



Economic Impact of Recycling in Alabama and Opportunities for Growth



Alabama Department of Environmental Management

Land Division
Solid Waste Branch



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Alabama Department of Environmental Management

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Materials Management Section, Solid Waste Branch Land Division

Alabama Department of Environmental Management (ADEM)

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Introduction and Purpose

In the past several decades, numerous studies concerning the management of solid waste have been conducted in the United States on both federal and state levels. These studies have presented data and conclusions on the different management methodologies undertaken by state and local governments and the resultant economic impacts of solid waste management to the state and local economy. The State of Alabama Recycling Program, housed in the Materials Management Section of the ADEM Land Division, recognized the need to have such information on the economic impacts to the state as a result of the recycling of solid waste. Such information would be beneficial to the Department not only in development and implementation of recycling programs and activities but also to the targeting of strategies to comply with the statewide 25% recycling goal set forth in the Alabama Solid Waste Management Program Regulations and adopted pursuant to the 2008 Solid Wastes and Recyclable Materials Management Act (SWRMMA).

In addition to benefits to the Department, the results would be of importance to state and local leaders in the development of policy and law concerning recycling in the state, specifically on the value of recycling to the state's economy and potential for increased recycling to positively impact the state's economy and provide for job growth. A study by the Southeast Recycling Development Council (SERDC) did determine the current value of recycling in terms of total manufacturing, employment, personal income and tax revenue, and the potential increase provided by a 10% greater recovery of recycled materials, and the findings of this study are extremely revealing¹. The goal of this report is to determine the net value loss realized in the state in consideration of both the value of recyclable materials disposed, and a partial determination of the avoided disposal cost had those materials been recovered for recycling. Findings of economic impacts from both sources should provide rationale for the support of recycling within Alabama.

History

In 1989, the Alabama Legislature amended the Solid Wastes Disposal Act, and required the development of an Alabama Solid Waste Management Plan (SWMP). In November 1989, the first phase of the plan included a statewide survey which indicated Alabamians generated an average of 6.5 pounds of solid waste per person per day, and

¹ SERDC, derived from "Research on Regional Demand for Recycled Feedstock", 2010

that approximately 5% of this waste stream was recycled. Later data provided during the second phase of the plan indicated a generation rate of 6.3 pounds per capita and a recycling rate of 2.6%. Even later local government data supplied during 2004-2007 indicated a generation rate of 9.9 pounds per capita, but this figure includes municipal, construction/demolition and industrial waste streams. This data also indicated a recycling rate for all three waste streams of 8.3% and included beneficial use as well as recycling in the rate calculation.² The recycling rate for Alabama, even at its highest stated rate of 8.3%, is well below the national average of 31-34.1% depending upon the definition of municipal solid waste (MSW) used in the calculation^{3,4,5}. However, as can be seen from the results of these data sets, past reported disposal and recycling rates have shown great variation. These variations can be attributed to a variety of factors including incomplete or inaccurate reporting as well as differing methods utilized to gather data by local governments and consultants for preparation and submittal of local SWMP's as required. It is important to note that most of the local SWMP's included recycling information for public programs, but did not have data for private recycling efforts within their jurisdictions, nor were there requirements for private concerns to report quantity data to the local government. In fact, many plans defaulted to an estimated national generation estimate of 5.3 pounds per capita per day.

Appendix A-1 of the 2008 document estimated the projected total state solid waste generation, per capita generation rate, projected rate recycled in tons, and percent recycled based on an increase in population utilizing historical trend calculations from the U.S. Census figures from 2000-2006. It is interesting to note that the estimations include an increase in population, and in total waste generation and recycling. Rates per capita in generation and total recycling however were estimated to remain stagnant at 9.94 pounds and 8.28% respectively through 2016. As the plan itself notes:

The future success of solid waste management in Alabama rests with the implementation of programs designed to minimize the state's dependence on disposal and increase efforts to reuse and recycle. Without a change of focus to these areas, Alabama will continue to meet its solid waste management needs through disposal. To continue the long term viability of this path, significant increases in resources must be devoted to the regulatory oversight of both permitted landfills and to the closure of illegal solid waste dumps. Public education and political support either for a fundamental paradigm shift to waste minimization and recycling, or for increased resources and significant revisions to the state's existing solid waste management system must be achieved if Alabama is to fully embrace the statutory purpose of the orderly management of solid wastes resulting from decisions based on comprehensive planning at the local, regional and state level.

