Economic Impacts of Recycling in Iowa

RECYCLE IOWA

CREATING SMART BUSINESS OPPORTUNITIES THROUGH RECYCLING®

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Regional Research Professionals

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Economic Impacts of Recycling

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Project Overview

R. W. Beck, Inc, in conjunction with Ames Economic Associates, was retained by Recycle Iowa to study the economic impacts of recycling on Iowa's economy. Specifically, the objectives of the Economic Impacts of Recycling Study (Study) were three-fold:

- measure the current economic impacts of recycling activities (collectors, processors, end-users, and recycling equipment manufacturers) on Iowa employment, income, and tax revenue;
- compare the results of the current Study to the results of the Economic Impacts of Recycling Study completed in 1997 (1997 Study); and
- identify specific recyclable material market development opportunities that maximize beneficial economic impacts upon the state of Iowa's economy.

Overall, in 1999, the Iowa recycling industry reflected the following:

- More than $101 million in commodity gross receipts based on estimated quantities of recyclable materials collected;
- 1,636 direct processing jobs and 2,720 in total recycling-related processing jobs (including organics and C & D);
- 9,482 in direct end-use recycling industry jobs and more than $2.268 billion in direct-industrial output;
- The recycling equipment industry, in itself, provided more than $80 million in total industrial output and 725 total jobs;
- For every 100 jobs created in the recycling processing industry, 72 additional jobs are sustained in the Iowa economy; and
- For every dollar in total income created in the recycling processing industry, $1.03 of additional income is sustained in the Iowa economy.

Recycling Data Collection

A comprehensive statewide survey of collectors, processors, brokers, end-users, and recycling equipment manufacturers was undertaken to gather recyclable materials quantity and recycling economic-related information. Specifically, the objective of the survey was to gather the following information: contact information; recycling activities conducted; employment, payroll, and gross sales information; recyclable material quantity and pricing information; and perceived barriers and drivers to recycling in Iowa.

A summary of the survey results by recycling activity including employment, payroll, and material quantities is provided below in Table ES 1.

TABLE ES 1
SUMMARY OF SURVEY RESULTS
(2001 STUDY)[1]

Recycling Activity	Total Quantities (tons per year)	Total Employment (FTE)	Total Payroll ($ million)
Collection	608,482	407	9.81
Processing	1,167,537	1,006	18.28
End-Use	2,045,726	1,407	70.95
Brokering	4,580	18	.30
Equipment Manufacturing		143	4.80

[1] All data is for calendar year 1999 and represents the documented survey information.

The individual survey responses were input into a materials flow model for collectors, processors, end-users, and brokers. Raw data was summarized by commodity-type for each survey group.

Commodity Flow Summary

The objective of the commodity flow analysis was to utilize the data gathered through the Study's survey efforts to identify potential opportunities for enhancing recycling market development.

To initiate the analysis, the quantitative survey data for the recyclable materials was aggregated by commodity type. Total 1999 tons collected, processed and consumed by Iowa entities was estimated based on the survey responses. Then, the quantities of recyclable materials imported by processors and end-users were calculated. The quantity of in-state commodity purchases was subtracted from the overall total quantities purchased for each individual respondent to calculate the quantity of imports. The imports for individual respondents were summed by commodity type to identify the total imports for each commodity. The commodity imports identified in the recyclable materials flow may represent a supply/demand imbalance. The imports for collectors also were calculated but the focus of the review is at the processor and end-user level. The Iowa Recyclable Materials Flow for the Study is provided below.

TABLE ES 2
IOWA RECYCLABLE MATERIALS FLOW
(2001 STUDY) [1, 2, 3]

COMMODITY	COLLECTORS		PROCESSORS		END-USERS	
Material Types	Total Collected	Exported	Total Processed	Imported (Calc)[4]	Total Consumed	Imported (Calc)[4]
Paper	333,039	47,167	351,115	8,315	892,381	800,276
Plastics	1,889	84	18,794	242	4,847	4,304
Glass	3,704	-	26,571	289	35,000	32,500
Metals	22,846	15,285	76,826	750	952,801	447,635
Wood Wastes	37,001	1,100	124,318	-	90,415	14,198
Construction & Demolition Wastes	108,914	-	186,791	-	2,090	-
Organic Wastes	101,090	-	383,121	-	68,192	-
TOTALS	**608,482**	**63,636**	**1,167,537**	**87,160**	**2,045,726**	**1,298,913**

[1] Represents only the quantities documented based upon the survey conducted by R. W. Beck as related to the Economic Impacts of Recycling Study. It does not necessarily represent 100% of the materials collected, processed, or used in Iowa.

[2] All data is for calendar year 1999.

[3] Totals may not sum due to rounding.

[4] These estimates are calculated by aggregating the data received from the individual respondents concerning overall commodity purchases as compared to in-state commodity purchases.

The Project Team reviewed the recyclable materials flow to assess the supply and demand for the various individual commodities. The processor information was compared to the end-user information to undertake a supply/demand analysis and develop preliminary recommendations.

The table below summarizes the supply/demand assessment.

TABLE ES 3 MATERIALS FLOW COMMODITY ANALYSIS	
Material	**Supply/Demand Status**
ONP	Excess supply
OCC	Excess demand
High Grade (Office)	More research needed
Other Paper (Mixed)	More research needed[1]
PET Plastics	Excess supply
HDPE Plastics	Excess supply
LDPE Plastics	Supply similar to demand
Mixed Plastics	Excess supply
Container Glass	Excess supply
Non-Container Glass	Excess demand
Steel Cans	Excess supply
Aluminum Cans	Excess supply
Ferrous	More research needed
Non-Ferrous	Excess supply
Wood	Excess supply
Asphalt	More research needed
Concrete	More research needed
Drywall	Supply likely meets demand
Asphalt Shingles	More research needed
Food Waste	Excess supply
Yard Waste	Excess supply

[1] It appears that demand exceeds the quantity of mixed paper processed in Iowa, although the definition of "other" or mixed paper is relatively fluid and may have impacted survey responses.

With the exception of old corrugated containers (OCC), non-container glass, and other (mixed) paper, it appears that there is excess supply to meet the present demand for most recycled material commodities in Iowa.

Recycling Industry Economic Values in Iowa

The Project Team used IMPLAN Pro™, an input-output (I-O) model to conduct the economic impact analysis. It is used as an inter-industrial accounting system to mathematically track the flow of commodities and finished goods among industries and, ultimately, to final consumers.

The survey data of estimated tonnage collected, processed, or consumed, along with sales, employees, and employee compensation were compiled and introduced into the modeling system to assess both the economic impacts of commodity production and the estimated economic importance to the state of Iowa of end-use manufacturing activities. The economic impact can be defined as a place where a discernible and measurable change in economic activity in a region is occurring. Economic importance can be defined as the overall magnitude of an industry as part of a larger regional or national economy.

The following table displays the economic impacts of recycling commodity processors in Iowa. This summary table displays several dimensions of information about Iowa's recycled commodity processing industries including: industrial output; total income; jobs; and economic multipliers.

TABLE ES 4
ECONOMIC IMPACTS OF RECYCLABLE MATERIALS PROCESSING
(2001 STUDY)[1]

	Direct	Indirect	Induced	Total	Income Multiplier	Jobs Multiplier
Industrial Output ($)	113,300,000	42,700,000	24,300,000	180,300,000		
Total Income ($)	34,700,000	21,300,000	14,400,000	70,400,000		
Jobs	1,271	506	408	2,185	2.03	1.72

[1] All data is for calendar year 1999.

The above excludes the organics and construction and demolition waste (C&D) estimated economic impacts. The survey results for these specific commodities were considered incomplete for our purposes. Thus, as an alternative, estimated impacts for these two commodities were modeled using national data tailored to Iowa's population. Table ES 5 below reflects these results.

TABLE ES 5
ORGANICS AND CONSTRUCTION & DEMOLITION PROCESSING INDUSTRY
ECONOMIC IMPACTS IN IOWA
(2001 STUDY)[1,2,3]

Organics Processing	Direct	Indirect	Induced	Total	Multiplier
Industrial Output ($)	19,822,000	3,597,200	4,386,200	27,805,500	
Total Income ($)	5,907,500	2,031,100	2,590,100	10,528,800	1.78
Jobs	330	45	74	448	1.36
Construction & Demolition	**Direct**	**Indirect**	**Induced**	**Total**	**Multiplier**
Industrial Output ($)	8,652,000	2,407,400	1,620,800	12,680,200	
Total Income ($)	3,667,200	1,256,900	957,200	5,881,300	1.59
Jobs	35	25	27	87.0	2.68

[1] Estimated using national economic values as opposed to the extrapolation of the survey results.

[2] All data is for calendar year 1999.

[3] Totals may not sum due to rounding.

Provided below in Table ES 6 are the results of the economic importance of end-use manufacturing. These results exclude multipliers because they represent the value of this segment of the industry as opposed to economic impacts. The value is defined as the overall size and characteristics of these firms.

TABLE ES 6
ECONOMIC IMPORTANCE OF END-USE MANUFACTURING
(2001 STUDY)[1,2]

	Direct	Indirect	Induced	Total
Industrial Output ($)	2,268,700,000	654,500,000	405,900,000	3,329,000,000
Total Income ($)	605,800,000	322,300,000	229,200,000	1,157,200,000
Jobs	9,482	7,053	6,801	23,336

[1] All data is for calendar year 1999.

[2] Totals may not sum due to rounding.

Provided below is a summary of the results for the recycling equipment manufacturers.

TABLE ES 7
RECYCLING EQUIPMENT MANUFACTURERS ECONOMIC IMPORTANCE
(2001 STUDY)[1]

	Direct	Indirect	Induced	Total
Industrial Output ($)	54,435,800	15,109,700	11,395,900	80,941,400
Total Income ($)	19,499,200	7,674,400	6,435,400	33,609,000
Jobs	360	174	191	725

[1] All data is for calendar year 1999.

Fiscal Impacts Analysis

When conducting an analysis of the economic values of specific kinds of industrial activity in a region or a state, it is instructive to look at the impacts of industrial change and growth on the flow of revenues into local governments and state governments.

Fiscal impact models are designed to use the findings of an input-output assessment to translate the job and income growth into household impacts, and then analyze those changes within the context of local government operations and state government receipts. For purposes of this Study, the jobs and income findings of the economics impacts analysis for recycling processing, end-use, and equipment manufacturing were used to estimate the likely fiscal outcomes for these specific recycling activities. Fiscal impacts were estimated for Iowa's urban counties (its 10 metropolitan counties) and its rural counties (its 89 non-metropolitan counties).

The net fiscal impacts (revenues less expenses) for processing and end-use are provided in the tables below.

TABLE ES 8
NET FISCAL IMPACTS ASSOCIATED WITH RECYCLED MATERIALS PROCESSING IN IOWA
(2001 STUDY)[1,2]

Government Type	Urban	Rural	Total
State	511,000	272,000	783,000
Local	8,000	204,000	212,000
Total	519,000	477,000	995,000

[1] Data is in 1999 dollars.

[2] Totals may not sum due to rounding.

TABLE ES 9
NET FISCAL IMPACTS ASSOCIATED WITH RECYCLED MATERIALS END-USE MANUFACTURING IN IOWA

(2001 STUDY)[1,2]

Government Type	Urban	Rural	Total
State	19,065,000	19,219,000	38,284,000
Local	55,000	52,000	107,000
Total	19,120,000	19,272,000	38,391,000

[1] Data is in 1999 dollars.

[2] Totals may not sum due to rounding.

The fiscal impacts analysis reflects that for recycled materials processors and end-users, the fiscal revenues generated exceed the costs as aggregated into the urban and rural sectors of the Iowa economy. On average, local governments impacted by the population, employment, and income changes, are likely to generate more revenues than costs as a result of the identified recycling processing and end-use activities.

If the fiscal benefits to state government are factored into the analysis, the net benefits are substantial. The total net fiscal benefits (state and local government) are estimated to be $40.5 million, including $38.4 million attributed to recycling end-use manufacturing, $1.1 million attributed to recycling equipment manufacturing, and $995,000 attributed to recycled commodity processing.

Comparison of the 1997 Study and 2001 Study Impacts

This section compares the major findings of the 1997 Economic Impacts of Recycling Study (1997 Study) with the current Study.

To reconcile the two studies, the direct data from the 1997 Study was remodeled utilizing current I-O modeling tools so that a valid comparison could be made between the results of the 1997 and 2001 Studies. This process produces an entirely different set of multipliers than were reported in the 1997 Study, but the multipliers are much more comparable to the type of multipliers produced in the present Study because they were determined using the same methodology.

There are two kinds of multiplier data that are reported in this comparison: a Type I multiplier and a Type II multiplier. The Type I multiplier is a measure of the amount of inputs that are stimulated by the recycling industry. For any category of economic activity that we are measuring, it represents the value of inputs that are supplied, the jobs it supports in the supplying industries, along with the income and value added that is associated with that demand. A Type I multiplier is used to estimate the extent of regional inter-industrial linkages.

The Type II multiplier is a broader measure of economic activity. It includes linkages to household spending that are as a result of all of the jobs supported in the direct and in the indirect industries that we measure. The Type II multiplier is typically used for estimating an economic impact.

A multiplier is a measure that represents the value of a change in the industry being analyzed. For example, a jobs multiplier of 1.25 means that for every 100 jobs directly created in the recycling industry, another 25 additional jobs are created in supporting industries. Likewise, an income multiplier of $1.50 means that for every $1.00 of income created directly though the recycling industry an additional $.50 of income is created in supporting industries.

At the outset, there are several economic factors that are different in the current Study than in the 1997 Study. They include the following:

1. Prices paid for commodities at all levels have changed.
2. The documentation of additional end-use, especially in metals, has led to a revision in the flow of metals.
3. The modeling system and its underlying foundation data have been modified and improved.

The table below reflects a comparison of the data gathered from the two studies.

TABLE ES 10
COMPARISON OF THE 1997 STUDY AND 2001 STUDY RECYCLED COMMODITY PRODUCTION AND RECEIPTS[1,2,3]

	1997		2001				
	Tons: All Suppliers (tons)	Expected Gross Receipts	All Suppliers (tons)	Expected Gross Receipts	Pct. change in Tons	Pct. Change in Receipts	Pct. Change $ Per Ton
All Paper	346,622	$38,656,006	341,692	$27,694,753	-1.4%	-28.3%	-29.5%
All Other Paper	150,749	$17,466,442	177,826	$17,974,735	17.9%	2.9%	-12.8%
Old Corrugated Containers	195,873	$21,189,564	163,865	$9,720,018	-16.3%	-54.1%	-45.2%
Plastics	20,442	$4,627,667	29,724	$3,665,062	45.4%	-20.8%	-45.5%
Glass	26,165	$715,068	47,409	$1,386,288	81.2%	93.9%	7.0%
All Metals	202,635	$11,102,824	608,627	$71,565,587	200%	544.6%	113.7%
All Other Metals	198,531	$8,026,899	601,569	$64,726,793	203%	706%	166.1%
Aluminum Cans	4,101	$3,075,925	7,058	$6,838,794	72%	122.3%	29.2%
Wood Wastes	39,173	$1,762,779	103,194	$8,977,906	163%	409%	93.3%
Total Quantity	**635,034**	**$56,864,344**	**1,130,646**	**$113,289,596**	**78%**	**99.2%**	**15.1%**

[1] All data is for calendar years 1995 and 1999.

[2] Estimated from extrapolating 1999 survey results and review of statewide reported recycling and diversion rates.

[3] Totals may not sum due to rounding.

The above table reflects changes in prices paid and materials flow. We estimate that the quantity of paper processed was relatively stable, but its gross receipts declined by more than 28 percent. Plastics tons increased by more than 45 percent but gross receipts decreased by more than 20 percent. Glass tons and receipts increased dramatically. The biggest change is in the metals group. Because of more comprehensive industry information from ferrous end-users and the aluminum end-users, the estimated amount of metals processed in Iowa is 200 percent greater than in the 1997 Study and the amount received is more than 544 percent higher. Wood waste processing increased by 163 percent and their receipts by more than 400 percent.

The market for recycled commodities is aptly reflected in the last column where price per ton differences are measured. The average price for all paper products declined by approximately 30 percent per ton, 13 percent for all other paper and 45 percent for old corrugated containers. Plastics receipts per ton also declined markedly by 46 percent. Minor improvements in price per ton were identified in the glass industry, though this amount probably just covers the rate of inflation. Coupled with the significantly higher estimates of tonnage in the metals are significant boosts in prices paid per ton. The weighted average for all metals was 114 percent per ton growth, a value that was driven by an estimated 166 percent increase in all other metals. The reported prices paid for wood waste almost doubled. The overall total estimated quantity for all commodities increased by 78 percent with receipts increasing by approximately 99 percent. However, there were significantly different economic changes within the different commodity groups. For example, receipts per ton of paper and plastics fell drastically, while receipts per ton for ferrous scrap and wood waste rose markedly.

Provided below is a table that shows the net differences between the two studies by commodity type. Values in parentheses reflect a lower value in the 2001 Study as compared to the 1997 Study results.

TABLE ES 11
IOWA PROCESSOR ECONOMIC IMPACTS
(COMPARISON OF 1997 AND 2001 MODELING RESULTS)[1]

All Other Paper	Direct	Total
Industrial Output ($)	508,293	1,504,570
Total Income ($)	(487,127)	84,911
Jobs	6	22
Old Corrugated Containers (OCC)	**Direct**	**Total**
Industrial Output ($)	(11,469,546)	(18,325,014)
Total Income ($)	(5,263,813)	(8,894,846)
Jobs	(46)	(139)
Plastics	**Direct**	**Total**
Industrial Output ($)	(962,605)	(1,751,260)
Total Income ($)	(865,943)	(1,276,118)
Jobs	(9)	(19)

TABLE ES 11
IOWA PROCESSOR ECONOMIC IMPACTS
(COMPARISON OF 1997 AND 2001 MODELING RESULTS)[1]

Glass	Direct	Total
Industrial Output ($)	671,220	1,403,284
Total Income ($)	785,080	1,193,034
Jobs	31	42
All Other Metal	**Direct**	**Total**
Industrial Output ($)	56,699,893	89,049,564
Total Income ($)	15,576,073	32,789,631
Jobs	536	977
Aluminum	**Direct**	**Total**
Industrial Output ($)	3,762,869	5,320,631
Total Income ($)	85,592	896,129
Jobs	15	35
Wood	**Direct**	**Total**
Industrial Output ($)	7,215,127	11,427,066
Total Income ($)	1,948,904	4,174,381
Jobs	86	143
All Commodity Processors	**Direct**	**Total**
Industrial Output ($)	56,425,251	88,628,840
Total Income ($)	12,841,801	31,159,660
Jobs	620	1,061

[1] Data compared is for calendar years 1995 and 1999 and reflects positive or (negative) changes.

In reviewing the comparison results, the largest overall changes in industrial output occurred in old corrugated containers (OCC), all other metals, and wood. OCC industrial output decreased from approximately $34 million to $16 million. This primarily can be attributed to a revenue per ton decrease of more than 45%.

The total industrial output for all other metals increased from $13 million to more than $102 million. This is due, in part, to an increase in the growth in the calculated quantity processed and, in part, to an increase in revenue received on a per ton basis. The total industrial output for wood increased from $2.9 million to more than $14 million. Again, this is due, in part, to an increase in quantity processed and, in part, to an increase in revenue per ton.

The largest changes relative to jobs occurred in OCC, all other metals and wood. The number of jobs in the OCC processing sector was reduced from 392 to 254. The number of total jobs created for all other metals increased from 198 to 1,175. As for wood, the total jobs created increased from 49 to 192.

Overall, the total number of jobs in the recyclable materials processing sector nearly doubled from 1,124 to 2,185. This can be attributed primarily to the growth in the metals and wood commodities.

Overall there is approximately a 78% growth in the quantities of materials recycled between the 1997 Study and the current Study. This can be considered an indicator of the growing strength of the economic linkages within the recycling industry. However, it should be noted that price volatility appears to directly influence the breadth of the economic values measured.

Recommendations

Overview

The following criteria were used in developing the recommendations:

- Projected economic impacts by commodity type;
- Supply/demand recyclable materials balance comparing materials processed and consumed;
- Calculated change in the quantities of materials recycled when comparing the 1997 Study results to the current Study results; and
- Knowledge of the industry.

The recommendations have been organized into three groups as identified below:

- Facilitation and Analysis;
- Financial Incentives; and
- Regulation

Facilitation and Analysis

Because Recycle Iowa is a visible and well-established program, its access to key recycling industry players and relevant information/analysis can be leveraged to promote recycling market development. Provided below are recommended initiatives.

- Meet with key end-users of OCC to discuss the economic benefits of increasing the use of Iowa OCC in their manufacturing processes. Following discussions with end-users, evaluate the potential benefits and drawbacks of establishing regional recyclable materials market development consortiums to enhance the collection and marketing of Iowa OCC within the State.
- Conduct additional research to determine the specific quality of ONP being generated by Iowa processors to identify the compatible end-uses (i.e., newspaper, boxboard, animal bedding, etc.). Based on the results of this analysis, determine if diversification of the market for ONP would promote recovery.
- Monitor and facilitate growth in the recycling equipment industry because of the unique niche composed by this sub-industry of recycling. Specifically, establish a roundtable of recycling equipment manufacturers to determine the size of the industry and identify the benefits of collaboratively working to promote market

share. Roundtable outcomes may include promoting the concept of economic development "clustering" within specific regions of Iowa.

