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2010 Recycling Economic Information Study Update for Illinois

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Since 1980

Prepared by:

DSM ENVIRONMENTAL

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- Association of Postconsumer Plastic Recyclers - Reclaimers
- US Plastic Recyclers Directory – Plastic Product producers
- American Chemistry Council: Plastic Division - Plastic Product producers
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Table of Contents

EXECUTIVE SUMMARY

Overview

Recycling is an important contributor to the economy of Illinois, providing local jobs through the network of municipal and private collection programs, material recovery facilities, reclaimers, converters, brokers, reuse operations, remanufactures and recycled-content product manufacturers. Further, recycling replaces materials often mined and manufactured outside of the state with materials collected and processed within Illinois. Through a grant from the Illinois Department of Commerce and Economic Opportunity (DCEO), the Illinois Recycling Association (IRA) contracted with DSM Environmental Services, Inc. (DSM) to research the contribution of recycling and reuse industries to the economy of the State of Illinois. The research is intended to provide state and local officials, the IRA, and other interested parties, with the ability to understand and communicate the economic value of the recycling industry in the state. DCEO commissioned a similar report in the 2001, *Illinois Recycling Economic Information Study*. This work, referred to as the *Study Update*, updates the results of that nearly decade-old report (referred to as the *2001 Report*).

The Executive Summary highlights the findings of the Study Update. The full report details the methodology used to estimate the economic impacts and also documents differences between the methodology used in the Study Update, and that used in the 2001 Report. Changes in methodology were made for the Study Update to more accurately reflect the economic contribution of the recycling industry of Illinois, even though in most cases these changes reduce the estimated economic impact when compared to the 2001 Report.

This Study Update presents both the direct economic impacts of the recycling, recycling reliant, and reuse industries (the recycling industry) in Illinois, as well as estimates of indirect and induced impacts, for each recycling industry sector (the multiplier effect). An effort was made to model the indirect and induced impacts associated with all of the recycling, recycling reliant and reuse industries without double counting.

Based on a "whole model approach" it is estimated that the combined ***direct, indirect and induced impacts of Illinois' Recycling, Recycling Reliant and Reuse Industries contribute***:

- **A total of 111,500 jobs;**
- **Payroll of $3.6 billion;**
- **$30.3 billion in additional gross receipts; and,**
- **Over $1 billion in state and local taxes** (see Table 9 for details).

The following table summarizes how jobs, payroll, gross receipts and tax revenues are distributed between direct, indirect and induced impacts:

Table ES.1

Summary of Direct, Indirect and Induced Economic Impacts (rounded)

Impact Type	Jobs	Payroll	Gross Receipts	State and Local Taxes[1]
Direct Effect	40,000	$1.5 billion	$17.1 billion	564.3 million
Indirect Effect	34,000	$1.2 billion	$7.1 billion	234.3 million
Induced Effect	37,500	$886 million	$6.1 billion	201.3 million
Total Effect	111,500	$3.6 billion	$30.3 billion	$1 billion

A detailed description of each recycling, recycling reliant and reuse industry sector is presented in the opening chapter of this report, and Table ES.1 summarizes the estimated direct, indirect and induced economic impacts of these sectors in more detail.

The primary source of data for the 2001 Report was the 1997 Economic Census. This Study Update is based primarily on 2007 Economic Census data. Therefore, this Study Update represents the economic status of the recycling industry ten years after the 2001 Report, considering the differences in methodology used in the 2001 Report.

It is important to note that this Study Update does not present the contribution of recycling industry to the statewide *Greenhouse Gas Emission reduction strategy* even though these industries not only limit the amount of organic materials landfilled (reducing methane generation) but more importantly, replace virgin materials in manufacturing with secondary materials which reduce mining, transport, and processing energy inputs and environmental impacts upstream from waste generation.

In addition, this Study Update used survey data from 2009, just before two important regulatory changes occurred in Illinois that likely will increase the economic contribution of recycling. These are the addition of food waste as an approved activity in organics composting; and, the addition of asphalt shingles as an approved feedstock for asphalt pavement by the Illinois Tollway Authority and the Illinois Department of Transportation (IDOT). In both cases the increased feedstock are anticipated to build and grow further economic activity in Illinois.

[1] The INPLAN model calculated a total tax impact, and did not allocate taxes to the direct, indirect and induced activities. Therefore this summary table reflects a simplistic assumption that state and local taxes are distributed similar to gross receipts, which may or may not be the case.

Summary of Direct Economic Impacts

Twenty-six business sectors were included in the 2001 Report, and are included again in this Study Update. These 26 sectors are divided into three categories: Recycling Industries, Recycling Reliant Industries, and Reuse and Remanufacturing Industries.

The size of each sector was determined through a combination of the following:

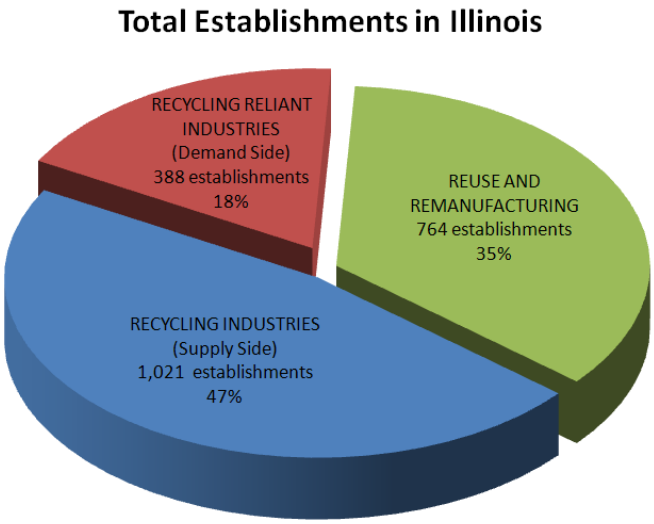
- U.S. Census Bureau data;
- Trade association data;
- State and private databases;
- Surveys of establishments in certain sectors; and
- Modeling of certain sectors based on the number of establishments and other attributes of the sector.

Establishments

A total of 2,173 establishments are involved in recycling, or the use of recycled materials, in Illinois. An establishment is defined by the U.S. Economic Census as a single physical location where business is conducted, or where services are performed. This would include processing centers, material recovery facilities, recycled-content product manufacturers, etc. As Figure ES.1 illustrates, 47 percent (1,021 establishments) of the total establishments are in the recycling industries, with another 35 percent in reuse and remanufacturing. Only 18 percent of establishments are recycling-reliant industries. This is consistent with the pyramid that one would expect; with many smaller collection, processing, and wholesaling operations feeding a few larger recycling reliant industries.

Figure ES.1

Total Establishments in Illinois

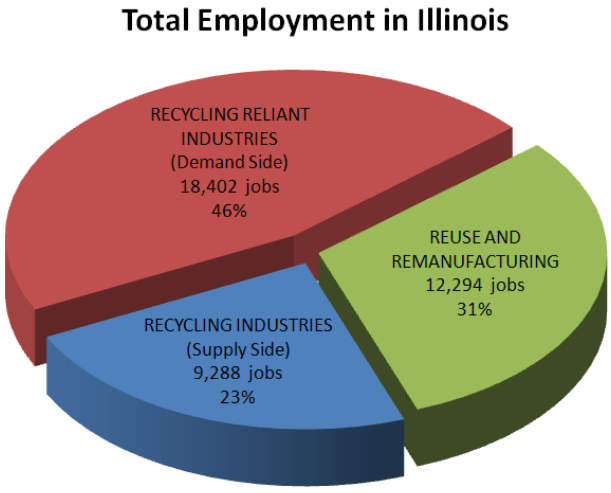


Employment

The 2,173 recycling establishments in Illinois employed an estimated 40,000 people (rounded) in 2009 (Figure ES.2).[2] Interestingly, the distribution of employment did not follow the distribution of establishments. The supply-side establishments (recycling industries) accounted for just 23 percent (9,300 jobs) of employment while the demand-side establishments (the recycling reliant industries) accounted for 46 percent (18,400 jobs). This phenomenon is explained by the small number of full-time equivalent (FTE) employees working at the large number of small composting and drop-off facilities that account for a significant portion of supply-side recycling establishments. The remaining 31 percent (12,300 jobs) were provided by the reuse and remanufacturing establishments.

Figure ES.2

Total Employment in Illinois



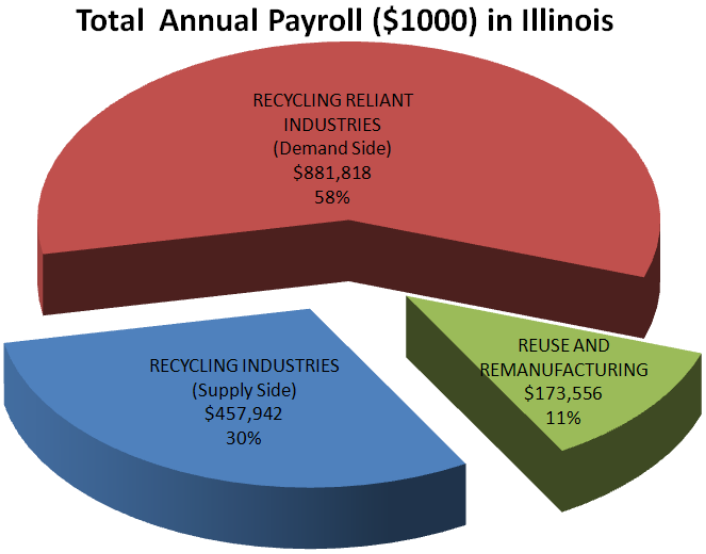
Payroll

The 40,000 jobs provided $1.5 billion dollars in annual payroll, with payroll roughly paralleling the employment distribution among recycling industries, recycling-reliant industries, and the reuse and remanufacturing industries. However, employee pay was higher in recycling-reliant industries, reflecting better paying manufacturing jobs.

[2] Data provided in this report are rounded to reflect that only a portion of the data are the result of Economic Census data, requiring estimates for certain sectors based on surveying and/or modeling.

Figure ES.3

Total Annual Payroll ($1000) in Illinois

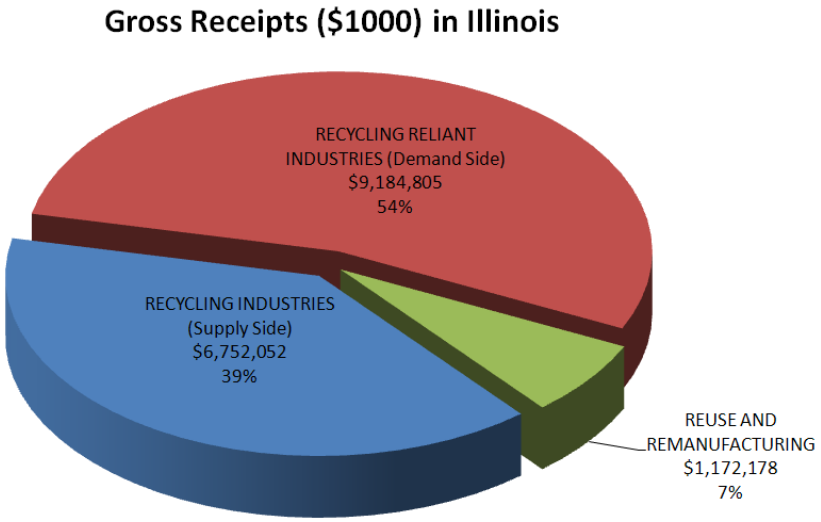


Gross Receipts

A total of $17 billion (rounded) in gross receipts were generated by the recycling, recycling reliant, and reuse and remanufacturing industries. Thirty-nine percent of gross receipts were generated by the recycling industries, with 54 percent generated by the recycling reliant industries. Only 7 percent of gross receipts were generated by the reuse and remanufacturing industries, which tend to deal in lower value materials, but may have significant environmental benefits.

Figure ES.4

Gross Receipts in Illinois



Indirect and Induced Effects

This Study Update presents estimated indirect and induced effects for each of the 26 sectors. Indirect effects measure the value of additional economic demands that the recycling, recycling reliant and reuse and remanufacturing industries place on supplying industries in the region. Induced effects accrue when workers in the direct and indirect industries spend their earnings on goods and services in the region. These indirect and induced effects were estimated using the IMPLAN model. The multipliers reported for each sector can be used by economic development agencies to support investments in recycling reliant (especially) industries. However, because of the all inclusive nature of this study, the indirect and induced effects cannot be added to the direct economic impacts when reporting on the economic contribution of recycling to Illinois without double-counting (see Part III for an explanation of the model and methodology).

However, as discussed in more detail in Part III of the report, a "whole model" approach was used to develop a rough estimate of the total (direct, indirect and induced) impact of the recycling, recycling reliant and reuse industries in Illinois without significant double-counting. Table ES.2 illustrates that, using the "whole model" approach, the recycling, recycling reliant, and reuse and remanufacturing industry contributed roughly 111,500 jobs, $3.6 billion in payroll (labor income), and $30.3 billion in gross receipts (output) to the State of Illinois in 2009.

Table ES.2

Indirect and Induced Impacts (rounded)

Impact Type	Employment	Labor Income	Gross Receipts
Direct Effect	40,000	$1,500,000,000	$17,100,000,000
Indirect Effect	34,000	$1,200,000,000	$7,100,000,000
Induced Effect	37,500	$886,000,000	$6,100,000,000
Total Effect	111,500	$3,600,000,000	$30,300,000,000

Part I. Background and Methodology

Introduction

Recycling is an important contributor to the economy of Illinois, providing local jobs and replacing materials often mined and manufactured outside of Illinois with materials collected and processed within Illinois. Through a grant from the Illinois Department of Commerce and Economic Opportunity (DCEO), the Illinois Recycling Association (IRA) contracted with DSM Environmental Services, Inc. (DSM) to research the contribution of recycling and reuse industries to the economy in the state of Illinois. The research is intended to provide state officials and the IRA with the ability to communicate the economic value of the recycling industry in Illinois and to compare the results of the 2010 (Study Update) to the original Illinois Recycling Economic Information Study published in 2001 (2001 Report).

This Study Update presents both the *direct* economic impacts, as well as estimates of *indirect and induced impacts,* for each recycling industry sector.

The primary source of data for the 2001 Report was the 1997 Economic Census. This Study Update is based primarily on 2007 Economic Census data. Therefore, this Study Update represents the economic status of the recycling industry ten years after the 2001 Report.

DSM attempted to follow the methodology used in the 2001 Report; however some modifications have been made in an attempt to further refine the methodology to make it as accurate a description of the economic role of recycling as possible. These modifications are described in detail below.

Data were gathered on total employment, total payroll, gross receipts and annual throughput (for applicable categories) for each recycling and reuse industry. These terms are defined as:

> **Employment** includes all employees (jobs) in the recycling, recycling reliant, and reuse industries (allocated by use of recycled versus virgin materials), from the factory worker to the administrator, and are reported as full time equivalent jobs.
>
> **Payroll** represents total taxable wages for each employee counted.
>
> **Gross receipts** represent total sales revenue for each recycling and reuse industry.
>
> **Throughput** represents estimated tons of recovered or recycled material handled, processed or otherwise used by the recycling or recycling reliant industries. Throughput is not available for many of the sectors for which economic data are reported and may be double counted in some cases.

The economic activities included in the recycling and reuse industries were defined in the 2001 Report, and were broadly grouped as follows:

- Collection, processing, and wholesaling of recyclable materials including paper, metals, glass, plastics, textiles, and electronics;
- Processing/composting and sale of organic materials, including leaf and yard waste, brush and tree trunks, food waste, and biosolids;
- Reclamation of processed materials to prepare them for end use (e.g. granulating plastics, cleaning up cullet);
- Manufacturing first stage products from recycled scrap including, but not limited to paper rolls, metal ingots, billet or rods, metal castings, plastic lumber, sheet or shapes, and glass containers;
- Wholesale reuse businesses, such as materials exchange services and used motor vehicle parts sales; and,
- Retail reuse businesses, such as used clothing, electronics, furniture, wood, and building supply stores.

Detailed descriptions of each sector within these broad categories are provided in this report, after a description of the study methodology and the differences between the methodologies employed for this Study Update and the 2001 Report.

Historical Background

Discussions among recycling industry stakeholders in the 1990's led to the definition of the "recycling industry" used in this report. This began with the 1994 report, *Value Added to Recyclable Materials in the Northeast* (Roy F. Weston) prepared under contract to the U.S. Department of Commerce, Economic Development Administration. The discussion of what industries to include, and at what level, continued with a Northeast Recycling Council report to the U.S. EPA in 1997, *Recommendations for Conducting a Study of the U.S. Recycling and Reuse Industries*, and concluded with the Recycling Economic Information (REI) study prepared for the Illinois Department of Commerce and Community Affairs by R.W. Beck and published in 2001 (2001 Report).

The final recycling industry definition in the 2001 Report included:

- All "supply side" activities that resulted in collecting, recovering, and preparing materials for recycling or products for resale; and,
- All "demand side" activities up to the first point at which the recovered material or product for reuse competes against the primary or virgin equivalent materials.

In other words, measurement of recycling economic activity was to stop at the primary manufacturing stage, or the last point before fabrication. This excluded any value added after first product manufacturing.