² ADEM, "Alabama Solid Waste Management Plan", May 2008

³ Resource Recycling, EPA Release, "2009 Municipal Solid Waste in the United States", January 27, 2011.

⁴ Waste and Recycling News, "Report: 75% Recycling Rate Would Create 1.5 Million Jobs", November 2011

⁵ EPA, 2010 National MSW Generation, Recycling and Disposal in the U.S.: Facts and Figures

In response to these identified needs for changes to solid waste management in Alabama, the Department offered the aforementioned SWRMMA bill to the Alabama legislature which passed it during the 2008 legislative session. The Act implemented a number of recommendations from the previous SWMP including establishment of the Alabama Recycling Fund to local governments to initiate or expand recycling and waste minimization and to fund educational programs related to these activities. The Act also provided for the regulation of recycling facilities within Alabama, and resulted in regulatory revisions to provide for more inclusive and accurate reporting on recycling activities occurring in the state. This reporting will result in a more comprehensive evaluation of solid waste management in Alabama, especially of recycling, although several years of data will need to be acquired before any definitive analysis of the entire spectrum of the management of solid waste in Alabama can be performed. However, while this regulated reporting will provide information concerning the statewide generation and recycling of solid waste in Alabama, it will not provide data concerning the economic ramifications of recycling within the state. Due to limited state resources, the performance of a comprehensive statewide Alabama waste characterization and economic impact study, such as the one done for the state of Georgia by R.W. Beck⁶, is not possible. Given this fact, and the fact that such information is valuable to state and local elected officials and other decision makers, other means of obtaining economic impact data including how increased recycling might impact job growth and financial returns to private entities as well as state and local governments was sought.

As mentioned previously, the study by the SERDC revealed information concerning current valuation and job impacts of recycling in Alabama, as well as an estimation of job impacts, personal income and tax revenue potentially realized through increased recycling. However, a study on the loss of material value through disposal of materials that otherwise could have been recycled has not been performed. While many studies have been conducted for other states and regions based on the characterization of wastes disposed, none exists specifically for Alabama. Therefore, due to the lack of resources to initiate a study specifically for Alabama, the initial steps of this analysis required a review of similar existing projects performed in other states. A careful examination of study parameters, generation and recycling rates and demographics would hopefully reveal a study that could form the basis for a comparative analysis between that state and Alabama.

Solid waste regulations require solid waste disposal facilities to report monthly data on quantities of waste delivered to their facility for disposal. These volume reports will provide the basis for determining any negative economic impact due to recyclable materials being disposed versus recovered for recycling. With total MSW disposal volumes known, any economic impact from disposal of recyclable materials would require a methodology to determine 1) the composition of MSW disposed of in Alabama, 2) the value of recyclable MSW being disposed, and 3) the cost of disposal which could be avoided through recovery of such materials. A per capita generation rate of such materials would also prove useful. As stated above, this requires an investigation of existing state reports that can be expected to have similarities to Alabama in MSW composition and generator demographics (e.g. residential vs. commercial, urban vs. rural).

⁶ RW Beck and Georgia Dept. of Community Affairs, "Georgia Statewide Waste Characterization Study", 2005

Review of Existing State Economic Impacts of Recycling Reports

The Materials Management Section of the ADEM Land Division researched the availability of completed reports that could be utilized for a comparative analysis of potential economic impacts of increased recycling in Alabama. As noted previously, a few existing studies provide the value of current recycling within the state as it relates to manufacturing and employment, but none include a valuation of recyclable commodities that are currently being disposed of in solid waste management facilities in Alabama. Of available reports, consideration was given first and foremost to the methodology, data collection, analysis techniques and scope of each report. Then consideration was given to the demographic similarity to Alabama, in terms of expected population and rural versus urban population numbers, characterization of solid waste, and composition of waste in terms of residential versus commercial generation. After careful consideration of each of these factors existing in the available reports that were comprehensive in nature, the State of Georgia 2005 Statewide Waste Characterization Study⁵ was selected for comparative analysis to MSW and recycling in Alabama. This study was performed by the consulting firm of R.W. Beck, with the outcomes of the study to:

“better anticipate the amount of municipal solid waste disposed in their community/region, document anticipated tonnages, and plan for the design or retrofit of facilities needed to process the solid waste stream. Each of these outcomes is beneficial as the State seeks to emphasize the importance of the role of solid waste management planning and how it relates to determining the quantity of material available for recovery through municipal programs, measuring the effectiveness of existing recycling programs, and determining future needs for solid waste and recycling facility siting.”