- Gather more data from processors of ferrous metals to confirm the extent of end-use in the state. A follow-up survey should be conducted once market prices for ferrous metals return to historical levels. The lower prices for metals in 1999 appear to have created a barrier to gathering detailed survey information as part of the current Study.
- Continue to gather recycling data as related to the processing and end-use of organics and C&D to monitor growth and refine the economic impacts analysis.
- Develop an informational campaign targeted toward major "players" in the Iowa construction industry to promote the recycling of C & D materials at large job sites.
- Initiate a study assessing recyclable materials pricing to compare Iowa recyclable materials pricing to surrounding states and to determine if there is a correlation between the maturity of the recycling industry infrastructure and pricing stability. The results of this Study should provide some direction as to where increased emphasis should be placed as to promoting growth in the recycling infrastructure for specific commodities.
- Initiate development of an ad hoc plastics industry task force to study the barriers of substituting the use of recycled plastics for virgin plastics in their manufacturing processes. Recycled plastics continue to be an underutilized commodity based on the materials commodity flow analyses.
- In order to entice more businesses and municipalities to respond to recycling surveys, consider making a recycling survey available on-line for potential respondents. In addition, by including the recycling survey as part of the comprehensive solid waste management planning requirements, it would be in each planning area's best interest to encourage their municipalities and businesses associated with recycling to respond to the survey. If the survey is periodically required, respondents may be more likely to complete it.

Financial Incentives

In order to determine which commodities, when recycled, generate the most income and create the most jobs, the multipliers can be compared. Table 12 below lists the income multipliers for each commodity, in descending order.

TABLE ES 12 TOTAL INCOME MULTIPLIERS (2001 STUDY)		
	Total Income	
Commodity	Type I	Type II
Aluminum	2.08	2.52
Plastics	1.73	2.15
Wood	1.69	2.09
All Other Metal	1.65	2.07
All Other Paper	1.55	1.96
Old Corrugated Containers	1.47	1.85
Glass	1.26	1.61

From this Study, it is apparent that aluminum has the highest value of industrial linkages (Type I multipliers). For every $1.00 of total income created through the recycling of aluminum, an additional $1.08 of income is created in supporting economic activity. When household spending is included (Type II), the amount increases to an additional $1.52 of income created. Aluminum is followed by plastics and wood for the second and third highest value recycled commodity, respectively.

Regarding jobs multipliers, Tables ES 13 and ES 14 indicate that aluminum again ranks the highest for both types of multipliers, but the commodities that follow in succession differ between Type I and Type II multipliers.

TABLE ES 13 TYPE I JOBS MULTIPLIERS (2001 STUDY)	
	Jobs
Commodity	Type I
Aluminum	1.62
Plastics	1.43
All Other Metal	1.43
All Other Paper	1.41
Wood	1.36
Old Corrugated Containers	1.28
Glass	1.16

Table ES 13 shows that for every 100 jobs directly created in the aluminum recycling industry, 62 additional jobs are created through supporting economic activity. This is followed by plastics, other metal and other paper.

TABLE ES 14
TYPE II JOBS MULTIPLIERS
(2001 STUDY)

Commodity	Jobs Type II
Aluminum	1.91
All Other Paper	1.78
All Other Metal	1.77
Plastics	1.73
Wood	1.61
Old Corrugated Containers	1.55
Glass	1.42

As shown in Table ES 14, when household spending is taken into account, for every 100 jobs directly created in the aluminum recycling industry, 91 additional jobs are created in supporting industries. This is followed by other paper and other metal.

The collection and processing infrastructure for aluminum beverage containers is well established in Iowa as a result of the Iowa "bottle bill". Thus, even though income and jobs multipliers for aluminum are higher than any of the other commodities, we would not recommend resources be put towards enhancing the processing of aluminum scrap.

The materials flow analysis identified excess supply of most recycled plastics. Plastics represents the second largest income multiplier and second largest Type I jobs multiplier. Therefore, we recommend that resources be put forth to promote increased processing of various plastics. Specifically, PET and HDPE represent the largest share of recycled plastics being collected for recycling.

The following represents additional financial program incentives that should be considered by Recycle Iowa to address commodity flow to balance supply and demand:

- Offer an OCC processing subsidy to Iowa processors to promote an increase in the supply of OCC. This subsidy would be offered directly to processors for marketing Iowa generated OCC to Iowa end-users.
- Enhance the end-use of wood waste by providing additional targeted grants to other potential end-users of wood waste.

- Develop and distribute a business prospectus for attracting a large user of ONP to the state of Iowa upon identifying the end-use most compatible with the ONP supply.

Regulation

The use of various regulatory approaches can be used to stimulate the market. Some approaches for consideration include:

- State-wide landfill disposal ban of OCC to generate an increased supply of OCC.
- State-wide landfill disposal ban of selected wood waste items, such as pallets.
- Expand the beverage container deposit law to include non-carbonated beverages, to capture the increasing number of PET and HDPE single-serve, plastic containers from water, juice and sports drinks.

Section 1

PROJECT OVERVIEW

Introduction

R. W. Beck, Inc, in conjunction with Ames Economic Associates was retained by Recycle Iowa to study the economic impacts of recycling on Iowa's economy. Specifically, the objectives of the Economic Impacts of Recycling Study (Study) were three-fold:

- measure the current economic impacts of recycling activities (collectors, processors, end-users, and recycling equipment manufacturers) on Iowa employment, income, and tax revenue;
- compare the results of the current Study to the results of the Economic Impacts of Recycling Study completed in 1997 (1997 Study); and
- identify specific recyclable material market development opportunities that maximize beneficial economic impacts upon the state of Iowa's economy.

Key Definitions

Prior to initiating the Study, the definitions for a set of key terms were agreed upon by the R. W. Beck Project Team and Recycle Iowa staff. These definitions provide a baseline for initiating the Study analysis.

Recycling Activities

The following definitions, were used for this Study:

Collectors: Establishments which pick-up or transfer materials through a curbside recycling materials collection, drop-off recyclable materials collection, or commercial on-site collection. This category may include for-profit organizations, non-profit organizations, local governments, and redemption centers.

Processors: Establishments that bale, crush, pelletize, compost, or otherwise change the form of the recyclable material for sale to an intermediate market or end manufacturer. This category may include materials recovery facility operators, scrap metal dealers, etc.

End-Users: Establishments that use recyclable materials as feedstock in the production of a new product that is placed into the stream of commerce. This category may include paper-mills, steel mills, etc. This category does not include companies which generate recycled

materials internally and reuse these materials. In addition, it does not include firms which use a limited amount of recycled materials in their manufacturing processes.

Broker: Individuals or establishments that purchase a recycled commodity, other than an end-user or processor, for purpose of commodity resale. Both collectors and processors may use brokers to sell recyclables to end-users.

Recycled Equipment Manufacturers: Establishments that manufacture equipment used solely for the purpose of collection and/or processing of recyclable materials for recovery and reuse. These companies are perceived as composing a unique, well-defined niche within the Iowa economy.

Material Types

Commodity material types selected for this Study include paper, plastics, glass, metals, wood waste, construction and demolition wastes, and organics. The types of materials within each commodity group targeted for this Study included the following:

PAPER			
Old Corrugated Containers (OCC)	Old Newsprint (ONP)	High Grade	Other Paper

PLASTICS						
PET (#1)	HDPE (#2)	PVC (#3)	LDPE (#4)	PP (#5)	PS (#6)	Mixed Plastics

GLASS				
CONTAINER				NON-CONTAINER
Clear (flint)	Brown (amber)	Green/Blue (emerald)	Mixed Glass	End-users

METALS			
CONTAINER		NON-CONTAINER	
Steel Cans	Aluminum Cans	Ferrous (non-vehicle)	Non-Ferrous (non-vehicle)

WOOD WASTE			
Pallets	Brush (non-yard waste)	Stumps/ Tree Trunks	Manufacturing Scrap (i.e., furniture)

CONSTRUCTION AND DEMOLITION WASTES					
Asphalt	Concrete	Drywall	Asphalt Shingles	Carpet and Padding	Mixed C&D

ORGANICS		
Food	Yard Waste (excludes tree stumps)	Other Organics

Economic Measures

The economic impacts upon Iowa's economy will be estimated using the following measures:

- industrial output;
- total income;
- value added; and
- number of jobs.

These outputs will be characterized as:

- direct values (firm specific);
- indirect values (inter-industry linkage as measured by the purchase of intermediate commodities or industrial inputs);
- induced values (economic change stemming from personal consumption or household values); and
- total impacts (the sum of direct, indirect, and induced).

In addition, total income and job multipliers will be generated for various recycling activities by commodity type. A multiplier is calculated by dividing the total values (impacts) by the direct values (impacts).

Key Assumptions

The following key assumptions are critical to the Study's analysis:

- The estimated current impacts are based on 1999 calendar year survey data from Iowa recycling establishments.

- The estimated economic impacts represent only the extent of the recycling activities documented through the Study survey process. Because it is unlikely that 100% of all the activity was documented, the estimated measures are likely to underestimate the overall economic impacts.
- All incremental benefits that may accrue as a result of recycling collection activities are considered nominal, when compared to the collection activities associated with these materials if they were not diverted from disposal.
- The processor level is the point at which initial value is added to the recycled commodities.
- The economic analysis does not account for the avoided disposal costs of the recyclable materials.
- The economic analysis for end-users measures the economic "importance" of the recycling industry to Iowa's economy, as opposed to a measure of the current economic impacts.
- Where net state and local fiscal impacts reflect a positive value, the impacts on population, employment, and income are likely to generate more fiscal revenues than costs.

Approach

The Study approach included the following Phases:

Phase I

- Project kick-off meeting (Appendix B).
- Develop and administer a written survey to collect recycling and economic data from Iowa recycling establishments (Appendix C).

Phase II

- Enhance existing recycling model by gathering detailed economic data from a sample of Iowa recycling establishments.
- Develop an estimated commodity flow analysis for the identified recyclable materials as related to quantities collected, processed, and end-used.
- Estimate the economic impacts of Iowa recycling activities using an Input-Output econometric model.
- Estimate the fiscal impacts of Iowa recycling activities using an Input-Output econometric model.

Phase III

- Compare the results of the 1997 Study to the results of the current Study.
- Provide a set of recycling market development recommendations.

Section 2

RECYCLING DATA COLLECTION

Introduction

A comprehensive statewide survey of collectors, processors, brokers, end-users, and recycling equipment manufacturers was undertaken to gather recyclable materials quantity and recycling economic-related information.

Methodology

To gather the needed recycling data, the R. W. Beck Project Team worked with Recycle Iowa staff to complete the follow steps:

- develop a comprehensive list of businesses/organizations to survey;
- draft a written survey and accompanying cover letter to reflect various combinations of recycling activities;
- pre-test the survey;
- revise the survey to reflect feedback from respondents; and
- administer the survey to the targeted list of recycling organizations.

Database Of Recycling Entities

The private businesses and public organizations selected to survey were based primarily upon the 1999 Iowa Recycling Directory. This list was reviewed to exclude duplications and businesses/organizations involved in the recycling of commodities excluded from this Study. A master list of entities to survey was developed that included collectors, processors, end-users, brokers, recycling equipment manufacturers, and entities involved in a combination of these activities. The database survey list was finalized to include approximately 1,115 recycling businesses and organizations.

Development of Surveys

Upon completing the list of those to be surveyed, the R. W. Beck Project Team, in conjunction with Recycle Iowa staff, developed a written survey to be administered to the various entities. The survey was drafted to gather the following information:

- accurate contact information;
- recycling activities conducted;
- employment, payroll, and gross sales information;

- recyclable material quantity and pricing information; and
- perceived barriers and drivers to recycling in Iowa.

One survey was developed with five separate sections for each of the following types of recycling entities:

- collectors;
- processors;
- brokers;
- end-users; and
- recycling equipment manufacturers.

The definitions of the five categories were outlined in the survey directions and respondents were asked to determine what sections of the survey applied to their business. All respondents were asked to complete Section 6 of the survey, titled General Opinion Questions. Cover letters were developed and sent with the survey. A copy of the survey can be found in Appendix C of this report.

Survey Pre-test

Prior to forwarding the surveys to the targeted entities, the surveys were pre-tested by ten entities representing a cross-section of recycling activities. Following receipt of the surveys, the R. W. Beck Project Team staff attempted to contact each of the ten entities via telephone to gather feedback on the surveys. The feedback from the pre-tested respondents included concerns about the length of survey and the lack of specific benefits to respondents for completing the survey.

As a result of the pre-test, the cover letter was modified to describe the breadth of the financial benefits offered through the Iowa Waste Exchange (IWE) and the Solid Waste Alternative Program (SWAP) to Iowa recycling industries.

Administering of Survey

Following the revisions to the cover letter, the cover letter and survey were mailed to the private businesses and public organizations on the finalized database list.

The process used to obtain both accurate and measurable responses to the surveys involved a three contact approach. Approximately two to three weeks after forwarding the surveys, the R. W. Beck Project Team staff attempted to reach by phone the contact persons for the targeted recipients of the survey. A priority list of respondents was developed collaboratively with Recycle Iowa staff. This list was composed of nearly 500 businesses and organizations from the database list. R. W. Beck staff and Recycle Iowa staff focused on contacting these individuals to solicit responses. If we were successful in reaching the identified contact persons, the contact information was confirmed and the recipient was encouraged to complete the survey and return it to the Recycle Iowa offices as soon as possible. A systematic protocol was used to explain objectives of the survey and obtain accurate information

from the recipient. If we were unsuccessful in reaching the contact persons, we attempted to leave messages for the identified individuals.

Overall, we attempted to reach the targeted survey recipient at least three times before considering companies as non-respondents. After approximately eight weeks, the R. W. Beck Project Team reviewed the list of respondents and identified processors and end-users who had not responded. From this list, the processors and end-users handling large quantities of materials were contacted by the R. W. Beck Project Manager and/or Recycle Iowa staff to attempt to obtain the needed data. The objective was to gather data from those recycling entities considered to play a "significant" role in Iowa recycling.

Survey Results

A summary of the survey results by recycling activity including employment, payroll, and material quantities is provided below.

TABLE 1
SUMMARY OF SURVEY RESULTS
(2001 STUDY)[1]

Recycling Activity	Total Quantities (tons per year)	Total Employment (FTE)	Total Payroll ($ million)
Collection	608,482	407	9.81
Processing	1,167,537	1,006	18.28
End-Use	2,045,726	1,407	70.95
Brokering	4,580	18	.30
Equipment Manufacturing		143	4.80

[1] All data is for calendar year 1999 and represents the documented survey information.

Recyclable Quantities

The individual survey responses were input into a materials flow model for collectors, processors, end-users, and brokers. Raw data was summarized by commodity-type for each survey group. In instances where the respondent provided an aggregated total (i.e., Total Paper), this total was allocated by commodity types (i.e., ONP, OCC, High Grade, and Other Paper) in that particular category based upon the average distribution for the other respondents involved in this activity (i.e., processors of paper).

For the collectors, an additional level of distribution was necessary to calculate the residential-commercial mix for collectors identifying materials collected in commingled form. This calculated residential-commercial split is based on the

percentage split among respondents providing detailed residential-commercial recycling quantity information. This calculation for the collectors was completed prior to segregating the material types (i.e., Total Paper) by commodity type (i.e., ONP, OCC, High Grade and Other).

Recyclable Material Pricing

The per ton prices for each of the recyclable commodities were calculated using two approaches. First, the average price per ton was calculated based upon the reported average prices per ton by commodity type reported by the survey respondents. Because of the limited pricing information provided by respondents, a second approach was undertaken to supplement the survey respondent pricing information. The monthly commodity prices in 1999 as reported in various industry sources including "Waste News", "Official Board Markets", "American Metal Markets", and "Composting News" were reviewed for the East Central Region of the United States. An average annual price per ton was calculated for each of the recyclable material commodities. Providing survey-specific average per ton pricing information, as well as an annual average per ton price from a reputable source within the industry, was designed to provide a comprehensive baseline in which to calculate the gross sales. The gross sales were calculated using the material quantity and pricing information to develop gross sales input information.

Section 3

COMMODITY FLOW ANALYSIS

Overview

The objective of this task is to utilize the data gathered through the Study's survey efforts to identify preliminary potential opportunities for enhancing recycling market development. To identify these commodity opportunities, the Project Team considered the following criteria:

- reliability and completeness of the survey data;
- quantities of recyclable materials imported into Iowa for processing and end-use; and
- overall documented commodity supply as compared to documented demand.

Company specific information from the survey results is not detailed because the Study methodology specified confidentiality for all respondents as related to company specific information.

Recyclable Materials Flow

To initiate the analysis, the quantitative survey data for the recyclable materials was aggregated by commodity type. Total 1999 tons collected, processed and consumed by Iowa entities was estimated based on the survey responses. Then, the quantities of recyclable materials imported by processors and end-users were calculated. The quantity of in-state commodity purchases were subtracted from the overall total quantities purchased for each individual respondent to calculate the quantity of imports. The imports for individual respondents were summed by commodity type to identify the total imports for each commodity. The commodity imports identified in the recyclable materials flow may represent a supply/demand imbalance. The imports for collectors also were calculated but the focus of the review is at the processor and end-user level. The 1999 Iowa Recyclable Materials Flow is provided below.

TABLE 1
IOWA RECYCLABLE MATERIALS FLOW
(2001 STUDY) [1,2]

COMMODITY		COLLECTORS		PROCESSORS		END-USERS	
Material Types		Total Collected[3]	Exported	Total Processed[3]	Imported (Calc)[4]	Total Consumed[3]	Imported (Calc)[4]
PAPER		333,039	47,167	351,115	8,315	892,381	800,276
	Newspaper	35,601	14,963	72,345	2,856	2,741	818
	Old Corrugated Containers	121,297	2,812	201,021	4,281	742,008	666,854
	High Grade (Office Paper)	41,961	9,309	44,506	1,167	34,290	31,165
	Other Paper (Other Grades & Mixed)	134,181	20,084	33,243	11	113,342	101,439
PLASTICS		1,889	84	18,794	242	4,847	4,304
	PET	1,050	9	11,197	101	35	25
	HDPE	619	7	5,309	138	3,574	3,386
	PVC	-	-	-	-	-	-
	LDPE	87	68	472	3	1,025	739
	PP	-	-	16	-	177	127
	PS	-	-	1	-	-	-
	Mixed Plastics	133	-	1,799	-	36	25
GLASS		3,704	-	26,571	289	35,000	32,500
	Clear(Flint)	987	-	7,664	156	-	-
	Brown(Amber)	489	-	13,124	57	-	-
	Green/Blue	31	-	3,485	38	-	-
	Mixed Glass	2,197	-	2,299	38	35,000	32,500
METALS		22,846	15,285	76,826	750	952,801	447,635
	Steel Cans	907	60	4,572	157	121	-
	Aluminum Cans	2,012	-	13,345	26	-	-
	Ferrous Scrap	16,646	12,790	55,552[5]	387	952,130	447,085
	Non-ferrous Scrap	3,280	2,435	3,357	180	550	550

TABLE 1
IOWA RECYCLABLE MATERIALS FLOW
(2001 STUDY) [1,2]

COMMODITY	COLLECTORS		PROCESSORS		END-USERS	
Material Types	Total Collected[3]	Exported	Total Processed[3]	Imported (Calc)[4]	Total Consumed[3]	Imported (Calc)[4]
WOOD WASTES	37,001	1,100	124,318	-	90,415	14,198
SUB-TOTALS	**398,478**	**63,636**	**597,624**	**9,596**	**1,975,444**	**1,298,913**
CONSTRUCTION & DEMOLITION WASTES	108,914	-	186,791	-	2,090	-
Asphalt	35,030	-	52,266	-	340	-
Concrete	65,120	-	120,709	-	-	-
Drywall	-	-	1,645	-	1,750	-
Carpet	-	-	-	-	-	-
Carpet Pad	-	-	2	-	-	-
Asphalt Shingles	160	-	12,169	-	-	-
Mixed C&D	8,604	-	-	-	-	-
ORGANIC WASTES	101,090	-	383,121	-	68,192	-
Food	92,187	-	202,893	77,564	-	-
Yard Waste	8,903	-	147,142	-	68,192	-
Other: Sewer Sludge	-	-	32,586	-	-	-
Other: Manure	-	-	500	-	-	-
TOTALS	**608,482**	**63,636**	**1,167,537**	**87,160**	**2,045,726**	**1,298,913**

[1] Represents only the quantities documented based upon the survey conducted by R. W. Beck as related to the Economic Impacts of Recycling study. It does not necessarily represent 100% of the materials collected, processed, or used in Iowa.

[2] All data is for calendar year 1999.

[3] Totals may not sum due to rounding.

[4] These estimates are calculated by aggregating the data received from the individual respondents concerning overall commodity purchases as compared to in-state commodity purchases.

[5] Under-represents the total amount of ferrous scrap processed in Iowa, based on the survey results of End-Users of ferrous metals.

Data Limitations

The data characterized above have limitations as related to measuring Iowa's overall recyclable materials supply and demand. Some survey respondents failed to differentiate between the quantities of materials originating from Iowa suppliers and the quantities originating from out-of-state suppliers. In these instances, it was assumed these quantities were generated by Iowa suppliers.

