WASTE REDUCTION ELEMENT

SOURCE REDUCTION AND REUSE

Both source reduction and reuse are waste management techniques for the non-production or unmaking of waste. In other words, waste reduction of this type can be defined as the reduction, avoidance or elimination of the generation of solid wastes. Since source reduction and reuse both result in the prevention of waste in the first place, the amount of waste which must composted, recycled, landfilled, etc. is reduced. Hence, waste reduction of this type is given the highest priority in solid waste management plans, because it reduces the demand placed on the management system. The downside is that it is the most difficult strategy to implement. Regulations may be needed to promote source reduction. The regulations can take the form of:

- Declaration of policy;
- Incentive regulations (tax credits, exemptions, positive labeling);
- Disincentive regulations (bans, taxes, deposits, product specifications).

Different strategies can be incorporated into a plan to promote source reduction and reuse. Strategies used by communities for source reduction and reuse follow.

Material Bans

Material bans may take two forms--outright bans on production or disposal bans. By far, the disposal ban is the easier to implement and more feasible on a local level. Beyond supporting sensible legislative efforts on a state or national level, the focus of this planning effort should be on disposal bans. When dealing with outright material bans, care must be taken that the alternative material, which must be substituted for the original, is not ultimately worse than the material it replaced.

Disposal bans, accomplish nothing unless there is an alternative to disposal provided. This alternative may be in recycling, composting or reuse alternative. It should be noted that disposal bans cannot be looked at as source reduction if they only result in the redirection of material from disposal to another segment of the waste management

system, such as recycling, without any waste reduction previous to entering this process. While it is certainly desirable for additional material to enter the recycling process, it cannot be considered source reduction as explained previously. Disposal bans can, however, result in some amount of actual source reduction if the alternative provided carries with it some detrimental attribute(s), e.g., either a direct or indirect cost, which provides some incentive to reduce waste.

Unit Pricing

Structuring waste disposal charges so that generators pay according to the amount of waste generated can encourage source reduction and recycling. Most refuse haulers charge a flat rate, sometimes specifying a maximum number of bags or containers per stop, which will be collected for that flat fee, thus providing little direct economic incentive for reduction. There are numerous schemes for variable user fees possible for collection, which include:

1. Charging by the number and/or size(s) of containers used
2. Charging by frequency of collection
3. Charging per bag of garbage collected using standard bags, allowing customers to alter the number of bags as needed
4. Charging customers on a weight basis

Variable garbage collection fees have administrative costs and also may encourage people to illegally dispose of waste. In areas that have instituted variable rates, these fears have been largely unrealized. What has happened is citizens will attempt to “shop around” in order to find the cheapest legal alternative, and they may be willing to go some distance to do so. Where an increase of illegal dumping has been noticed is in white goods and other similar large items that may carry a relatively high user fee.

Landfill Surcharges

Landfill surcharges have been used by a number of states and local governments. Such surcharges don’t encourage waste reduction by individuals as long as waste collectors charge flat fees. Landfill surcharges do, however, provide waste reduction incentives to

commercial and industrial customers because they generally pay on a volume related basis, such as size of collection container or frequency of service. Revenues collected from disposal surcharges may be used to fund waste reduction education, recycling programs, household hazardous waste collections and other desirable waste management alternatives.

Product Disposal Charges

Product disposal charges may be a charge by weight, unit, composition, value or a combination. A product disposal charge is a tax assessed on product or packaging producers at the time of manufacture, or on the consumer at time of purchase. Unlike product deposits, these charges are not refundable. Instead, they would internalize the product's eventual disposal costs. A popular example of this is product disposal charges on tires.

Since disposal costs vary greatly by both geography and product type, it is nearly impossible to assess a tax to cover the true cost of disposal in all situations. Administration of actual disposal costs of specific products in specific locations would be impossible. Factors to consider in determining product disposal charges include the disposal costs of the product, volume of waste generated in the product manufacture, difficulty of disposal of the product or manufacturing by-products, and environmental impact of the product or manufacturing by-product disposal. Such charges should allow flexibility for exemptions or prorating for secondary material (recycled) usage in product manufacture.