The study evaluated the characterization of MSW generated and disposed of in the State of Georgia through the use of hands-on randomized sampling of MSW arriving at solid waste facilities for disposal. Loads of MSW were evaluated by type of generation including residential, commercial, arriving from a transfer station and mixed. For the purposes of this comparative analysis, only that data consisting exclusively of MSW will be utilized, with industrial, construction/demolition, sludges and biosolids, and imported MSW excluded. For disposal quantities, the study utilized regulatorily required disposal volume reports as is also required in Alabama and which will be utilized for comparison. The definition of MSW as used in the Georgia study is similar to the regulatory definition of solid waste in Alabama. It should be noted however, that as the Georgia study provided for actual random sampling of waste, this provided the ability to normally exclude any industrial waste, sludges and biosolids which may have found its way into the MSW stream from waste characterization calculations. Since this comparative analysis will not allow for such intensive sampling of Alabama MSW but will rely on disposal volume reports from Alabama disposal facilities only, there exists the possibility that results of this analysis will be affected by this difference. However, Georgia MSW disposal volumes were adjusted downward by 33% to eliminate any other waste type and provide a greater level of accuracy in reporting volumes of recyclable wastes disposed of within that state. Disposal volumes in Alabama will also be similarly

adjusted for any non-MSW volumes that may be present from being utilized in value calculations.

Summary of Methodology of Georgia Waste Characterization Study

The Georgia study conducted by R.W. Beck utilized an intensive sampling plan that resulted in the collection of 569 samples with a target weight of 200-250 pounds each, with each sample being adjusted for contamination. The study also included moisture analysis which was found to be inconsequential in data analysis. Samples were collected from 13 separate MSW facilities representing 13 of the states 16 Regional Development Centers. Samples were collected at differing times of year to provide for seasonal variations in MSW composition, and stratified random sampling was used to select loads for sampling. Samples were also collected for the appropriate variation in generating type (residential vs. commercial). Their analysis is in line with national estimates of MSW ranging from 60/40 residential to commercial to 60/40 commercial to residential with a 20% margin of variance. Samples were also collected from private and public disposal facilities which received a minimum of 25,000 tons per year for disposal.

The Georgia Department of Community Affairs in conjunction with consultants from R.W. Beck, compiled a categorized listing of MSW components that were of greatest importance for solid waste and recycling planning. The listing was comprised of 7 major material types further divided into 39 material categories. A table in that report listing these material types and their organization is presented below.

Table 1: Georgia DCA/R.W. Beck MSW Components Of Greatest Importance For Solid Waste and Recycling Planning

| | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <p>Paper Newspaper Corrugated Cardboard Office Magazine/Glossy Paperboard Mixed (other recyclable) Other paper (non-recyclable)</p> | <p>Metals Steel Cans Aluminum Cans Other Ferrous Metals Other Nonferrous metals</p> |
| <p>Plastic #1 PET Bottles #2 HDPE Bottles #3 - #7 Bottles Expanded Polystyrene Film Plastic Other Rigid Plastic</p> | <p>Glass Clear Green Amber Other</p> |
| <p>Inorganics Televisions Computers Other Electronics Tires Household Hazardous Waste Other Inorganics</p> | <p>Organics Yard Waste Wood (non C&D) Food Waste Textiles Diapers Fines Other Organics</p> |
| | <p>Construction and Demolition Debris Drywall Wood Inerts Carpet Other C&D</p> |

All samples were manually hand sorted at the disposal facility into the categories above. As previously mentioned, portions of selected samples were sent for moisture analysis. Results from this analysis did not result in the need to adjust data.