Survey responses were not obtained from some Iowa recycling firms and community programs. As a result, the documented quantities per the survey do not represent 100% of the recyclable materials collected, processed, and end-used within Iowa. Yet, the Project Team worked collaboratively with Recycle Iowa staff to identify major recycling industry organizations and gather information from each. It is the Project Team's opinion that the survey results represent most of the materials collected, processed, and end-used in the state of Iowa, except for the noted exceptions.

Materials Supply and Demand

The Project Team reviewed the recyclable materials flow to assess the supply and demand for the various commodities. The processor information is compared to the end-user information to undertake the supply/demand analysis. A brief analysis is provided below by commodity type. All tonnages are for the calendar year 1999.

Old Newspaper (ONP)

The supply of ONP appears to be substantially greater than the demand for ONP. Approximately 72,300 tons of ONP was processed but only 2,700 tons was consumed in Iowa. Thus, additional ONP consumption represents a recycling market development opportunity in the State.

Old Corrugated Containers (OCC)

More than 201,000 tons of OCC was processed in Iowa in 1999. Approximately 742,000 tons were consumed. Out of the total tons consumed, only 75,000 represents the portion of materials estimated as generated in Iowa. This results in almost 667,000 tons of OCC being imported to Iowa for consumption. Based upon the documented survey information, it appears that the demand for OCC substantially exceeds the quantity of OCC collected and processed in Iowa. It should be noted that long-term contractual relationships between processors and end-users may influence the quantity of materials imported. Yet the large quantity of materials imported represents, at some level, a recycling market development opportunity.

High Grade Paper (Office Paper)

The quantity of high grade paper processed in 1999 was 44,500 tons and 34,000 tons were documented as consumed in the state of Iowa. Of the amount consumed, over 31,000 tons (90%) were imported. These results suggest only a small portion of the high grade paper processed in the state is being consumed in Iowa, yet the total supply

actually exceeds the demand for this material. These results represent an imbalance in the supply and demand. However, the specifications of the office paper imported into Iowa for consumption may vary from the specifications of the office paper being generated within Iowa. Follow-up with high grade end-users suggest the continued use of this fiber grade may not be long term. This issue should be further researched before determining if a market development opportunity exists.

Other Paper (Other Grades & Mixed Paper)

Approximately 33,200 tons of mixed paper was processed in Iowa in 1999 while 113,300 tons were consumed. The quantity of documented Iowa tons consumed was 11,900 tons resulting in over 101,400 tons imported for use. Based on this data, it appears that demand exceeds the quantity of mixed paper processed in Iowa. It should be noted that the definition of "other" or mixed paper is relatively fluid and may have impacted the survey responses. Moreover, long-term contractual relationships between processors and end-users may influence the quantity of materials imported. Again, specifications of the consumed fiber should be researched prior to finalizing conclusions as to a recycling market development opportunity.

Plastics

PET

The amount of PET plastic processed in Iowa in 1999 was over 11,000 tons, while only 35 tons were documented as consumed by Iowa end-users. Supply appears to be substantially greater than demand.

HDPE

Over 5,000 tons of HDPE was processed in 1999, and 3,500 tons were consumed. It should be noted that 95% of the tons consumed were imported for end use. Supply appears to be greater than demand.

LDPE

The quantity of LDPE processed in Iowa in 1999 was 472 tons, while 1,025 tons were consumed. Of the amount consumed, 739 tons were imported. Thus, the supply and demand appears to be similar.

Mixed Plastics

Approximately 1,800 tons of mixed plastics were processed in Iowa in 1999, but only 36 tons were consumed. The supply of mixed plastics appears to exceed the demand.

PVC, PP & PS

The amounts reported of other types of plastics processed and consumed were negligible.

Glass

The amount of glass processed in Iowa in 1999 was over 26,000 tons. It is believed that the majority of this glass is container glass via the Iowa “Bottle Bill”. Because

there is no measurable end-user of container glass in the state, the supply of container glass is believed to be shipped out of state. The survey results also reflected 35,000 tons of non-container glass was consumed in Iowa, however, it appears that most of it (93%) was imported. Thus, there appears to be greater demand for non-container glass, than there is supply.

Steel Cans

Approximately 4,500 tons of steel cans were processed in Iowa in 1999. Only 121 tons were consumed, indicating supply exceeds demand.

Aluminum Cans

Over 13,300 tons of aluminum cans were processed in Iowa in 1999. Because no end-users of aluminum can scrap were identified, it appears that supply exceeds demand.

Ferrous Scrap

The amount of ferrous scrap reported as processed in Iowa was 55,500 tons. Because over 952,000 tons were consumed (excludes auto bodies per survey responses), and 447,000 tons were imported for consumption, it is estimated that approximately 505,000 tons of Iowa generated ferrous was consumed. Thus, it appears that the total amount of ferrous processed in Iowa is under-represented, based on end-user survey responses. More data on processors of ferrous scrap should be gathered regarding this commodity to assess the supply and demand.

Non-Ferrous

Survey results indicate that approximately 3,300 tons of non-ferrous scrap was processed in Iowa in 1999, while only 550 tons were consumed. Of the amount consumed, 100% was imported. Supply appears to exceed demand.

Wood

More than 124,300 tons of wood waste was processed in Iowa in 1999. Because approximately 90,400 tons were consumed, and 14,200 tons were imported for consumption, approximately 76,200 tons of Iowa wood waste was consumed. This indicates that supply exceeds the demand for this material. However, based on our knowledge of the wood waste industry, the supply typically exceeds the demand for this commodity type.

Construction & Demolition Wastes

Asphalt

Over 52,200 tons of asphalt were reported processed in 1999, while only 340 tons were consumed. Likely end-users of asphalt may not have been surveyed. More research on end-use is recommended before drawing specific conclusions.

Concrete

Over 120,000 tons of concrete were reported processed in 1999, while no end-users reported consuming concrete. Likely end-users of concrete may not have been surveyed. More research on end-use is recommended before drawing specific conclusions.

Drywall

The amount of drywall processed in 1999 was approximately 1,600 tons. End-users reported 1,750 tons consumed, with only 35 tons imported, implying that the supply is close to meeting the demand.

Asphalt Shingles

Survey results indicate 12,100 tons of asphalt shingles were processed in 1999. No end-users for this material were documented, but it is likely that end-users of this material are active in Iowa. More research on end-use is needed.

Carpet and Carpet Padding

No carpet tonnages were reported. Carpet padding was negligible at 2 tons processed, and no consumption was reported.

Organic Wastes

Food

Over 202,800 tons of food waste were processed in Iowa in 1999. Based on follow-up discussions with processors, a primary end-user of processed food waste is the Iowa hog farming industry. Surveys were not forwarded to hog farmers to document this end use.

Yard Waste

The amount of yard waste processed was approximately 147,100 tons in 1999. End-users reported consuming 68,000 tons, resulting in excess supply. Given the varied types of potential end-users, it would be difficult to effectively survey all yard waste end-users. It should be noted that there is a significant reduction in the volume of yard waste after it is processed/composted, thus for every ton of yard waste composted there is not one ton of compost produced. Moreover, based on our knowledge of yard waste operations, the supply typically exceeds the demand for this commodity type and most municipalities provide the finished compost to residents at no charge.

Other Organics

Small amounts of sewer sludge and manure were reported as processed in 1999. No tonnages were reported consumed by end-users, but it is likely these materials were used as inputs to composting operations.

The table below summarizes the supply/demand assessment.

TABLE 2 MATERIALS FLOW COMMODITY ANALYSIS	
Material	**Supply/Demand Status**
ONP	Excess supply
OCC	Excess demand
High Grade (Office)	More research needed
Other Paper (Mixed)	More research needed
PET Plastics	Excess supply
HDPE Plastics	Excess supply
LDPE Plastics	Supply similar to demand
Mixed Plastics	Excess supply
Container Glass	Excess supply
Non-Container Glass	Excess demand
Steel Cans	Excess supply
Aluminum Cans	Excess supply
Ferrous	More research needed
Non-Ferrous	Excess supply
Wood	Excess supply
Asphalt	More research needed
Concrete	More research needed
Drywall	Supply likely meets demand
Asphalt Shingles	More research needed
Food Waste	Excess supply
Yard Waste	Excess supply

Summary

With the exception of old corrugated containers (OCC), other (mixed) paper and those commodities requiring more research, it appears that there is excess supply to meet the present demand for most recycled material commodities in Iowa. Based solely on the data gathered above and our knowledge of the industry, we recommend consideration of the following preliminary recycling market development opportunities:

- facilitate additional development of the Iowa processing infrastructure for OCC to meet documented in-state demand;
- promote new end-users of ONP by focusing on quality and quantity of fiber available;
- promote new end-users of various recycled plastics, with emphasis on PET because of the quantity of available supply;

- promote the research and development of alternative end-uses for container glass;
- further document the processing of ferrous metals to compare the supply to the present demand for these materials; and
- gather more data and promote development of end-users of organics and construction and demolition materials.

The above preliminary recommendations should be considered in the context of the economic impacts analysis and its results to prioritize the opportunities.

Section 4

RECYCLING INDUSTRY ECONOMIC VALUES IN IOWA

Introduction

Isolating the economic values of recycling and recycling related industries has garnered increased interest since the completion of the Economic Impacts of Recycling Study in 1997 (1997 Study). The 1997 Study established a framework for assessing the economic contributions of recycling industries that has been replicated, modified, and expanded in other states. There are three elements necessary for assessing recycling industry economic values: (1) reliable survey information from recycling industries, (2) recycling industry experience and expertise, and (3) a set of protocols for translating recycling industry information into standard industrial measures of economic activity. In this section of this report we focus on the last element.

Measures of regional economic values may be estimated with the use of input-output (I-O) models. I-O models are basically an accounting of the flow of commodities and finished goods among industries and, ultimately, to final consumers. The model that we use in our assessment is called Implan Pro™, and it contains detailed information on 531 commodity production sectors as well as consuming institutions and households[1]. The foundation data that are used in this model are updated annually, so the modeling structure for this Study is highly reflective of the existing Iowa economy.

At the heart of the I-O model are measures of which industries *use* specific commodities and which industries *make* those commodities, along with an accounting of their presence in an area of study. Relying on annual industrial surveys conducted by the U.S. Bureau of Economic Analysis, the Bureau of Labor Statistics, and quinquennial surveys of industries by the Bureau of Commerce, the model allows for the identification of the industrial composition of the nation, states, and sub-state regions, counties or groups of counties. Knowing the industrial composition of a region, successive rounds of transactions stemming from an initial purchase or the sale of a commodity or some other economic event can then be summed to provide an estimate of the following:

- **Direct values** (usually firm specific);

[1] The modeling system and data that were used for the 1997 Study were manufactured and distributed by the IMPLAN company, as well. The current assessment system is significantly more sophisticated than the earlier versions. Owing to newer and faster processing systems, I-O assessments have improved both technically and in terms of the overall accuracy of the findings. The technical improvements are primarily due to better computing capacity, better software design, and increased functionality. The accuracy improvements are related indirectly to computer technology and their influences on government data collection. The amount, timeliness, and availability of government data used in compiling I-O accounts increased in the past few years.

- **Indirect values** (inter-industry linkages as measured by purchases of intermediate commodities or industrial inputs);
- **Induced values** (economic change stemming from personal consumption or household values); and
- **Total values** (the sum of 1 through 3) for all industries "impacted" by the economic event in the region under study.

The economic values are estimated for the following:

- **Total industrial output** as a measure of gross sales.
- **Total value added** is comprised of all income from employee compensation and investments, plus indirect tax payments to governments (sales, excise, and use taxes).
  - **Total income** represents the value of earnings, profits to owners, and dividends to share holders.
    - **Employee compensation** represents all wages, salaries, and benefits.
    - **Property income** is the sum of returns to owners (sole proprietors) and investors (dividend payments).
  - **Jobs in the region** are defined as the number of positions that exist in an industry, not the number of working persons.

Methodology

For purposes of this Study, "economic impact" is where a discernible and measurable change in economic activity in a region is occurring. This change may come about from one of the following three types of occurrences:

1. Commodity production intended primarily for export. This includes traditional industrial sales, along with tourism and recreational activities, that result in benefits both within and outside the local region.
2. The development of industries locally that are substituted for historical imports, or "import substitution". Much of recycling can often take the form of import substitution.
3. Focused and significant government institutional spending such as schools, hospitals, and prisons. Each of these represents a consolidation of public spending that provides public goods.

When the industrial activity that we are measuring clearly fits into one of these three categories, for the purposes of this Study, we characterize this activity as "economic impact". If the activity does not fit into one of these three groupings for purposes of this Study, we characterize this activity as an "economic value".

The processing of recycled commodities, either as producer inputs or as final goods, generally do not "fit" standard industry groups. A few instances, such as paperboard, metals, and aluminum manufacturing, have historically strong inter-industrial linkages with the byproducts or the wastestreams of other industries. Other commodities like

glass, plastics, construction and demolition materials, and organics processing are not well-represented in standard industrial groupings.

The flow of industrial activity in recycling industrial analysis begins with collecting recyclables, processing them into industrial inputs or intermediate raw materials, and the end-use of processed recycled commodities in the production of final goods intended for household or institutional consumption. Information from a survey of collectors, commodity processors, and end-users were collected in late 2000 and early 2001. These data were used to manually change our I-O model to identify the industrial values of recycling in Iowa and their implicit relationships. In effect, we introduced these industries into our model and manipulated the other industries and institutions represented to mathematically acknowledge them. We also linked these industrial activities together.

Data for this Study were collected for collection, processing, and end-use manufacturing for the following commodities:

- All Paper
  - All other paper
  - Old corrugated containers
- Plastics
- Glass
- Metals
  - All other metals
  - Aluminum
- Wood Waste
- Organic Matter
- Construction & Demolition Materials

The survey data of estimated tonnage collected, processed, or consumed, along with sales, employees, and employee compensation were compiled and introduced into our modeling system to assess both the economic impacts of commodity production and the estimated economic value to the state of Iowa of end-use manufacturing activities.

Study Assumptions

As in the previous Study, there are several assumptions that are implicit in the economic modeling:

- The types of materials that are collected by kind and by source (residential and commercial) documented in the survey are indicative of the overall statewide distribution of recyclables that are collected.
- All recycled commodities that are collected and sold within the state are processed by in-state industries.

- All brokering activities along any continuum of recycling industry activity are subsumed within the purchase prices paid for the recycled commodity either by the processor or by the end-user.
- The prices received per commodity by collectors and by processors are based on reported regional market averages.
- The appropriate point for economic impact analysis is at the processor level because that is the point at which initial value is added to the recycled commodity, although the overall economic values of end-use industrial activity and of recycling equipment manufacture are documented and reported.
- All incremental benefits that may accrue as a result of recycling collection activities are considered nominal when compared to the collection activities associated with these materials if they were not diverted from disposal.

Base Values

Table 1 below itemizes the base values that were used to modify and compile the I-O model for Iowa and its recycling-related industries. These totals were derived from the survey information and by follow-up phone-calls with key industrial groups. By our estimate, reviewing existing Iowa studies and the reported aggregate recycling rate, we estimated that 1.212 million tons of recyclable commodities were collected in Iowa in 1999. Residential collections accounted for 262,000 tons, and commercial collections accounted for 950,100 tons. The total collected, along with the proportions of residential and commercial materials, is extrapolated from the overall survey information. The total tonnage attributable to only the metals category is substantial. In 1999, they accounted for 52.5 percent by weight of all commodities collected. This number reflects the large quantity of ferrous metals reported used as raw materials by Iowa end-users of Iowa-generated ferrous scrap. All paper products followed at 32.2 percent. Of the total, approximately 97,400 tons were exported, leaving 1.115 million tons (92 percent) available to in-state processors.

TABLE 1
ESTIMATED RECYCLED COMMODITIES COLLECTED BY TYPE AND SOURCE
(2001 STUDY)[1,2]

Material Types	Total Tons Collected[3]	Residential Tons Collected	Commercial Tons Collected	Total Tons Exported	Net Iowa	Expected 2000 Gross Receipts[3]
All Paper	391,086	76,219	314,868	57,664	333,423	18,072,583
All Other Paper	226,692	61,671	165,020	53,645	173,047	7,058,127
Old Corrugated Containers	164,395	14,547	149,848	4,019	160,376	11,014,456
Plastics	31,342	29,891	1,451	2,001	29,341	3,653,536
Glass	46,894	45,415	1,479	-	46,894	1,266,129
All Metals	635,695	87,165	548,530	33,943	601,752	71,460,868
All Other Metals	628,651	85,080	543,571	33,943	594,708	67,826,252
Aluminum Cans	7,044	2,085	4,959	-	7,044	3,634,616
Wood Wastes	106,974	23,217	83,757	3,780	103,194	7,006,794
TOTAL QUANTITY	**1,211,991**	**261,907**	**950,085**	**97,388**	**1,114,604**	**$101,459,910**

[1] All data is for calendar year 1999.

[2] Totals may not sum due to rounding.

[3] Estimated from extrapolating 1999 survey results and review of statewide reported recycling and diversion rates.

Assuming that all of the collected tonnage was sold at reported regional prices (i.e., commodity indices), the expected receipts for these recyclables are $101.5 million. A very large fraction of that total, 70.4 percent, is attributable to the metals sector. All collected paper was expected to generate $18.1 million in receipts, waste wood another $7.01 million, plastics $3.7 million, and glass $1.27 million.

Table 2 displays our estimate of the total amount of recyclable commodities that are actually processed in Iowa. These distributions were derived from the survey of processors and end-users in Iowa. The totals are assumed to be, by commodity, representative of the distribution of processors activities in Iowa.

We estimate that the total amount of processed recycled commodities in Iowa in 1999 was 1.130 million tons. As with collections, metal processing amounted to the preponderance of the tonnage at 53.8 percent. All paper accounted for 30.2 percent, and wood waste accounted for just under 10 percent. Total expected receipts for these processed goods were quite large, given average prices in effect at the time. In 1999, these processed commodities, if sold at the regional average rates, would have amounted to $113.3 million in gross receipts. Metals accounted for $71.5 million of the total, followed by paper at $27.7 million, wood wastes at $8.9 million, plastics at $3.6 million, and glass at $1.3 million.

TABLE 2
ESTIMATED PROCESSED COMMODITIES TYPE
(2001 STUDY)[1,2]

Material Types	Iowa Suppliers[3]	Imported	All Suppliers	Expected 2000 Gross Receipts
All Paper	333,423	8,269	341,692	27,694,753
All Other Paper	173,047	4,779	177,826	17,974,735
Old Corrugated Containers	160,376	3,490	163,865	9,720,018
Plastics	29,341	383	29,724	3,665,062
Glass	46,894	516	47,409	1,386,288
All Metals	601,752	6,875	608,627	71,565,587
All Other Metals (non-vehicle)	594,708	6,861	601,569	64,726,793
Aluminum Cans	7,044	14	7,058	6,838,794
Wood Wastes	103,194	-	103,194	8,977,906
TOTAL QUANTITY	**1,114,604**	**16,042**	**1,130,646**	**$113,289,596**

[1] All data is for calendar year 1999.

[2] Totals may not sum due to rounding.

[3] Data is derived from Table 1 and is extrapolated from 1999 survey results and review of statewide reported recycling and diversion rates.

We have allocated the total amount of collections that are sold in-state to the processing sector. That amount is 1.114 million tons, compared with an estimated 16,042 tons that were purchased from out-of-state suppliers. We estimate in this table that 98.6 percent of the commodities that are processed in these industries comes from in-state sources.

Table 2 is very important to the subsequent modeling activities. The gross sales by major commodity become the industrial output that is entered into the I-O model. In short, the expected sales accounted for in Table 2 are the same amounts that the economic impact assessment will report when summed. The models were also created so that there is industrial-level sensitivity to both the amounts and costs of labor, as indicated in the survey.

Recycled Commodity Processing and Linkages

For purposes of this Study, the economic value of a commodity is determined when the commodity is transformed into an intermediate good. Recyclable commodities are transformed into an input to further production at the processing stage. This is where the commodities receive their first significant added value and the processed commodities are then used in the production of a final good.

There are several advantages for using the processing stage to assign the initial highest value of the recycled commodities as opposed to tracking the commodity flow from household or business to collector and on to the processors. First, the value of the commodity at the collection level, in some instances, may be misleading because of the subsidies provided for recyclable materials collection. In short, the values received by consumers or businesses as measured by direct economic welfare gains are unknown. A financial or market value of recycling is not determined until the commodity is sold. Even though we may know the price of commodities sold, we may not know the full amount of public sector investment in the enterprise as compared to the public's overall investment in solid waste disposal. Second, at the collection level, one runs the risk of seriously overestimating the amount of labor and capital involved with recycling. In general, the labor and capital needs or shifts in capital are still very similar to those needed to process solid waste in landfills. For these reasons, we have characterized collection as a margined economic benefit: this means, that for *x* amount of processing sales only a small increase in specialized labor and capital is needed to ready the commodity supply for distribution to the processors.

For the analysis of Iowa's recycled commodities processing industries, we modified industrial production factors to represent the capital, labor, and value of product sold by each commodity. In short, even though many commodities types may be processed by individual processors, we have created production functions that are sensitive to the characteristics of each commodity. These new commodity-processing industries, one for each specified commodity studied, are linked to the collectors (public and private recycled materials collection), along with the traditional industrial linkages that are necessary for the productions of goods (industrial equipment, finance, utilities, transportation, specialized business services, etc.). The value of these linkages were determined by adapting the characteristics of closely-related processing sectors in the original model and by shifting their demand for commodity inputs to the recycled commodity collectors. Each commodity-type industry's factors to production were adjusted to the expected values determined by the baseline analysis. Specifically, returns to capital, employee compensation, employment, and industrial output were adjusted relative to the overall value of the commodity sold per ton and the estimated labor needs to produce the product. When the model was re-compiled with these new values, all other industries in Iowa mathematically recognized the existence of the new recycling commodity processors.