In theory, product disposal charges are an ideal method of internalizing the costs of social responsibility since it is the manufacturers and product consumers that pay in advance for the eventual disposal and environmental costs a product will create when its useful life is over. Disposal charges should encourage desirable waste management in two ways. First, economics would dictate that volume, difficulty of disposal, or hazardousness of a product be reduced in order to reduce product disposal charges and so reduce production

costs. Second, the money collected from product disposal charges could be used to correct or reduce the undesirable impacts of product disposal.

In reality, however, there are problems in assessing such charges effectively. Methods to assess charges differ. One method is to levy the charge on virgin feedstock for metal, paper, plastic, rubber, glass, etc. at the point of product manufacture. Another is to levy it as an excise tax on wholesale or retail finished products. The latter is more realistic for implementation on a local government level. Although, as has been noted previously and from experience in states having container deposits, people will "shop around" in order to avoid such charges by purchasing goods elsewhere. For this reason, such waste reduction measures are more effective if instituted on a larger geographical basis.

Charges may be placed on both durable and nondurable products or a disposal charge only on non-durables and deposits on durables. It is difficult sometimes to determine appropriate disposal charges on durables because of the delay between manufacture and disposal. Deposits on durable goods would encourage recycling while disposal charges would not.

There are several ways to estimate disposal costs, including a per unit basis, a weight basis, and a product value basis. In order to be effective, taxing on a per-unit basis would need to establish different rates by product categories, material composition, and product sizes. Taxing by weight of a product is another way of assessing a disposal charge. There are several problems with a weight-based tax:

1. It encourages the substitution of lighter but potentially more environmentally dangerous feedstock during manufacture,
2. Unless an exclusion existed for reusable products, such a tax would discourage reusability. Returnable glass beverage containers, for example are heavier than non-returnables and lightweight aluminum is not reusable,
3. The effect of a weight-based charge diminishes as a product's price-to-weight ratio increases.

The last problem could be addressed by using a product value (cost) in the equation for determining a product disposal tax rate. Such a value-based tax would encourage both a reduction in the materials used to manufacture products and their substitution by less expensive materials. It would discourage the use of expensive materials such as metal/plastic laminates, which are difficult to recycle. Another effect would be reduction in expensive excess packaging, which is used solely for marketing. Exemptions should be allowed for secondary material content and reusability.

Economic analyses and modeling was done in the mid 1980's to analyze the recycling and waste reduction effects on paper packaging and containers of product disposal charges, recycling subsidies, variable waste disposal fees and litter taxes. Materials included in the model were steel, glass, aluminum, paper, and plastics. For the product disposal charge analysis, the model applied the charge at the bulk materials production stage. Of the four policies analyzed, the model indicated the product disposal charge was consistently best and recycling subsides the worst.

Product Stewardship

A relatively new concept that has arisen in the U.S. is product stewardship. Product stewardship is primarily industry driven with encouragement from the environmental community. It can involve proactive concepts such as what has become known as "design for the environment".

The design for the environment concept incorporates into product development environmental attributes such as reduction of environmentally sensitive materials, decreases in equipment energy consumption, extension of product life span and utilization of parts that can be reused, resold or recycled.

Some examples of this might include (computer):

- Modular, upgradeable design - parts can be removed without use of special tools - allowing easy repair and upgrades, thus lengthening the useful life of the computer.
- Designed for ease of assembly and disassembly - most parts snap together, no glue and minimal use of screws used as fasteners.

- Large plastic parts are marked to aid recycling.
- Internal chassis made of recyclable steel.

Some manufacturers, most notably, computer manufacturers, have designed recycling and reuse programs. One such computer manufacturer, Dell, offers recycling and donation (reuse) options. Through Dell's partnership with the National Cristina Foundation, consumers can donate their systems to charity in exchange for a potential tax deduction.