Results of Georgia Study and Relevance/Suitability for Comparative Analysis to Alabama Waste Composition

R.W. Beck and the Georgia Department of Community Affairs designed their study to provide data and analysis for each of the 13 Regional Development Centers selected for study as well as for aggregation to provide data on the state’s solid waste stream to a great degree of precision. ADEM MMS personnel noted during review of the R.W. Beck study, the demographic information concerning number of commercial establishments, employment, household income, residents per household and disposal results for the Atlanta Regional Commission RDC very closely approximated Alabama as a whole (See Table 2 below). Therefore, the comparative analysis performed for Alabama will be done in consideration of the Atlanta Regional Commission because of the similarity of the data, and because we believe this RDC with a mix of urbanized and rural, commercial and residential MSW, would closely approximate that of the state of Alabama, and provide for a more accurate analysis than using the aggregated State of Georgia data as its basis. In consideration that composition of MSW in terms of percentage of recyclable commodity type is the focus of this report, the data is similar enough to provide for a meaningful analysis of economic impacts of recycling to the state.

Table 2: Comparison of Demographic Information of Selected Georgia RDC And the State of Alabama⁷

| Demographic Information | Atlanta Regional Commission RDC | State of Alabama |
|--------------------------------------------|----------------------------------------|---------------------------------|
| Number of Commercial Establishments | 101,571²⁰⁰¹ | 99,261²⁰⁰¹ |
| Employment | 1,760,405²⁰⁰⁰ | 1,653,074²⁰⁰⁰ |
| Household Income | 49,750¹⁹⁹⁹ | 41,657¹⁹⁹⁹ |
| Residents per household | 2.62²⁰⁰⁰ | 2.49²⁰⁰⁰ |

Methodology for Alabama Waste Characterization and Economic Information

As stated earlier, disposal volumes for Alabama are available through disposal facility volume reports as required by regulation in the state. This reporting does require imported waste to be reported separately. This is important because it allows those volumes to be

⁷ U.S. Census Bureau, Demographic Data from year indicated

removed from the annual statewide generation to provide a more accurate determination of per capita generation of the MSW stream, and present information on waste quantities that could be affected through behavioral, policy or statutory changes in Alabama.

To determine the costs associated with the disposal of this Alabama generated MSW, a survey of “tipping” or gate fees was conducted among solid waste disposal facilities to determine an average rate. These fees alone do not provide a comprehensive cost figure for solid waste disposal due to the fact that the costs of collection and transportation are not entirely clear, depending upon the method of waste disposal in Alabama communities (e.g. publicly transported for disposal vs. waste hauler/disposal facility contract) and the fact that such fees are occasionally adjusted. This also does not take into account the present or future value of airspace taken up by this MSW in terms of new cell or landfill construction reduced or avoided through recycling. However, this only increases the “value” of current recycling and any additional value realized through increased recycling within the state. Disposal of and current or increased recycling of solid waste disposed of in C&D and industrial landfills will not be included in this report, which will be limited to MSW.

Table 3: 2011 Alabama Solid Waste Disposal Volumes

| | |
|--------------------------------------|-----------|
| Total Tons MSW disposal reported* | 5,220,846 |
| Total Tons Imported MSW* | 1,666,530 |
| Net Tons MSW Generated In-State | 3,554,316 |
| Adjusted Tons MSW Generated In-State | 2,369,662 |

*From 2011 volume reports of permitted MSW disposal facilities

Presented in Table 3 above, are volumes of MSW disposed of in Alabama for 2011 which were obtained from required volume reports of MSW facilities. MSW imported from other states was removed from this total disposal volume due to the fact that limitation of such imported wastes through recycling is currently beyond the control of the State of Alabama and should not be presented as potential value lost due to not recycling this material. Also, while this imported waste could be recycled just prior to disposal, consideration of contamination and other issues including the requirement for processing equipment at the disposal site to remove recyclable material is beyond the scope of this report. Additionally, in-State generation was further reduced by approximately one-third as was done in the Georgia study to account for any non-MSW wastes that may have entered the MSW waste stream for disposal.