The Economic Impacts of Recycling Commodity Processing

Table 3 displays the economic impacts of recycling commodity processors in Iowa. This table displays several dimensions of information about Iowa's recycled commodity processing industries including the following:

- Industrial output;
- Total income;
- Value added; and

- Jobs.

The direct values represent the amounts for the particular industry that we are studying. The direct industrial output for all other paper is $17.97 million. That number corresponds with the expected receipts for that industry that were displayed in Table 2. The indirect values represent industrial inputs into production to produce the direct commodity that we are measuring. Induced activity comes about as a result of workers receiving paychecks and converting them into household spending. The sum of all direct, indirect, and induced values in a category yields the total economic value.

The last column is the economic multiplier. The multiplier simply is a ratio of the total economic value in a category to the direct value. It tells us the expected change in the total economy per unit change in the direct value. The jobs multiplier for all other paper is 1.78. It is derived by dividing the total jobs by the direct jobs, or *367 ¸ 206 = 1.78*. This means that for every 100 jobs in the direct industry (all other paper), 78 additional jobs are expected to be sustained in the regional economy. The total income multiplier of 1.96, *$12,779,754 ¸ $6,509,178 = 1.96*, means that for every dollar in total income in the direct sector, $ .96 in additional income is sustained in the rest of the economy. Multipliers explain the current relationship of the regional economy to the industry that we are measuring. Multipliers vary across commodities for the following reasons:

- Industries with very strong linkages to existing firms will generate higher multipliers, whereas firms with low regional linkages will generate lower multipliers;
- Firms that produce a high-value commodity, all other things being equal, will have higher multipliers than others; and
- Firms that provide relatively high compensation will generate high jobs multipliers as their household spending will drive more retail and service consumption in an area.

Table 3 reflects the unique I-O results for each measured commodity processor and the totals for all of them. When we compile the values for all commodities, we find that the direct estimated commodity sales of $113.2 million in Iowa in 1999 resulted in $42.6 million in indirect purchases, $24.3 million in induced purchases, and $180.2 million in total industrial output. All of these transactions supported $45.5 million in employee compensation, $70.3 million in total income, and $73.4 million in total value added. Over 2,185 jobs in Iowa were directly, indirectly, or through induction, dependent on these recycling industries.

The all other metals values accounted for 56.6 percent of the industrial output and 53.7 percent of the jobs. Excepting them, the highest category for industrial output was for all other paper at $29.6 million, followed by old corrugated containers at $16.2 million, and wood waste at $14.3 million.

The economic multipliers are also listed. In all, the highest average multipliers are found in the aluminum processing sector[2]. This is reflective of the comparatively high value of the product produced and the fact that there are strong linkages from collection, to processing, to end-use in the state.

TABLE 3
ESTIMATED ECONOMIC IMPACTS OF IOWA'S RECYCLING COMMODITY PROCESSING INDUSTRIES (2001 STUDY)[1]

All Other Paper	Direct	Indirect	Induced	Total	Multiplier
Industrial Output ($)	17,974,735	7,168,634	4,550,720	29,694,089	
Property Incomes ($)	1,844,614	1,444,638	1,201,517	4,490,769	
Employee Compensation ($)	4,664,564	2,138,550	1,485,872	8,288,985	1.78
Total Income ($)	6,509,178	3,583,188	2,687,389	12,779,754	1.96
Value Added ($)	6,637,412	3,824,515	2,868,384	13,330,311	2.01
Jobs	206	85	76	367	1.78

Old Corrugated Containers	Direct	Indirect	Induced	Total	Multiplier
Industrial Output ($)	9,720,018	3,876,511	2,649,567	16,246,095	
Property Incomes ($)	1,413,813	781,202	699,559	2,894,575	
Employee Compensation ($)	2,715,850	1,156,442	865,120	4,737,412	1.74
Total Income ($)	4,129,663	1,937,645	1,564,679	7,631,986	1.85
Value Added ($)	4,211,020	2,068,144	1,670,060	7,949,224	1.89
Jobs	163	46	44	254	1.55

Plastics	Direct	Indirect	Induced	Total	Multiplier
Industrial Output ($)	3,665,062	1,238,279	611,285	5,514,626	
Property Incomes ($)	224,094	249,424	161,397	634,915	
Employee Compensation ($)	625,378	369,444	199,593	1,194,415	1.91
Total Income ($)	849,473	618,868	360,989	1,829,330	2.15
Value Added ($)	866,208	660,548	385,302	1,912,058	2.21
Jobs	34	15	10	59	1.73

Glass	Direct	Indirect	Induced	Total	Multiplier
Industrial Output ($)	1,386,288	554,316	625,796	2,566,399	
Property Incomes ($)	427,596	111,655	165,228	704,479	
Employee Compensation ($)	640,222	165,382	204,331	1,009,935	1.58
Total Income ($)	1,067,819	277,036	369,558	1,714,413	1.61
Value Added ($)	1,088,855	295,695	394,448	1,778,998	1.63
Jobs	40	7	10	57	1.42

[2] The multiplier that is produced by our modeling system is called a Type II multiplier. It is driven primarily by assumptions about income growth and consumption in the industry and the region that we are studying. We previously used a multiplier that was called a Type III multiplier. That multiplier assumed, implicit, that concomitant income and job impacts in a region would result automatically in in-migration. In short, the multiplier contained a population growth component. During the 1990s, however, the state of Iowa compiled impressive job growth, but very, very slow population growth. In general, nearly all regional scientists in the U.S. have abandoned the use of the Type III multipliers. Consequently, the multipliers that are produced in this Study are somewhat lower than the multipliers that were evidenced in 1997 because they explicitly exclude a population growth component.

TABLE 3
ESTIMATED ECONOMIC IMPACTS OF IOWA'S RECYCLING COMMODITY PROCESSING INDUSTRIES (2001 STUDY)[1]

All Other Metal	Direct	Indirect	Induced	Total	Multiplier
Industrial Output ($)	64,726,793	24,036,395	13,352,235	102,115,423	
Property Incomes ($)	4,850,582	4,841,602	3,525,364	13,217,547	
Employee Compensation ($)	13,660,050	7,171,315	4,359,683	25,191,048	1.84
Total Income ($)	18,510,632	12,012,917	7,885,047	38,408,595	2.07
Value Added ($)	18,875,302	12,821,984	8,416,103	40,113,389	2.13
Jobs	665	285	224	1,175	1.77

Aluminum	Direct	Indirect	Induced	Total	Multiplier
Industrial Output ($)	6,838,794	2,187,628	754,798	9,781,220	
Property Incomes ($)	238,524	440,649	199,288	878,461	
Employee Compensation ($)	772,199	652,685	246,452	1,671,335	2.16
Total Income ($)	1,010,723	1,093,334	445,739	2,549,796	2.52
Value Added ($)	1,030,635	1,166,969	475,760	2,673,364	2.59
Jobs	42	26	13	81	1.91

Wood	Direct	Indirect	Induced	Total	Multiplier
Industrial Output ($)	8,977,906	3,589,873	1,791,240	14,359,019	
Property Incomes ($)	774,173	723,101	472,937	1,970,211	
Employee Compensation ($)	1,832,534	1,071,047	584,864	3,488,445	1.90
Total Income ($)	2,606,707	1,794,148	1,057,801	5,458,656	2.09
Value Added ($)	2,658,061	1,914,983	1,129,044	5,702,088	2.15
Jobs	119	43	30	192	1.61

All Commodity Processors	Direct	Indirect	Induced	Total	Multiplier
Industrial Output ($)	113,289,596	42,651,636	24,335,640	180,276,872	
Property Incomes ($)	9,773,397	8,592,270	6,425,289	24,790,957	
Employee Compensation ($)	24,910,797	12,724,864	7,945,913	45,581,574	1.83
Total Income ($)	34,684,194	21,317,134	14,371,202	70,372,530	2.03
Value Added ($)	35,367,494	22,752,839	15,339,100	73,459,432	2.08
Jobs	1,271	506	408	2,185	1.72

[1] All data is for calendar year 1999.

Organics and Construction & Demolition Economic Activities

The processing of organics and construction and demolition wastes represent important, but not well documented, dimensions of recycling in Iowa. In the first instance, yard wastes and other organic matter are being diverted from landfill disposal for composting. The finished material is often simply given to the public, used for erosion control, or applied as a soil amendment on public land. Thus, much of the collection, diversion, processing, and distribution of this material fall outside traditional economic industrial activities.

Construction and demolition wastes also are not well documented in terms of their collection and processing, and end-use. For example, most asphalt is simply collected, crushed, and quickly reapplied during the construction of a new roadway. Recovered concrete often becomes clean fill or is used for erosion control. Efforts are underway to re-process wood, drywall, sheet rock, and asphalt shingles, though instances of usage are not well documented in the state.

Table 4 summarizes the survey results for the collection, processing and end-use sectors. As is readily evident, the coverage by material is not indicative of the likely level of organics and C & D collection, processing and consumption in the state. Of the 101,090 tons of organic matter collected, 92,200 tons were food. It is not likely that the statewide ratio of food organics collection to yard waste is 9 to 1. We see also that the vast preponderance of C & D collections were for asphalt and concrete, which may be reflective of the distribution of collections statewide, but that only 108,914 tons of material were reported collected. It was reported that 68,200 tons of yard waste and 2,100 tons of C & D were consumed, but 147,100 tons of yard waste and 186,800 tons of C & D were processed. These values do not lend themselves to statewide estimates of the type of products collected, total tonnage, expected gross receipts (or industrial output), jobs, or worker compensation levels.

TABLE 4
SUMMARY OF ORGANICS AND C & D SURVEY RESPONSES (2001 STUDY)[1]

Organic Wastes						
	Yard Waste		Food Waste		Total	
Collection	8,903		92,187		101,090	
Processing	147,142		202,893		350,035	
End-Use	68,192		0		68,192	
Construction & Demolition Wastes						
	Asphalt	Concrete	Asphalt Shingles	Drywall	Mixed C&D	Total
Collection	35,030	65,120	160	0	8,604	108,914
Processing	52,266	120,709	12,169	1,645	0	186,789
End-Use	340	0	0	1,750	0	2,090

[1] All data is for calendar year 1999.

An alternative indication of a large fraction of these two sectors of the Iowa recycling economy can be inferred from national statistics. Table 5 summarizes characteristics of industrial activity in composting and in producing pavement mixes from recycled C & D waste nationally. We next took Iowa's population share (1.04%) times these national values to estimate the expected Iowa values. Looking at this table, it is conceivable that the organics material processors in Iowa account for 330 jobs and

$19.8 million in total industrial output. Those involved in pavement production using C & D materials are estimated to account for 35 jobs and $8.6 million in industrial output. The primary national production functions of these sectors were entered into our Iowa I-O model to produce an estimate of total economic impacts/values associated with these two types of recycling activity. These findings are summarized in Table 6.

TABLE 5
ESTIMATES OF ORGANICS AND C&D PROCESSING
(2001 STUDY)[1]

Composting and Miscellaneous Organics Producers		
	National	**Iowa (est)**
Jobs	31,719	330
Annual Payroll	$330,679,000	$3,439,000
Industrial Output	$1,905,971,000	$19,822,000
Total Tons Processed	60,431,000	628,000
Pavement Mix Producers (asphalt & aggregates) from Recovered C&D		
	National	**Iowa (est)**
Jobs	3,460	36
Annual Payroll	$135,936,000	$1,414,000
Industrial Output	$831,912,000	$8,652,000
Total Tons Processed	27,351,000	284,000

[1] All data is for calendar year 1999.

Table 6 characterizes the potential size of these two sets of recycling industries in Iowa. If these industries mirrored national averages, each would contribute sizable amounts of industrial output to the state and to the state's recycling industries. All organics processing is expected to sustain $27.8 million in total industrial output, $10.5 million in total income, and 448 jobs. Due to the seasonality associated with this kind of work and, thus, the relatively low annual pay per job, the jobs multiplier is low (1.36).

In the construction and demolition category we are measuring industrial activity designed to recover primarily road asphalt and concrete, and the re-manufacture of recovered material into new asphalt or for use as some other road surfaces. This kind of processing would sustain, we estimate, approximately $12.7 million in industrial output, $5.8 million in total income, and 87 jobs. The jobs multiplier is quite high (2.68) in this sector because it is a capital-intensive and input-intensive sector which in turn drives high levels of consumer spending.

TABLE 6
ORGANICS AND CONSTRUCTION & DEMOLITION PROCESSING INDUSTRY
ECONOMIC IMPACTS IN IOWA[1]
(2001 STUDY)[2]

Organics Processing	Direct	Indirect	Induced	Total	Multiplier
Industrial Output ($)	19,822,000	3,597,221	4,386,241	27,805,462	
Property Incomes ($)	2,468,493	966,573	1,159,411	4,594,477	
Employee Compensation ($)	3,439,000	1,064,556	1,430,736	5,934,292	1.73
Total Income ($)	5,907,493	2,031,129	2,590,147	10,528,769	1.78
Value Added ($)	6,023,874	2,167,925	2,764,592	10,956,392	1.82
Jobs	330.3	44.7	73.5	448.2	1.36
Construction & Demolition	**Direct**	**Indirect**	**Induced**	**Total**	**Multiplier**
Industrial Output ($)	8,652,000	2,407,412	1,620,836	12,680,248	
Property Incomes ($)	2,253,246	598,680	427,965	3,279,892	
Employee Compensation ($)	1,414,000	658,183	529,204	2,601,386	2.18
Total Income ($)	3,667,246	1,256,863	957,169	5,881,278	1.59
Value Added ($)	3,739,493	1,341,513	1,021,634	6,102,640	1.62
Jobs	35.0	24.8	27.2	87.0	2.68

[1] Estimated using national economic values as opposed to the extrapolation of the survey results.

[2] All data is for calendar year 1999.

Iowa's Recycling Industry End-Users

There are several categories of industries in Iowa that are significant end-users of recycled commodities. Some of these are considered emerging industries, such as some forms of paper recovery and re-manufacturing, and some of these firms have a long heritage in the state, like metals recovery, forging, and fabrication. Because these firms are able to purchase recycled commodities that are processed in Iowa, these purchases represent import substitutions and prevent the flow of dollars out of the state. In general, the stronger the linkages that are established between commodity processors and end-users in the state, the stronger the overall economic value of the entire industrial process is to the state.

While the total amount of in-state purchases of recycled commodities can only be estimated, we can characterize the overall size and characteristics of these firms in the state. End-user types were constructed to align with the commodity processors: all other paper, old corrugated containers, plastics, all other metals, aluminum, non-container glass, and wood waste. Each of these industries was linked directly to the commodity supply that it purchases to more fully account for the amount and kind of transactions that are expected to occur between supplier and end-user. Each industry's regional purchasing coefficients for their primary inputs were adjusted to reflect the results of the survey regarding the amounts of commodities purchased in-state.

End-user responses to the survey were used to determine size of each industry in terms of the number of employees that were stated. For industries that did not respond to the survey, they were matched with the Iowa Manufacturers Directory to identify total employment and to verify their industry type. These data were then compiled by industrial category and entered into the I-O model to obtain an estimate of the overall size of these firms in Iowa. Multipliers were not developed for end-users. The findings are contained in Table 7.

Some caution should be used when describing these industries in total. The discrete assessments that we performed excludes measuring the degree to which these industries actually supply manufactured inputs to each other. As a consequence, the totals will reflect a minor amount of double counting in the indirect and the induced columns.

Overall, when we sum all of the employment in these firms we find 9,459 direct manufacturing jobs, $451.1 million in employee compensation ($47,691 per job), 628.4 million in value added (which subsumes all property and employee incomes), and produces $2.266 billion in direct industrial output. All of this direct activity works its way through the economy and supports 23,293 total jobs in the state, $827.6 million in employee compensation, $1.25 billion in value added, and $3.325 billion in total industrial output.

As is the case when conducting similar studies in other states, the metals industry's values are much larger than for the other commodities. Aluminum and all other metals manufacturing account for 64% of the direct jobs and 75% of the direct industrial output. The next highest category is plastics, which accounts for 1,704 jobs and $273.5 million in direct industrial output. The remainder, in order, are all other paper manufacturing (967 jobs and $189.6 million in industrial output), old corrugated containers (308 jobs and $65.3 million in industrial output), and wood manufacture with 449 jobs and $31.8 million in direct industrial output.

TABLE 7
ESTIMATED ECONOMIC IMPORTANCE OF IOWA'S RECYCLING END-USE INDUSTRIES (2001 STUDY)[1]

All Other Paper	Direct	Indirect	Induced	Total
Output ($)	189,625,536	47,277,098	33,446,387	270,349,013
Proprietors' Income ($)	8,715,118	7,188,578	6,358,255	22,261,952
Employee Compensation ($)	40,505,880	17,098,294	12,529,228	70,133,401
Total Income ($)	49,220,998	24,286,872	18,887,483	92,395,353
Value Added ($)	51,204,476	27,358,556	21,082,310	99,645,343
Jobs	967	539	560	2,066

Old Corrugated Containers	Direct	Indirect	Induced	Total
Output ($)	65,286,836	18,114,427	11,486,480	94,887,741
Proprietors' Income ($)	8,015,763	2,523,278	2,183,627	12,722,668
Employee Compensation ($)	13,849,931	5,933,318	4,302,890	24,086,140
Total Income ($)	21,865,694	8,456,596	6,486,517	36,808,808
Value Added ($)	22,538,106	9,395,316	7,240,288	39,173,711
Jobs	308	187	193	688

Plastics	Direct	Indirect	Induced	Total
Output ($)	273,524,576	127,798,979	55,298,923	456,622,491
Proprietors' Income ($)	19,811,626	17,145,149	10,513,055	47,469,831
Employee Compensation ($)	58,180,260	37,056,591	20,714,627	115,951,479
Total Income ($)	77,991,886	54,201,740	31,227,682	163,421,310
Value Added ($)	79,839,224	59,389,483	34,856,618	174,085,318
Jobs	1,704	1,189	927	3,819

Glass	Direct	Indirect	Induced	Total
Output ($)	2,577,425	872,933	648,715	4,099,073
Proprietors' Income ($)	452,150	141,574	123,332	717,052
Employee Compensation ($)	823,955	291,912	242,993	1,358,860
Total Income ($)	1,276,105	433,486	366,325	2,075,912
Value Added ($)	1,307,004	473,980	408,895	2,189,879
Jobs	23	9	11	43

All Other Metal	Direct	Indirect	Induced	Total
Output ($)	528,375,232	185,451,677	107,650,435	821,477,319
Proprietors' Income ($)	27,021,725	28,716,867	20,455,689	76,194,279
Employee Compensation ($)	110,470,020	65,936,417	40,335,531	216,741,968
Total Income ($)	137,491,745	94,653,284	60,791,220	292,936,247
Value Added ($)	142,078,192	107,439,374	67,852,734	317,370,295
Jobs	2,692	2,035	1,804	6,531

Aluminum	Direct	Indirect	Induced	Total
Output ($)	1,177,431,552	264,081,720	189,176,935	1,630,690,250
Proprietors' Income ($)	87,641,264	40,131,773	35,948,864	163,721,900
Employee Compensation ($)	217,770,592	94,905,985	70,881,436	383,558,023
Total Income ($)	305,411,856	135,037,758	106,830,300	547,279,923
Value Added ($)	319,941,472	152,994,279	119,240,316	592,176,053
Jobs	3,339	2,965	3,170	9,474

TABLE 7
ESTIMATED ECONOMIC IMPORTANCE OF IOWA'S RECYCLING END-USE INDUSTRIES (2001 STUDY)[1]

Wood	Direct	Indirect	Induced	Total
Output ($)	31,836,170	10,854,834	8,148,665	50,839,669
Proprietors' Income ($)	2,202,024	1,480,210	1,549,204	5,231,437
Employee Compensation ($)	10,333,167	3,700,593	3,052,394	17,086,154
Total Income ($)	12,535,191	5,180,803	4,601,598	22,317,591
Value Added ($)	12,805,486	5,816,154	5,136,351	23,757,991
Jobs	449	130	137	715
All Commodity End-Users	**Direct**	**Indirect**	**Induced**	**Total**
Output ($)	2,268,657,327	654,451,668	405,856,540	3,328,965,556
Proprietors' Income ($)	153,859,670	97,327,429	77,132,026	328,319,119
Employee Compensation ($)	451,933,805	224,923,110	152,059,099	828,916,025
Total Income ($)	605,793,475	322,250,539	229,191,125	1,157,235,144
Value Added ($)	629,713,960	362,867,142	255,817,512	1,248,398,590
Jobs	9,482	7,053	6,801	23,336

[1] All data is for calendar year 1999.

Recycling Equipment Manufacturers Economic Importance

Recycling equipment manufacturers were also surveyed. The data for the responding firms was compiled from the surveys, and additional data were gathered from the Iowa Manufacturers Directory for non-respondents. These data were summarized by industrial code and the estimated employment in these firms was entered into our I-O model to determine the expected size of this component of Iowa's recycling industrial matrix.

