and manufacturing.

[4] Average wage data and total jobs data come from the U.S. Bureau of Economic Analysis, regional accounts data, regional economic profile for the U.S. for 1997 wage and salary jobs.

[5] Percentages come from dividing value added as estimated by economic modeling by gross domestic product data (national value added totals) as reported by the U.S. Bureau of Economic Analysis, "Gross State Product in Current Dollars, 1992-1998" table using data for 1997.