To determine the value of recyclable materials disposed of in Alabama MSW landfills on an annual basis, a determination will be made as to both the value of those materials at the time of disposal as well as the disposal cost. As mentioned previously, costs of transportation of material for disposal as well as airspace costs and avoided costs due to the requirement for additional capacity resulting from disposal of recyclable materials will not be addressed in this report. The costs associated with disposal are presented solely on the basis of gate or tipping fees at MSW landfills. This cost was obtained through survey of existing public and private MSW landfills within the state to determine an average cost per ton of disposal. The cost of \$31.67 per ton was determined through this survey and will be utilized in the final determination of value loss.

The current value of recyclable commodities disposed, which will be presented later in this report, forms the final cost associated with disposal and potential lost revenue of recyclable materials through landfilling (i.e. not recycling).

Determination of Total and Per Capita Alabama Disposal Volumes

Data from the 2010 U.S. Census states an Alabama population of 4,802,740. Total MSW disposal in the state for 2011 was 5,220,846 tons, and yields an annual per capita generation of 1.09 tons and a per capita daily generation rate of 5.97 pounds. The total annual disposal volume was adjusted downward for imported MSW to 3,554,316 tons, resulting in an in-state annual generation per capita rate of .74 tons per year or a daily per capita rate of 4.05 pounds. This volume was additionally adjusted downward by approximately 33%, as in the R.W. Beck Georgia study to eliminate non-MSW waste which may have been disposed of in MSW facilities, to provide a greater level of accuracy in reporting volumes of recyclable MSW wastes disposed. This results in a further adjusted disposal volume of 2,369,662 tons. Utilization of this adjusted disposal figure results in an annual per capita disposal rate of .49 tons per year or a daily per capita rate of 2.68 pounds. This final adjusted total disposal volume will be utilized for the determination of lost recycling value due to disposal of materials in the MSW stream which could have been recovered for recycling. As stated previously, these adjustments will lower the estimate of total material value and may, in fact, be significantly lower than the actual value potentially realized through recovery of all recyclable commodities. Only the cost for disposal of those recyclable materials with a higher probability and ease of recycling will be utilized in the determination of lost material value. Both of these reductions will yield a more conservative estimation of final economic value which could be realized through recycling.

Determination of Alabama Solid Waste Disposal Cost

As determined from a survey of Alabama MSW disposal facilities, the weighted average cost per ton of solid waste disposed of in Alabama solid waste landfills is \$31.67. This cost does not include factors such as transportation, airspace value or potential new landfill construction costs, but only an average per ton gate or tipping fee of public and private Alabama facilities. Applied to the final adjusted MSW disposal volume of 2,369,662 tons, the annual cost of disposal for this adjusted volume of MSW is \$75,047,196. When considering only the disposal of those recyclable materials with a high probability of being able to be recycled without potentially cost prohibitive infrastructure development (36.8%, See Table 5), the disposal cost becomes \$25,365,952. In addition to this disposal cost, the value of these recyclable materials that could be recovered prior to disposal will yield the total potential value lost from the disposal of such materials.

Waste Sample Analysis Results and Categorization

Waste characterization performed for the Georgia study provided data on the average composition of MSW destined for disposal. Included was the volume of recyclable materials in 7 major material types further subdivided into 39 material categories. These results allowed for determination of recyclable commodity volumes per ton of MSW disposed of in

Georgia, and were derived from hands-on randomized sampling of MSW arriving at facilities for disposal. The categorization of MSW in percent composition is presented in Table 4. Due to the selection of the Atlanta RDC and similarities to Alabama as a whole, commodity type and volume data from that regional analysis will be utilized for determination of material values for Alabama. It should be again noted, that the results of the Atlanta RDC portion of the analysis as relates to percent composition of MSW closely approximated the State of Georgia as a whole.

Methodology for Determination of Value of Recyclable Materials Currently Disposed of in Alabama

The weight in percent of disposal volume for the 7 major material types and 39 categories presented in Table 4, provides the basis on which to apply cost considerations for the value of materials which could have been realized if the material had been diverted for recycling in lieu of being disposed. This Atlanta RDC data was obtained for the Georgia study during hands-on randomized sampling once during each of the four seasons during 2003-2004 to account for any seasonal variation in composition, and is the result of 4 sampling events totaling 100 samples. Samples were obtained from MSW landfills located in three different counties and 60 samples were taken from public facilities and 40 from private facilities. This 60:40 public to private sampling ratio is similar to Alabama MSW landfills which are approximately 50:50 public to private. Based on the high level of detail and accuracy in collection of the data, this report assumes that the average composition of MSW tonnage has not changed substantially from the time data was collected and the completion of this report.