Recycling equipment includes the containers, processing equipment, and the vehicles necessary to collect and process recyclable products. We estimate that these firms employed 360 workers, provided $14.2 million in direct employee compensation, and generated $54.44 million in industrial output. As these activities work their way through the economy, we estimate that 725 total jobs are sustained by this sector, $23.9 million in employee earnings are supported, and total industrial output is $80.94 million. While a portion of the demand for these goods originates within the state, a large fraction of the total demand likely comes from out-of-state. Consequently, these firms generate sales for export and are thus considered a part of Iowa's industrial base.

TABLE 8 RECYCLING EQUIPMENT MANUFACTURERS ECONOMIC IMPORTANCE (2001 STUDY)[1]				
Recycling Equipment Manufacturers	**Direct**	**Indirect**	**Induced**	**Total**
Output ($)	54,435,844	15,109,669	11,395,920	80,941,434
Proprietors' Incomes ($)	5,278,344	2,270,586	2,166,458	9,715,388
Employee Compensation ($)	14,220,890	5,403,814	4,268,908	23,893,611
Total Income ($)	19,499,234	7,674,400	6,435,366	33,608,999
Value Added ($)	19,932,880	8,699,650	7,183,201	35,815,732
Jobs	360.0	174.0	190.9	725.0

[1] All data is for calendar year 1999.

Summary

Overall, in 1999, the Iowa recycling industry economic values reflected the following:

- More than $101 million in commodity gross receipts;
- 1,636 direct processing jobs and 2,720 in total recycling-related processing jobs (including organics and C & D);
- 9,482 in direct end-use recycling industry jobs and more than $2.268 billion in direct-industrial output;
- The recycling equipment industry, in itself, provides more than $80 million in total industrial output and 725 total jobs;
- For every 100 jobs created in the recycling processing industry, 72 additional jobs are sustained in the Iowa economy; and
- For every dollar in total income created in the recycling processing industry, $1.03 of additional income is sustained in the Iowa economy.

Section 5

FISCAL IMPACTS ANALYSIS

Overview

When conducting an analysis of the economic values of specific kinds of industrial activity in a region or a state, it is instructive to look at the impacts of industrial change and growth on the flow of revenues into local governments and state governments. State and local governments are an intrinsic component of a regional or state economy, and, we can measure the economic outcomes to local and state government operations using fiscal impact modeling.

Overall, these models are designed to use the findings of an input-output assessment to translate the job and income growth into household impacts, and then analyze those changes within the context of local government operations and state government receipts. Thus, for purposes of this Study, the jobs and income findings of the economics impacts analysis for recycling processing, end-use, and equipment manufacturing were used to estimate the likely fiscal outcomes for these specific recycling activities.

Methodology

Fiscal impacts are estimated for Iowa's urban counties (its 10 metropolitan counties) and its rural counties (its 89 non-metropolitan counties). In this analysis, the processor and the end-use jobs were apportioned by the statewide distribution of durable manufacturing jobs in Iowa. For the equipment manufacturers, we allocated the data to their appropriate county of location.

The findings first isolate all local government general revenues, by source of that revenue, and local government general expenditures, by major function. Local schools, municipalities, and county governments account for the vast majority of local government receipts and spending. Comparatively minor amounts of revenues and spending are attributable to townships and special districts.

Local governments must balance their budgets, so revenue and costs in our models tend to offset each other. In other words, all households demand a mix of public services, that can be estimated. To fund these service demands, we isolated an expected flow of revenues. When economies grow, so too do their local governmental revenues and service demands. For some communities, given their size and the kind of growth occurring, economic growth might generate only marginally more revenues than expenditures. In others, the reverse might be true.

Next, we isolated expected state government tax receipts. These receipts constitute roughly 90 percent of the state of Iowa's own source revenues. We offset that amount by the funds that flow directly back to local governments in the forms of education

aid, road use tax fund transfers to counties and cities, and all other forms of state aid to local governments. This provides us with an estimate of the amount of state receipts that are remaining and available to fund remaining state government activities. We make no attempt in this report to estimate an offsetting amount of state government expenditures.

Fiscal Impacts of Recycled Commodity Processing

The data that were compiled in the economic impacts analysis were used to estimate local and state government fiscal outcomes that are generated in recycled commodity processing in the state. These findings are depicted below in Table 1.

General receipts to all local governments in urban/metropolitan counties (i.e. Standard Metropolitan Statistical Area) that are attributable to the economic activity of processing commodities for end-use recycling in Iowa are estimated to generate $2.91 million, $1.02 million of which would be in property taxes. Expected general expenditures associated with the households and the commerce that this employment supports is expected to amount to $2.9 million. Rural county local government general receipts amount to $3.64 million, $1.301 million of which are property taxes. Associated spending would be $3.44 million. Total estimated general revenues supported by the commodity processing firms and their total employment in Iowa is estimated to be $6.55 million, and total spending would amount to $6.34 million. Thus, the total local governmental revenues are expected to exceed the total local governmental expenditures as a result of the changes in population, employment, and income from recyclable materials processing activities.

All of the incomes that are paid to individuals are subject to state income, sales, and use taxes, along with taxes paid by corporations that provide goods and services to households. Total state government receipts accruing from metropolitan employment in the commodity processing industries are estimated be $1.29 million, and the amount from rural counties would be $1.48 million. After transfers back to local governments are accounted (mostly in the form of state aid to education and road-use tax fund payments), net receipts to the state are estimated at $783,150. Again, this represents a net fiscal gain.

TABLE 1
FISCAL IMPACTS ASSOCIATED WITH RECYCLED PRODUCTS PROCESSING IN IOWA (2001 STUDY)[1,2]

Local Government Fiscal Summary			
Revenues	**Urban**	**Rural**	**Total**
Federal Government	147,768	130,350	278,118
State Government	781,093	1,207,762	1,988,855
Local Government	46,110	70,689	116,799
Property Taxes	1,019,919	1,300,656	2,320,575
Other Taxes	120,943	137,124	258,067
General Charges	427,961	524,761	952,722
Special Assessments	9,301	11,352	20,653
Interest Earnings	205,906	264,621	470,527
Other Revenues	36,032	86,091	122,123
Total General Revenues	2,908,971	3,644,196	6,553,167
Expenditures			
Education	1,298,705	1,771,942	3,070,647
Public Safety	214,460	238,468	452,928
Streets	232,210	334,481	566,692
Other Public Works	293,899	317,927	611,826
All Other	861,708	777,324	1,639,031
Total General Expenditures	2,900,982	3,440,143	6,341,124
Net Local (Revenues - Expenditures)	7,990	204,053	212,043
State Government Receipts			
Personal Income Tax	646,968	741,375	1,388,343
Sales Taxes	377,038	432,057	809,095
Use Taxes	63,338	72,581	135,919
Corporation Taxes	89,093	102,094	191,187
Other Taxes	115,317	132,144	247,461
Total State Receipts	1,291,754	1,480,251	2,772,005
Less Transfers to Local Govt	781,093	1,207,762	1,988,855
Net State	510,662	272,489	783,150
Plus			
Net Local	7,990	204,053	212,043
Net State and Local Receipts	518,651	476,542	995,193

[1] Data is in 1999 dollars.
[2] Totals may not sum due to rounding.

Fiscal Impacts of End-Use Manufacturing

From the economic impacts analysis, we found that all estimated end-use manufacturing in the state sustained 23,336 jobs and generated nearly $1.16 billion in total income. Those jobs and incomes can be allocated to estimate the local and state government fiscal impacts.

Table 2 details the fiscal outcomes. As the employment and the income numbers are large, the amounts of local and state receipts are also large. The local governments in urban counties would yield $34.01 million in general revenues, of which $11.84 million would be property taxes. Their general spending estimated to be $33.95 million, $15.2 million of which would go to support elementary and secondary education. The rural counties would generate nearly $48.9 million in general local government revenues, and local spending would be $48.84 million. Combined, end-use manufacturing employment in Iowa is expected to sustain $82.9 million in local government general revenues, of which $28.8 million are property taxes. Thus, the total local governmental revenues are expected to exceed the total local governmental expenditures as a result of the changes in population, employment, and income from recyclable materials end-use activities.

State receipts are substantial, too. Total state income, use, sales, corporation and other taxes are anticipated to be $60.4 million, approximately one half of which shows up as personal income taxes. After we except transfers back to local governments, we find that net state receipts are estimated at $38.28 million.

TABLE 2
FISCAL IMPACTS ASSOCIATED WITH END-USE MANUFACTURING IN IOWA
(2001 STUDY)[1,2]

Local Government Fiscal Summary			
Revenues	**Urban**	**Rural**	**Total**
Federal Government	1,740,490	2,510,910	4,251,400
State Government	9,094,836	13,049,438	22,144,274
Local Government	535,273	766,912	1,302,185
Property Taxes	11,840,523	16,964,970	28,805,493
Other Taxes	1,440,468	2,088,854	3,529,322
General Charges	5,011,003	7,208,984	12,219,987
Special Assessments	110,558	160,174	270,732
Interest Earnings	2,414,268	3,475,494	5,889,762
Other Revenues	400,151	560,883	961,034
Total General Revenues	34,009,570	48,892,125	82,901,696
Expenditures			
Education	15,182,630	21,825,931	37,008,562
Public Safety	2,517,867	3,626,871	6,144,738
Streets	2,675,505	3,819,521	6,495,026
Other Public Works	3,434,978	4,937,392	8,372,369
All Other	10,143,854	14,630,061	24,773,915
Total General Expenditures	33,954,834	48,839,775	82,794,610
Net Local (Revenues - Expenditures)	54,736	52,350	107,086
State Government Receipts			
Personal Income Tax	14,103,548	16,161,576	30,265,124
Sales Taxes	8,219,232	9,418,605	17,637,838
Use Taxes	1,380,738	1,582,219	2,962,958
Corporation Taxes	1,942,184	2,225,593	4,167,777
Other Taxes	2,513,844	2,880,671	5,394,516
Total State Receipts	28,159,547	32,268,666	60,428,213
Less Transfers to Local Govt	9,094,836	13,049,438	22,144,274
Net State	19,064,712	19,219,227	38,283,939
Plus			
Net Local	54,736	52,350	107,086
Net State and Local Receipts	19,119,448	19,271,577	38,391,025

[1] Data is in 1999 dollars.
[2] Totals may not sum due to rounding.

The Fiscal Impacts of Recycling Equipment Manufacturing

In the last component of our economic impacts analysis, we identified 725 jobs and $33.6 million in total incomes that are attributable to firms that manufacture equipment for the recycling industries in Iowa and the remainder of the United States. As the number of these firms is relatively small and localized, we are only reporting the amounts in aggregate for the counties that were identified in the survey.

We estimate approximately $2.31 million in general revenues attributable to the total employment in this grouping. Of that amount, $839,144 would come from property taxes. Anticipated general spending would be $2.21 million, and just under half of that is likely for education.

Total state government receipts from all tax sources are estimated to be $1.76 million, $880,554 of which would be in the form of state income taxes. After we except transfers back to local governments, $1.022 million remains as net tax receipts.

TABLE 3
FISCAL IMPACTS ASSOCIATED WITH RECYCLING EQUIPMENT MANUFACTURING IN IOWA
(2001 STUDY)[1,2]

Revenues	**Total**
Federal Government	101,123
State Government	735,897
Local Government	45,022
Property Taxes	839,144
Other Taxes	85,986
General Charges	344,501
Special Assessments	8,974
Interest Earnings	129,195
Other Revenues	39,371
Total General Revenues	2,308,814
Expenditures	
Education	1,089,368
Public Safety	166,128
Streets	210,900
Other Public Works	194,935
All Other	547,857
Total General Expenditures	2,209,188
Net Local (Revenues - Expenditures)	99,626
State Government Receipts	
Personal Income Tax	880,554
Sales Taxes	513,167
Use Taxes	86,206
Corporation Taxes	121,260
Other Taxes	156,952
Total State Receipts	1,758,140
Less Transfers to Local Govt	735,897
Net State	1,022,244
Plus	
Net Local	99,626
Net State and Local Receipts	1,121,870

[1] Data is in 1999 dollars.
[2] Totals may not sum due to rounding.

Summary

The fiscal impacts analysis reflects that for recycled materials processors and end-users (including equipment manufacturers), the fiscal revenues generated exceed the costs as aggregated into the urban and rural sectors of the Iowa economy. In other words, on average, local governments impacted by the population, employment, and income changes, are likely to generate more revenues than costs as a result of the identified recycling processing and end-use activities.

If the fiscal benefits to state and local governments are factored into the analysis, the net benefits are substantial. Specifically, Tables 1, 2, and 3 identify net state and local governmental revenue resulting from Iowa's recycling industry to be $40.5 million, including $38.4 million attributed to recycling end-use manufacturing, $1.1 million attributed to recycling equipment manufacturing, and $995,000 attributed to recycled commodity processing.

Most interestingly, the aggregating of the results into urban and rural sectors reflects some differences. For recyclable materials processing, the local government rural sector revenues exceed the expenses by a greater margin than in the urban sector. Arguably, this provides evidence that this type of economic activity results in more substantial fiscal benefits for the rural sector than in the urban sector. For recyclable materials end-use, the reverse appears to be reflected in the analysis.

Section 6

COMPARISON OF THE 1997 STUDY AND 2001 STUDY IMPACTS

Overview

This section compares the major findings of the 1997 Economic Impacts of Recycling Study (1997 Study) with the current Study. While overall economic effects or impacts are important, it is important to place the two studies into context. There are two initial issues that need to be discussed: (1) our overall understanding of the activities of recycled commodity processing in Iowa, and (2) the kind of econometric technology applied to our analysis, in light of our understanding of the recycling activities in Iowa.

Our overall understanding of the interrelationships among recycling activities is emerging. Although the state of Iowa has a "progressive" history of solid waste recovery, information about what constitutes recyclable commodity collection, distribution, processing, and remanufacturing continues to evolve. To our knowledge, no comprehensive surveys of recycling industries with the sole objective of comprehensively accounting for all inter-industrial transactions have been administered. Through the current Study survey and the 1997 Study survey, we have gathered an understanding of the overall recycled commodity flow, but we still do not have all of the information needed as to how these firms interact via their economic relationship with each other and with other firms. Yet, in undertaking the current Study, we did enhance our modeling efforts by using detailed economic information collected through individual surveys of a select sample of recycling businesses. Though, for some of our analyses, we are still relying on broad industrial averages when we estimate industrial inputs.

Second, the econometric technology that we now employ in our analysis is significantly different than what was available for the 1997 Study. Enhanced computing capacity has altered the processes of input-output modeling analysis. Due to computing limitations, earlier I-O models used calculation short-cuts in some estimations that would have strained computing capacity. Contrastingly, the current model is significantly more sophisticated and functional than the DOS-based systems that were employed during the 1997 Study period. We add to this capacity significantly enhanced data collection and processing capacity on the part of federal agencies that process these data for input-output analysis. The current model also contains inter-industrial assumptions that are significantly improved from the 1997 Study, due to significant revisions in the base input-output accounts at the federal

level.[3] In other words, due to factors such as increased reliance on technical inputs, changes in regional and global business conditions and competition, along with other macro-economic factors, such as energy prices and transport costs, there are different assumptions about inter-industrial activities for the present Study (1992 benchmark input-output account data), as compared with the 1997 Study (1987 benchmark input-output account data).

There is one more additional critical factor that has impacted our analysis. In the early 1980s, input-output models and analysts used a multiplier that assumed job growth led to population and household growth. In the 1997 Study such a multiplier was called a Type III multiplier. Nationwide and in Iowa, however, those assumptions began to significantly break down. For example, in Iowa, nonfarm job growth composed approximately 280,000 jobs between 1990 and 1998, but the state's estimated population change over that time was under 90,000 persons. Earlier models would have assumed, all other things equal, that this kind of job growth would have yielded from 320,000 to 380,000 new persons in the state, and that population growth assumption was built into the subsequent estimates of induced economic effects. Recognizing this change in demographic trend, input-output modelers abandoned this technique in favor of a technique that relies solely on employee compensation and household spending changes to estimate induced economic activity. Explicit population growth assumptions were abandoned. *Therefore, the multipliers used in this Study are dissimilar to those that were compiled in the 1997 Study.*

Methodology

To reconcile the two studies, we have taken the direct data from the 1997 Study and entered them into our current I-O model so that we can compare the results to the current Study and re-estimate the 1997 Study economic impacts on recycling processing in Iowa. This process produces an entirely different set of multipliers than were reported in the 1997 Study, but the multipliers are much more comparable to the type of multipliers produced in the present Study. They were determined using the same methodology.

There are two kinds of multiplier data that are reported in this comparison: a Type I multiplier and a Type II multiplier. The Type I multiplier is a measure of the amount of inputs that are stimulated by the recycling industry. For any category of economic activity that we are measuring, it represents the value of inputs that are supplied, the jobs it supports in the supplying industries, along with the income and value added that is associated with that demand. Another way to characterize the Type I multiplier is that it statistically measures the value of industrial linkages with other firms in the region.

[3] There are several important data elements and structural constraints in I-O systems. Information on jobs, income, value added, and output are updated annually utilizing U.S. Department of Labor and U.S. Bureau of Economic Analysis data sources. U.S. Census Department quinquennial surveys are used to update production characteristics for industries in the models. Finally, inter-industrial transactions are estimated by the U.S. BEA and distributed as the "Benchmark Input-Output Accounts for the U.S. Economy." The current model uses 1992 benchmarks, the 1997 model utilized 1987 benchmarks. The nation's economic structure changed structurally significantly between 1987 and 1992, and will have further changed significantly when the new benchmark report is issued in April 2002 for 1997.

The Type II multiplier is a broader measure of economic activity. It includes linkages to household spending that are as a result of all of the jobs supported in the direct and in the indirect industries that we measure. The Type II multiplier is typically used for estimating an economic impact. A Type I multiplier is used to estimate the extent of regional inter-industrial linkages.

The calculations for these two types of multipliers are straightforward. We can determine these multipliers for each category that we measure accordingly:

Type I = (Direct + Indirect) / Direct

Type II = (Direct + Indirect + Induced) / Direct

As a result, we have developed a comparison of the Type I and Type II multipliers for the two studies.

A multiplier is a measure that represents the value of a change in the industry being analyzed. For example, a jobs multiplier of 1.25 means that for every 100 jobs directly created in the recycling industry, 25 additional jobs are created in supporting industries. Likewise, an income multiplier of $1.50 means that for every $1.00 of income created directly though the recycling industry an additional $.50 of income is created in supporting industries.

Study Comparison

At the outset, there are several economic factors that are different in the current Study than in the 1997 Study. They include the following:

4. Prices paid for commodities at all levels have changed.
5. The documentation of additional end-use, especially in metals, has led to a revision in the flow of metals.
6. The modeling system and its underlying foundation data have been modified and improved.

The accompanying Table 1 displays the major changes as related to the first two factors.

TABLE 1
COMPARISON OF THE 1997 STUDY AND 2001 STUDY RECYCLED COMMODITY PRODUCTION AND RECEIPTS[1,2,3]

	1997		2001				
	Tons: All Suppliers (tons)	Expected Gross Receipts	All Suppliers (tons)	Expected Gross Receipts	Pct. change in Tons	Pct. Change in Receipts	Pct. Change $ Per Ton
All Paper	346,622	$38,656,006	341,692	$27,694,753	-1.4%	-28.3%	-29.5%
All Other Paper	150,749	$17,466,442	177,826	$17,974,735	17.9%	2.9%	-12.8%
Old Corrugated Containers	195,873	$21,189,564	163,865	$9,720,018	-16.3%	-54.1%	-45.2%
Plastics	20,442	$4,627,667	29,724	$3,665,062	45.4%	-20.8%	-45.5%
Glass	26,165	$715,068	47,409	$1,386,288	81.2%	93.9%	7.0%
All Metals	202,635	$11,102,824	608,627	$71,565,587	200%	544.6%	113.7%
All Other Metals	198,531	$8,026,899	601,569	$64,726,793	203%	706%	166.1%
Aluminum Cans	4,101	$3,075,925	7,058	$6,838,794	72%	122.3%	29.2%
Wood Wastes	39,173	$1,762,779	103,194	$8,977,906	163%	409%	93.3%
Total Quantity	**635,034**	**$56,864,344**	**1,130,646**	**$113,289,596**	**78%**	**99.2%**	**15.1%**

[1] All data is for calendar years 1995 and 1999.

[2] Estimated from extrapolating 1999 survey results and review of statewide reported recycling and diversion rates.

[3] Totals may not sum due to rounding.

The above table reflects changes in prices paid and materials flow. We estimate that the quantity of paper processed was relatively stable, but its gross receipts declined by more than 28 percent. Plastics tons increased by more than 45 percent but gross receipts decreased by more than 20 percent. Glass tons and receipts increased dramatically. The biggest change is in the metals group. Because of more comprehensive industry information from ferrous end-users and the aluminum end-users, the estimated amount of metals processed in Iowa is 200 percent greater than in the 1997 Study and the amount received is more than 544 percent higher. Wood waste processing increased by 163 percent and their receipts by more than 400 percent.

The market for recycled commodities is aptly reflected in the last column where price per ton differences are measured. The average price for paper products declined by approximately 30 percent per ton, 13 percent of all other paper and 45 percent for old corrugated containers. Plastics receipts per ton also declined markedly by 46 percent. Minor improvements in price per ton were identified in the glass industry, though this amount probably just covers the rate of inflation. Coupled with the significantly higher estimates of tonnage in the metals are significant boosts in prices paid per ton. The weighted average for all metals was 114 percent per ton growth, a value that was driven by an estimated 166 percent increase in all other metals. The reported prices

paid for wood waste almost doubled. The overall total estimated quantity increased by 78 percent and receipts by approximately 99 percent. However, there were significantly different economic changes within the different commodity groups. For example, receipts per ton of paper and plastics fell drastically, but receipts per ton for ferrous scrap and wood waste rose markedly.