In the case of paper, this was at the paper mill, where a roll of paper was manufactured with pulp made in whole or part from recycled paper. While it included molded paper products, such as egg cartons, it excluded any conversion activities, such as envelopes or container making. In the case of rubber product manufacturers, this included the companies that produced mulch for use as a product for playgrounds and sports fields but it excluded the companies producing rubber crumb or other recycled rubber material as feedstock for another company. In addition, the definition of recycling activities excluded:

- Activities involving incineration or use of recovered materials as fuel; and,
- Activities of non-business entities involved in education, advocacy, or other activities that do not directly support or add value to the recovered materials or used products.

Table 1 below, reproduces Table 2.1 Business Category Definitions that were included in the 2001 Report. These same business categories (referred to as "sectors" in this report) are included in this Study Update although the definitions have been revised slightly to accurately reflect current activity in each sector.

Table 1

Sector Definitions

Sector		Definition
RECYCLING AND RECYCLING RELIANT INDUSTRIES: Categories 1 - 19		
1	Municipal Residential Curbside and Drop-Off Collection	Recyclables, leaf and yard waste collection from curbside and drop-off collection programs using government employees
2	Private Residential and Commercial Collection	Private sector collection of recyclables, leaf and yard waste, including contract collection on behalf of municipalities, cardboard and mixed paper collection from businesses
3	Compost and Miscellaneous Organics Producers	Establishments that produce compost and mulch from yard and wood waste received from municipal yard waste collection. Includes food composting operations.
4	Materials Recovery Facilities (MRFs)	Establishments that separate (by material type or grade), remove contaminants and densify recovered materials typically collected commingled from municipal recycling programs, or from the commercial sector
5	Recyclable Material Wholesalers	Paper stock dealers, scrap metal processors, and other establishments that may remove contaminants and further densify recovered materials for wholesale, including wholesalers of recovered electronics, textiles, and plastics

6	Glass Container Manufacturing Plants	Establishments that produce finished glass containers
7	Glass Product Producers (other recycled uses)	Establishments that produce glass products other than containers, such as fiberglass, abrasives, or other products
8	Nonferrous Secondary Smelting and Refining Mills	Recycling and alloying of nonferrous metals into primary shapes including billets, ingots, and other basic shapes
9	Nonferrous Product Producers	The production of nonferrous primary products through extrusion, rolling, or drawing processes
10	Nonferrous Foundries	Produce castings from nonferrous metals
11	Paper and Paperboard Mills/Deinked Market Pulp Producers	Produce paper and paperboard products from recovered paper or market pulp and/or deink recovered paper and sell pulp
12	Paper-Based Product Manufacturers	Produce cellulose-based products from recovered paper or paperboard (e.g., cellulose insulation, hydro-seeding, molded fiber trays)
13	Pavement Mix Producers (asphalt and aggregate)	The production of asphalt paving mix from Recycled Asphalt Pavement (RAP)
14	Plastics Reclaimers	Transform recovered plastics into raw materials (recycled feedstock) such as flake or pellet ready for remanufacture
15	Plastics Product Manufacturers	Transform recovered plastics directly into products (e.g., plastic lumber) or convert a recycled plastic flake or pellet into an intermediate or end product
16	Rubber Product Manufacturers	Manufacture products using crumb rubber, mulched rubber or cut rubber shapes as feedstock
17	Steel Mills	Produce iron and steel slabs, billets, bar, plate, and sheet from scrap and/or raw materials including upstream preparation and downstream stamping and cutting
18	Iron and Steel Foundries	Produce cast iron or steel products
19	Other Recycling Processors/Manufacturers	Processors and manufacturers not elsewhere classified, such as fluorescent lamp and mercury recyclers, construction and demolition recyclers, carpet recyclers, waste oil recycling, textile (rags) recycling
REUSE AND REMANUFACTURING INDUSTRY: Categories 20 – 26		
20	Computer and Electronic Appliance Demanufacturers	Sort, grade, dismantle, and/or rebuild used computers or electronic appliances
21	Motor Vehicle Parts (used)	Clean, sort, inspect, remanufacture, wholesale, and retail used automobile parts
22	Retail Used Merchandise Sales	Retail thrift stores, antique shops, reuse centers, and other shops dedicated to selling used merchandise, including building materials
23	Tire Retreaders	Remove old tread from worn tires and add new tread
24	Wood Reuse	Process used wood for reuse (e.g., pallet rebuilders, construction materials)
25	Materials Exchange Services	Facilitate the reuse of products and materials by commercial and industrial establishments
26	Other Reuse	Other reuse or remanufacturing, not elsewhere classified

It should be noted that the 1994 Roy F. Weston report methodology was modified significantly in the 2001 Report. Two important differences between the 1994 Report and the 2001 Report include:

- The 1994 Report estimated the value added associated with using recyclables instead of virgin materials, while the 2001 Report used gross receipts. Using gross receipts double counts economic activity because it ignores the purchase cost of the recycled material, which represents the gross receipts of the supply side activity providing the scrap material. For this reason, one cannot compare total recycling economic activity as a percent of Gross Domestic Product (GDP) for the State of Illinois, because GDP is based on value added calculations.

- The 1994 report estimated economic activity for demand side activities based on the tons of scrap used per employee – in essence allocating employment and receipts based on the percent of scrap consumed. The 2001 Report assumed that most economic activity at a plant that used recycled material as an input could be allocated to recycling.

Subsequent to publication of the 2001 Report there were criticisms of the NERC/EPA methodology published in influential trade magazines questioning the scope of the activities included, and the methodology for counting total economic activity. DSM attempted to address these criticisms during preparation of the NERC Study Update for five northeastern states in 2009, and has used these same modifications for this Study Update for Illinois.

Modifications to the 2001 Methodology

Three significant modifications to the 2001 Methodology were proposed by DSM and agreed to by the IRA Staff and Board members during the project kickoff meeting. These changes in methodology are discussed below.

1) Division of Economic Data between Recycling Activities and Industries that rely on Recycled Materials (Recycling Reliant Industries)

This Study Update explicitly divides the direct economic data into three categories of economic activity (see Table 4, below, for a detailed list by category). The first category includes all activities associated with the collection and processing of recyclables to make them available for use in a new industrial process. These industries were labeled "supply side" activities in the 2001 Report and are now explicitly labeled the "recycling industry." The recycling industry is separated in this report from industries that purchase secondary materials from the recycling industry. These industries were labeled "demand side" activities in the 2001 Report and are now labeled as "recycling reliant" industries. That is because a plastic molder is first and foremost, part of the plastics industry and a glass container manufacturer is part of the glass industry. Both plastic and glass can be produced without using secondary materials, but often use a mix of secondary materials purchased from the recycling industry, as well as virgin materials. The third category remains the same as in the 2001 Report and includes all reuse and remanufacturing industries.

The reason for this division is to allow Illinois to quantify the "recycling industry" – those activities that collect and broker recyclables, sort into compatible materials, sort out contaminants, and process the sorted material to the point where they can be used in a manufacturing activity - and then to separately quantify the size of the industry which relies on these recycled materials as input into the production process.

2) Allocation of Employment, Payroll, and Revenues within the Industries which rely on Recyclables

As discussed above, most industries can use virgin material, recycled material, or a mix of virgin and recycled materials. It is unreasonable to assume, for example that all employees (and all revenues) from a glass container manufacturer that purchases both cullet and raw materials (e.g. sand, soda and limestone) are related to recycling; ignoring the mining and quarrying economy that is also contributing to the input to the glass plant. As stated above, one of the criticisms of the original REI methodology (that was followed to some extent in the 2001 Report) was that the estimated direct economic impact did not explicitly account for this issue. For that reason it was decided for this Study Update, to more clearly allocate recycling economic activity in all sectors to that portion of the manufacturing facility that uses recycled materials.

For example, if a glass container plant uses an estimated average of 25 percent cullet , then 25 percent of employment, payroll, and gross receipts is allocated to recycling. While it is understood that the relationship between use of recycled material and employment and revenue is not directly related, it is a reasonable assumption given the level of data available to conduct this analysis.

It should be noted that this change in allocation would, all other things being equal, result in declines in reported economic activity associated with recycling in some sectors over that reported in the 2001 Report. As such, it is difficult to directly compare the results of the Study Update with those of the 2001 Report.

3) Iron and Steel

The iron and steel industry is different from industries that manufacture paper, plastic, and glass in that many modern steel mills require a significant percentage of scrap in the making of new iron and steel products.[3]. This was noted in the 2001 Report, which as a consequence counted all economic activity associated with iron and steel production, including making steel and shapes and forming tube and pipe, except for exclusion of five percent of activity to account for downstream conversion.[4]

[3] This is primarily the case for steel mills using electric arc furnaces.
[4] The 2001 Report utilized 1997 Economic Census data for NAICS sector 331111 but excluded NAICS subsector 3311114 non-integrated mills from the totals (leaving roughly 88% of the values) and then subtracted 5% of the totals to account for downstream conversion. The economic Census data no longer breaks out data for non integrated mills.

This Study Update (2010) counts downstream activities as recycling related, but modifies the 2001 methodology to allocate employment, payroll, and gross receipts based on the underlying types of furnaces operating in Illinois and the national average scrap consumption by furnace type. According to research performed by the Steel Recycling Institute (SRI), electric arc furnaces (EAF) run on a very high charge of scrap (83 percent on average in the US in 2006), while basic oxygen furnaces run on a much lower charge of scrap (averaging 29 percent in 2006). According to the SRI, Illinois electric arc furnaces use an even higher charge of scrap (estimated to be 90 percent) due to production of wire and rebar.[5]

DSM relied on the SRI to provide data on the number of electric arc and basic oxygen furnaces operating in Illinois in 2009 and their capacity. DSM then allocated employment, payroll, and gross revenues based on the throughput of each type of furnace and the agreed upon scrap usage percentage. This change in methodology reduced the recycling economic impact for the iron and steel industry in Illinois, but not significantly. In the end, 56% percent of total economic activity was allocated to recycling (based on the mix of electric arc and basic oxygen furnaces operating in Illinois) and scrap metal recycling continues to play a very important economic role in Illinois.

Comparison with the 2001 Report

The Request for Proposals for this Recycling Economic Information Study Update states:
"At a minimum the updated study shall: Compare the results of the current Study to the results of the Illinois Economic Information Study completed in 2001;"

Unfortunately, despite this goal there are two primary issues that make a direct comparison difficult.

First, as discussed above, changes have been made to the methodology, especially with respect to the economic analysis of the recycling reliant, or demand side, industries. These changes make a direct comparison between the 2001 Report and this Study Update difficult for those demand side industries most affected by the change in methodology – especially glass, plastic, and steel.

Second, there were literally hundreds of manipulations of data necessary to estimate the economic information contained in the 2001 Report. While DSM has attempted to follow a similar methodology, there are many cases where data that were not available for the 2001 Report are now available, but other data are not available now, requiring new manipulations. These manipulations of data for both studies introduce a lot of "noise," for a lack of a better term, to the data which makes direct comparisons very difficult.

Therefore, the reader is cautioned that this report can not readily address the need for comparison between 2001 and 2010. As a result, this report should, first and foremost, be read as a stand-alone

[5] According to the SRI, electric arc furnaces used to produce "long product" (e.g. wire and rebar) use greater quantities of scrap than facilities producing sheet products.

document that provides a rough approximation of the size of the recycling, recycling reliant and reuse industries in Illinois; and only secondarily as a rough comparison between recycling economic activity in 2001 versus 2010.

An attempt has been made in the sector-by-sector descriptions and at the end of this report to provide general information on the change in the industry since the 2001 Report, but this general information is not necessarily informed by a comparison of economic data from the two reports.

Research and Survey Methodology

DSM attempted to compile, and accurately classify, recycling activity in each sector for the state of Illinois, including or counting only known recycling industries, as defined in the original REI methodology report.

The data development and survey approach included the following steps.

First, DSM sought to develop a comprehensive database of recycling businesses, by sector, for Illinois. DSM collected and merged contact lists from a myriad of sources, including state recycling market listings and databases, trade organization member lists, and published and purchased directories. DSM then carefully reviewed the listings for duplication, and performed limited research to attempt to correctly code each listing, with the goal of creating a single database of recycling businesses for Illinois coded by sector.

Second, DSM reviewed and compiled available government economic and throughput data on each sector. The types of government economic data used for the study included:

- **The United States Economic Census** is conducted every five years in the years ending with '2 and '7, with the most recent data available from 2007[6]. For 2007, the economic census covers 27 million businesses and collects data from 4.4 million business locations representing 96% of the U.S. economic activity. The U.S. Census Bureau mails the majority of larger employers in the private, non-farm economy a survey to gather data from 1060 NAICS categories including manufacturing, construction, real estate, utilities, and wholesale and retail trade. Compliance is mandatory, and response rates are reported to be over 80%. However some data, particularly at the State or County level, are not published due to a small sample size and/or federal disclosure laws. Data are collected on a location or establishment basis and reported specific to each separate location.

- **County Business Patterns (CBP)** is a supplemental set of economic data on employment and wages. Essentially additional payroll data are collected through other sources and reported on what is known as "multi-unit companies" (those with more than one location).

[6] As of June 30, 2010, the 2007 economic census data for the wholesale and retail trade sectors had still not been released.

These data are matched to the data in the Business Registry by use of Employer Identification Numbers (EINs) and other identifying information to update the Business Registry (formerly called the Standard Statistical Establishment List). The most recent year of CBP data for Illinois is 2007, and is used in this report. CBP data includes establishment counts, employment counts and total payroll but not gross receipts.

- **The Annual Survey of Manufacturers (ASM)** is an annual survey undertaken by the U.S. Census Bureau of a subset of manufacturers. According to census bureau employees, a weighting factor is applied to determine how large a sample, and from which NAICS code, surveys should be conducted each year. As in the case of the economic census, businesses are mandated by law to complete the survey form. Data are reported in less detail than the Economic Census, with many 4, 5, and 6 digit NAICS codes and some state level data omitted. Therefore, while data from some industries, such as iron and steel mills, glass container manufacturing, foundries (ferrous and nonferrous are grouped together), and pulp, paper and paperboard mills are available for 2008, data for some manufacturing industries that are reliant on scrap are not available.

- **The Bureau of Labor Statistics (BLS)** provides quarterly and annual employment statistics by state and occupation, which can be used to supplement suppressed data from the economic census and/or to research average wages in a state or specific occupation. For example, BLS data are available on refuse and recyclable materials collection workers that can be used for estimating or modeling recycling collection payroll. The most recent data available were from 2009.

- **The United States Geological Survey Metals Yearbook** provides an annual review of the mineral and material industries of the United States and foreign countries, and contains statistical data on materials and minerals including economic and technical trends and development. While some data are available at the state level, national data for nonferrous scrap recovery in 2007 were used for this study.

Third, DSM contacted all active trade organizations representing recycling industries in the United States. A list of contacts made to trade organizations and to other government experts (including the different sections of the Census Bureau) and that provided input ultimately used for this study are shown in Table 2. This includes a list of organizations with data and information contained on their websites that was used as a resource for this research.

Table 2

Government, Industry and Organization Resources used by DSM

Organization	Contact and/or Resource	Sector
American Chemistry Council, Plastics Division	Database	14, 15
American Forest & Paper Association	Stan Lancey	11, 12
American Foundry Society	Database	10 and 18
Association of Post Consumer Recyclers	Database	14
Azure Technologies	Sergio Firpo	14, 15
Bureau Labor Statistics	Databases	Many
Carpet America Recovery Effort (CARE)	Databases	19
Cellulose Insulation Manufacturing Association	Mr. Dan Lea, Executive Director	12
Asphalt Paving	Databases	13
FIRST (Foundry Industry Recycling Starts Today)	Resources	8, 9, 10
Glass Packaging Instutute	Joe Cattaneo	6, 7
Institute of Scrap Recycling Industries	Tom Crane	5 and 29
Illinois Asphalt Pavement Association	Marvin Trailer	13
Illinois Recycling Association	Members List	Many
Illinois EPA's Registered Electronic Waste Recyclers List	Databases	20
National Wood Pallet and Container Association	Databases	24
Illinois Recycling Association and Executive Board	President Kristina A. Kaar, Vice-President Paul Jaquet, Treasurer Pete Adrian, Secretary David Miller, Executive Director Mike Mitchell.	Many
NAPCOR	Databases	14
National Solid Waste Managers' Association	Steve Changaris, Regional Manager	2
Non-Ferrous Founders' Society	James Mallory, Executive Director	10
US Plastic Recyclers Directory – Plastic Product producers	Databases	15
Government Advisory Associates	MRF Database purchased	4
Scrap Tire and Rubber 2010 Users Directory	Scrap Rubber Industry Information purchased	16
Illinois EPA, Bureau of Land	Derek Rompot, P.E.	3
Steel Recycling Institute	Robert MacDonald	17
Tire Retread Information Bureau	Databases	23
US Census Bureau - Annual Survey of Manufacturers	Thomas Flood, Annual Survey of Manufacturers	Many
US Census Bureau - Metals Manufacturers	Nathaniel Shelton	Many
US Census Bureau - Wholesale Trade	Yvonne Wade, Wholesale trade	5, 29
US Geological Society	Lee Bray	8, 9

Fourth, for sectors where existing data were unavailable or insufficient, DSM surveyed establishments based on the lists compiled from the sources described above. Survey data were used to either define economic activity for that sector, or to provide partial data to complement existing economic census information where data were suppressed on a statewide basis. A discussion of the sectors surveyed and the survey method follows.

Finally, DSM gathered data necessary to model the public and private recycling collection industries in Illinois. The modeling approach is described in more detail below for these sectors.