Due to the fact that disposal volumes for Alabama were determined based on 2011 disposal volume reports, commodity value results will be presented as the average value during 2011, based on the average prices per quarter during 2011. While value results will be presented as to the value of materials that could generally be recovered in Alabama without requirement for excess collection and processing infrastructure development, it does allow for consideration in other forms, including on a per ton basis and value annually per capita, per household, etc. With the exception of whole computer scrap taken from online pricing services and ferrous metals from a survey of Alabama recycling facilities, commodity pricing utilized is an average of quarterly Municipal Recovery Facility (MRF) pricing in the State of North Carolina as reported by the North Carolina Department of Environment and Natural Resources (DENR). This source was utilized based on the comprehensive nature of available data sources and is representative of pricing in the Southeastern U.S. Although current pricing for the first few months of 2012 was available, pricing during 2011 was utilized due to the fact that the latest annual disposal data available for Alabama was from the same year.

Table 4: Landfilled MSW Composition Detail (Weight Percent)

| Group | Material | Average Percent Composition |
|-----------------------------|--------------------------|------------------------------------|
| Paper | Newspaper | 4.9% |
| | Corrugated Cardboard | 11.3% |
| | Office | 3.5% |
| | Magazine/Glossy | 2.8% |
| | Paperboard | 3.5% |
| | Mixed (Other Recyclable) | 3.4% |
| | Other (Non-Recyclable) | 10.6% |
| | Total Paper | 40.0% |
| Plastic | #1 PET | 1.3% |
| | #2 HDPE | 1.1% |
| | #3-#7 | 0.2% |
| | Expanded Polystyrene | 1.4% |
| | Film Plastic | 7.5% |
| | Other Rigid Plastic | 4.3% |
| | Total Plastic | 15.8% |
| Glass | Clear | 1.8% |
| | Green | 0.5% |
| | Amber | 1.2% |
| | Other | 0.3% |
| | Total Glass | 3.8% |
| Metal | Steel Cans | 1.3% |
| | Aluminum Cans | 0.6% |
| | Other Ferrous | 3.0% |
| | Other Non-Ferrous | 0.6% |
| | Total Metal | 5.5% |
| Organics | Yard Waste | 2.4% |
| | Wood (non C&D) | 1.8% |
| | Food Waste | 12.2% |
| | Textiles | 3.7% |
| | Diapers | 2.3% |
| | Fines | 2.7% |
| | Other Organics | 1.0% |
| | Total Organics | 26.1% |
| C&D | Drywall | 0.5% |
| | Wood | 2.2% |
| | Inerts | 0.2% |
| | Carpet | 1.8% |
| | Other C&D | 0.8% |
| | Total C&D | 5.5% |
| Inorganics | Televisions | 0.1%* |
| | Computers | 0.1% |
| | Other Electronics | 1.7% |
| | Tires | 0.3% |
| | HHW | 0.5% |
| | Other Inorganics | 0.6% |
| | Total Inorganics | 3.2% |
| Total All Categories | | 100.0% |

*Adjusted for estimated volume of Television units disposed of in Alabama MSW landfills

The goal of this report is to determine the net economic value loss from the disposal of potentially recyclable materials in Alabama. As such, the value of recyclable commodities as reported does not subtract the cost of processing, transportation, etc. included in the pricing utilized. Our basis is that these costs reflected in the actual MRF pricing are for processing power, labor, etc. which in fact should be considered as a factor in the economic benefit of recycling. Therefore, the stated value of these materials, coupled with the avoided costs of disposal (see Determination of Alabama Solid Waste Disposal Cost) presented earlier in this report, will provide the result for total economic value lost due to disposal. It must also be noted that this report does not address nor account for “induced impacts”, also known as rollover impacts, which materials recycling provides, including value of recycled materials in end products, and further spending of generated income.