The Type I and the Type II multipliers for the 1996 Study and for the present Study are displayed in Tables 2 and 3. The Type I multipliers in each of the industries for the categories of employee compensation, total income, value added, and jobs tended to range from between 1.4 to just under 1.6 in the 1997 Study. The exception, plastics and aluminum processors, had the highest Type I multipliers for employee compensation of 1.68 and 1.71, respectively. Our estimate for the 1997 Study estimated that the lowest jobs multipliers were 1.29 in all other metal and 1.25 in waste wood processing.

In the current Study the aluminum processors yielded the highest Type I multiplier of employee compensation at 1.85. Part of this growth is due to the introduction of a linkage in this sector to the trade sector where the preponderance of initial collections take place and an improvement in the inter-industrial linkages in the I-O model, especially to other metals manufacturing firms in the state. This in turn drove up the Type I multiplier in the aluminum sector in 1999 in all categories. The Type I numbers declined in the OCC sector owing primarily to the reduction in commodity prices. The glass numbers also declined sharply as well, but the overall amount of activity in that sector is already low. Due to the increased in prices paid for wood wastes, we also identified growth in the Type I multiplier in that sector comparing the results of the 1997 Study to the current Study.

It is sometimes more instructive to focus on Type I multipliers than the more commonly used Type II numbers. When we use the Type I multiplier to assess inter-industrial linkages we are usually measuring demand for producer inputs. These usually include manufacturing goods, transportation, communications and utilities, financial and other business services. These linkages tend to be to relatively high-paying industrial sectors, versus comparisons that include household spending (Type II multipliers).

We have nonetheless included the Type II multipliers comparison for the two studies. The primary change in the overall Type II multipliers is driven by the average changes in the prices received per ton of the commodity measured. For those commodities where prices declined, a multiplied-through reduction in receipts to owners, workers, and suppliers results in lower total multipliers. For those commodities where prices increased, we assume higher prices paid to suppliers and to workers; consequently, the households purchasing effects are increased.

The jobs and employee compensation Type II multipliers declined in the OCC category. The same is true for plastics and glass. Type II multipliers increased somewhat for the all other metals, aluminum, and wood.

As the recycling industry becomes more mature and as supply becomes more stable, we would expect price stability and concomitant stability in the Type I and the Type II multipliers.

Provided below are three tables characterizing the results of the 1997 Study, the current Study, and the differences in outcomes, respectively.

TABLE 2
IOWA PROCESSOR ECONOMIC VALUES (1997 STUDY)[1]

All Other Paper	Direct	Indirect	Induced	Total	Type I	Type II
Industrial Output ($)	17,466,442	6,984,069	3,739,008	28,189,519		
Property Incomes ($)	3,171,098	1,406,786	987,203	5,565,088		
Employee Compensation ($)	3,825,206	2,083,714	1,220,836	7,129,756	1.54	1.86
Total Income ($)	6,996,304	3,490,500	2,208,039	12,694,844	1.50	1.81
Value Added ($)	7,134,136	3,725,584	2,356,750	13,216,471	1.52	1.85
Jobs	200	83	63	345	1.42	1.73
Old Corrugated Containers	**Direct**	**Indirect**	**Induced**	**Total**	**Type I**	**Type II**
Industrial Output ($)	21,189,564	8,472,782	4,908,764	34,571,110		
Property Incomes ($)	4,371,549	1,706,654	1,296,051	7,374,254		
Employee Compensation ($)	5,021,927	2,527,875	1,602,776	9,152,579	1.50	1.82
Total Income ($)	9,393,476	4,234,529	2,898,827	16,526,832	1.45	1.76
Value Added ($)	9,578,533	4,519,724	3,094,063	17,192,320	1.47	1.79
Jobs	209	101	82	392	1.48	1.87
Plastics	**Direct**	**Indirect**	**Induced**	**Total**	**Type I**	**Type II**
Industrial Output ($)	4,627,667	1,850,403	787,816	7,265,886		
Property Incomes ($)	909,437	372,722	208,005	1,490,164		
Employee Compensation ($)	805,978	552,072	257,233	1,615,283	1.68	2.00
Total Income ($)	1,715,415	924,794	465,238	3,105,447	1.54	1.81
Value Added ($)	1,749,210	987,079	496,571	3,232,860	1.56	1.85
Jobs	43	22	13	78	1.51	1.81
Glass	**Direct**	**Indirect**	**Induced**	**Total**	**Type I**	**Type II**
Industrial Output ($)	715,068	285,924	162,124	1,163,116		
Property Incomes ($)	116,878	57,594	42,805	217,277		
Employee Compensation ($)	165,861	85,306	52,936	304,103	1.51	1.83
Total Income ($)	282,739	142,900	95,741	521,379	1.51	1.84
Value Added ($)	288,309	152,524	102,189	543,022	1.53	1.88
Jobs	9	3	3	15	1.36	1.66
All Other Metal	**Direct**	**Indirect**	**Induced**	**Total**	**Type I**	**Type II**
Industrial Output ($)	8,026,900	3,209,608	1,829,351	13,065,859		
Property Incomes ($)	1,063,034	646,504	483,000	2,192,539		
Employee Compensation ($)	1,871,524	957,594	597,308	3,426,426	1.51	1.83
Total Income ($)	2,934,558	1,604,098	1,080,308	5,618,964	1.55	1.91
Value Added ($)	2,992,371	1,712,134	1,153,066	5,857,571	1.57	1.96
Jobs	129	38	31	198	1.29	1.53
Aluminum	**Direct**	**Indirect**	**Induced**	**Total**	**Type I**	**Type II**
Industrial Output ($)	3,075,925	982,421	402,243	4,460,589		
Property Incomes ($)	513,615	197,887	106,204	817,706		
Employee Compensation ($)	411,516	293,108	131,338	835,962	1.71	2.03
Total Income ($)	925,131	490,995	237,541	1,653,667	1.53	1.79
Value Added ($)	943,357	524,063	253,540	1,720,960	1.56	1.82
Jobs	27	12	7	46	1.43	1.68

TABLE 2
IOWA PROCESSOR ECONOMIC VALUES (1997 STUDY)[1]

Wood	Direct	Indirect	Induced	Total	Type I	Type II
Industrial Output ($)	1,762,779	704,858	464,316	2,931,953		
Property Incomes ($)	182,783	141,978	122,592	447,353		
Employee Compensation ($)	475,020	210,296	151,606	836,922	1.44	1.76
Total Income ($)	657,803	352,274	274,198	1,284,275	1.54	1.95
Value Added ($)	670,762	376,000	292,665	1,339,427	1.56	2.00
Jobs	33	8	8	49	1.25	1.49
All Commodity Processors	**Direct**	**Indirect**	**Induced**	**Total**	**Type I**	**Type II**
Industrial Output ($)	56,864,345	22,490,065	12,293,622	91,648,032		
Property Incomes ($)	17,292,261	7,093,229	4,592,211	28,977,701		
Employee Compensation ($)	11,768,542	6,398,875	3,899,724	22,067,142	1.54	1.88
Total Income ($)	21,842,393	10,593,586	6,776,892	39,212,871	1.49	1.80
Value Added ($)	23,298,865	11,889,073	7,676,085	42,864,023	1.51	1.84
Jobs	651	267	206	1,124	1.41	1.73

[1] All data is for calendar year 1995.

TABLE 3
IOWA PROCESSOR ECONOMIC VALUES (2001 STUDY)[1]

All Other Paper	Direct	Indirect	Induced	Total	Type I	Type II
Industrial Output ($)	17,974,735	7,168,634	4,550,720	29,694,089		
Property Incomes ($)	1,844,614	1,444,638	1,201,517	4,490,769		
Employee Compensation ($)	4,664,564	2,138,550	1,485,872	8,288,985	1.46	1.78
Total Income ($)	6,509,178	3,583,188	2,687,389	12,779,754	1.55	1.96
Value Added ($)	6,637,412	3,824,515	2,868,384	13,330,311	1.58	2.01
Jobs	206	85	76	367	1.41	1.78
Old Corrugated Containers	**Direct**	**Indirect**	**Induced**	**Total**	**Type I**	**Type II**
Industrial Output ($)	9,720,018	3,876,511	2,649,567	16,246,095		
Property Incomes ($)	1,413,813	781,202	699,559	2,894,575		
Employee Compensation ($)	2,715,850	1,156,442	865,120	4,737,412	1.43	1.74
Total Income ($)	4,129,663	1,937,645	1,564,679	7,631,986	1.47	1.85
Value Added ($)	4,211,020	2,068,144	1,670,060	7,949,224	1.49	1.89
Jobs	163	46	44	254	1.28	1.55
Plastics	**Direct**	**Indirect**	**Induced**	**Total**	**Type I**	**Type II**
Industrial Output ($)	3,665,062	1,238,279	611,285	5,514,626		
Property Incomes ($)	224,094	249,424	161,397	634,915		
Employee Compensation ($)	625,378	369,444	199,593	1,194,415	1.59	1.91
Total Income ($)	849,473	618,868	360,989	1,829,330	1.73	2.15
Value Added ($)	866,208	660,548	385,302	1,912,058	1.76	2.21
Jobs	34	15	10	59	1.43	1.73

TABLE 3
IOWA PROCESSOR ECONOMIC VALUES (2001 STUDY)[1]

Glass	Direct	Indirect	Induced	Total	Type I	Type II
Industrial Output ($)	1,386,288	554,316	625,796	2,566,399		
Property Incomes ($)	427,596	111,655	165,228	704,479		
Employee Compensation ($)	640,222	165,382	204,331	1,009,935	1.26	1.58
Total Income ($)	1,067,819	277,036	369,558	1,714,413	1.26	1.61
Value Added ($)	1,088,855	295,695	394,448	1,778,998	1.27	1.63
Jobs	40	7	10	57	1.16	1.42
All Other Metal	**Direct**	**Indirect**	**Induced**	**Total**	**Type I**	**Type II**
Industrial Output ($)	64,726,793	24,036,395	13,352,235	102,115,423		
Property Incomes ($)	4,850,582	4,841,602	3,525,364	13,217,547		
Employee Compensation ($)	13,660,050	7,171,315	4,359,683	25,191,048	1.52	1.84
Total Income ($)	18,510,632	12,012,917	7,885,047	38,408,595	1.65	2.07
Value Added ($)	18,875,302	12,821,984	8,416,103	40,113,389	1.68	2.13
Jobs	665	285	224	1,175	1.43	1.77
Aluminum	**Direct**	**Indirect**	**Induced**	**Total**	**Type I**	**Type II**
Industrial Output ($)	6,838,794	2,187,628	754,798	9,781,220		
Property Incomes ($)	238,524	440,649	199,288	878,461		
Employee Compensation ($)	772,199	652,685	246,452	1,671,335	1.85	2.16
Total Income ($)	1,010,723	1,093,334	445,739	2,549,796	2.08	2.52
Value Added ($)	1,030,635	1,166,969	475,760	2,673,364	2.13	2.59
Jobs	42	26	13	81	1.62	1.91
Wood	**Direct**	**Indirect**	**Induced**	**Total**	**Type I**	**Type II**
Industrial Output ($)	8,977,906	3,589,873	1,791,240	14,359,019		
Property Incomes ($)	774,173	723,101	472,937	1,970,211		
Employee Compensation ($)	1,832,534	1,071,047	584,864	3,488,445	1.58	1.90
Total Income ($)	2,606,707	1,794,148	1,057,801	5,458,656	1.69	2.09
Value Added ($)	2,658,061	1,914,983	1,129,044	5,702,088	1.72	2.15
Jobs	119	43	30	192	1.36	1.61
All Commodity Processors	**Direct**	**Indirect**	**Induced**	**Total**	**Type I**	**Type II**
Industrial Output ($)	113,289,596	42,651,636	24,335,640	180,276,872		
Property Incomes ($)	9,773,397	8,592,270	6,425,289	24,790,957		
Employee Compensation ($)	24,910,797	12,724,864	7,945,913	45,581,574	1.51	1.83
Total Income ($)	34,684,194	21,317,134	14,371,202	70,372,530	1.61	2.03
Value Added ($)	35,367,494	22,752,839	15,339,100	73,459,432	1.64	2.08
Jobs	1,271	506	408	2,185	1.40	1.72

[1] All data is for calendar year 1999.

TABLE 4
IOWA PROCESSOR ECONOMIC VALUES
(COMPARISON OF 1997 AND 2001 MODELING RESULTS)[1]

All Other Paper	Direct	Indirect	Induced	Total
Industrial Output ($)	508,293	184,565	811,712	1,504,570
Property Incomes ($)	(1,326,485)	37,852	214,314	(1,074,319)
Employee Compensation ($)	839,358	54,836	265,036	1,159,229
Total Income ($)	(487,127)	92,688	479,350	84,911
Value Added ($)	(496,724)	98,930	511,634	113,840
Jobs	6	2	14	22
Old Corrugated Containers	**Direct**	**Indirect**	**Induced**	**Total**
Industrial Output ($)	(11,469,546)	(4,596,271)	(2,259,197)	(18,325,014)
Property Incomes ($)	(2,957,736)	(925,452)	(596,492)	(4,479,679)
Employee Compensation ($)	(2,306,077)	(1,371,433)	(737,657)	(4,415,167)
Total Income ($)	(5,263,813)	(2,296,885)	(1,334,149)	(8,894,846)
Value Added ($)	(5,367,513)	(2,451,579)	(1,424,003)	(9,243,096)
Jobs	(46)	(55)	(38)	(139)
Plastics	**Direct**	**Indirect**	**Induced**	**Total**
Industrial Output ($)	(962,605)	(612,124)	(176,531)	(1,751,260)
Property Incomes ($)	(685,343)	(123,298)	(46,608)	(855,250)
Employee Compensation ($)	(180,600)	(182,628)	(57,640)	(420,868)
Total Income ($)	(865,943)	(305,927)	(104,249)	(1,276,118)
Value Added ($)	(883,002)	(326,531)	(111,270)	(1,320,802)
Jobs	(9)	(7)	(3)	(19)
Glass	**Direct**	**Indirect**	**Induced**	**Total**
Industrial Output ($)	671,220	268,392	463,672	1,403,284
Property Incomes ($)	310,719	54,061	122,423	487,202
Employee Compensation ($)	474,361	80,076	151,395	705,832
Total Income ($)	785,080	134,136	273,818	1,193,034
Value Added ($)	800,546	143,171	292,259	1,235,976
Jobs	31	3	8	42
All Other Metal	**Direct**	**Indirect**	**Induced**	**Total**
Industrial Output ($)	56,699,893	20,826,787	11,522,884	89,049,564
Property Incomes ($)	3,787,547	4,195,098	3,042,364	11,025,009
Employee Compensation ($)	11,788,526	6,213,721	3,762,375	21,764,622
Total Income ($)	15,576,073	10,408,819	6,804,739	32,789,631
Value Added ($)	15,882,931	11,109,850	7,263,037	34,255,818
Jobs	536	247	193	977
Aluminum	**Direct**	**Indirect**	**Induced**	**Total**
Industrial Output ($)	3,762,869	1,205,207	352,554	5,320,631
Property Incomes ($)	(275,091)	242,762	93,084	60,756
Employee Compensation ($)	360,683	359,577	115,114	835,373
Total Income ($)	85,592	602,339	208,198	896,129
Value Added ($)	87,278	642,906	222,220	952,405
Jobs	15	14	6	35

TABLE 4
IOWA PROCESSOR ECONOMIC VALUES
(COMPARISON OF 1997 AND 2001 MODELING RESULTS)[1]

Wood	Direct	Indirect	Induced	Total
Industrial Output ($)	7,215,127	2,885,015	1,326,924	11,427,066
Property Incomes ($)	591,390	581,122	350,345	1,522,857
Employee Compensation ($)	1,357,514	860,751	433,258	2,651,524
Total Income ($)	1,948,904	1,441,873	783,603	4,174,381
Value Added ($)	1,987,299	1,538,983	836,379	4,362,661
Jobs	86	34	22	143
All Commodity Processors	**Direct**	**Indirect**	**Induced**	**Total**
Industrial Output ($)	56,425,251	20,161,571	12,042,018	88,628,840
Property Incomes ($)	(7,518,864)	1,499,041	1,833,078	(4,186,744)
Employee Compensation ($)	13,142,254	6,325,989	4,046,189	23,514,432
Total Income ($)	12,841,801	10,723,548	7,594,311	31,159,660
Value Added ($)	12,068,628	10,863,766	7,663,014	30,595,408
Jobs	620	239	202	1,061

[1] All data is for calendar years 1995 and 1999.

Findings

In reviewing the comparison results in Table 4, the largest overall changes in industrial output occurred in OCC, all other metals, and wood. OCC industrial output decreased from approximately $34 million to $16 million. This primarily can be attributed to a revenue per ton decrease of more than 45%.

The total industrial output for all other metals increased from $13 million to more than $102 million. This is due, in part, to an increase in the growth in the calculated quantity processed and, in part, to an increase in revenue received on a per ton basis. The total industrial output for wood increased from $2.9 million to more than $14 million. Again, this is due, in part, to an increase in quantity processed and, in part, to an increase in revenue per ton.

The largest changes relative to jobs occurred in OCC, all other metals and wood. The number of jobs in the OCC processing sector was reduced from 392 to 254. The number of total jobs created for all other metals increased from 198 to 1,175. As for wood, the total jobs created increased from 49 to 192.

As for the substantial increase in quantities of metals recycled, this quantitative and economic relationship between metals and other commodities is consistent with similar study results in other states throughout the United States. States that have large metals industries tend to have higher recycling economic values.

Overall, the total number of jobs in the recyclable materials processing sector nearly doubled from 1,124 to 2,185. This can be attributed primarily to the characterization of the metals and wood commodities. As for the metals industry, the extent of the information available in 2001 appears to be more comprehensive and thus has confirmed a larger presence of the use of metal scrap in Iowa industry than that

reflected in the 1997 Study. As for the wood, it appears that a growth in this industry has occurred since 1997. This observation would be consistent with the increased resources provided by Recycle Iowa and the Iowa Department of Natural Resources to the wood recovery industry in the last 3 to 5 years. It also should be emphasized that the fluctuations in individual commodity pricing is the single, largest driver as to the measurable economic impacts.

Overall there is approximately a 78% growth in the quantities of materials recycled between the 1997 Study and the current Study. This can be considered an indicator of the growing strength of the economic linkages within the recycling industry. However, it should be noted that price volatility appears to directly influence the breadth of the economic values measured.

Section 7

RECOMMENDATIONS

Project Objectives

Recycle Iowa has identified the following objectives and potential uses for this Study:

- Identify "gaps" in the state's current recycling system;
- Compare the 1997 and 2001 Study results and identify significant changes;
- Use as a tool to promote recycling activities to the general public and for economic development;
- Support existing recycling activity establishments;
- Advocate funding for program support and policy implementation;
- Link results to the National Recycling Coalition's national economic study; and
- Use as a resource to assist with short- and long-term planning efforts.

Recommendations

Overview

The following criteria were used in developing these recommendations:

- Projected economic impacts by commodity type;
- Supply/demand recyclable materials balance comparing materials processed and consumed;
- Calculated change in the quantities of materials recycled when comparing the 1997 Study results to the current Study results; and
- Knowledge of the industry.

The recommendations have been organized into three groups as identified below:

- Facilitation and Analysis;
- Financial Incentives; and
- Regulation

Facilitation and Analysis

Because Recycle Iowa is a visible and well-established program, its access to key recycling industry players and relevant information/analysis can be leveraged to promote recycling market development. Provided below are recommended initiatives.

- Meet with key end-users of OCC to discuss the economic benefits of increasing the use of Iowa OCC in their manufacturing processes. Following discussions with end-users, evaluate the potential benefits and drawbacks of establishing regional recyclable materials market development consortiums to enhance the collection and marketing of Iowa OCC within the State.
- Conduct additional research to determine the specific quality of ONP being generated by Iowa processors to identify the compatible end-uses (i.e., newspaper, boxboard, animal bedding, etc.). Based on the results of this analysis, determine if diversification of the market for ONP would promote recovery.
- Monitor and facilitate growth in the recycling equipment industry because of the unique niche composed by this sub-industry of recycling. Specifically, establish a roundtable of recycling equipment manufacturers to determine the size of the industry and identify the benefits of collaboratively working to promote market share. Roundtable outcomes may include promoting the concept of economic development "clustering" within specific regions of Iowa.
- Gather more data from processors of ferrous metals to confirm the extent of end-use in the state. A follow-up survey should be conducted once market prices for ferrous metals return to historical levels. The lower prices for metals in 1999 appear to have created a barrier to gathering detailed survey information as part of the current Study.
- Continue to gather recycling data as related to the processing and end-use of organics and C&D to monitor growth and refine the economic impacts analysis.
- Develop an informational campaign targeted toward major "players" in the Iowa construction industry to promote the recycling of C & D materials at large job sites.
- Initiate a study assessing recyclable materials pricing to compare Iowa recyclable materials pricing to surrounding states and to determine if there is a correlation between the maturity of the recycling industry infrastructure and pricing stability. The results of this Study should provide some direction as to where increased emphasis should be placed as to promoting growth in the recycling infrastructure for specific commodities.
- Initiate development of an ad hoc plastics industry task force to study the barriers of substituting the use of recycled plastics for virgin plastics in their manufacturing processes. Recycled plastics continue to be an underutilized commodity based on the materials commodity flow analyses.
- In order to entice more businesses and municipalities to respond to recycling surveys, consider making a recycling survey available on-line for potential respondents. In addition, by including the recycling survey as part of the comprehensive solid waste management planning requirements, it would be in each planning area's best interest to encourage their municipalities and businesses associated with recycling to respond to the survey. If the survey is periodically required, respondents may be more likely to complete it.