Surveys

The survey instrument was designed based on the 2001 Report. However, using advances in desktop application software, DSM also generated an electronic, interactive survey form which could be emailed to targeted establishments and returned electronically. The survey form could be viewed and downloaded from DSM's web page, or printed and faxed if the respondent preferred. The survey was also posted on the IRA website.

Both DSM's and IRA's web sites also contained an introductory letter from IRA with additional information about the project and statements of data confidentiality. This letter was also sent to potential survey participants to introduce the project, and gain support. Finally, DSM created a separate statement of confidentiality for use during surveying when potential respondents expressed concern over how the data would be used and whether they would be individually indentified.

DSM conducted surveys in the sectors shown in Table 3 below.

Table 3

Sectors Surveyed by DSM

Sector	Name
1	Drop-off Recycling
3	Organics Recycling
6	Glass Container Manufacturers
7	Glass Product Manufacturers
12	Paper-based Product Manufacturers
13	Pavement Mix Producers (asphalt and aggregate)
14	Plastic Reclaimers
15	Plastic Product Manufacturers
16	Rubber Product Manufacturers
19	Other Recycling Processors/Manufacturers
20	Computer and Electronic Appliance Demanufacturers
24	Wood Reuse
25	Materials Exchange Services
26	Other Reuse

For each sector, DSM developed a comprehensive database of establishments. The database was populated using a number of sources including industry trade association membership lists, recycling organization lists, state recycling market lists, published lists, and internet and other research. Establishments were coded by sector and targeted for contact, as well as recoded during the survey process if necessary.

Establishments were contacted and surveyed via a combination of email and telephone calls. Contacts were emailed a survey form along with an introductory letter. If a response was not received within a designated time period, DSM surveyors attempted to follow up by telephone.

DSM attempted to contact all listed establishments in each sector unless collected survey responses for that sector reached a point where meaningful extrapolations could be made for the rest of the establishments. Overall, 668 establishments were contacted of the 958 contacts identified. A total of over 100 surveys were completed, or 15 percent of those targeted for the survey.

In some sectors, where there was a small sample size for that sector, all establishments in the sector were successfully surveyed and the data aggregated for complete reporting. In the majority of

cases, however, sector-wide data were estimated by applying average data from surveyed establishments across Illinois. Where survey response rates were low in a sector, industry sources and other data were sought to confirm or supplement data, and/or survey data from the recent REI study performed for the Northeastern states of Pennsylvania, New York, Delaware, Massachusetts and Maine were included to obtain a larger sample size for extrapolation.

It should be noted that surveying business sectors to estimate economic activity is a difficult task. In some cases it was simply impossible to obtain sufficient participation from individual establishments concerning their economic activity to accurately estimate economic activity for that sector. Only the U.S. Census Bureau, which has the legal authority to require full reporting, is capable of obtaining sufficient and complete data. As such, should IRA or the state of Illinois desire to continue to update this study going forward, contacts should be made with the U.S. Census Bureau to encourage further disaggregation and reporting of specific industries listed in Table 3.

Modeling

Sector 1 (Municipal Residential Curbside and Drop-Off Collection), and Sector 2 (Private Residential and Commercial Collection) were modeled by DSM to estimate the number of employees and gross revenues. In the case of Sector 2 the number of establishments was derived using Economic Census data. However, the number of employees, payroll and gross revenues were estimated based on modeling and Census Bureau and Bureau of Labor Statistics data on average wages for those in the collection sector.

To model municipal collection activity, DSM collected data on municipal recycling collection programs and the estimated number of households served and the estimated tons of residential material collected. DSM used the resulting household count to estimate costs and labor requirements in Illinois.

To model commercial collection activity, DSM used data on the estimated tons of commercial paper recycled in Illinois. Collection costs were modeled based on truck and labor requirements based on DSM's database of commercial collection costs.

DSM is fairly comfortable that public and private collection data for Sector 1 are reasonable. However, DSM was unable to obtain complete data on the number of curbside and drop-off collection programs in Illinois from any source. In addition, no tonnage data were available from local or State agencies, requiring DSM to make rough estimates based on estimated throughput processed at Illinois MRF's.

Modeling of private commercial collection in Illinois is also difficult. Modeling is driven by DSM's best estimates of the tons of commercial recyclables (e.g. OCC and mixed paper) collected; compiled using throughput data from Illinois MRF's and the estimated percentages that were identified as commercial. From this throughput data, commercial collection costs were modeled even though pricing of collection is negotiated between a myriad of private entities and is almost never reported.

As such, estimates of private commercial collection should be viewed as rough estimates based on best professional judgment.

Supporting Data and Base Year

For many sectors (as described in the footnotes to the spreadsheets, Part II, below), DSM used a combination of approaches to finalize the economic estimates, including 2007 Economic Census data, 2007 County Business Patterns (CBP) data, 2008 Annual Survey of Manufacturing Data, economic data from trade organizations (2007 – 2009), economic data on individual businesses from business databases, tonnage and program information from State agencies, and direct surveying of individual firms to develop total numbers for each sector in Illinois.

Work on compiling databases and surveying firms began in March 2010 and was finalized in mid-June 2010, with the majority of the information gathered from April through May 2010. The survey data provided was based on 2009 calendar or fiscal year at the business.

Study Limitations

While DSM believes that this study accurately portrays the magnitude of the recycling industry in Illinois, the following limitations must be taken into account when reviewing and using the economic data contained in this report:

- Both industry data and industry purchased databases that could be helpful to this study at the national level are often not helpful at the state level because company financial data are not always specific to a specific state. For some industries, DSM had to be more reliant on Economic Census data, which is developed on an establishment or single location basis, and on survey data.

- It was often the case that state and national databases mixed brokers with recycling reliant firms (or end users), and it was difficult to separate these two activities unless a telephone survey was successfully completed to properly designate each listing. This makes an absolute count of establishments in some sectors questionable.

- Wherever possible DSM relied on Economic Census data, which was last published for calendar year 2007, and which is now more than two years old. In addition, as of June 30, 2010 (the closing date for use of data in this report), not all of the 2007 Economic Census data had been published. While the manufacturing sector data were published for Illinois, wholesale and retail trade data had not been published requiring DSM to use a combination of data from County Business Patterns and the National Economic Census and the 2002 Economic Census in order to estimate Gross Receipts for these unreported sectors.

- There are some critical sectors where Economic Census data and trade association data are not available (e.g. the plastics, rubber, and glass products industry), making it necessary to

rely on survey data. The results are likely to be less reliable because it is extremely difficult to obtain survey data on sensitive economic information. In most cases it took a significant effort to reach a knowledgeable person by telephone, and many firms were reluctant, or refused to divulge economic data. As a consequence, survey responses were lower than hoped for in some categories, leading to potential underreporting in some cases of recycling activity or potential over reporting when a small sample size included a large establishment. For example, glass, rubber and paper product manufacturers were difficult to identify, or when identified, refused to be surveyed. Therefore extrapolating these data from one business to another had to be done even though businesses are not homogenous in this sector.

- In order to increase the willingness of businesses to report economic data, survey data were gathered in ranges for employment, payroll, and gross receipts. While in some cases the business owner reported actual figures, most surveys produced data from a range. DSM used the midpoint of each range from which to compile the data.

- DSM reported data only from plastic product manufacturers (they were called "plastic converters" in the 2001 Report) known to use recycled resins. This is a significant departure from the 2001 Report which assumed a much wider use of recycled resin use in new plastic products than data available to DSM appear to indicate. This significantly lowers the reported economic activity for this sector.

- First stage products are sometimes converted into final stage products (e.g. envelopes, or metal parts) at the same facility, and isolating the costs of production of the first stage product is difficult if not impossible for some facilities.

- There were limited data available at the time that the study was undertaken, on the amount of residential and commercial recycling occurring in Illinois. Typically residential program and tonnage data can be used to model residential collection and commercial tonnage data to model curbside collection. Because these data are not collected in Illinois, DSM had to make estimates using MRF tonnage data for the State.

- Finally, there is no question that tonnage data are double, triple, or quadruple counted in this report, as they were in the 2001 Report. Given that this is an economic study, it may be that eliminating the reporting of tonnage data should be considered because there is no way for the various industries to avoid double counting of tonnage as it moves up the supply chain.

The Recycling Industry Sector by Sector

Table 4 lists the 26 sectors for which economic information were collected for this report. Table 4 divides the sectors into the three overarching categories: Recycling Industries (supply side), Recycling Reliant Industries (demand side), and Reuse and Remanufacturing Industries. Following Table 4 is a more detailed description of each sector.

Table 4

Categorization of Included Sectors

Sector	Description
	RECYCLING INDUSTRIES (Supply Side)
1	Government Staffed Residential Collection
2	Private Staffed Recycling Collection
3	Compost/Organics Processor
4	Materials Recovery Facilities
5	Recyclables Material Wholesalers
14	Plastics Reclaimers
	RECYCLING RELIANT INDUSTRIES (Demand Side)
6	Glass Container Manufacturing Plants
7	Glass Product Producers
8	Nonferrous Secondary Smelting and Refining Mills
9	Nonferrous Product Producers
10	Nonferrous Foundries
11	Paper and Paperboard Mills/Deinked Market Pulp Producers
12	Paper-based Product Manufacturers
13	Pavement Mix Producers (asphalt and aggregate)
15	Plastics Product Manufacturers
16	Rubber Product Manufacturers
17	Steel Mills
18	Iron and Steel Foundries
19	Other Recycling Processors/Manufacturers
	REUSE AND REMANUFACTURING
20	Computer and Electronic Appliance Demanufacturers
21	Motor Vehicle Parts (used)
22	Retail Used Merchandise Sales
23	Tire Retreaders
24	Wood Reuse
25	Materials Exchange Services
26	Other Reuse

Recycling Industries (Supply Side)

Sector 1: Public Collection

Municipal curbside and drop-off recycling collection programs are expanding in Illinois, and are an important first step in the municipal recycling process. They also are a large and often overlooked contributor to the recycling economy.

Recycling participation and recovery rates may be encouraged by regulations in Illinois as thirty-one counties/municipalities have a residential recycling ordinance in place and 11 counties have a commercial recycling ordinance in place[7]. There is also an extensive system of drop-off recycling. Many residents living in the rural areas of Illinois have access to drop off collection stations and there are 33 locations spread throughout Chicago. However, there are still rural areas in Illinois that do not have access to recycling with only two municipalities in the southern five counties that have recycling available for residents.[8]

Residential recycling collection is accounted for under Public Collection (Sector 1) or Private Collection (Sector 2). Public collection (Sector 1) encompasses municipal curbside and drop-off recycling collection programs offered through local governments, including towns, cities, villages, counties and solid waste districts or authorities, and staffed by public employees, although some of the drop-offs are not staffed at all. Sector 1 data excludes those programs offered through local government but under contract to a private entity, which are accounted for under Sector 2.

DSM updated a list provided by IRA of municipal curbside recycling collection programs. DSM added population and household data to the list and researched those larger municipalities missing from the list to finalize a list of municipal curbside programs operating in Illinois, and the estimated number of households or total population served by the program.

Using the household counts, DSM was able to estimate curbside collection labor and costs necessary to service the population, as well as estimate recycling tonnages. DSM then modeled total costs based on per household costs and collection labor necessary. DSM used data reported in the County Business Patterns (2007) for NAICS Code 562111, Solid Waste Collection, to determine the average pay of recycling collection workers, and to estimate total payroll based on the modeled labor requirements in Illinois.

[7] Nonhazardous Solid Waste Management and Landfill Capacity in Illinois: 2008, December 2009, Appendix E
[8] Crystal Davenport, Regional Planner, Southern Five Regional Planning Commission

For municipal yard waste collection, DSM followed the same methodology as for municipal curbside costs, adjusting for a shorter collection season, a crew count of two per truck, and 75% of Economic Census wages for solid waste collection workers.

For drop-off collection, DSM surveyed municipal drop-offs in Illinois and combined these data with data from the NERC REI study states (2009 data) to determine the average per ton costs and labor requirements per ton and per drop-off. Using rough estimates on the average tonnage collected at drop-offs and estimated drop-off tonnage for the State of Illinois, DSM was able to model drop-off collection labor and costs.

Sector 2: Private Collection

This sector encompasses those private businesses engaged in the collection of recyclables from residents and businesses through a direct contract with the municipality (to service residents) or the generator (for all commercial recycling collection). [9]

These recycling haulers collect mixed recyclables from households or businesses (delivering them to materials recovery facilities for sorting as described in Sector 4), or specific materials such as corrugated, mixed paper, and metals, and in some cases plastics, electronics, or glass.

DSM estimated employment, payroll, and gross receipts from these recycling haulers using two approaches:

- For municipal contracted collection, DSM estimated collection labor, payroll and operating costs based on the number of households served, and average per household costs to service municipal customers using recent DSM collection cost models. DSM used 2007 County Business Patterns wage data for collection workers to validate estimated labor costs.
- For commercial recycling costs, DSM used the Government Advisory Associates (GAA) database on total MRF throughput reported as commercial. This was compared against estimated quantities of commercial cardboard and mixed paper reported as collected for recycling in Delaware, and Massachusetts, used in the Northeast Recycling Council (NERC) 2009 Recycling Economic Information Study Update to confirm the accuracy of the GAA reported commercial tonnage. Using the tonnage data and the tonnage by source (as available), DSM estimated the amount of material collected by private haulers as opposed to brokered directly from the commercial generator to the end user. Once these final net tonnage estimates were completed, DSM was able to estimate the number of trucks necessary to collect material and average truck operating costs, including labor (based on collection models DSM had developed for other projects).

[9] Nonhazardous Solid Waste Management and Landfill Capacity in Illinois: 2008, December 2009

Sector 3: Organics

Landscape compost in Illinois is produced by permitted municipal and private facilities that accept, handle and process leaf and yard waste, brush and tree trimmings, and 10% additive (typically food scraps or manure) to material specifications. Landscape composting facilities handle and process material using a combination of low technology windrow composting and higher technology in-vessel systems.

There were 39 permitted landscape composting facilities and 6 permitted non-landscape compost facilities in Illinois in 2009 for a total of 45 permitted composting facilities. The non-landscape compost facilities are typically food scrap composters. There are only two permitted facilities that compost biosolids or residuals from wastewater treatment facilities, as biosolids have traditionally been land applied in Illinois instead of composted. In addition to the 45 permitted composting facilities, there were 9 on farm composting facilities reported for a total of 54 composting facilities.

While facilities that handle animal wastes and food waste on a large scale utilize more sophisticated composting processes to control orders and material curing time, yard waste (grass, leaves and brush) and wood wastes (branches, limbs, trunks and ground untreated wood) are often composted in simple windrows, at relatively low cost.

DSM surveyed public and private composting facilities by telephone and email to determine the average cost of operations, annual throughput, annual employment (full time equivalents) and payroll costs to estimate total economic activity for this sector in Illinois. The facility averages were then applied to total facility counts in the state to develop total estimates of employment, payroll, and gross receipts, adjusting for average per ton operating costs.

This sector also includes facilities that produce mulch, bark, and other soil amendments in addition to compost. For example, a grinding operation that ground wood waste for use as landscaping materials or mulch was part of the survey and accounted for in the total activity for Illinois. However this sector does not include small, unpermitted leaf and yard waste composting and mulching operations that are likely to operate in the State but that DSM was unable to obtain reliable estimates on the total number of facilities, nor size of the typical operation.
It also should be noted that organics composting activity is expected to grow in the coming years with the passing of SB99 which exempts facilities that accept food waste for composting from pollution control facility requirements, regulating these facilities much like the large number of landscape waste composting facilities.

Sector 4: Materials Recovery Facilities

Materials recovery facilities (MRFs) are processing facilities that handle mixed and separated recycled materials but that have the capacity to mechanically sort as well as process materials for sale to end markets. MRFs add value to recycling by allowing municipalities and private haulers to collect material commingled, making collection more efficient, and then deliver mixed materials to the MRF which cleans, separates, and densifies materials for transport to specific end markets.

DSM purchased a commercially available database of MRFs from GAA (Westport, CT) to obtain data on the number of establishments, employment, throughput, and source of material (residential versus commercial). DSM then performed research to supplement the list of facilities.

DSM applied average material revenues (from 2009 research on material prices) to total tonnage throughput to estimate gross receipts, and used economic census data (2007 County Business Patterns) to estimate payroll for reported employment.

Sector 5: Recyclable Material Wholesalers

This sector encompasses those businesses that are primarily engaged in the *"merchant wholesale distribution of automotive scrap, industrial scrap, and other recyclable materials."* This includes establishments which wholesale and distribute scrap iron and steel, paper and paperboard (e.g. paper stock dealers), and recovered nonferrous metals, textiles, glass, plastics, rubber, and oil.

These businesses primarily handle material processed elsewhere, such as corrugated from grocery and large retail outlets. However, wholesalers may also consolidate loads, and may reprocess material to increase value by removing contaminants from lower grade materials.

DSM used the Economic Census data from 2007 to estimate establishments, employment, payroll and gross receipts for this sector.[10] This sector incorporates NAICS code 4239301 - Iron & Steel Scrap Merchant Wholesalers – processors and dealers, NAICS code 4239302 - Recyclable Paper & Paperboard Merchant Wholesalers – and NAICS Code 4239303 – All other Recyclable Material Merchant Wholesaler, , which include brokers of plastics, textiles, glass and rubber,

[10] There is separate Economic Census data on Materials Recovery Facilities (Sector 4) under NAICS code 562920.