Selection of Materials Utilized for Recyclable Commodity Pricing Calculation

As stated previously, quarterly MRF pricing for the four quarters of 2011 was averaged to present commodity values for material types as contained in Table 4. While the R.W. Beck characterization study for the State of Georgia, utilizing hands-on randomized sampling, presents percent of total volume for a diverse array of materials composing the adjusted MSW volume arriving for disposal, this report will focus only on those materials that could reasonably be expected to be suitable for recycling given the current or reasonably expanded recycling infrastructure in Alabama. Large increases in infrastructure, the capture of additional materials currently not included in this valuation, research into the viability of those materials for recycling by end-use manufacturers within economically viable transportation distances and other factors would increase the loss in value due to disposal. As such, monetary figures presented could possibly be undervalued and recycling potentially responsible for a greater impact than the results of this study will present.

Table 5 on the following page, represents the recyclable materials and their percentage of MSW composition, following the methodology detailed earlier in this report and corresponding to in-state generated tonnage disposed of in Alabama during 2011. Again, this table provides detailed disposal data for only those materials that could currently be expected to be recycled in Alabama given existing or reasonably expected expansion of infrastructure in the State. The methodology utilized to arrive at these figures provides a conservative estimate of recyclable material volumes currently being disposed. Of particular interest are those materials (paper, cardboard, aluminum, steel) that are most easily recycled and most attractive for recycling in Alabama given existing infrastructure and commodity pricing.

Table 5: Recyclable Materials and Percent MSW Composition

| Group | Material | Average Percent Composition | Tons Disposed |
|-----------------------------------------------------------|---------------------------------|------------------------------------|----------------------|
| Paper | Newspaper | 4.9% | 116,113 |
| | Corrugated Cardboard | 11.3% | 267,772 |
| | Office | 3.5% | 82,938 |
| | Magazine/Glossy | 2.8% | 66,351 |
| | Paperboard | 3.5% | |
| | Mixed (Other Recyclable) | 3.4% | 80,569 |
| | Other (Non-Recyclable) | 10.6% | |
| | Total Paper | 40.0% | |
| Plastic | #1 PET | 1.3% | 30,806 |
| | #2 HDPE | 1.1% | 26,066 |
| | #3-#7 | 0.2% | |
| | Expanded Polystyrene | 1.4% | |
| | Film Plastic | 7.5% | |
| | Other Rigid Plastic | 4.3% | |
| | Total Plastic | 15.8% | |
| Glass | Clear | 1.8% | 42,654 |
| | Green | 0.5% | 11,848 |
| | Amber | 1.2% | 28,436 |
| | Other | 0.3% | |
| | Total Glass | 3.8% | |
| Metal | Steel Cans | 1.3% | 30,806 |
| | Aluminum Cans | 0.6% | 15,218 |
| | Other Ferrous | 3.0% | 71,090 |
| | Other Non-Ferrous | 0.6% | |
| | Total Metal | 5.5% | |
| Organics | Yard Waste | 2.4% | |
| | Wood (non C&D) | 1.8% | |
| | Food Waste | 12.2% | |
| | Textiles | 3.7% | |
| | Diapers | 2.3% | |
| | Fines | 2.7% | |
| | Other Organics | 1.0% | |
| | Total Organics | 26.1% | |
| C&D | Drywall | 0.5% | |
| | Wood | 2.2% | |
| | Inerts | 0.2% | |
| | Carpet | 1.8% | |
| | Other C&D | 0.8% | |
| | Total C&D | 5.5% | |
| Inorganics | Televisions | 0.1%* | |
| | Computers | 0.1% | 2,370 |
| | Other Electronics | 1.7% | |
| | Tires | 0.3% | |
| | HHW | 0.5% | |
| | Other Inorganics | 0.6% | |
| | Total Inorganics | 3.2% | |
| Total Recyclable Material | | 36.8% | 873,037 |
| Percentage and Tonnage Utilized for Study Purposes | | | |

Value of Recyclable Material Disposed of in Alabama in 2011

While similar studies performed in other states or regions in the U.S. have adjusted commodity prices for increases in the Producer Price Index, considered all disposed MSW to be recyclable, and/or increased the value of recyclable materials by other factors, this report does not include such adjustments, and relies entirely on the market value of materials which could reasonably be expected to be recycled during the year in which they were disposed. Table 6 below includes those materials, tonnage disposed of in Alabama MSW landfills during 2011, and their 2011 average prices as detailed earlier. The materials utilized for pricing are those materials that are commonly recycled, and those which could reasonably be expected to be recycled without extensive infrastructure improvements. Any additional materials (e.g. organics, #3-#7 plastics, plastic film) to which pricing data was applied would increase the total value of materials disposed in lieu of recycling.