Financial Incentives

As discussed in Section 6 of this report, two types of multipliers were calculated to measure the affects of recycling on the economy: a Type I multiplier and a Type II multiplier. The Type I multiplier is a measure of the amount of inputs that are stimulated by the recycling industry. It represents the value of inputs that are supplied, the jobs it supports in the supplying industries, along with the income and value added that is associated with that demand. Another way to characterize the Type I multiplier is that it statistically measures the value of industrial linkages with other firms in the region.

The Type II multiplier is a broader measure of economic activity. It includes linkages to household spending that are as a result of the jobs supported in the direct and in the indirect industries that we measure. The Type II multiplier is typically used for estimating an economic impact. A Type I multiplier is used to estimate the extent of regional inter-industrial linkages.

In order to determine which commodities, when recycled, generate the most income and create the most jobs, the multipliers can be compared. Table 1 below lists the income multipliers for each commodity, in descending order.

TABLE 1
TOTAL INCOME MULTIPLIERS
(2001 STUDY)

	Total Income	
Commodity	**Type I**	**Type II**
Aluminum	2.08	2.52
Plastics	1.73	2.15
Wood	1.69	2.09
All Other Metal	1.65	2.07
All Other Paper	1.55	1.96
Old Corrugated Containers	1.47	1.85
Glass	1.26	1.61

From this Study, it is apparent that aluminum has the highest value of industrial linkages (Type I multipliers). For every $1.00 of total income created through the recycling of aluminum, an additional $1.08 of income is created in supporting economic activity. When household spending is included (Type II), the amount increases to an additional $1.52 of income created. Aluminum is followed by plastics and wood for the second and third highest value recycled commodity, respectively.

Regarding jobs multipliers, Tables 2 and 3 indicate that aluminum again ranks the highest for both types of multipliers, but the commodities that follow in succession differ between Type I and Type II multipliers.

TABLE 2
TYPE I JOBS MULTIPLIERS
(2001 STUDY)

Commodity	Jobs Type I
Aluminum	1.62
Plastics	1.43
All Other Metal	1.43
All Other Paper	1.41
Wood	1.36
Old Corrugated Containers	1.28
Glass	1.16

Table 2 shows that for every 100 jobs directly created in the aluminum recycling industry, 62 additional jobs are created through supporting economic activity. This is followed by plastics, other metal and other paper.

TABLE 3
TYPE II JOBS MULTIPLIERS
(2001 STUDY)

Commodity	Jobs Type II
Aluminum	1.91
All Other Paper	1.78
All Other Metal	1.77
Plastics	1.73
Wood	1.61
Old Corrugated Containers	1.55
Glass	1.42

As shown in Table 3, when household spending is taken into account, for every 100 jobs directly created in the aluminum recycling industry, 91 additional jobs are created in supporting industries. This is followed by other paper and other metal.

The collection and processing infrastructure for aluminum beverage containers is well established in Iowa as a result of the Iowa "bottle bill". Thus, even though income and jobs multipliers for aluminum are higher than any of the other commodities, we would not recommend resources be put towards enhancing the processing of aluminum scrap.

The materials flow analysis identified excess supply of most recycled plastics. Plastics represents the second largest income multiplier and second largest Type I jobs multiplier. Therefore, we recommend that resources be put forth to promote increased processing of various plastics. Specifically, PET and HDPE represent the largest share of recycled plastics being collected for recycling.

The following represents additional financial program incentives that should be considered by Recycle Iowa to address commodity flow to balance supply and demand:

- Offer an OCC processing subsidy to Iowa processors to promote an increase in the supply of OCC. This subsidy would be offered directly to processors for marketing Iowa generated OCC to Iowa end-users.
- Enhance the end-use of wood waste by providing additional targeted grants to other potential end-users of wood waste.
- Develop and distribute a business prospectus for attracting a large user of ONP to the state of Iowa upon identifying the end-use most compatible with the ONP supply.

Regulation

The use of various regulatory approaches can be used to stimulate the market. Some approaches for consideration include:

- State-wide landfill disposal ban of OCC to generate an increased supply of OCC.
- State-wide landfill disposal ban of selected wood waste items, such as pallets.
- Expand the beverage container deposit law to include non-carbonated beverages, to capture the increasing number of PET and HDPE single-serve, plastic containers from water, juice and sports drinks.

Appendix A

GLOSSARY

Appendix A

GLOSSARY

Aluminum Cans	Beverage containers made from aluminum.
Blue Glass	All blue glass food, beverage, wine, liquor and beer containers.
Broker	Individuals or establishments that purchase a recycled commodity, other than an end-user or processor, for purpose of commodity resale. Both collectors and processors may use brokers to sell recyclables to end-users.
Brown Glass (Amber)	All brown glass food, beverage, wine, liquor and beer containers.
Clear Glass (Flint)	All clear glass food, beverage, wine, liquor and beer containers.
Collectors	Establishments which pick-up or transfer materials through a curbside recycling materials collection, drop-off recyclable materials collection, or commercial on-site collection. This category may include for-profit organizations, non-profit organizations, local governments, and redemption centers.
Commodity Flow Analysis	An analysis of the quantities of recyclable materials that are collected, processed and consumed in a region.
Construction and Demolition (C & D) Waste	Waste building materials including, metals, and rubble which result from construction or demolition of structures. Such waste shall also include carpets, rugs, bricks, mortar, shingles, and drywall. Wood should be sorted into the wood categories.
Direct Values	Economic change measured at the firm level where the various recycling activities occur.
Econometric	Application of mathematical and statistical techniques to economics in the study of problems, the analysis of data, and the development and testing of theories and models.
Economic Impact	A place where a discernible and measurable change in economic activity in a region is occurring.

Economic Importance	The overall magnitude of an industry as part of a larger regional or national economy.
End-Users	Establishments that use recyclable materials as feedstock in the production of a new product that is placed into the stream of commerce. This category may include paper-mills, steel mills, etc. This category does not include companies which generate recycled materials internally and reuse these materials. In addition, it does not include firms which have limited historical linkages with processors and use a limited amount of recycled materials in their manufacturing processes.
Ferrous Scrap	Includes all non-vehicle (auto/truck) scrap such as sheet metal products, pipes, miscellaneous metal scraps, and other magnetic metal items.
Food Waste	Food preparation wastes, food scraps, spoiled food.
Green Glass	All green glass food, beverage, wine, liquor and beer containers.
High Density Polyethylene (#2 - HDPE)	Plastic containers such as milk jugs, shampoo bottles, and laundry detergent bottles coded #2.
High Grade Office Paper	High grade continuos form computer paper, white paper including bond, photocopy or notebook paper and colored ledger paper primarily from offices.
Indirect Values	Inter-industry linkages as measured by purchases of intermediate commodities or industrial inputs or purchases of goods and services by industries supporting recycling activities as a result of the recycling activities undertaken by other firms/organizations.
Induced Values	Economic change stemming from personal consumption or household values that results from the direct recycling activity and the inter-industry linkages.
Input-Output (I-O) Econometric Model	An accounting of the flow of commodities and finished goods among industries and, ultimately, to final consumers.
Low Density Polyethylene (#4 - LDPE)	Flexible plastic packaging including sheet film plastic, bread bags, clothing, furniture, carpet, and flexible squeeze bottles, (e.g. honey, mustard) coded #4.

Magazines	All magazines plus promotional materials printed on slick paper.
Mixed Glass	Unknown breakdown of clear, brown, green and/or blue glass.
Mixed Plastics	Unknown breakdown of plastic containers #1 - #7 and other plastic items such as molded toys, extruded pipes and hoses, clothes hangers, etc.
Multiplier	A measure that represents the value of an economic change in the industry being analyzed.
Non-Ferrous Scrap	Includes all non-vehicle (auto/truck) scrap such as brass, copper, or other non-magnetic metal.
Non-Recyclable Paper	Paper products including waxed, plastic, or metal coated paper, napkins, paper towels, frozen food packaging, tissues, paper plates and cups, and pizza boxes.
Old Corrugated Containers (OCC)	Uncoated cardboard boxes with a wavy core and not contaminated with other materials such as a wax or plastic coating wood. Includes brown paper bags.
Old Newspaper (ONP)	Black and white newspaper including other paper normally distributed inside a newspaper such as colored advertisements, comics, fliers, and tabloids.
Organic Waste	Related to or derived from living organisms.
Other Paper (Other Grades and Mixed)	Paper other than ONP, OCC and Office Paper. Includes box board (such as cereal boxes and egg cartons), envelopes with and without windows, toilet paper cores and other mixed recyclable paper.
Polyethylene Terephthalate (#1 - PET)	Plastic soft drink and water bottles, beer bottles, mouthwash bottles, peanut butter and salad dressing containers, etc. coded #1.
Polypropylene (#5 - PP)	Flexible and rigid plastic packaging including ketchup bottles, yogurt containers, margarine tubs, medicine bottles, etc. coded #5.
Polystyrene (#6 - PS)	Rigid or foam plastic packaging including compact disc jackets, meat trays, egg cartons, aspirin bottles, cups, plates, etc. coded #6.

Polyvinyl Chloride (#3 - PVC)	Flexible and rigid plastic including medical tubing, wire and cable insulation, clear food packaging, and shampoo bottles coded #3.
Processors	Establishments that bale, crush, pelletize, compost, or otherwise change the form of the recyclable material for sale to an intermediate market or end manufacturer. This category may include materials recovery facility operators, scrap metal dealers, etc.
Recycled Equipment Manufacturers	Establishments that manufacture equipment used solely for the purpose of collection and/or processing of recyclable materials for recovery and reuse.
Steel Cans	Food and beverage containers composed primarily of steel or tin, including bi-metal (aluminum and steel) cans.
Total Income	The value of earnings, profits to owners and dividends to share holders.
Total Industrial Output	A measure of gross sales.
Total Value Added	All income from employee compensation and investments, plus indirect tax payments to governments (sales, excise, and use taxes).
Wood Waste	Includes non-yard wood waste such as construction demolition, pallets, stumps/tree trunks, sawdust, sawmill scrap, and manufacturing scrap.
Yard Waste	Includes waste such as grass clippings, leaves, garden waste, brush, and trees. Yard waste does not include tree stumps.

Appendix B

KICK-OFF MEETING SUMMARY

KICK-OFF MEETING SUMMARY
AUGUST 16, 2000
RECYCLE IOWA ECONOMIC IMPACTS STUDY 2001

PARTICIPANTS

Johanna Woelfel, Iowa Department of Economic Development (IDED); David Cretors, IDED; Jeff Geerts, Iowa Department of Natural Resources (IDNR); David Swenson, Ames Economic Associates; Bob Craggs, R. W. Beck; Julie Vorhes, R. W. Beck.

PROJECT OBJECTIVES

Bob Craggs requested meeting participants to delineate primary objectives for the 2001 Study and how the results are likely to be used. IDED and IDNR staff identified the following objectives and potential uses:

- Identify "gaps" in the state's current recycling system;
- Compare the 1997 and 2001 Study results and identify significant changes;
- Use as a tool to promote recycling activities to the general public and for economic development;
- Support existing recycling activity establishments;
- Use for legislative purposes, including advocating funds for program support and policy implementation;
- Link results to the national economic study; and
- Use as a resource to assist with short and long-term planning efforts.

IDED AND IDNR PROGRAM OVERVIEW

Bob Craggs asked if the emphasis of market development focuses on recruiting new establishments or supporting existing establishments. The 1997 Study emphasized recruiting new establishments. Currently, the emphasis includes facilitation/support for existing businesses before developing an atmosphere of competition.

The mission of the Recycle Iowa Program has not changed since the 1997 Study was conducted. However, IDED philosophy has shifted, now emphasizing the quality or type of businesses locating in Iowa rather than simply focusing on the number of new businesses and jobs locating in the state.

Jeff Geerts reported that the DNR's strategic plan, which includes recommendations and a prioritization of tasks, has been completed. The plan includes six main objectives, and

further links prioritized tasks associated with each objective. Examples of objectives and tasks include:

- A market development objective that is related specifically to organics (especially wood, paper and food).
- A desire to update the "bottle bill" by expanding the scope to also target non-deposit beverage containers.
- Enhance industrial/commercial/institutional (ICI) assistance, including the development of environmental management programs.
- In addition to the "bottle bill", legislative initiatives include exploration of potential landfill bans by commodity type (OCC and C&D, for example) and mandatory recycling.

Craggs asked if the IDED and the IDNR are focusing on specific commodities. The IDED is currently focusing on wood, paper and food waste. An advisory committee is currently being formed, which may delineate additional specific commodities. The IDNR is investigating glass. It is the DNR's understanding that most all glass containers are currently shipped out of Iowa. Research is being conducted in order to explore alternative commodity uses for green and brown glass.

In addition, Iowa, Minnesota and Wisconsin have formed the Midwest Carpet Recycling Workgroup. The workgroup is composed of a cross section of interested parties, including manufacturers, retailers and government representatives.

PROJECT APPROACH

Bob Craggs distributed a summary of the three-phase project. The summary included bulleted descriptions of objectives and deliverables for each phase.

Phase I

Phase I includes the project kick-off meeting and data collection. The survey will be collaboratively designed and administered to collect employment, income and sales data for targeted collectors, processors, and end-users.

Deliverables include summary notes from the project kick-off meeting, written cover letters and surveys for each recycling activity group, and a completed database for collectors, processors and end-users that can be used to provide inputs for the economic impact analysis. It was agreed that the information database would be developed in Microsoft Access.

Phase II

Phase II includes analysis of the data and modeling. Objectives include developing concise representations of materials flow throughout the recycling infrastructure in the context of a supply/demand trade balance. The flow analysis assists in identifying possible "gaps" between supply and demand. In addition, the existing input-output (I-O)

recycling model will be enhanced in order to increase confidence of the Study results. The linkages in the model will be enhanced by gathering intermediate input data from selected firms to further specify costs associated with production, such as amounts paid for raw materials, transportation and utilities. Finally, Phase II includes estimating the direct, indirect and induced economic effects of current recycling activities in Iowa and characterizing the fiscal impacts of current recycling activities in the state.

Deliverables of Phase II include: a commodity flow analysis summary work paper including supply/demand matrices; summary of the costs of production interview information gathered from various types of recycling businesses; and a set of tables representing the economic impacts resulting from the I-O modeling efforts. The fiscal impacts will be analyzed and presented on the urban and rural levels.

Phase III

The objectives of Phase III include comparing the economic impacts of the 2001 Study with those estimated in the 1997 Study and incorporating the analysis into a project report.

Deliverables include a set of tables comparing the direct, indirect and induced effects between the 1997 and 2001 studies by commodity type and in the aggregate; a written summary identifying the differences between the 1997 and 2001 studies and providing a potential rationale for the differences; and a draft and final report summarizing the information and analysis using tables, graphs and matrices where appropriate. IDED and IDNR staff will provide input before the report is finalized. The final report will provide recommendations regarding market development. In 1997, the Study results were released on two levels: the commodity flow was based on actual numbers supplied by survey respondents and the economic results were aggregated and extrapolated to estimate state totals. IDED and IDNR staff requested that commodity flow results reflect not only survey respondent totals, but also be extrapolated to estimate commodity quantities that may exist statewide. This is a prerequisite to completing the modeling tasks.

PROJECT SCHEDULE

The project is anticipated to be completed in 2001. Task 4 interviews are planned to take place simultaneously with administration of the survey in Task 2.

DATA REQUEST

Julie distributed a summary table that outlined the five recycling activity groups surveyed in 1996. The table is attached for reference. The table included definitions for each recycling activity category, examples of establishments that fit each category and the total number of surveys sent to each activity category. In 1996, a total of 517 separate establishments were surveyed. The private businesses and public organizations selected to survey were based primarily on the Iowa Recycling Directory. In addition, supplementary lists identifying additional recycling end-users, recycling equipment

manufacturers, and community solid waste departments were provided by Recycle Iowa staff in 1996.

The latest Iowa Recycling Directory does not distinguish or classify establishments as collectors, processors or end-users. Recycle Iowa staff agreed to forward a specific list of companies they would like surveyed. The list will be based on queries of the current database and any additional establishments Recycle Iowa would like surveyed. An updated list of redemption centers is available. All redemption centers will be surveyed. The redemption centers will receive the collector's survey. In addition, it was agreed that all compost facilities in the state would be surveyed. The list composed of 62 facilities will be also be forwarded.

The draft list of potential survey recipients will be forwarded to R. W. Beck in electronic form. Beck will review the list and augment the list as necessary using its national database.

MATERIAL TYPES

As agreed by meeting participants, the 2001 Study will include the recycled material commodities included in the 1997 Study:

Metals: ferrous container, non-ferrous container, ferrous non-container, non-ferrous non-container.

Glass: clear container, brown container, green/blue container, mixed, non-container.

Plastic: Coded #1, #2, #3, #4, #5, #6, and other (mixed and non #1 - #6).

Paper: OCC, ONP, and mixed.

Wood: as defined in the 1995 Iowa Wood Waste Survey.

In addition, the 2001 Study will include construction and demolition (C&D) and organic waste. The C&D category is proposed to include asphalt, concrete, drywall, carpet, carpet pad, and asphalt shingles. OCC and wood should not be included as part of OCC. IDED will refer to other surveys and confirm the C&D definition. Study results will report C&D as an aggregate category rather than producing results for each of the individual materials. The organics category includes food and yard waste. Results for the organics category will also be reported in the aggregate only. Jeff offered to provide the food waste study and Iowa Statewide Compost Market Assessment for reference.

CONFIDENTIALITY POLICY

IDED would like to have access to all survey information, including individual respondent data. Meeting participants agreed that individual survey responses would be held confidential and all Study results released publicly will be in an aggregated format. The level at which the results are aggregated (defined by Iowa Waste Exchange regions, dividing the state into quarters, etc.) will be further discussed and finalized at a later date. David Cretors offered to forward some potential language that could be used to address the issue of confidentiality as part of the survey.

SURVEY APPROACH

To gather the needed recycling data, the following steps will be completed:

- **Develop a comprehensive list of businesses and organizations to survey**. Development of the final list of businesses and organizations to survey will be a collaborative effort. IDED and IDNR will develop an initial list and forward it to R. W. Beck. Beck will review the list and supplement the list, as necessary.
- **Draft a written survey and accompanying cover letters to reflect various combinations of recycling activities**. Beck will draft the cover letters that will accompany the surveys. Suggested revisions to the 1996 cover letters include:
  - greater discussion of potential financial benefits the business/organization may enjoy as a result of the Study;
  - stress that the 2001 Study is the first update of the 1997 landmark Study;
  - alter the tone so that the letter is less formal;
  - decrease the length of the cover letter;
  - discuss issues of confidentiality (stress that publicly released survey responses will be aggregated and that individual responses will not be released to regulators); and
  - alter the way in which R. W. Beck is discussed.
- David Swenson will review the 1996 surveys further in order to ensure elicitation of responses that will be most useful for the economic modeling.
- **Pre-test the surveys**. Draft surveys will be distributed to approximately 10 establishments that represent a cross-section of recycling activities.
- **Revise the surveys to reflect responses from respondents, as necessary**.
- **Administer the surveys using the three contact approach**. Using the survey database developed by Beck, IDED will print mailing labels and mail the survey. The surveys will be sent out so that recycling establishments have received the survey by the fall ISOSWO conference (October 4 –6). The fall conference may offer an opportunity to follow-up with those receiving surveys. Beck staff will follow-up on the survey. Survey recipients will be contacted twice by phone before being considered a non-respondent. Respondents will return the surveys directly to IDED. IDED will explore the potential for businesses and organizations to respond electronically. IDED will forward the raw survey responses to Beck for compilation.

  The interviews to gather intermediate input data to enhance the modeling efforts will be conducted concurrent with the survey process. IDED will develop a list of potential candidates to interview. The interviews may also be conducted at the fall ISOSWO conference. David Swenson will provide Beck with a checklist of questions to ask during the interview in order to elicit required modeling information. Beck will finalize the questions and forward interview information to IDED. Bob encouraged IDED staff to use experienced staff to conduct the interviews of the designated recycling establishments.

NATIONAL STUDY

IDED and IDNR staff would like to ensure that the 2000 survey information may also be used as part of the National Economic Information Study being conducted by R. W. Beck for NERC and NRC. The Iowa Study analyzes and reports information on the commodity level while the National Study reports information at the industry level. Because establishment categories are dissimilar between the two studies, meeting participants agreed as part of a future meeting to assign survey respondents to one of the designated National Study categories so that the Iowa survey data may also be included as part of the National Study. Therefore, Iowa will be considered a "contributor" state.

ACTION ITEMS

All parties will sign the finalized project contract.

IDED will query their database of establishments to sort by recycling activity and forward the resulting list of potential survey recipients to Beck in electronic format.

IDED and IDNR staff will review this potential survey list and supplement the list with any additional establishments IDED would like surveyed.

IDED staff will review the initial potential survey list and exclude any establishments that should not be surveyed.