Sector 14: Plastic Reclaimers

Plastics Reclaimers buy post-industrial and post-consumer plastics and process them to prepare them for end-use in a manufacturing facility. Plastic reclaimers are separate from establishments that broker, sort, or bale plastic material, or manufacture an end product, which are included in Sector 4, Sector 5, and Sector 15.

Reclaimers often specialize in a single resin (e.g. polyethylene or polypropylene, or in engineering or other specialty resins). Depending on the needs of the end user, processes at reclaimers may include: grinding into flake, washing, colorizing, or adding other additives, compounding, remixing, and/or extruding into pellets.

Economic Census data are not available for this sector. Therefore DSM surveyed reclaimers in Illinois to develop economic data. During the survey process, a few Illinois reclaimers stated that they were closed for all or part of 2008 and 2009 due to both low virgin prices and lack of demand. While they also stated that as the economy recovers and demand increases, they hoped to reopen their doors, it will take time to return to the same level of business before the economic downturn.

The plastic reclaimer contact list was developed using the Association of Postconsumer Plastic Recyclers members list, DSM's network of industry contacts, and the US Plastic Recyclers Directory for Illinois. DSM surveyed plastics reclaimers over the telephone and by email to determine the average gross revenues from operations, the typical size and throughput, annual employment, and payroll costs to estimate total economic activity in the state of Illinois.

Recycling Reliant Industries (Demand Side)

Sector 6: Glass Container Manufacturers

This sector is comprised of manufacturers of glass containers typically used for liquor, beer, wine, other beverages, and food. Glass container manufacturers use color sorted recycled glass cullet along with virgin materials in their production.

DSM surveyed by telephone glass container manufacturing facilities located in Illinois to estimate average cullet throughput, annual employment, and payroll costs, and gross receipts. The use of recycled material at the surveyed

establishments was 15 percent of all throughput, and therefore total estimates of employment, payroll, and gross receipts are reduced by the percentage cullet used at each facility to account for only that activity involving recycled material.

Sector 7: Glass Product Producers

This sector encompasses manufacturers (other than glass container manufacturers, which are covered in Sector 6) which use recycled glass to produce a product. Examples of Sector 7 manufacturers include those producing fiberglass and specialty glass products. DSM surveyed glass product producers to develop estimates of the average size of facilities, and then applied the averages to facility counts to estimate total employment, payroll, and gross receipts.

Sector 8: Nonferrous Secondary Smelting and Refining Mills

Nonferrous metals (those that do not contain iron) are used in a wide variety of manufactured products, including beverage cans, electronics, automobiles, and household appliances. Secondary manufacturers smelt (chemically reduce), refine, and sometimes blend nonferrous scrap along with metals recovered from shaping and trimming during primary metal production and fabrication processes. The most common nonferrous metals recovered in the United States are aluminum, lead, copper, and zinc followed by chromium, nickel, and magnesium.

Aluminum, the most widely used nonferrous metal, is used by container and packaging manufacturers as well as in the transportation, construction, and electrical sectors. Copper is used in power, lighting, and communications transmissions. While the domestic use of lead has decreased in most products, it is still found in storage batteries for automobile ignition starters, and uninterruptible and standby power supplies (necessary for computers, emergency lighting, and telephones). Finally, zinc is primarily used to galvanize products found in the automobile, steel, and construction industries, but secondary zinc is often used to produce brass and bronze or blended for alloys.

Data to estimate the value of the nonferrous smelting and refining operations in Illinois came primarily from the Economic Census. However the percentage of scrap usage was reviewed with the Aluminum Association and USGS metal experts for the 2009 NERC REI Study and applied here. The NAICS codes used by the Economic Census separates secondary smelting and refining mills by metal type, for aluminum (331314), and copper (331423), but groups the rest of nonferrous metals into NAICS 331492, as *Secondary Smelting, Refining, and Alloying of Nonferrous Metals*.

Sector 9: Nonferrous Product Producers

The nonferrous product producers sector encompasses manufacturers that produce primary products or shapes from nonferrous scrap, including bar plate, sheet, strip, and tube. This sector excludes secondary smelting and refining activity (see: Sector 8) but includes the following activities:

- *Aluminum sheet, plate, and foil manufacturing*, includes flat, rolling or continuous casting sheet, plate, foil, and welded tube from purchased aluminum and/or recovering aluminum from scrap and flat rolling or continuous casting sheet, plate, foil, and welded tube in integrated mills.
- *Aluminum extruded product manufacturing* includes rolling, drawing, and/or extruding shapes in integrated mills.
- *Other aluminum rolling and drawing* includes extruding aluminum bar, pipe, and tube blooms, or extruding or drawing tube from purchased aluminum and/or recovering aluminum from scrap and extruding bar, pipe, and tube blooms in integrated mills.
- *Copper rolling, drawing and extruding* includes rolling, drawing, and/or extruding shapes (except bare or insulated copper communication or energy wire) from purchased copper and/or recovering copper from scrap and rolling, drawing, and/or extruding shapes (except bare or insulated copper communication or energy wire) in integrated mills.
- *Nonferrous metals* (other than copper and aluminum) includes rolling, drawing, and/or extruding shapes from purchased nonferrous metals and/or recovering nonferrous metals from scrap and rolling, drawing, and/or extruding shapes in integrated mills.

Sectors 10 and 18: Nonferrous and Ferrous Foundries

Ferrous and nonferrous foundries specialize in melting and casting metals into specific shapes used in automobiles, plumbing fixtures, trains, airplanes, and other equipment. A wide variety of casting processes (utilizing molds made of sand, metal dies, and ceramics) and metal choices can be combined to create the characteristics necessary for the final product. While all metals can be cast, the most predominant are iron, aluminum, steel, and copper-base alloys.

According to the American Foundry Society (AFS), more than 12.6 million tons of castings were produced in the U.S. in 2008, valued at more than $31.5 billion. After China, the U.S. is the world's second-largest producer of castings, followed by Japan, Russia, Germany, and India. There are currently 2,130 operations representing over 200,000 jobs in the U.S. (80 percent of which are small businesses with less than 100 employees) down from 3,300 operations in 1990. According to the AFS, this decrease is due to increased foreign competition, regulatory burdens, and some attempts over the past decade to position the U.S. more toward a service economy. Forecasts for 2009 expect lower production than 2008 (most recent national statistics available).

Nonferrous casting is primarily done with aluminum and copper (roughly 70 – 80 percent by weight according to experts at the AFS), with magnesium representing a large percentage of the remainder.

Economic data on both ferrous and nonferrous foundries were obtained primarily from Economic Census data (2007) with input from technical experts from the American Foundry Society, and the Nonferrous Founders Society to allocate scrap percentages.

Sector 11: Pulp and Paper Mills

According to the American Forest and Paper Association (AF&PA), 79 percent of all paper mills in the United States used some recovered (recycled) paper in 2009 and 119 mills used only recovered paper.

According to AF&PA, paper mills in Illinois use 100 percent recycled feedstock. Therefore all activity at Illinois paper mills can be attributed to recycling. However the methodology measured activity at the first stage of manufacturing only. For paper, this was at the mill where a roll of paper was made, and excluded any conversion of paper to products such as containers or envelopes, even if they had some or all recycled content.

The 2007 Economic Census was used to develop the base economic data for this sector. Employment, payroll and gross receipts for NAICS code 3221 (pulp, paper, and paperboard mills) was not adjusted to represent the percent of recycled scrap paper used in Illinois compared to virgin pulp since 100% of scrap consumption was reported.

Sector 12: Paper-based Product Manufacturers

This sector encompasses manufacturers (other than paper mills, which are covered in Sector 11) that use recycled paper to produce a product. Examples of Sector 12 manufacturers include those producing cellulose insulation, hydro-seeding mulch, pressed paperboard and molded fiber (e.g. egg cartons, tableware, berry baskets and food service cartons), construction paperboard (e.g. for poured concrete spacers), and masking tape backing.

DSM attempted to survey owners and managers of all the hydro-seed and cellulose manufacturing companies located in Illinois. Only one hydro-seed manufacturing company manufactures product in Illinois, although others have offices in Illinois but manufacture product in other states. DSM was unable to identify any cellulose insulation manufacturing companies producing insulation in Illinois. Most of the companies DSM surveyed for this sector are manufacturing pressed paperboard products for the food packaging industry.

DSM surveyed manufacturers over the telephone and by email to determine throughput and percentage of recycled paper used, annual employment, and payroll costs, and gross revenues to estimate total economic activity.

Sector 13: Pavement Mix Producers (asphalt and aggregate)

This category includes the use of recycled asphalt and aggregate. Recycled asphalt pavement (RAP) consists of old asphalt pavement milled and ground into aggregate. RAP can substitute for a portion of aggregate required in bituminous concrete (i.e. asphalt pavement) in both the base course and surface course. The advantages of using RAP include savings on purchasing new aggregate and the use of less liquid asphalt per ton - an increasing advantage since the price for liquid asphalt rises when petroleum prices increase.

Most new hot-mix plants have installed the equipment necessary to use RAP in their product, whereas older plants often do not have the capability. The amount of RAP used in pavement varies by project in Illinois, and is often limited by bid specifications. The road base and shoulder are typically allowed a higher percent RAP than the finished road. Hot mix plants report an overall average of 14% RAP for the state of Illinois for 2009. While other recycled materials such as asphalt shingles, crushed concrete, crumb rubber, ground glass and slag also can be used in asphalt paving, very little of this is reportedly done in Illinois. Three hot mix companies reported using concrete for road base, two companies reported the use of asphalt shingles in the hot mix and one company reported the use of slag in the hot mix. This is expected to change however as the recent acceptance of post- consumer as well as pre-consumer asphalt shingles for use in Illinois Tollway construction projects is likely to increase the amount of asphalt shingle recovery and use in road projects in Illinois, and in turn likely increase the economic value of this sector in Illinois.[11]

Although industry groups such as the Illinois Asphalt Pavement Association and Illinois Department of Transportation do not collect definitive data on tons of RAP used, DSM worked with knowledgeable experts at the Illinois Asphalt Pavement Association to produce an accurate count of RAP-capable plants in Illinois. DSM then surveyed members of the Illinois Asphalt Pavement Association to determine the percent of recycled asphalt used, size and throughput of the company, annual payroll costs, and gross receipts. Survey data were extrapolated to the establishment count of hot mix plants in Illinois to develop economic data for this sector.

A few companies in Illinois are using in place solutions such as Cold In place Recycling (CIR) which reuses existing bituminous pavement on-site. A bituminous aggregate is created by grinding the road surface, mixed with an emulsion, laid down and compacted to the specified density and then after curing, surfaced with a wearing course. CIR was not accounted for in this study because it did not meet the definition of a recycling or reuse and remanufacturing industry, which accounts for

[11] Illinois Tollway Construction Bulletin No. 10-01, January 22, 2010.

recycling or reuse of materials offsite, and not back into the same manufacturing (or construction) process on-site.

Sector 15: Plastic Products

The 2001 Report used the term "Plastic Converters" for Sector 15, and included "Establishments which produce intermediate plastic products (e.g. molded products and components, sheet and fiber) using recycled pellets or granulated plastic as a feedstock." The definition of a "plastic converter" is *"[a] manufacturer who uses raw materials such as plastic resins and films, paper, foil, cellophane, adhesives and inks to create rigid or flexible packages or packaging materials that are then sold to organizations who package products therein."*

DSM has changed the name of Sector 15 to "Plastic Product Manufacturers" to more closely represent this industry, which essentially purchases recycled plastic flake, granulate, and/or pellets; for use in the production of new plastic products. Most of the establishments use post-industrial plastic scrap which has been processed by a plastics reclaimer or grinder. A few are using post-consumer resins (PCR), and others are reclaiming material themselves before manufacturing. Only establishments that are purchasing or receiving recycled materials from external sources are included (those recovering only their own scrap back into their process are excluded). Examples of Sector 15 manufacturers include manufacturers of plastic lumber and furniture, plastic bags, clamshell packaging, plastic tackle and tool boxes, custom injection molding and packaging inserts.

In most cases the recycled plastic resin is mixed with virgin resins to produce the final product. Therefore, as is the case with paper, steel, and glass product manufacturing, economic activity is allocated to represent the average recycled resin content of the products manufactured. The recycled content found in the plastic product manufacturing industry varies by company and year. Many of the plastic product manufacturers fill custom orders, therefore are often bound to the restraints of each order's specifications. If the order specifications allow for a certain amount of recycled plastic, then the company manufacturing the product has the option to purchase and use the recycled resin. The plastic product manufacturing industry is also reflective of the broader economy with recycled feedstock competing with virgin feedstock.

DSM interviewed a number of plastic product manufacturing company owners who said that business was slow the last two years due to the economic recession. Many of the business owners DSM contacted indicated that purchasing/using recycled plastic resin in their products increases when the demand for their products increases and oil prices are high (therefore virgin resin prices are also high); conversely, using recycled plastic resin in their products decreases when oil prices are low and demand for their products is low.

DSM developed a list of plastics manufacturers that potentially use recycled resins using: the American Chemistry Council, Plastic Division's website; Illinois Recycling Association member list; internet searches; and, listing services for recycling companies. DSM then attempted to survey these companies to collect information on the percent of recycled resin used, size and throughput, annual employment and payroll costs, and gross receipts. Survey results were applied to the estimated count of plastic product manufacturing establishments developed from the lists (above) to estimate employment, payroll, and gross receipts.

Sector 16: Rubber Product Manufacturers

Illinois generates approximately 13 million used tires per year. The Used Tire Management Act, adopted by the Illinois legislature in 1992 created the Used Tire Management Fund which today adds $2.50 to the price of each new and used tire sold at retail in Illinois. The Management Fund supports inspection and enforcement activities (Illinois EPA regulates the generators, transporters, processors, and end users of waste tires), clean up of tire piles, and mosquito research and control. While Illinois is recognized nationally as a leader in the management of used and waste tires, more than 90 percent of the tires collected are shredded for use as tire-derived fuel (TDF)[12], likely because the marketplace for recycled rubber products is limited in Illinois.

According to the Institute of Scrap Recycling Industries:

> "The carbon footprint of tire recycling is relatively low when compared to that of most virgin materials for which it can substitute. These applications, e.g. asphalt displacement or use in molded or plastic products, appear to offer the largest opportunity for the recycled tire industry to provide a real reduction in greenhouse gas emissions. In some cases carbon footprint reductions of up to 95% are possible."[13]

Following the REI methodology, DSM surveys of this category specifically excluded companies that perform grinding, reprocessing, and reclaiming of rubber products for use in tire-derived fuel and civil engineering applications. This is consistent with the methodology followed in the original REI studies that reported on establishments that manufacture products using crumb rubber or cut rubber shapes and stampings as feedstock.[14]

[12] Used Tire Program 2005 Biennial Report, Illinois Environmental Protection Agency, March 2006
[13] Carbon Footprint of USA Rubber Tire Recycling 2007, by the Institute for Environmental Research and Education November of 2009 for the Institute of Scrap Recycling Industries
[14] The 2001 Report reported 4 establishments accounting for an estimated 226 employees with a payroll of 11 million and gross receipts of 22 million based on 2 surveys completed.

DSM also excluded companies that collect, distribute, or broker ground rubber materials including buffings and rubber dust because these companies are already included in Sector 5.

DSM used lists of potential tire recycling companies, and the associated contacts from the Recycling Research Institute's *Scrap Tire and Rubber 2010 User's Directory* - which was cited by a representative of the Rubber Manufacturing Association as being the best source of companies that utilize recycled rubber for manufacture of other products- to compliment DSM research on this industry.

DSM surveyed 15 rubber product manufacturing companies located in Illinois and found that eight of the companies reported no use of recycled rubber in their products. From DSM's research, four companies were identified in Illinois that use recycled rubber in their products, the same number identified in the 2001 Study. One of the four companies (which fabricated stamped products such as gaskets from recycled rubber) had gone out of business in the first quarter of 2009. DSM gathered survey information from the other three companies to determine the percent of recycled rubber used, size and throughput, annual employment and payroll costs, and gross receipts. Products produced by these companies include rubber mulch for use as playground equipment.

These companies were all much smaller than the establishments reported a decade ago with the sector totaling 38 employees, payroll of less than $1 million, and gross receipts estimated at $4.4 million. This compares with the States of Massachusetts, New York and Pennsylvania (where an REI was done in 2008) where receipts ranged from $16 million in Massachusetts to $45 million in Pennsylvania (Northeast Recycling Council REI Study, 2009).

Because the companies surveyed in the 2001 Report were not identified DSM can only speculate on whether these results indicate a loss in business by these same companies, or a migration of the former larger businesses out of state. This could be partially due to reported budget cuts in 2004 for market development assistance which could be helpful to redevelop the rubber products recycling industry.

Sector 17: Iron and Steel Mills

Steel (an alloy of iron and carbon) is produced in mills that rely on scrap metal to produce new steel. In fact, as discussed in the Modifications to 2001 Methodology, above, it is no longer possible to produce steel in some steel mills in the United States without scrap as one of the inputs. In 2008 82 million tons of U.S. generated steel scrap were recycled or exported for recycling representing a recycling rate of 83.3% of production.[15]

Depending on the mill capacity, furnace type, and available scrap supply, different quantities of scrap metal are used. In general, however, input to U.S. mills employing electric arc furnaces averaged roughly 82.8 percent ferrous scrap in 2006 to produce products such as structural beams

[15] Steel Recycling Institute, "*2008 Overall Steel Recycling Rate Hits All-Time High Record Tonnages and Production Mean Record Levels of Production.*" December 10, 2009.

and steel plates. In contrast, input to basic oxygen furnaces averaged roughly 28.9 percent ferrous scrap in 2006 to produce products such as automotive fenders, and food and product packaging (e.g. food cans and steel drums).