Table 6: Value of Recyclable Materials Disposed of in Alabama During 2011

| Group | Material | Average Percent Composition | Tons Disposed | Price Per Unit | Total Material Value |
|-------------------------------------------------------------------------------------------------|-----------------------------|--------------------------------------------|--------------------------|-------------------------------------|-------------------------------------|
| Paper | Newspaper | 4.9% | 116,113 | 132.30/ton | \$15,361,750 |
| | Corrugated Cardboard | 11.3% | 267,772 | 154.48/ton | \$41,365,419 |
| | Office | 3.5% | 82,938 | 241.67/ton | \$20,043,626 |
| | Magazine/Glossy | 2.8% | 66,351 | 147.50/ton | \$9,786,773 |
| | Mixed (Other Recyclable) | 3.4% | 80,569 | 127.92/ton | \$10,306,386 |
| Plastic | <i>#1 PET</i> | 1.3% | 30,806 | .31/lb. | \$19,099,720 |
| | <i>#2 HDPE</i> | 1.1% | 26,066 | .29/lb. | \$15,118,280 |
| Glass | Clear | 1.8% | 42,654 | 25.08/ton | \$1,069,762 |
| | Green | 0.5% | 11,848 | 5.01/ton | \$59,358 |
| | Amber | 1.2% | 28,436 | 18.08/ton | \$514,123 |
| Metal | Steel Cans | 1.3% | 30,806 | 264.15/ton | \$8,137,405 |
| | Aluminum Cans | 0.6% | 15,218 | .88/lb. | \$26,783,680 |
| | Other Ferrous | 3.0% | 71,090 | 350.00/ton | \$24,881,500 |
| Inorganics | Computers | 0.1% | 2,370 | .20/lb. | \$948,000 |
| Total Recyclable Material Percentage and Tonnage Utilized for Study Purposes | | 36.8% | 873,037 | | |
| | | | | Total Material Value | \$193,475,782 |

Determination of Net Value Loss Due to Disposal of Recyclable Materials in Alabama

As stated in the Introduction and Purpose of this report, the goal of this study was to determine the net value loss of the disposal of recyclable materials disposed of in Alabama on an annual basis. The total lost value is determined by adding the cost of disposal which could have been avoided through materials recycling to the value of those materials. Disposal values were determined as an average annual gate rate of disposal at Alabama MSW landfills during 2011. Recyclable material values were derived from several sources including industry surveys, online commodity pricing services and commodities pricing as collected by the North Carolina DENR. Previous sections of this report have detailed the methodologies for determination of these figures, and provided rationale for consideration of these estimates as conservative. Included is the removal of imported waste, reduction of total disposal volume for non-MSW, and probability of materials recycling given infrastructure constraints. Utilizing this methodology the results of this study reveals the following net value loss of the disposal of this recyclable material in Alabama during 2011.

| | |
|------------------------------------------------------------------|------------------------|
| Disposal Cost of Materials With Higher Probability of Recycling: | \$ 25,365,952 |
| Value of Those Materials Disposed in Alabama MSW Landfills: | + <u>\$193,475,782</u> |
| Net Value Loss: | \$218,841,734 |

Summary and Conclusions

This report provides the net value loss realized through the disposal of recyclable materials in Alabama MSW landfills in 2011. Information obtained through this study sheds light on the current state of recycling in Alabama and provides information that can be used by solid waste planners, state and local leaders and others when reviewing existing and future planned solid waste management strategies and activities. Disposal data provides information that can be utilized when developing strategies for meeting the state solid waste goal of 25% and in furthering actions detailed in both the Alabama Solid Waste Management Plan and the SWRMMA enacted in 2008. Coupled with the results of the SERDC study which determined that an increase of 10% in the state's recycling rate could provide an additional \$3,000,000 in state tax revenue, \$66,000,000 in personal income and 1,400 new jobs, the over \$218,000,000 that could be realized through recycling of materials currently disposed as MSW provides real economic possibilities for Alabama.