IDNR staff will forward the Iowa Statewide Compost Market Assessment and updated list of redemption centers for reference.

Appendix C

RECYCLING SURVEYS

RECYCLE IOWA+
CREATING SMART BUSINESS OPPORTUNITIES THROUGH RECYCLING™

September 18, 2000

«org_name»
«contact»
«org_add»
«city_add», «state_add» «zip_add»

Dear «contact»:

Iowa's recycling industry has grown substantially over the last ten years. To measure the benefits of recycling activities on Iowa's economy, Recycle Iowa (a program of the Iowa Department of Economic Development), commissioned the *Economic Impacts of Recycling in Iowa* study in 1996. As anticipated, the study revealed the valuable and beneficial nature of the state's recycling industry.

Based largely on the results of the landmark 1996 study, Recycle Iowa was able to increase and expand the services and funding opportunities offered to businesses involved in Iowa's recycling industry. Since the release of the first study, the numbers of collectors, processors and end users in the state has increased enormously. By updating the Economic Impact study this year, we hope to explore additional markets for recyclable materials, fine-tune our business and technical assistance, and rally for increased funding for programs to improve Iowa's recycling infrastructure and help existing Iowa businesses. The results of the enclosed survey will allow us to improve current statewide programs like the Iowa Waste Exchange (IWE) and the Solid Waste Alternatives Program (SWAP), which provided over *three million dollars* to Iowa businesses in the last year alone.

Because you are an important member of Iowa's recycling industry, we are asking you and other recyclable materials manufacturers, collectors, processors and end-users around the state to help us update the 1996 Study by completing the enclosed survey. **Individual survey responses will be held confidential.**

We appreciate your participation in this important study and thank you in advance for completing the enclosed survey. You may fax your completed survey to (515) 242-4776, attention Recycle Iowa, or mail the completed survey to: Johanna Woelfel, Recycle Iowa/IDED, 200 East Grand Avenue, Des Moines, IA 50309. Please respond by September 30, 2000. If you have any questions regarding the survey, please contact Johanna Woelfel or David Cretors at 800-532-1216.

Thank you again for your valuable contribution toward the future of Iowa's recycling industry.

Sincerely,

C. J. Niles
Director, Iowa Department of Economic Development

Economic Impacts of Recycling in Iowa Survey

Please verify the information below and make any necessary changes. **Survey results are confidential;** public results will be released *only* in aggregate form.

Please forward the completed survey to Recycle Iowa via facsimile at (515) 242-4776 or mail your survey to Recycle Iowa, 200 East Grand Avenue, Des Moines, IA 50309. If you have any questions related to this survey, please contact David Cretors or Johanna Woelfel at (800) 532-1216. Thank you in advance for taking the time to complete this survey.

Contact Information

Contact:

Organization:

Address:

City:

State:

Zip:

Phone:

Fax:

Email:

Survey Directions

There are six sections to this survey. Please read the following categories to determine what sections of the survey apply to your business.

You previously identified yourself as one or more of the following: collector, processor, end-user, broker and/or recycling equipment manufacturer. These activities are defined as follows:

COLLECTORS include establishments that pick-up or transfer materials through curbside recyclable materials collection, drop-off recyclable materials collection, or commercial on-site collection. If you are a collector, please complete Section 1 (pink section) of this survey.

PROCESSORS include establishments that bale, crush, pelletize, compost, or otherwise change the form of the recyclable material for sale to an intermediate market or end manufacturer. If you are a processor, please complete Section 2 (blue section) of this survey.

END-USERS include establishments that use recyclable materials as feedstock in the production of a new product that is placed into the stream of commerce. If you are an end-user, please complete Section 3 (tan section) of this survey.

BROKERS include individuals or establishments that purchase a recycled commodity, other than an end-user or processor, for the purpose of commodity resale. If you are a broker, please complete Section 4 (green section) of this survey.

EQUIPMENT MANUFACTURERS include establishments that manufacture equipment used solely for the purpose of collection and/or processing of recyclable materials for recovery and reuse. If you are an equipment manufacturer, please complete Section 5 (yellow section) of this survey.

<u>All respondents</u> should complete Section 6 (white section) of this survey.

Economic Impacts of Recycling in Iowa Survey

SECTION 1: COLLECTORS

Please complete this section if you are a collector. Collectors include establishments that pick-up or transfer materials through curbside recyclable materials collection, drop-off recyclable materials collection, or commercial on-site collection.

Employment Information:	***1999 Number of Employees:*** [1]	_____ Employees
	1999 Payroll: [2]	***$***_____

[1] Pertains to employees or full-time-equivalent employees who are directly involved in COLLECTION of recyclable material.

[2] Payroll includes salary, hourly pay, and benefits received in lieu of cash payments for employees directly involved with recyclables processing activities.

continue to next page

Please complete the following tables for the recyclable materials that your organization collects. Please include information for calendar year 1999.

Materials Collected For Recycling

Materials	1999 Material Quantities				
	Iowa Suppliers		All Suppliers		
	Residentially Generated Tons Collected [1]	Commercially Generated Tons Collected [2]	Total Tons Collected	Tons Exported out of Iowa	$/Ton Average Price Received (from Buyer)
PAPER					
Old Newspaper (ONP)					
Old Corrugated Containers (OCC)					
High Grade (Office Paper)					
Other Paper (Other grades and Mixed)					
TOTAL					
PLASTICS					
Polyethylene Terephthalate (#1 - PET)					
High Density Polyethylene (#2 - HDPE)					
Polyvinyl Chloride (#3 - PVC)					
Low Density Polyethylene (#4 - LDPE)					
Polypropylene (#5 - PP)					
Polystyrene (#6 - PS)					
Mixed Plastics (unknown breakdown)					
TOTAL					
GLASS					
Clear (Flint)					
Brown (Amber)					
Green or Blue					
Mixed					
TOTAL					
METALS					
Steel Cans					
Aluminum Cans					
Ferrous Non-Container Scrap [3]					
Non-Ferrous Non-Container Scrap [3]					
TOTAL					
WOOD WASTES [4]					
All Wood Wastes					
TOTAL					

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Economic Impacts of Recycling in Iowa Survey

Section 1, Collector Survey (continued)

Materials Collected For Recycling

Materials	1999 Material Quantities				
	Iowa Suppliers		All Suppliers		
	Residentially Generated Tons Collected [1]	Commercially Generated Tons Collected [2]	Total Tons Collected	Tons Exported out of Iowa	$/Ton Average Price Received (from Buyer)
CONSTRUCTION & DEMOLITION WASTES					
Asphalt					
Concrete					
Drywall					
Carpet					
Carpet Pad					
Asphalt Shingles					
TOTAL					
ORGANIC WASTES					
Food					
Yard Waste [5]					
TOTAL					
TOTAL					

[1] Represents only materials collected that were generated by households.
[2] Represents only materials collected that were generated by business, industry, or institutions.
[3] Includes all non-vehicle (auto/truck) ferrous and non-ferrous scrap.
[4] Includes non-yard wood waste such as construction demolition, pallets, stumps/tree trunks, sawdust, sawmill scrap, and manufacturing scrap.
[5] Includes waste such as grass clippings, leaves, garden waste, brush, and trees. Yard waste does not include tree stumps.

END OF SECTION 1, COLLECTOR SURVEY.

THANK YOU FOR TAKING THE TIME TO COMPLETE THE COLLECTOR SECTION OF THIS SURVEY.
PROCEED TO SECTION 2 (BLUE SECTION) IF YOU ARE A PROCESSOR.
PROCEED TO SECTION 3 (TAN SECTION) IF YOU ARE AN END-USER.
PROCEED TO SECTION 4 (GREEN SECTION) IF YOU ARE A BROKER.
PROCEED TO SECTION 5 (YELLOW SECTION) IF YOU ARE AN EQUIPMENT MANUFACTURER.
ALL RESPONDENTS SHOULD COMPLETE SECTION 6 (WHITE SECTION) OF THIS SURVEY.

SECTION 2: PROCESSORS

Please complete this section if you are a processor. Processors include establishments that bale, crush, pelletize, or otherwise change the form of the recyclable material for sale to an intermediate market or end manufacturer.

Employment Information:	***1999 Number of Employees:*** [1]	_____ Employees
	1999 Payroll: [2]	***$***_____

[1] Pertains to employees or full-time-equivalent employees who are directly involved in PROCESSING of recyclables only.

[2] Payroll includes salary, hourly pay, and benefits received in lieu of cash payments for employees directly involved with recyclables processing activities.

continue to next page

Economic Impacts of Recycling in Iowa Survey

Section 2, Processor Survey (continued)

Please complete the following tables for the recyclable materials that your organization processes. Please include information for calendar year 1999.

Materials Processed For Recycling [1]				
Materials	***1999***			
	Material Quantities		***Average*** [2] ***Price ($) Per Ton***	
	Total Tons Processed			
	Iowa Suppliers	All Suppliers	Paid (to suppliers)	Received (from buyer)
PAPER				
Old Newspaper (ONP)				
Old Corrugated Containers (OCC)				
High Grade (Office Paper)				
Other Paper (Other grades and Mixed)				
TOTAL				
PLASTICS				
Polyethylene Terephthalate (#1 - PET)				
High Density Polyethylene (#2 - HDPE)				
Polyvinyl Chloride (#3 - PVC)				
Low Density Polyethylene (#4 - LDPE)				
Polypropylene (#5 - PP)				
Polystyrene (#6 - PS)				
Mixed Plastics (unknown breakdown)				
TOTAL				
GLASS				
Clear (Flint)				
Brown (Amber)				
Green or Blue				
Mixed				
TOTAL				
METALS				
Steel Cans				
Aluminum Cans				
Ferrous Non-Container Scrap [3]				
Non-Ferrous Non-Container Scrap [3]				
TOTAL				
WOOD WASTES [4]				
All Wood Wastes				
TOTAL				

continue to next page

Materials Processed For Recycling [1]				
Materials	1999			
	Material Quantities		Average (2) Price ($) Per Ton	
	Total Tons Processed			
	Iowa Suppliers	All Suppliers	Paid (to suppliers)	Received (from buyer)
CONSTRUCTION & DEMOLITION WASTES				
Asphalt				
Concrete				
Drywall				
Carpet				
Carpet Pad				
Asphalt Shingles				
TOTAL				
ORGANIC WASTES				
Food				
Yard Waste [7]				
TOTAL				
TOTAL				

[1] Represents materials baled, crushed, pelletized, or a change in the form of the recyclable material for the purpose of resale.
[2] Represents the annual average of the price paid to generators and collectors for material(s) and the average annual price received from processors or end-users for the sale of material(s).
[3] Includes all non-vehicle (auto/truck) ferrous and non-ferrous scrap.
[4] Includes non-yard wood waste such as construction demolition, pallets, stumps/tree trunks, sawdust, sawmill scrap, and manufacturing scrap.
[5] Represents only materials processed that were generated by households.
[6] Represents only materials processed that were generated by business, industry, or institutions.
[7] Includes waste such as grass clippings, leaves, garden waste, brush, and trees. Yard waste does not include tree stumps.

END OF SECTION 2, PROCESSOR SURVEY.
THANK YOU FOR TAKING THE TIME TO COMPLETE THE PROCESSOR SECTION OF THIS SURVEY.
PROCEED TO SECTION 3 (TAN SECTION) IF YOU ARE AN END-USER.
PROCEED TO SECTION 4 (GREEN SECTION) IF YOU ARE A BROKER.
PROCEED TO SECTION 5 (YELLOW SECTION) IF YOU ARE AN EQUIPMENT MANUFACTURER.
ALL RESPONDENTS SHOULD COMPLETE SECTION 6 (WHITE SECTION) OF THIS SURVEY.

Economic Impacts of Recycling in Iowa Survey

SECTION 3: END USERS

Please complete this section if you are an end-user. End-users include establishments that use recyclable materials as feedstock in the production of a new product that is placed into the stream of commerce.

Employment Information:	***1999 Number of Employees:*** [1] _____ Employees ***1999 Payroll:*** [2] ***$***_____

[1] Pertains to employees or full-time-equivalent employees who are directly involved in END-USE production using recycled materials as the primary feedstock.

[2] Payroll includes salary, hourly pay, and benefits received in lieu of cash payments for employees directly involved with collection activities.

Sales Information:	***1999 Gross Sales*** [3] _____

[3] Pertains solely to sales of recycled content product(s) absolute dollars.

continue to next page

Please complete the following table for the processed recyclable materials purchased by your firm specifically as feedstock in the production of a product. Please include information for calendar year 1999.

Recycled Materials Used in Manufacturing				
Materials	***1999***			
	Material Quantities			***Average*** [2] ***Price ($) Per Ton***
	% of Total Inputs that are recycled materials	Total Tons Purchased[1]	Tons Purchased In-state [1]	Paid (to processors)
PAPER				
Old Newspaper (ONP)				
Old Corrugated Containers (OCC)				
High Grade (Office Paper)				
Other Paper (Other grades and Mixed)				
TOTAL				
PLASTICS (no regrind)				
Polyethylene Terephthalate (#1 - PET)				
High Density Polyethylene (#2 - HDPE)				
Polyvinyl Chloride (#3 - PVC)				
Low Density Polyethylene (#4 - LDPE)				
Polypropylene (#5 - PP)				
Polystyrene (#6 - PS)				
Mixed Plastics (unknown breakdown)				
TOTAL				
GLASS				
Clear (Flint)				
Brown (Amber)				
Green or Blue				
Mixed				
TOTAL				
METALS				
Steel Cans				
Aluminum Cans				
Ferrous Scrap [3]				
Non-Ferrous Scrap [3]				
TOTAL				
WOOD WASTES [4]				
All Wood Wastes				
TOTAL				

continue to next page

Economic Impacts of Recycling in Iowa Survey

Section 3, End-User Survey (continued)

Recycled Materials Used in Manufacturing				
Materials	***1999***			
	Material Quantities			***Average*** [2] ***Price ($) Per Ton***
	% of Total Inputs that are recycled materials	Total Tons Purchased[1]	Tons Purchased In-state [1]	Paid (to processors)
CONSTRUCTION & DEMOLITION WASTES				
Asphalt				
Concrete				
Drywall				
Carpet				
Carpet Pad				
Asphalt Shingles				
TOTAL				
ORGANIC WASTES				
Food				
Yard Waste				
TOTAL				
TOTAL				

[1] Represents processed recycled materials purchased by Iowa End-Use manufacturers for use as a feedstock in an Iowa production facility.

[2] Represents the annual average of the price paid to processors and/or collectors for recycled material(s).

[3] Includes all non-vehicle (auto/truck) ferrous and non-ferrous scrap.

[4] Includes non-yard wood waste including construction demolition, pallets, brush, stumps/tree trunks, sawdust, sawmill scrap, and manufacturing scrap.

[5] Includes waste such as grass clippings, leaves, garden waste, brush, and trees. Yard waste does not include tree stumps.

END OF SECTION 3, END USER SURVEY.

THANK YOU FOR TAKING THE TIME TO COMPLETE THE END USER SECTION OF THIS SURVEY.

PROCEED TO SECTION 4 (GREEN SECTION) IF YOU ARE A BROKER.

PROCEED TO SECTION 5 (YELLOW SECTION) IF YOU ARE AN EQUIPMENT MANUFACTURER.

ALL RESPONDENTS SHOULD COMPLETE SECTION 6 (WHITE SECTION) OF THIS SURVEY.

Economic Impacts of Recycling in Iowa Survey

SECTION 4: BROKERS

Please complete this section if you are a broker. Brokers include individuals or establishments that purchase a recycled commodity, other than an end-user or processor, for the purpose of commodity resale.

Employment Information:	***1999 Number of Employees:*** [1] _____ Employees ***1999 Payroll:*** [2] ***$***_____

[1] Pertains to employees or full-time-equivalent employees who are directly involved in BROKERING of recyclables only.

[2] Payroll includes salary, hourly pay, and benefits received in lieu of cash payments for employees directly involved with brokering activities.

Sales Information:	***1999 Gross Sales*** [3] _____

[3] Pertains solely to sales of recyclable materials in absolute dollars.

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Please complete the following table for the materials that your organization brokers. Please include information for calendar year 1999.

Materials Brokered [1]					
	1999				
Materials	***Material Quantities***				***Average [2] Price ($) per Ton***
	Tons Bought In-State	Tons Bought Outside of Iowa	Tons Sold in Iowa	Paid (for material)	Received (from buyer)
PAPER					
Old Newspaper (ONP)					
Old Corrugated Containers (OCC)					
High Grade (Office Paper)					
Other Paper (Other grades and Mixed)					
TOTAL					
PLASTICS					
Polyethylene Terephthalate (#1 - PET)					
High Density Polyethylene (#2 - HDPE)					
Polyvinyl Chloride (#3 - PVC)					
Low Density Polyethylene (#4 - LDPE)					
Polypropylene (#5 - PP)					
Polystyrene (#6 - PS)					
Mixed Plastics (unknown breakdown)					
TOTAL					
GLASS					
Clear (Flint)					
Brown (Amber)					
Green or Blue					
Mixed					
TOTAL					
METALS					
Steel Cans					
Aluminum Cans					
Ferrous Non-Container Scrap [3]					
Non-Ferrous Non-Container Scrap [3]					
TOTAL					
WOOD WASTES [4]					
All Wood Wastes					
TOTAL					

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Economic Impacts of Recycling in Iowa Survey

Section 4, Broker Survey (continued)

Materials Brokered [1]					
	1999				
Materials	***Material Quantities***				***Average [2] Price ($) per Ton***
	Tons Bought In-State	Tons Bought Outside of Iowa	Tons Sold in Iowa	Paid (for material)	Received (from buyer)
CONSTRUCTION & DEMOLITION WASTES					
Asphalt					
Concrete					
Drywall					
Carpet					
Carpet Pad					
Asphalt Shingles					
TOTAL					
ORGANIC WASTES					
Food					
Yard Waste [5]					
TOTAL					
TOTAL					

[1] Represents recycled materials purchased for the purpose of commodity resale.
[2] Represents the annual average of the price paid to generators/processors upon purchase of material(s) and the average annual price received from end-users.
[3] Includes all non-vehicle (auto/truck) ferrous and non-ferrous scrap.
[4] Includes non-yard wood waste such as construction demolition, pallets, stumps/tree trunks, sawdust, sawmill scrap, and manufacturing scrap.
[5] Includes waste such as grass clippings, leaves, garden waste, brush, and trees. Yard waste does not include tree stumps.

END OF SECTION 4, BROKER SURVEY.
THANK YOU FOR TAKING THE TIME TO COMPLETE THE BROKER SECTION OF THIS SURVEY. PROCEED TO SECTION 5 (YELLOW SECTION) IF YOU ARE AN EQUIPMENT MANUFACTURER. ALL RESPONDENTS SHOULD COMPLETE SECTION 6 (WHITE SECTION) OF THIS SURVEY.

SECTION 5: EQUIPMENT MANUFACTURERS

Please complete this section if you are an equipment manufacturer. Recycling equipment manufacturers include establishments that manufacture equipment used solely for the purpose of collection and/or processing of recyclable materials for recovery and reuse.

Employment Information:	***1999 Number of Employees:*** [1]	_____ Employees
	1999 Payroll: [2]	***$***_____

[1] Pertains to employees or full-time-equivalent employees who are directly involved in manufacturing equipment that is used by recycled material collection and/or processors.

[2] Payroll includes salary, hourly pay, and benefits received in lieu of cash payments for employees directly involved with manufacturing equipment that is used by recycled material collectors and/or processors.

Sales Information:	***1999 Gross Sales*** [3]	_____

[3] Pertains solely to sales of equipment used in the collection and/or processing of recyclable materials in absolute dollars.

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Economic Impacts of Recycling in Iowa Survey

Section 5, Equipment Manufacturer Survey (continued)

Please complete the following table for the recycling-related equipment that your organization manufactures. Please include information for calendar year 1999.

Equipment Manufactured for Use in Recycling Collection and Processing			
Equipment Manufactured	***1999***		
	Units Produced [1]	***Units Exported out of Iowa***	***Total Sales ($)*** [2]
VEHICLES			
Trucks			
Skid Loaders			
Front Loaders			
Trailers			
Other Vehicles			
CONTAINERS			
Curbside Recyclable Type Containers			
Drop-Off Type Containers			
Other Containers (Please List Below)			
PROCESSING EQUIPMENT			
Balers			
Shredders			
Grinders			
Glass Crushers			
Plastics Processors (Pelletizers, etc.)			
Commingled Recyclables Handling Equipment			
OTHER (Please List)			

[1] Includes the number of units of equipment produced that are used in the recycling industry to collect and/or process recyclable materials.

[2] Represents the total sales in absolute dollars per equipment category.

END OF SECTION 5, EQUIPMENT MANUFACTURER SURVEY.

Appendix C

THANK YOU FOR TAKING THE TIME TO COMPLETE THE EQUIPMENT MANUFACTURER SECTION OF THIS SURVEY.
ALL RESPONDENTS SHOULD COMPLETE SECTION 6 (WHITE SECTION) OF THIS SURVEY.

SECTION 6: GENERAL OPINION QUESTIONS

1. In collecting, processing, buying, and/or selling recyclables, are you experiencing any specific barriers, for example, adequate supply, quality of supply, excessive transportation costs, etc.?

2. What types of recycling businesses would you like to see expanded or created in the State?

END OF SECTION 6, GENERAL OPINION QUESTIONS.
THANK YOU FOR PARTICIPATING IN THE SURVEY.