Using these average scrap percentages by furnace type and data from the Steel Recycling Institute (SRI) on the capacity of each mill located in Illinois, DSM worked with the SRI to estimate total scrap throughput of steel for the state of Illinois. Scrap usage for Illinois was calculated at 56 percent and used to allocate employment, payroll, and gross receipt data to recycling activity.

DSM used the Annual Survey of Manufacturer's economic data (2008) as the basis for the allocation as it represents the most recent economic data available for Illinois[16]. NAICS code 3311 *"Iron and Steel Mills and Ferroalloy Manufacturing"* data were used and comprises establishments "primarily engaged in one or more of the following manufacturing activities:

- Direct reduction of iron ore;
- Pig iron in molten or solid form;
- Converting pig iron into steel;
- Ferroalloys;
- Making steel;
- Making steel and shapes (e.g., bar, plate, rod, sheet, strip, and wire); and
- Making steel and forming pipe and tube."

Employment and payroll data were estimated with some guidance from SRI. Estimates of total employment for Illinois were obtained from SRI and compared to government statistics. The 2001 Report used the 1997 Economic Census adjusted to roughly 90% to exclude "non-integrated mills" and then used 95 percent of total reported value to account for downstream conversion. In contrast, this Study Update relied on data provided by the SRI on actual mill capacity and estimated scrap usage at steel producing mills as the basis for recycling employment, payroll, and gross receipts.

Sector 18: Ferrous Foundries

See description of Sectors 10 and 18: Nonferrous and Ferrous Foundries, above.

Sector 19: Other Recycling Processors

This is the first of two catch-all categories in the study (Sector 26: Other Reuse, is the other). Establishments engaged in recycling that did not fall into any other recycling category are classified here. In some cases, it was possible to define and identify lists of companies that potentially fall in this category. By definition, this category includes:

- Fluorescent lamp and mercury recyclers;
- Construction and Demolition recyclers;

[16] There was significant difference between gross receipts reported in 2008 versus 2007 for the Annual Survey of Manufacturers (and from 2007 Economic Census data). However since 2008 represented the most recent year available, this data set was used.

- Carpet recyclers;
- Waste oil recycling (e.g. re-refining); and
- Textile (rags) recycling.

The acquisition of comprehensive lists for such a diverse array of niche recyclers was relatively challenging. While some trade associations exist that address one or more of these functions, none of these associations are as mature (and therefore as informative) when compared to most of the other recycling business categories included in the study. The list for this category was generated from IRA member lists, professional contacts, and internet searches for key terms like "Construction and Demolition recyclers in Illinois." As a consequence DSM believes that the results undercount the contribution from these recyclers, both from the industries that were specifically defined to be in this category, as well as other businesses that were never even identified for surveying.

Reuse and Remanufacturing Industries

Sector 20: Computer and Electronic Appliance Demanufacturers

The Illinois electronic recycling law, SB 2313, "The Electronic Products Recycling and Reuse Act," was enacted on September 17, 2008 and came into effect on January 1, 2010. This law requires manufacturers to finance and implement a recycling program to accept e-waste from consumers. Over the next few years, the law's recycling requirements will gradually come into effect, which are likely to further impact this already fast growing industry.

Contacts for recovery of electronic waste (e-waste) fall into a three primary categories on the Illinois EPA website: collectors, recyclers and refurbishers. A collector is a drop-off location that accepts e-waste. A recycler is involved with the recovery of the component parts of e-waste, through dismantling, sorting, grading, and recycling. A refurbisher is involved in the reuse of electronics through a process of remanufacture (with unusable components subsequently shipped downstream for further processing and recovery).

DSM attempted to survey all of the recyclers and refurbishers on the Illinois EPA's Registered Electronic Waste Recyclers List. The drop-off locations for e-waste would be part of Sector 1 (Municipal Residential Curbside and Drop-Off Collection) or Sector 2 (Private Residential and Commercial Collection) and therefore not part of the survey efforts for Sector 20.

DSM attempted to determine the percent of e-waste reuse and recycling activities, size and throughput of the company, annual payroll costs, and gross receipts through the surveys. Averages of those who responded were then applied to the establishment count of e-waste recycling companies in Illinois to develop total estimates of employment, payroll, and gross receipts.

Sector 21: Motor Vehicle Parts (used)

This sector is primarily covered under NAICS code 423140 - *Motor Vehicle Parts (Used) Merchant Wholesalers*. It comprises establishments "primarily engaged in the merchant wholesale distribution of used motor vehicle parts (except used tires and tubes) and establishments primarily engaged in dismantling motor vehicles for the purpose of selling the parts." Motor vehicle parts are first removed and sold for reuse (or in some cases the high metal value) before the vehicle is crushed and processed as scrap metal.

DSM used the County Business Patterns (2007) under NAICS 423140 for employment and payroll data to report on this sector and relied on Economic Census data (2007) to calculate the increase in gross receipts for Illinois for 2007 over 2002. However DSM found from performing the NERC REI study that to directly compare this sector with the 2001 Report data, there is a need to add in economic data from the retailing of used motor vehicle parts. While DSM was able to obtain unpublished data from the Census Bureau for 2002 to determine that 9 percent (rounded) of NAICS code for retail automotive parts and accessories stores were classified as "used," DSM has not applied this percentage to the NAICS code 441310 to account for used retail sales since census data will not be reported in this way at the State level in the future. This reporting change alone may account for the large drop in employment, payroll, and receipts when compared to the 2001 Report.

Sector 22: Retail Used Merchandise Sales

This sector is covered under NAICS code 453310 - *Used Merchandise Stores* – and comprises "establishments primarily engaged in retailing used merchandise, antiques, and secondhand goods (except motor vehicles, such as automobiles, RVs, motorcycles, and boats; motor vehicle parts; tires; and mobile homes)."

DSM was able to confirm, after significant discussion with the U.S. Census Bureau, that this new NAICS code captures antique stores (and historic documents), used apparel stores, used clothing, used book dealers, used household appliance stores, thrift stores and used sporting good stores; in addition to brick dealers, used building material stores, flea markets, used furniture stores, salvage stores, and second hand stores. In addition to for-profit companies, this category includes not-for-profit organizations such as Goodwill Industries, Habitat for Humanity's ReStores and Salvation Army Thrift Shops.

DSM used establishment, employment, payroll and gross receipts data directly from the 2007 Economic Census data to estimate the values for this sector.

Sector 23: Tire Retreaders

This sector is covered under NAICS code 326212 *Tire Retreaders,* which comprises *"establishments primarily engaged in retreading or rebuilding tires."* Retreads are made from tires that are worn yet otherwise structurally sound or that have a good foundation. The first step in retreading is inspection, then buffing (where the remaining tread is removed), then preparing the casing, and applying the new tread.

DSM reviewed the Tire Retread Information Bureau (TRIB) database for establishment counts for Illinois. TRIB does not maintain industry economic data at the State level, therefore DSM used the Economic Census data (2007) for employment, payroll, and gross receipts.

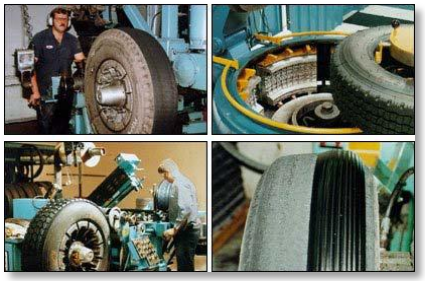


Photo Source: Tire Retread Information Bureau

Sector 24: Wood Reuse

This category consists of all establishments that accept clean wood (primarily wood pallets and possibly some dimensional lumber) and either remanufacture pallets and/or chip clean wood to create a saleable product other than wood chips for fuel or mulch. DSM attempted to survey all of the companies located in Illinois from the National Wood Pallet and Container Association (NWPCA) list to determine the percent of wood reuse, size and throughput of the company, annual payroll costs, and gross receipts. The averages were then applied to the establishment count of wood reuse companies in Illinois to develop total estimates of employment, payroll, and gross receipts. The list from the NWPCA was supplemented with the Illinois recycler lists and internet searches to ensure all of the largest companies were contacted.

DSM's intent was to place all wood ground to produce mulch and as a bulking agent for compost in Sector 3, although it is possible that some of the ground wood produced by companies in this sector also goes into mulch –primarily colored mulches. This category does not include companies that grind wood for use as fuel, nor does it include specialty antique wood product recovery companies.

Sector 25: Materials Exchanges

The Materials Exchanges category includes any business or entity that provides a virtual market where generators of used materials (industrial, construction-related, residential durable goods, etc.) and potential users of such products can facilitate a transaction to reuse otherwise end-of-life materials. Virtual exchanges do not have physical space or a mechanism for physically handling any of the materials that are exchanged. As such it is difficult to quantify the economic value of the activity.

DSM identified materials exchanges through the U.S. EPA website and Illinois state websites. At least one exchange was found to be temporarily non-operational, although with the expectation of resuming operations in the future. Two well known entities, FreeCycle and Craigslist, fall under the definition of a materials exchange in whole or in part. However, the direct economic contribution of these organizations occurs outside the state of Illinois and therefore is not included, despite the volume of material reuse that may be occurring because of their existence.

It came to DSM's attention during this project that the term "materials exchange" has evolved in recent years from the historically narrow definition as a virtual market for used goods, to encompass a broader number of reuse and exchange-related organizations that provide so-called "triple bottom line" (financial, environmental, social) benefits. These organizations have not been included in Sector 25, but have been included under Sector 20 (Computer and Electronic Appliance Demanufacturers); Sector 22 (Retail Used Merchandize Sales); and, for the many entities with social missions associated with collecting donations and redistributing them to parties in need, Sector 26 (Other Reuse).

Sector 26: Other Reuse

This is the second catch-all category, intended to capture all businesses and non-profit organizations not elsewhere classified that either purchase or otherwise obtain used materials, equipment, or merchandise for repairing, cleaning, or otherwise putting back into use.

DSM's ability to identify such businesses was limited to their inclusion on one of the recycling directories consulted at the outset of the project, or as the result of internet searches for "reuse in Illinois". DSM identified three reuse non-profit organizations and was able to obtain survey information for all three organizations. It should be noted that the direct economic contribution of the non-profit reuse-focused organizations are relatively low based on donation-based and volunteer-heavy business models. As a result, DSM's projections of the economic contribution of this sector may be low.

Part II. Results and Comparison

Results by Sector

Detailed results for industries identified, and the economic activity attributed to recycling, are shown in Appendix A – Detailed Reporting Form. Also in Appendix A are footnotes that explain the data source for each sector, and any differences between data sources.

The detailed results are summarized below in Table 5. Table 5 has been reproduced to match Table ES-1 of the 2001 Report for comparison purposes. Note that in reading Table 5, the data for establishments and employment are actual; while the reported data for tons, payroll, and gross receipts are all in 1,000s.

Table 5

Summary of Recycling Direct Economic Impacts

RECYCLING AND RECYCLING RELIANT INDUSTRY: Categories 1-19			
1	Municipal Residential Curbside and Drop-Off Collection	Establishments	308
		Employment	665
		Annual Payroll ($1,000)	$27,981
		Estimated Receipts ($1,000)	$62,786
		Estimated Throughput (1,000 tons)	380
2	Private Residential and Commercial Collection	Establishments	239
		Employment	1,215
		Annual Payroll ($1,000)	$60,859
		Estimated Receipts ($1,000)	$113,792
		Estimated Throughput (1,000 tons)	1,058
3	Compost and Miscellaneous Organics Producers	Establishments	54
		Employment	262
		Annual Payroll ($1,000)	$14,056
		Estimated Receipts ($1,000)	$63,216
		Estimated Throughput (1,000 tons)	497
4	Materials Recovery Facilities (MRFs)	Establishments	22
		Employment	899
		Annual Payroll ($1,000)	$46,625
		Estimated Receipts ($1,000)	$61,191
		Estimated Throughput (1,000 tons)	1,224
5	Recyclable Material Wholesalers	Establishments	368
		Employment	5,225
		Annual Payroll ($1,000)	$267,048
		Estimated Receipts ($1,000)	$6,064,254
		Estimated Throughput (1,000 tons)	0

RECYCLING AND RECYCLING RELIANT INDUSTRY: Categories 1-19 (continued)			
6	Glass Container Manufacturing Plants	Establishments	3
		Employment	124
		Annual Payroll ($1,000)	$7,750
		Estimated Receipts ($1,000)	$33,875
		Estimated Throughput (1,000 tons)	62
7	Glass Product Producers (other recycled uses)	Establishments	1
		Employment	(D)
		Annual Payroll ($1,000)	(D)
		Estimated Receipts ($1,000)	(D)
		Estimated Throughput (1,000 tons)	136
8	Nonferrous Secondary Smelting and Refining Mills	Establishments	20
		Employment	943
		Annual Payroll ($1,000)	$71,048
		Estimated Receipts ($1,000)	$731,764
		Estimated Throughput (1,000 tons)	376
9	Nonferrous Product Producers	Establishments	15
		Employment	1,825
		Annual Payroll ($1,000)	$89,122
		Estimated Receipts ($1,000)	$1,628,947
		Estimated Throughput (1,000 tons)	0
10	Nonferrous Foundries	Establishments	100
		Employment	5,027
		Annual Payroll ($1,000)	$196,213
		Estimated Receipts ($1,000)	$1,006,829
		Estimated Throughput (1,000 tons)	0
11	Paper and Paperboard Mills/ Deinked Market Pulp Producers	Establishments	13
		Employment	869
		Annual Payroll ($1,000)	$44,785
		Estimated Receipts ($1,000)	$542,323
		Estimated Throughput (1,000 tons)	371
12	Paper-Based Product Manufacturers	Establishments	6
		Employment	135
		Annual Payroll ($1,000)	$2,021
		Estimated Receipts ($1,000)	$11,506
		Estimated Throughput (1,000 tons)	11
13	Pavement Mix Producers (asphalt and aggregate)	Establishments	55
		Employment	438
		Annual Payroll ($1,000)	$18,319
		Estimated Receipts ($1,000)	$249,615
		Estimated Throughput (1,000 tons)	4,709
14	Plastics Reclaimers	Establishments	30
		Employment	1,023
		Annual Payroll ($1,000)	$41,373
		Estimated Receipts ($1,000)	$386,813
		Estimated Throughput (1,000 tons)	401

RECYCLING AND RECYCLING RELIANT INDUSTRY: Categories 1-19 (continued)			
15	Plastics Product Manufacturers	Establishments	64
		Employment	2,091
		Annual Payroll ($1,000)	$57,514
		Estimated Receipts ($1,000)	$542,364
		Estimated Throughput (1,000 tons)	323
16	Rubber Product Manufacturers	Establishments	3
		Employment	38
		Annual Payroll ($1,000)	$823
		Estimated Receipts ($1,000)	$4,433
		Estimated Throughput (1,000 tons)	20
17	Steel Mills	Establishments	53
		Employment	3,587
		Annual Payroll ($1,000)	$238,570
		Estimated Receipts ($1,000)	$3,556,051
		Estimated Throughput (1,000 tons)	2,898
18	Iron and Steel Foundries	Establishments	36
		Employment	2,951
		Annual Payroll ($1,000)	$132,981
		Estimated Receipts ($1,000)	$764,973
		Estimated Throughput (1,000 tons)	0
19	Other Recycling	Establishments	20
	Processors/Manufacturers	Employment	339
		Annual Payroll ($1,000)	$21,923
		Estimated Receipts ($1,000)	$97,125
		Estimated Throughput (1,000 tons)	16,251
RECYCLING SUBTOTALS		Establishments	1,409
		Employment	27,690
		Annual Payroll ($1,000)	1,339,760
		Estimated Receipts ($1,000)	15,936,857
REUSE AND REMANUFACTURING INDUSTRY: Categories 20-26			
20	Computer and Electronic	Establishments	60
	Appliance Demanufacturers	Employment	5,960
		Annual Payroll ($1,000)	$47,663
		Estimated Receipts ($1,000)	$528,630
		Estimated Throughput (1,000 tons)	298
21	Motor Vehicle Parts (used)	Establishments	66
		Employment	482
		Annual Payroll ($1,000)	$16,350
		Estimated Receipts ($1,000)	$100,986
		Estimated Throughput (1,000 tons)	0
22	Retail Used Merchandise Sales	Establishments	595
		Employment	4,602
		Annual Payroll ($1,000)	$78,901
		Estimated Receipts ($1,000)	$346,864
		Estimated Throughput (1,000 tons)	0

REUSE AND REMANUFACTURING INDUSTRY: Categories 20-26 (Continued)			
23	Tire Retreaders	Establishments	19
		Employment	279
		Annual Payroll ($1,000)	$9,728
		Estimated Receipts ($1,000)	$69,848
		Estimated Throughput (1,000 tons)	0
24	Wood Reuse	Establishments	20
		Employment	967
		Annual Payroll ($1,000)	$20,861
		Estimated Receipts ($1,000)	$125,500
		Estimated Throughput (1,000 tons)	493
25	Materials Exchange Services	Establishments	1
		Employment	(D)
		Annual Payroll	(D)
		Estimated Receipts	(D)
		Estimated Throughput (1,000 tons)	0
26	Other Reuse	Establishments	3
		Employment	3
		Annual Payroll ($1,000)	$28
		Estimated Receipts ($1,000)	$300
		Estimated Throughput (1,000 tons)	0
REUSE AND REMANUFACTURING SUBTOTALS		Establishments	764
		Employment	12,294
		Annual Payroll ($1,000)	173,556
		Estimated Receipts ($1,000)	1,172,178
GRAND TOTALS Recycling, Reuse, & Remanufacturing		Establishments	2,173
		Employment	39,984
		Annual Payroll ($1,000)	1,513,316
		Estimated Receipts ($1,000)	17,109,035

Note that "(D)" indicates data was suppressed to follow disclosure agreements. Figures suppressed have been aggregated and reported in all totals.

Comparison of Relative Size of the Recycling Industry (Supply Side) and Recycling Reliant (Demand Side) Industries

Table 6, below, summarizes the number of establishments, total employment, payroll, and gross receipts for the Recycling Industries (Supply Side), Recycling Reliant Industries (Demand Side) and the Reuse and Remanufacturing Industries.

Table 6

Comparison of Recycling, Recycling Reliant, and Reuse and Remanufacturing Industries (Establishments, Employment, Payroll, and Gross Receipts)

		Establish-ments	Employees	Payroll ($ 1,000's)	Gross Receipts ($ 1,000's)	Tonnage (1,000's)
	RECYCLING INDUSTRIES (Suply Side)					
1	Government Staffed Residential Curbside Collection	308	665	$27,981	$62,786	380
2	Private Staffed Residential Curbside Collection	239	1,215	$60,859	$113,792	1,058
3	Compost/organics processor	54	262	$14,056	$63,216	497
4	Materials Recovery Facilities	22	899	$46,625	$61,191	1,224
5	Recyclables Material Wholesalers	368	5,225	$267,048	$6,064,254	NA
14	Plastics Reclaimers	30	1023	$41,373	$386,813	401
	Subtotal:	***1,021***	***9,288***	***$457,942***	***$6,752,052***	
	RECYCLING RELIANT INDUSTRIES (Demand Side)					
6	Glass Container Manufacturing Plants	3	124	7,750	33,875	62
7	Glass Product Producers	1	(D)	(D)	(D)	136
8	Nonferrous secondary smelting and refining mills	20	943	$71,048	$731,764	376
9	Nonferrous Product Producers	15	1,825	$89,122	$1,628,947	NA
10	Nonferrous Foundries	100	5,027	$196,213	$1,006,829	NA
11	Paper and Paperboard Mills/Deinkled Market Pulp Producers	13	869	$44,785	$542,323	371
12	Paper-based Product Manufacturers	6	135	$2,021	$11,506	11
13	Pavement Mix Producers (asphalt and aggregate)	55	438	$18,319	$249,615	4,709
15	Plastics Product Manufacturers	64	2,091	$57,514	$542,364	323
16	Rubber Product Manufacturers	3	38	$823	$4,433	20
17	Steel Mills	53	3,587	$238,570	$3,556,051	2,898
18	Iron and Steel Foundries	36	2,951	$132,981	$764,973	NA
19	Other Recycling Processors/Manufacturers	20	339	$21,923	$97,125	16,251
	Subtotal:	***388***	***18,402***	***$881,818***	***$9,184,805***	
	REUSE AND REMANUFACTURING					
20	Computer and Electronic Appliance Demanufacturers	60	5,960	$47,663	$528,630	298
21	Motor Vehicle Parts (used)	66	482	$16,350	$100,986	NA
22	Retail Used Merchandise Sales	595	4,602	$78,901	$346,864	NA
23	Tire Retreaders	19	279	$9,728	$69,848	NA
24	Wood Reuse	20	967	$20,861	$125,500	493
25	Material Exchange Services	1	(D)	(D)	(D)	(D)
26	Other Reuse	3	3	$28	$300	NA
	Subtotal:	***764***	***12,294***	***$173,556***	***$1,172,178***	
	Total:	***2,173***	***39,984***	***$1,513,316***	***$17,109,035***	

As would be expected, the Recycling Industries comprise the bulk of establishments (47 percent of the total), followed by Reuse and Remanufacturing Industries. Recycling Reliant industries comprise a relatively small percent of total establishments (18 percent) but are the largest employer (at 46 percent), and are the largest source of payroll and gross receipts (58 and 54 percent, respectively).

Comparison with 2001 Report

As discussed above, it is difficult to draw direct comparisons between the economic data presented in the 2001 Report and this Study Update for two primary reasons:

First, materials values have changed significantly. The year that materials' prices were based on for the 2001 Report is unclear, although for many sectors it was 1997 (based on the 1997 economic census). In 2007 (the year used for material prices for most sectors in this Study Update based on the 2007 Economic Census), materials prices were very high by historic standards. However for sectors where Economic Census data were not available, 2008 and 2009 data are reported, when material prices were significantly lower, and many businesses cut production.

Second, there have been significant changes in methodology between the two reports, as explained earlier in this report.

Given these caveats concerning direct comparisons, some general comparisons can be made based on a review of the data and the Project Team's professional observations of the recycling industry.

Impact of Export

There has been concern among economic development and recycling professionals that the increase in export of secondary materials, and the decline in manufacturing in the United States, would adversely impact on the Recycling Reliant Industries. A general observation is that the Recycling Reliant Industries have not shrunk as significantly as one would have expected over the last decade in Illinois. This is due, in part, to the fact that Illinois paper mills have already been reliant on recovered paper, therefore not transitioning from the use of virgin pulp to recovered paper. In addition, steel production has continued fairly strong in Illinois, with an increased reliance on scrap in steel making, even though there have been significant job losses in this sector over the last decade (about 4500 fewer jobs according to the US Census data).

Jobs

As would be expected the number of jobs reported in this Study Update have decreased by 29% when compared to those reported in the 2001 Report. While it is plausible that some job loss is due to increased mechanization and productivity, the largest single factor affecting the number of jobs reported in this Study Update is the change in methodology (mainly in the steel and the plastic products manufacturers sectors), which allocates employment based on the percent of secondary material used in the Recycling Reliant Industries, rather than a reflection of actual job loss.

The other factors are changes in the economy. The most significant job losses were found in Iron and Steel foundries where employment was reported at 50% from 1997 levels in Illinois. This compares with the nation as a whole which experienced a loss of 35% of jobs from the levels in 1997.

Municipal and Private Collection

This Study Update reports slightly lower employment and payroll for this sector when compared to the 2001 Report. However, this is mostly due to over reporting in the 2001 Study of the percentage of the population with access to curbside recycling – in part because of the inclusion of all of Chicago as "curbside collection" in 2001 even though Chicago at that time was collecting all recyclables as blue bag material on the refuse truck. DSM has also been aggressive in trying to accurately measure access to curbside recycling and therefore quantify employment, payroll and collection costs associated with these trucks on the road.

Organics

There are five fewer composting facilities and 63 less composting jobs reported for the 2010 Study Update compared to the 2001 Study, but payroll, receipts and throughput all have increased since the 2001 Study. This is probably due to better permitting and tracking of actual facilities, more mechanization of composting operations, and some consolidation of material at the permitted facilities. In the future, this sector is expected to expand with the change in regulations on food waste acceptance that may impact many of these existing facilities, and encourage siting of additional facilities.

Materials Recovery Facilities

While the number of reported Materials Recovery Facilities has decreased by six since 2001 Study, the number of employees, payroll, total receipts and throughput have all increased. Employment was up by 30 percent and the average pay per employee has also increased significantly.

Plastics Manufacturing

There is a significant decline in the number of companies reported in this sector, but that is due to a significant change in methodology, not to a decline in the amount of PCR resin actually used. DSM believes that the use of PCR resin has increased in the past ten years in Illinois as more manufacturers' source recycled resin; especially as virgin resin prices increased in the past several years. The 2001 Report assumed roughly 16.2 percent of plastic "converters" used recycled PCR (or a total of 147 Illinois companies), and then counted 80% of all economic activity. DSM assumed most plastic manufacturers do not use recycled PCR resin, and instead built data from surveys of known PCR users and allocated economic data based on the percent of PCR resin reported as used by these companies. DSM believes this to be a more accurate portrayal of the actual economic activity associated with recycled plastic resin use in Illinois since the Economic Census does not segregate PCR users from all other plastic product manufacturers. However, because of the methodology DSM used, it is likely that this sector is now under-reported because DSM is not confident that all plastic manufacturers using PCR have been identified.

Rubber Products Manufacturing

There is a decline of one company reported but an overall decline in jobs, payroll and receipts in this sector. Employment was down over 80 percent and payroll over 90 percent. Gross receipts were also down 80 percent when compared to the2001 Study. This might be due to three factors: a

change in methodology of defining this sector and allocating their recycling economic activity to that portion of the business that uses recycled materials (e.g. inclusion of TDF product or crumb rubber); the propensity for Illinois processors of scrap rubber to export material for processing into end products out of state, and the overall US economy during the study years of this report (since one company that was identified closed their business in 2009). However it does demonstrate that market development for use of scrap rubber and tires would be an opportunity to create jobs in Illinois.

Pavement Mix Producers

There are large increases over the previous study. This is probably due to better data collected through surveying members of the Illinois Asphalt Pavement Association combined with an increased use of recycled asphalt in the past ten years as RAP has become accepted by highway engineers and highway specifications have allowed an increase in the percent RAP in new asphalt paving.

Steel Mills

Employment and payroll are down due both to a change in methodology and to the economic recession. However, gross receipts are up slightly due to much higher commodity prices even though a change in methodology ultimately counted less economic activity in this industry. Higher steel prices mask the change in methodology which would otherwise have reported significantly reduced gross receipts.

Reuse and Remanufacturing

It is difficult to obtain accurate data on this sector. Therefore the estimate of economic activity is based primarily on survey data and secondarily on Economic Census data. However, even a significant increase in the number of establishments would not impact total recycling economic activity appreciably because of low wages and gross receipts for most of these establishments. Data from the Economic Census has been reduced significantly because retail sale of used motor vehicle parts were not included in this Study Update, however the increase in the number and size of Sector 20 – computer and electronic appliance de-manufacturers – was a major contributor to overall growth in Reuse and Remanufacturing Industries in Illinois since 2001.

Recommendations for Future Studies

Return to Value Added Calculation

DSM believes that a more accurate assessment of the contribution of the recycling and recycling reliant industries to the economy of Illinois would be based on a value added assessment for the demand side industries. This is the approach that was used in the original 1994 Report. In essence, this would subtract the input price for recycled scrap when calculating receipts.

A return to value added calculations for the demand side industries would provide benefits in two areas. First, it would allow a comparison of the role of the recycling industry to total industrial

activity in Illinois as a percent of GDP. Second, and more importantly, it would allow future comparisons of the recycling industry that are not masked by large changes in commodity values – because these commodity values would be incorporated into the input price for the demand side industries.

Because gross receipts were used in the 2001 Report, and are reported in this report, the next update should report both gross receipts and value added data to ease the transition to value added reporting.

Maintain State-Wide Databases

DSM was hampered by the lack of quality databases of recycling industries and demand side industries in Illinois. The database developed during this report should be maintained and updated periodically by Illinois to assure continuity in future updates and reduce the cost of compiling the updates.

Conduct Updates in Sync with Release of Most Recent Economic Census Data

This Study Update was almost ideally timed to use the most recent Economic Census data; however, data for the wholesale and retail trade sectors has still not been released (as of June 30, 2010). The Economic Census is currently conducted in the second and seventh year of each ten year period, but is typically not released for at least 18 months to two years after completion of the survey. Each state has a different release schedule as well. It is safe to say that conducting the next study update in late 2014 or early 2015 would ensure that 2012 census data was released in completion.

Work with the US Census Bureau on Further Aggregating Recycling Industries

With the transition to NAICS codes in the 1997 census, many SIC industry categories had to be aggregated or in some cases disaggregated to better match NAICS category descriptions. Moving forward, any opportunities to work with the Census Bureau to better define some of the recycling and reuse industries would provide more opportunity to more easily track the economic indicators from these sectors. More importantly, better defined NAICS categories for recycling and recycling reliant industries would be a significant benefit to future economic development activities for Illinois centered around increased use of recycled materials.

Consider Reporting Requirements

Illinois should consider introducing legislation requiring that all brokers, processors, and demand side users report annually on quantities of recyclables handled by material type. This reporting requirement would not only improve the accuracy of the Recycling Economic Information Studies, but also of any state recycling rate calculations.

Continue to Allocate Based on Recycled Material Input

DSM believes that it is critical that future reports continue to allocate employment, payroll, and receipts based on the percent of input of recycled material to the demand side industries. In the future reporting the percentage of recycled use for each industry may make for an interesting comparison.

Part III. Indirect and Induced Impacts

Introduction

As in the 2001 RW Beck Report, DSM has estimated indirect and induced economic impacts associated with the direct economic activity reported for each sector in Table 6, above.

The estimates were completed by Dr. Steven Deller at the University of Wisconsin using the IMPLAN model[17] and the direct economic coefficients reported in Table 6.

The following description of the Input/Output model and its limitations is excerpted from previous Recycling Economic Information studies conducted by DSM, and from the 2001 Recycling Economic Information Study prepared for the Illinois Department of Commerce and Community Affairs.[18] The description and limitations remain as valid today as they did in the past, although the quality of data underlying the IMPLAN model continues to improve.

Input / Output Modeling Process and Limitations

The most common and widely accepted methodology for measuring the total economic impact of a firm or industry in a given geographic area is Input/Output (I/O) analysis. I/O analysis is a mathematical model developed by Wassily Leontief (1905 – 1999) to express relationships between sectors of an economy in a chosen geographic area.[19] I/O models are used descriptively to show the relative importance to the economy of a business, industry, or sector (e.g., paper mills), or to predict the economic impact on a region from alternative actions (e.g., construction of a new paper mill, expanding the existing paper mill, or closing the existing mill).

An I/O model details the sales and purchases of goods and services between all sectors of the economy in a geographic area for a given period of time. The activities of all economic agents (industry, government, households) are divided into production sectors. The transactions between the sectors are measured in terms of dollars and segmented into two broad categories: non-basic, which includes transactions between local industries, households, and other institutions, and basic transactions between industries, households, and other institutions outside the economy being modeled (i.e., imports).

One can think of an I/O model as a large spreadsheet of the economy. Figure 1, below, presents a simplified example of an I/O model for a paper mill located in Illinois, purchasing some of its inputs from recycling industries, households, and the transport and engineering sectors within Illinois,

[17] http://www.economics.nrcs.usda.gov/technical/implan/implanmodel.html
[18] See *Recycling Economic Information Study Update, Delaware, Maine, Massachusetts, New York, and Pennsylvania,* Prepared for NERC, Prepared by DSM Environmental Services and MidAtlantic Solid Waste Consultants, February 2009 and *Final Report, Illinois Recycling Economic Information Study,* Prepared for the Illinois Department of Commerce and Community Affairs, Prepared by R.W. Beck, Inc. December 2001.
[19] Leontief won the Nobel Memorial Prize in Economic Sciences for his development of this model.

and purchasing other inputs from outside of Illinois. The columns represent purchasing agents in the economy. For example, the MRF in Figure 1 purchases commingled waste paper from private and government collection programs and from brokers within Illinois, and also imports some waste paper from outside of Illinois. The MRF also purchases labor from households in the region, and services (e.g., engineering, equipment repair, fuel) from within Illinois and outside of Illinois.

In general, the greater the amount of purchases made from within Illinois, the larger the multipliers; the greater the purchase of imports from outside of Illinois, the lower the multipliers. Recycling industries are an important example of an industry stimulating the economy in two ways. First, an Illinois based recycling industry provides direct employment and income within Illinois. Second, the recycling industry provides a local source of inputs to recycling reliant industries in Illinois. Using an Illinois paper mill as an example, the mill can either import pulp from Wisconsin or Michigan, or it can use secondary fiber collected within Illinois. To the extent that it uses secondary fiber from Illinois, it multiplies the impact of the recycling industry by increasing employment in the recycling industry in Illinois. These employees go on to spend a significant amount of their labor income in Illinois, resulting in higher indirect and induced impacts when compared to the paper mill importing pulp from Wisconsin or Michigan.

The rows of the spreadsheet represent agents that are selling in the economy. These agents include industries selling goods and services to other industries, households selling labor to the industries in the region, and governments, and consumers outside of the region purchasing the outputs of the industries within the region. The latter represents exports out of the economy. Within the terminology of input-output modeling, this "spreadsheet of the economy" is referred to as a transactions table.

Figure 1

Simplified I/O Table (For Illustration Purposes Only)

Processing Sectors	**Production Sectors**						**Final Demand**		**Total/Output**
	Collection	Broker	MRF	Transport	Mill	Services	HH	Exports	
Collection	0	10	20	1	2	1			34
Broker	0	5	2	0	30	0	10	90	137
MRF	0	0	0	0	10	10	0	70	90
Transport	20	10	15	2	10	5	5	30	97
Mill	0	0	1	0	0	2	1	200	204
Services	30	10	10	20	25	10	15	15	135
HH (Labor)	30	20	30	20	40	15	10	20	185
Imports	20	10	10	10	25	10	20	0	105
Total/Inputs	100	55	68	52	140	52	61	425	953

Input-Output Multipliers

Using linear algebra to manipulate the matrix represented in Figure 1, it is possible to compute a unique multiplier for each sector in the economy. These multipliers can be used to estimate the economic impact of changes in the local economy associated with a change in one sector of the economy. In addition, the multipliers can be used to identify the degree of structural interdependence between different sectors of the economy.

Initial (Direct), Indirect, and Induced Effects

The construction of the multipliers allows the user to decompose the multiplier effect into three parts: the initial (or direct) impact, the indirect, and the induced effects. The direct economic activity of each recycling, recycling reliant and remanufacturing and reuse sector is presented in Table 6, above.

In order to produce outputs (the direct economic activity), the firm or industry must purchase inputs. The inputs take two forms: (1) purchases from other businesses, and (2) labor. Purchases from other businesses *within the region being modeled* create what is referred to as the *indirect effect;* labor spending income within the region being modeled create the *induced effect*.

As the 2001 Report states[20]:

Economic data is further reported as direct, indirect, induced, and total economic effects.

- ***Direct effects*** refer to the operational characteristics of the firms or institutions that are studied. This study measured the apparent value of twenty-six categories of recycling and reuse establishments. The direct output of these entities is, therefore, their reported gross sales. The direct jobs are the jobs that are associated with those establishments. The direct personal income contains their reported payments to all employees, plus an additional estimate of benefit values and of returns to sole proprietors. The estimate of benefit values and returns to sole proprietors were based on industrial averages in industries that are similar to the recycling and reuse industries included in this study.

- ***Indirect effects*** measure the value of additional economic demands that the direct firms or institutions place on supplying industries in the region. When firms produce goods or conduct business or when public entities provide public services, they must make many purchases. Some of these are from suppliers in the area. Some are not. Public utilities, communications systems, fuel, wholesale goods and services, manufactured goods, financial and legal services, raw and processed commodities, and a variety of professional services are necessary to produce the direct values described above.

- ***Induced effects*** accrue when workers in the direct and indirect industries spend their earnings on goods and services in the region. Induced effects can also be called household effects, and the terms are often used inter-changeably. When workers in direct and indirect

[20] R.W. Beck, 2001

industries purchase goods and services for household consumption, they, in turn, stimulate another layer of the economy. Most induced activity accrues to retail, services, and finance, insurance, and housing spending. Because employment is stimulated in these industries as well, *their* demands for inputs increase, yielding an additional round or additional rounds of indirect purchases and additional rounds of induced activity. The I-O models solve for these iterative rounds of transactions until all of the possible inter-industrial transactions have been accumulated.

- ***Total economic effects*** are the sum of direct, indirect, and induced effects. They are all of the transactions attributable, either directly or indirectly, to the activities of establishments in the business categories included in this study.

Modeling System

The input-output modeling system used in this report is the IMPLAN Model, originally developed by the USDA Forest Service. It is currently one of the most widely used I/O models in the United States. To accommodate demand for the model, the Forest Service privatized IMPLAN which is now operated by the Minnesota IMPLAN Group (MIG). In addition to updating and improving the databases and software, MIG holds regular training sessions, biannual user conferences and maintains a collection of hundreds of papers that make use of IMPLAN. MIG annually updates the model using aggregated production, employment and trade data from local, regional, and national sources, including the U.S. Census Bureau *County Business Patterns* report and the U.S. Bureau of Labor Statistics annual report called *Covered Employment and Wages*.

Limitations

There are four important limitations to the use of the IMPLAN model (or any other I/O model) which must be recognized by Illinois when reporting total economic impacts from the recycling, recycling reliant, and reuse and remanufacturing industries.

First and foremost, the sum of indirect and induced economic activity across each sector ***cannot*** be added to the sum of direct economic activity across each sector to make statements about the total economic impact of the "recycling industry" in a state. That is because the indirect and induced estimates for the recycling reliant industries ***include*** inputs from the recycling industries supplying the recycled material, which has ***already been accounted for*** (direct impacts). Therefore summing the indirect and induced impacts, together with the direct economic activity, results in some double counting. The illustrative transaction table presented above (figure 1) clearly demonstrates, for example, that the paper mill is purchasing services, either directly or indirectly from the collection company (or municipality), the broker (or wholesaler) and the MRF, which have already been accounted for in Table 6.

Dr. Deller has attempted to overcome this limitation as follows:

"I also ran a 'whole model' analysis so we can talk in terms of aggregate impacts. Using the scalar multiplier analysis, you cannot just add the individual impacts up to get a total impact. That would results in some double counting and over-state the total impact. Using the 'whole model' approach I shock the IL model with all (26) sectors identified at once. This gives a total impact of all the industries considered at once. This 'whole model' approach also allows us to conduct a state and local government tax revenue impact."

Second, I/O models are most effective when it is possible to obtain actual economic inputs through surveying, rather than relying on national or state-level data. It may be more practical and not cost-prohibitive to examine the impact of an industry on a single county through direct surveys for required I/O model inputs, but this level of surveying was not possible for this study.

Third, the I/O coefficients used in the IMPLAN model are based in part on U.S. Census data, including the County Business Pattern data. However, as DSM learned during development of the direct economic impact data, County Business Pattern data are often suppressed, even at the state level because of confidentiality issues. Therefore, the multipliers used in the IMPLAN model may be based on national (or multi-state) data, which make it difficult to apply to state or regional data.

Fourth, and finally, while IMPLAN has developed multipliers for over 500 sectors of the economy, these sectors do not necessarily include all of the sectors used in this report. For example, while the Census Bureau has reasonably captured the "tire retread" industry, there are no precise industry sectors for "plastics manufacturers that use secondary resin as a feedstock" or "other recycling processors and manufacturers." For this reason it was necessary to first attempt to match the recycling sectors to the closest sector for which IMPLAN had multipliers, and then to manipulate the multipliers where they appeared to be out of the range of the expected values.

Results

Five tables are presented in this section. First, multipliers, and the resulting indirect, induced, and total impacts for each sector are presented, divided into Table 7.1 for the recycling industries, Table 7.2 for the recycling reliant industries, and Table 7.3 for the reuse and remanufacturing industries. These tables can be used by Illinois to evaluate the potential impacts of changes in any sector on the economy of Illinois, or preferably, the economic region within Illinois where the change occurs.

For example, Illinois could assess the total economic impact of closure (or expansion) of a steel mill using data on the mill's employment, payroll, and receipts, and the indirect and induced multipliers.

It should be noted that the multipliers run off of the direct impacts in the far left column, which are taken directly from the far right column of Table 6 (Part II) for each sector.

Table 7.1

Recycling Industries

Sector # and Description		*Data Type*	IL	MULTIPLIER	IMPACTS			
RECYCLING INDUSTRY:			DIRECT IMPACTS	Indirect + Induced	Indirect	Induced	Indirect + Induced	Total
1	Municipal Residential	Establishments (#)	308					
	Curbside and Drop-Off	Employment (#)	665	2.563	456	584	1,039	1,704
	Collection	Annual Payroll ($1,000)	$27,981	2.010	$14,484	$13,779	$28,263	$56,244
		Receipts ($1,000)	$62,786	1.972	$29,871	$31,158	$61,029	$123,815
2	Private Residential and	Establishments (#)	239					
	Commercial Collection	Employment (#)	1,215	2.563	833	1,067	1,899	3,114
		Annual Payroll ($1,000)	$60,859	2.010	$31,503	$29,968	$61,471	$122,330
		Receipts ($1,000)	$113,792	1.972	$54,138	$56,471	$110,609	$224,401
3	Compost and Misc.	Establishments (#)	54					
	Organics Producers	Employment (#)	262	1.308	4	76	81	343
		Annual Payroll ($1,000)	$14,056	1.360	$388	$4,671	$5,059	$19,115
		Receipts ($1,000)	$63,216	2.196	$6,307	$69,309	$75,615	$138,831
4	Materials Recovery	Establishments (#)	22					
	Facilities (MRFs)	Employment (#)	899	2.563	616	789	1,405	2,304
		Annual Payroll ($1,000)	$46,625	2.010	$24,135	$22,959	$47,094	$93,718
		Receipts ($1,000)	$61,191	1.972	$29,112	$30,367	$59,479	$120,671
5	Recyclable Material	Establishments (#)	368					
	Wholesalers	Employment (#)	5,225	2.316	2,372	3,849	6,220	11,445
		Annual Payroll ($1,000)	$267,048	1.840	$103,778	$120,447	$224,226	$491,274
		Receipts ($1,000)	$6,064,254	1.910	$1,568,064	$2,159,375	$3,727,439	$9,791,693
14	Plastics Reclaimers	Establishments (#)	30					
		Employment (#)	1,023	2.563	701	898	1,599	2,622
		Annual Payroll ($1,000)	$41,373	2.010	$21,416	$20,373	$41,789	$83,162
		Receipts ($1,000)	$386,813	1.972	$184,029	$191,961	$375,990	$762,802

Table 7.2

Recycling Reliant Industries

Sector # and Description		*Data Type*	IL	MULTIPLIER	IMPACTS			
RECYCLING RELIANT INDUSTRIES:			**DIRECT IMPACTS**	Indirect + Induced	Indirect	Induced	Indirect + Induced	**TOTAL**
6	Glass Container	Establishments (#)	3					
	Manufacturing Plants	Employment (#)	124	2.965	104	140	243	367
		Annual Payroll ($1,000)	$7,750	2.175	$4,971	$4,136	$9,108	$16,858
		Receipts ($1,000)	$33,875	1.878	$16,904	$12,835	$29,739	$63,614
7	Glass Product Producers	Establishments (#)	1					
	(other recycled uses)	Employment (#)	(D)					(D)
		Annual Payroll ($1,000)	(D)					(D)
		Receipts ($1,000)	(D)					(D)
8	Nonferrous Secondary	Establishments (#)	20					
	Smelting and Refining	Employment (#)	943	3.012	938	960	1,898	2,842
	Mills	Annual Payroll ($1,000)	$71,048	2.455	$60,611	$42,795	$103,406	$174,454
		Receipts ($1,000)	$731,764	1.888	$385,958	$263,690	$649,647	$1,381,411
9	Nonferrous Product	Establishments (#)	15					
	Producers	Employment (#)	1,825	3.012	1,815	1,858	3,673	5,498
		Annual Payroll ($1,000)	$89,122	2.455	$76,030	$53,682	$129,712	$218,833
		Receipts ($1,000)	$1,628,947	1.888	$859,164	$586,988	$1,446,152	$3,075,099
10	Nonferrous Foundries	Establishments (#)	100					
		Employment (#)	5,027	2.195	2,339	3,669	6,007	11,034
		Annual Payroll ($1,000)	$196,213	1.912	$86,911	$92,119	$179,030	$375,243
		Receipts ($1,000)	$1,006,829	1.877	$420,303	$462,637	$882,940	$1,889,769
11	Paper and Paperboard	Establishments (#)	13					
	Mills / Deinked Market	Employment (#)	869	4.132	1,466	1,256	2,722	3,591
	Pulp Producers	Annual Payroll ($1,000)	$44,785	3.039	$57,862	$33,445	$91,308	$136,093
		Receipts ($1,000)	$542,323	1.845	$302,004	$156,013	$458,018	$1,000,341
12	Paper-Based Product	Establishments (#)	6					
	Manufacturers	Employment (#)	135	2.199	72	90	162	296
		Annual Payroll ($1,000)	$2,021	2.219	$1,364	$1,100	$2,464	$4,485
		Receipts ($1,000)	$11,506	1.739	$4,760	$3,745	$8,505	$20,011
13	Pavement Mix Producers	Establishments (#)	55					
	(asphalt and aggregate)	Employment (#)	438	3.964	365	934	1,300	1,738
		Annual Payroll ($1,000)	$18,319	1.762	$6,064	$7,896	$13,960	$32,279
		Receipts ($1,000)	$249,615	1.693	$96,741	$76,361	$173,102	$422,717
15	Plastic Product Manufacturers	Establishments (#)	64					
		Employment (#)	2,091	1.978	748	1,297	2,045	4,136
		Annual Payroll ($1,000)	$57,514	1.857	$23,099	$26,194	$49,294	$106,807
		Receipts ($1,000)	$542,364	1.717	$194,463	$194,313	$388,776	$931,139
16	Rubber Product	Establishments (#)	3					
	Manufacturers	Employment (#)	38	4.018	52	63	115	153
		Annual Payroll ($1,000)	$823	2.485	$721	$501	$1,223	$2,046
		Receipts ($1,000)	$4,433	1.642	$1,870	$974	$2,844	$7,278
17	Steel Mills	Establishments (#)	53					
		Employment (#)	3,587	6.386	10,726	8,591	19,318	22,904
		Annual Payroll ($1,000)	$238,570	3.691	$423,895	$218,127	$642,022	$880,592
		Receipts ($1,000)	$3,556,051	1.823	$1,959,935	$967,651	$2,927,587	$6,483,637
18	Iron and Steel Foundries	Establishments (#)	36					
		Employment (#)	2,951	4.108	4,802	4,368	9,171	12,121
		Annual Payroll ($1,000)	$132,981	2.954	$163,431	$96,376	$259,807	$392,788
		Receipts ($1,000)	$764,973	1.838	$420,914	$219,968	$640,882	$1,405,856
19	Other Recycling	Establishments (#)	20					
	Processors /	Employment (#)	339	2.563	233	298	530	870
	Manufacturers	Annual Payroll ($1,000)	$21,923	2.010	$11,348	$10,795	$22,143	$44,065
		Receipts ($1,000)	$97,125	1.972	$46,208	$48,200	$94,408	$191,533

Table 7.3

Reuse and Remanufacturing Industries

Sector # and Description		Data Type	IL	MULTIPLIER	IMPACTS			
REUSE AND REMANUFACTURING INDUSTRIES:			DIRECT IMPACTS	Indirect + Induced	Indirect	Induced	Indirect + Induced	TOTAL
20	Computer and Electronic	Establishments (#)	60					
	Appliance	Employment (#)	5,960	2.490	4,206	4,671	8,877	14,837
	Demanufacturers	Annual Payroll ($1,000)	$47,663	2.654	$47,804	$31,017	$78,821	$126,483
		Receipts ($1,000)	$528,630	2.026	$310,645	$231,634	$542,279	$1,070,909
21	Motor Vehicle Parts	Establishments (#)	66					
	(used)	Employment (#)	482	2.692	371	445	816	1,298
		Annual Payroll ($1,000)	$16,350	2.272	$11,688	$9,109	$20,796	$37,146
		Receipts ($1,000)	$100,986	1.836	$47,151	$37,298	$84,449	$185,436
22	Retail Used Merchandise	Establishments (#)	595					
	Sales	Employment (#)	4,602	1.253	329	834	1,163	5,765
		Annual Payroll ($1,000)	$78,901	1.587	$15,629	$30,660	$46,289	$125,190
		Receipts ($1,000)	$346,864	1.904	$101,012	$212,594	$313,607	$660,471
23	Tire Retreaders	Establishments (#)	19					
		Employment (#)	279	2.419	166	230	396	675
		Annual Payroll ($1,000)	$9,728	2.017	$5,084	$4,813	$9,897	$19,625
		Receipts ($1,000)	$69,848	1.706	$26,122	$23,174	$49,296	$119,144
24	Wood Reuse	Establishments (#)	20					
		Employment (#)	967	1.949	430	487	917	1,884
		Annual Payroll ($1,000)	$20,861	2.153	$13,047	$11,011	$24,058	$44,919
		Receipts ($1,000)	$125,500	1.909	$60,834	$53,211	$114,046	$239,546
25	Materials Exchange	Establishments (#)	1					
	Services	Employment (#)	(D)					(D)
		Annual Payroll ($1,000)	(D)					(D)
		Receipts ($1,000)	(D)					(D)
26	Other Reuse	Establishments (#)	3					
		Employment (#)	3	2.563	2	3	5	8
		Annual Payroll ($1,000)	$28	2.010	$14	$14	$28	$56
		Receipts ($1,000)	$300	1.972	$143	$149	$292	$592

Second, Table 8 sums the results of conducting the "Whole Model Approach" to estimate the total indirect and induced impact of the 26 sectors on Illinois's economy. As illustrated by Table 8, Recycling, Recycling Reliant and Reuse Industries are roughly responsible for a total of $30.3 billion in direct, indirect and induced activity in Illinois, sustaining roughly 111,500 jobs and $3.6 billion in payroll.

Table 8

Estimated Total Impact of Recycling, Recycling Reliant, and Reuse Industries on the Illinois Economy (rounded)

Impact Type	Employment	Labor Income	Gross Receipts
Direct Effect	40,000	$1,500,000,000	$17,100,000,000
Indirect Effect	34,000	$1,200,000,000	$7,100,000,000
Induced Effect	37,500	$886,000,000	$6,100,000,000
Total Effect	111,500	$3,600,000,000	$30,300,000,000

Finally, Table 9 presents estimated total tax revenue associated with the Recycling, Recycling Reliant, and Reuse industries in Illinois. As illustrated by Table 9, total tax revenues are estimated to be roughly $1 billion per year.

Table 9

Estimated Total Tax Revenues Generated by the Recycling, Recycling Reliant, and Reuse Industries in Illinois

State and Local Government Revenue Impacts	
Dividends	$63,219,368
Social Ins Tax- Employee Contribution	$3,598,581
Social Ins Tax- Employer Contribution	$15,482,267
Indirect Bus Tax: Sales Tax	$310,497,440
Indirect Bus Tax: Property Tax	$354,320,832
Indirect Bus Tax: Motor Vehicle Lic	$10,612,866
Indirect Bus Tax: Severance Tax	$18,778
Indirect Bus Tax: Other Taxes	$28,141,714
Indirect Bus Tax: S/L NonTaxes	$38,432,764
Corporate Profits Tax	$31,946,014
Personal Tax: Income Tax	$101,291,888
Personal Tax: NonTaxes (Fines- Fees)	$31,376,922
Personal Tax: Motor Vehicle License	$12,033,299
Personal Tax: Property Taxes	$3,702,077
Personal Tax: Other Tax (Fish/Hunt)	$1,913,460
Total State and Local Tax	$1,006,588,270

Appendix A

Explanation of units used under Data Type: Payroll is in $1,000, Receipts is in $1,000 and throughput is in 1,000 tons.

			Illinois Detailed Reporting Form								
			Tier 1		Tier 2		Tier 3				
			C. Total statistics on All Industry Establishments (not all perform recycling or reuse-related activities)		D. Total statistics on Establishments Undertaking Some Recycling or Reuse Activities (includes recycling and non-recycling activities)		E. Statistics on Employees Undertaking Recycling or Reuse Activities (excluding virgin material preparation and downstream conversion activities)		F. Statistics on Establishments 100% Recycling or Reuse-Dependent (No virgin material)		G. Estimates of Total Recycling-Related Economic Activity (Sum of columns E and F)
Sector #	Description	Data Type	Estimates	Sources	Estimates	Sources	Estimates	Sources	Estimates	Sources	
RECYCLING INDUSTRY: Categories 1-19											
1	Municipal Residential Curbside and Drop-Off Collection	Establishments							308	REI Study Database	308
		Employment							665	Modeling (1)	665
		Annual Payroll							27,981		27,981
		Estimated Receipts							62,786		62,786
		Estimated Throughput							380		380
2	Private Residential and Commercial Collection	Establishments							239	REI Study Database	239
		Employment							1,215	Modeling (2)	1,215
		Annual Payroll							60,859		60,859
		Estimated Receipts							113,792		113,792
		Estimated Throughput							1,058		1,058
3	Compost and Miscellaneous Organics Producers	Establishments							54	Permitted facilities	54
		Employment							262	Results extrapolated based on Illinois survey mean, where n = 16	262
		Annual Payroll							14,056		14,056
		Estimated Receipts							63,216		63,216
		Estimated Throughput							497		497
4	Materials Recovery Facilities (MRFs)	Establishments							22	GAA Database supplemented by DSM research	22
		Employment							899		899
		Annual Payroll							46,625		46,625
		Estimated Receipts							61,191		61,191
		Estimated Throughput							1,224		1,224
5	Recyclable Material Wholesalers	Establishments							368	US Census, 2007 Economic Census, NAICS 421930	368
		Employment							5,225		5,225
		Annual Payroll							267,048		267,048
		Estimated Receipts							6,064,254		6,064,254
		Estimated Throughput									-
6	Glass Container Manufacturing Plants	Establishments			3	Survey of Illinois companies, n = 3	3	Survey of Illinois companies, n = 3, adjusted for non-covered activities			3
		Employment			825		124				124
		Annual Payroll			55,000		7,750				7,750
		Estimated Receipts			245,000		33,875				33,875
		Estimated Throughput			138		62				62
7	Glass Product Producers (other recycled uses)	Establishments			1	Survey of Illinois companies, n = 1	1	Survey of Illinois companies, n = 1			1
		Employment			(D)		(D)				(D)
		Annual Payroll			(D)		(D)				(D)
		Estimated Receipts			(D)		(D)				(D)
		Estimated Throughput					136				136
8	Nonferrous Secondary Smelting and Refining Mills	Establishments			20	US Census 2007 Economic Census, NAICS codes 331314, 331423, 331492			20	Column D adjusted for non-covered activities (US Minerals Yearbook, 2007)	20
		Employment			993				943		943
		Annual Payroll			74,787				71,048		71,048
		Estimated Receipts			770,277				731,764		731,764
		Estimated Throughput							376	US Minerals Yearbook	376

9	Nonferrous Product Producers	Establishments	29	US Census 2007 Economic Census, NAICS codes 331315, 331421, 331316, 331319, 331491					15	US Census 2007 Economic Census, NAICS codes 331315, 331421, 331316, 331319, 331491	15
		Employment	4,212						1,825		1,825
		Annual Payroll	213,027						89,122		89,122
		Estimated Receipts	4,201,440						1,628,947		1,628,947
		Estimated Throughput									-
10	Nonferrous Foundries	Establishments			100	US Census 2007 Economic Census, NAICS code 33152	100	Adjusted for non-covered activities (1)			100
		Employment			5,585		5,027				5,027
		Annual Payroll			218,014		196,213				196,213
		Estimated Receipts			1,118,699		1,006,829				1,006,829
		Estimated Throughput									-
11	Paper and Paperboard Mills/ Deinked Market Pulp Producers	Establishments			13	US Census 2007 Economic Census, NAICS code 3221			13	Column D adjusted for non-covered activities (AF&PA)	13
		Employment			869				869		869
		Annual Payroll			44,785				44,785		44,785
		Estimated Receipts			542,323				542,323		542,323
		Estimated Throughput			371	AF&PA			371	AF&PA	371
12	Paper-Based Product Manufacturers	Establishments							6		6
		Employment							135	Results extrapolated based on Illinois survey mean, where n = 3	135
		Annual Payroll							2,021		2,021
		Estimated Receipts							11,506		11,506
		Estimated Throughput							11		11
13	Pavement Mix Producers (asphalt and aggregate)	Establishments					55	Results extrapolated based on Illinois survey mean, where n = 13			55
		Employment					438				438
		Annual Payroll					18,319				18,319
		Estimated Receipts					249,615				249,615
		Estimated Throughput					4,709				4,709
14	Plastics Reclaimers	Establishments							30		30
		Employment							1,023	Results extrapolated based on Illinois survey mean, where n = 7	1,023
		Annual Payroll							41,373		41,373
		Estimated Receipts							386,813		386,813
		Estimated Throughput							401		401
15	Plastics Product Manufacturers	Establishments			64	Results extrapolated based on regional surveys mean, where n = 21	64	Results extrapolated based on regional surveys mean, where n = 21			64
		Employment			4,547		2,091				2,091
		Annual Payroll			118,696		57,514				57,514
		Estimated Receipts			1,289,499		542,364				542,364
		Estimated Throughput			473		323				323
16	Rubber Product Manufacturers	Establishments					3	Results extrapolated based on Illinois survey mean, where n = 4			3
		Employment					38				38
		Annual Payroll					823				823
		Estimated Receipts					4,433				4,433
		Estimated Throughput					20				20
17	Steel Mills	Establishments			53	CBP 2007	53				53
		Employment			6,405	ASM 2008 for NAICS 3311	3,587	Adjusted for non-covered activities			3,587
		Annual Payroll			426,018		238,570				238,570
		Estimated Receipts			6,350,091		3,556,051				3,556,051
		Estimated Throughput			5,175	SRI for 2008	2,898	SRI 2009			2,898
18	Iron and Steel Foundries	Establishments			36	US Census 2007 Economic Census, NAICS code 33151	36				36
		Employment			3,106		2,951	Adjusted for non-covered activities (1)			2,951
		Annual Payroll			139,980		132,981				132,981
		Estimated Receipts			805,235		764,973				764,973
		Estimated Throughput									-

REUSE AND REMANUFACTURING INDUSTRY: Categories 20-26									
20	Computer and Electronic Appliance Demanufacturers	Establishments				60	Results extrapolated based on Illinois survey mean, where n = 10	60	Adjusted for non-covered activities	60
		Employment				7,692		5,960		5,960
		Annual Payroll				56,100		47,663		47,663
		Estimated Receipts				622,380		528,630		528,630
		Estimated Throughput				318		298		298
21	Motor Vehicle Parts (used)	Establishments						66	US Census 2007 Economic Census, NAICS code 423140 and CBP 2007 for Illinois	66
		Employment						482		482
		Annual Payroll						16,350		16,350
		Estimated Receipts						100,986		100,986
		Estimated Throughput								-
22	Retail Used Merchandise Sales	Establishments						595	US Census 2007 Economic Census, NAICS code 453310, CBP 2007 for Illinois	595
		Employment						4,602		4,602
		Annual Payroll						78,901		78,901
		Estimated Receipts						346,864		346,864
		Estimated Throughput								-
23	Tire Retreaders	Establishments						19	US Census 2007 Economic Census, NAICS code 326212 for Illinois	19
		Employment						279		279
		Annual Payroll						9,728		9,728
		Estimated Receipts						69,848		69,848
		Estimated Throughput								-
24	Wood Reuse	Establishments				20	Results extrapolated based on Illinois survey mean, where n = 9	20	Adjusted for non-covered activities	20
		Employment				1,122		967		967
		Annual Payroll				25,889		20,861		20,861
		Estimated Receipts				150,556		125,500		125,500
		Estimated Throughput						493		493
25	Materials Exchange Services	Establishments				1	Results extrapolated based on regional surveys mean, where n = 3	1	Results extrapolated based on regional surveys mean, where n = 3	1
		Employment				(D)		(D)		(D)
		Annual Payroll				(D)		(D)		(D)
		Estimated Receipts				(D)		(D)		(D)
		Estimated Throughput								-
26	Other Reuse	Establishments				3		3		3
		Employment				5		3		3
		Annual Payroll				74		28		28
		Estimated Receipts				1,850		300		300
		Estimated Throughput								-
REUSE AND REMANUFACTURING SUBTOTALS		Establishments								764
		Employment								12,294
		Annual Payroll								173,556
		Estimated Receipts								1,172,178
GRAND TOTALS Recycling, Reuse, & Remanufacturing		Establishments								2,173
		Employment								39,984
		Annual Payroll								1,513,316
		Estimated Receipts								17,109,035

(1) Note that "(D)" indicates data was suppressed to follow disclosure agreements. Figures suppressed have been aggregated and reported in all totals.

Footnotes by Sector

Sector	Metric	Description
1	Establishment Count	*Estimated from research and program data on municipal programs*
	Employees and Operating Costs	*Collection labor and costs modeled using from estimates on households served by municipality; 80% are assumed to also collect yard waste*
	Payroll	*Collection labor estimates applied to average wage in Illinois for Solid Waste Collection Workers (County Business Patterns, 2007)*
2	Establishment Count	*Country Business Patterns for Illinois (2007) indicate 319 establishments are engaged in solid waste collection and 75% are estimated to be collecting some recyclables*
	Employees and Operating Costs	*Modeling based on households served (private contract curbside and drop-off operating per ton costs) and estiamted tons collected from businesses (commercial OCC and MOP)*
	Payroll	*Collection labor estimates applied to average wage in Illinois for Solid Waste Collection Workers (County Business Patterns, 2007)*
	Tons	*From MRF Data totals and estimates of residential vs commercial*
3	Establishment Count	*From State permits and estimate of unpermitted farm-based leaf and yard waste composting sites*
	Employees, Payroll, Gross receipts and Tons	*Survey data where n = 15 for 53 facilities operating in Illinois, with one outlier survey exlcuded from the average.*
4	All except for payroll and gross receipts	*GAA MRF database data for Illinois supplemented by research. Used establishment count, employment and throughput*
	Payroll	*CBP payroll data used to calculated average Pay per employee and multiplied by employment data from GAA/reearch*
	Gross Receipts	*GAA data on throughput supplemented by research multiplied by average material values*
5	All	*US Census, 2007 Economic Census, NAICS 421930*
6	All	*Surveyed all facilites identified in Illinois*
7	All	*Surveyed and used Northeast Recycling Council States (DE, MA, ME, NY, and PA) 2009 survey data results to supplement results*
8	All	*US Census 2007 Economic Census, NAICS codes 331314, 331423, 331492. Estimated 95% of activity related to scrap use or "covered" as in 2001 Report*
	Tons	*USGS 2007 Minerals yearbook totals for Al, Copper and other nonferrous for US adjusted for Illinois based on Illinois % of gross receipts for each category (2007 census)*
9	Establishment Count	*Assumed at least 50% of establishments enganged in scrap recovery use*
	All	*2007 Economic census data on first stage product producers assumed to use scrap percentages of 44.5% aluminum, 30% copper and 49.8% other nonferrous metals per USGS Mineral handbook (2007) for "covered" activities*

10	All	*Used 2007 Economic Census data, and adjusted for 90% scrap usage average to estimate "covered" activities*
11	All	*Estimated 100% of activity covered via AF&PA recovered paper consumption for the State of Illinois*
	Tons	*Recovered Paper Consumption, AF&PA 2008*
12	All	Attempted to survey all identified paper product producers, reported only confirmed producers
13	Establishment Count	From Illinois Asphalt Pavement Association list of hot mix plants that use recycled asphalt
	Employment, Payroll and Gross Receipts	Attempted to survey all hot mix facilities identified by the Illinois Asphalt Pavement Association
14	All	*Surveyed from list of know reclaimers and applied results to assumed know reclaimers*
15	All	*Surveyed from list of assumed users of plastic scrap in Illinois and applied results combined with NERC States 2009 survey data*
16	All	*Surveyed all facilites identified in Illinois by the Scrap Tire and Rubber 2010 Users Directory*
17	Establishment Count	*County Business Patterns 2007 for NAICS 33111 Iron and Steel Mills*
	Employment, Payroll and Gross Receipts	*ASM 2008 data for NAICS 33111 and adjusted for "covered" activites based on SRI data on scrap useage at Illinois steel mills (estimaetd at 56% based on furnace types and products made)*
	Tons	*SRI Data on Furnace Type, Capacity and 2008 estimated throughput of 75% at capacity, furnace type then expected to run 56% scrap on average for Illinois*
18	All	*Used 2007 Economic Census data, and adjusted for 95% scrap usage average to estimate "covered" activities*
19	All	*Surveyed list of recycling*
21	Establishment Count	*CBP 2007*
	Employment and Payroll	*CBP 2007*
	Gross Receipts	*US Census 2007 Average Establishment Receipts x Establishments in Illinois*
22	Establishment Count	*CBP 2007*
	Employment and Payroll	*CBP 2007*
	Gross Receipts	*US Census 2007 Average Establishment Receipts x Establishments in Illinois*
23	All	*Used 2007 Economic Census data*
24	All	*Attempted to survey all companies in Illinois from the National Wood Pallet and Container Association (NWPCA) list*
25	All	*Attempted to survey all identified Materials Exchange Services in Illinois from US EPA website, Illinois EPA website, Illinois state agency websites and internet searches*
26	All	*Surveyed all identified Reuse businesses identified by industry contacts and internet searches*

Appendix B

Supplementary Data

Method and assumptions for estimating totals for Sectors 1 and 2:

	MODEL FOR ILLINOIS COLLECTION COSTS				
	Curbside Recycling		**Public**	**Private**	**Source**
		100%	25%	75%	Estimated from limited data
	Total Municipalities	***270***	***75***	***225***	IRA database supplemented by DSM research.
	Total Tons Collected	***450,000***	***112,500***	***337,500***	Estimated 400 lbs per household x #1
1	Total Households	2,250,000	562,500	1,687,500	IRA database supplemented by DSM research.
2	Annual Cost Per Household		$42.00	$33.00	DSM modeling
3	***Total Costs (Gross Receipts $)***		***$23,625,000***	***$55,687,500***	Multiply #1 (households) by #2 (cost per household served)
4	***Employees***	**863**	**216**	**647**	Assumes 1.5 persons per truck plus 15% administration.
	Payroll	***$46,506,657***	**$11,626,664**	***$34,879,993***	Economic Census NAICS 562111 average wage per employee x #4
	Drop-off Recycling		80%	20%	Estimated with limited data
	Total Municipalities	**300**	**236250**	**59062.5**	AFandPA Community Survey (2008) and IRA / RRS Database survey data as of June 30, 2010.
5	***Total Tons Collected***	***150,000***	***120,000***	***30,000***	Illinois MRF Database estimates (Total Residential - #1 above)
	Total Costs (Gross Receipts $)	***$26,450,956***	***$21,160,765***	***$5,290,191***	Multiply #5 x #9.
6	Average Tons Per Employee	1,152			DSM Survey Data
7	***Employees***	***130***	***104***	***26***	Divide #5 by #6
8	Average Pay Per Employee	$23,068			DSM Survey Data
	Payroll	***$3,003,353***	***$2,402,683***	***$600,671***	Multiply #7 x #8.
9	Cost per ton	$176			DSM Survey Data
	Yard Waste Collection		**Public**	**Private**	
		100%	50%	50%	Estimated with limited data
	Total Municipalities	**216**	***150***	***150***	Assumed 80% of municipalities with curbside recycling had yard waste collection.
1	*Average Lbs per Household Per Year*		350	350	
2	***Total Tons Collected***	***295,313***	***147,656***	***147,656***	
3	Total Households	1,687,500	843,750	843,750	Assumed 75% of households with curbside recycling had yard waste collection.
4	Annual Cost Per Household		$16.00	$16.00	Assumed cost of $2 per month for 8 months of year
5	***Total Costs (Gross Receipts $)***		***$13,500,000***	***$13,500,000***	Multiply #3 x #4
6	***Employees***	**518**	**259**	**259**	Divide #3 by 5000 (households served weekly), then multiply x 2 (crew) x 1.15 (admin) x 8/12 (months of year served)
	Payroll		***$13,951,997***	***$13,951,997***	Multiply #6 x Economic Census average wage per employee x 75% (assumed lower pay)