The National Cristina Foundation is a non-profit organization that places used technology with local non-profit organizations and public agencies throughout the U.S. that service disabled and economically disadvantaged children and adults. Computers, which may no longer be useful for the original purchaser, may have several years of life left in them for a non-profit or public agency.

The recycling option involves shipping the equipment back to the manufacturer. Sometimes computer equipment is accepted from any manufacturer. There is often a fee associated with this service to cover shipping, recycling and processing costs.

Litter Tax

Another potential financial disincentive to promote source reduction is a litter tax. Litter taxes are normally an ad valorem excise tax placed on items judged to be a litter problem. Funds collected could be used for litter clean up, recycling promotion or other management purposes. Litter taxes tend to be revenue producing devices, although theoretically raising the prices of litter prone products could cause a shift to products less likely to become litter.

Drop and Swaps

Drop and swaps, a form waste exchange, have been used in a number of areas with some success. Such programs work on the principle that waste is a resource in the wrong place. When items can be matched to people who need them, they are reused and cease to be waste. Drop and swaps have had success such as in the collection of household paints. Leftover paint can make up in excess of 60 percent of the total volume of materials

collected at household hazardous waste (HHW) collection events. Drop and swaps may be held on the same date as HHW collections but need to be managed independently of such events, because there is no time at a HHW event to separate usable from unusable paints. A pilot project held in 1990 in central Vermont resulted in approximately 50 percent of the paint being diverted for reuse.

Another drop and swap that has been successful is a furniture drop and swap. Such a program was conducted by the Lamoille County Solid Waste District, Vermont. Officials there found that, at times, items had "new homes" even before being off-loaded by the previous owner.

Commercial and Industrial Waste Reduction

EnviroShare

The origins of the EnviroShare program in Hall County go back to New England, specifically to Vermont. Around 1989, WasteCap was started by the Associated Industries of Vermont. The gist of the program was a business helping business approach, via a team of business volunteers, who toured requesting businesses and offered advice as to what they might do to reduce their solid waste. The strength of the program came from the fact that it operated via peer matching to offer non-threatening, non-regulatory assistance. Others liked the idea, and WasteCap has since spread to Maine, New Hampshire, Massachusetts and Wisconsin to name a few. WasteCap programs are most often operated by state industry associations on a statewide basis.

The WasteCap concept was included in Hall County's Comprehensive Solid Waste Management Plan adopted in 1993 as a recommended program. The Greater Hall Chamber of Commerce was approached with the idea. A subcommittee of the Chamber's Solid Waste Committee approved of the concept and renamed it EnviroShare. This expressed both the fundamental purpose (the environment) and the method (information and materials sharing).

In March 1994 the EnviroShare Team was formed from Hall County business people with proven experience in waste reduction. The first site visit was conducted on

March 17, 1994, weeks before formal announcement of the program. Site visits involve a walk through by the EnviroShare team of the requesting business's facilities. Following the walk through, a brainstorming session takes place during which time waste reduction ideas are developed. These are then formulated into a written format and mailed to the requesting business within a few days of the site visit.

It was decided by the Environmental Management Committee (formerly, Solid Waste Committee) that, while members of the EnviroShare team already had a good knowledge of waste reduction practices, a certification program was still in order. Certification would be required of team members in order to be permitted to conduct site visits of requesting businesses.

EnviroShare seeks to:

- Improve our environment by helping each other reduce solid waste.
- Establish a library of best practices for waste reduction (waste prevention and recycling).
- Provide information on services/consultants for special needs beyond what the EnviroShare team can provide.
- Provide sources for recycling markets.
- Assist with waste audits.
- Provide information on personnel with specific expertise for volunteer assistance.
- Encourage networking and information exchange.
- Facilitate materials exchange.
- Be a clearinghouse of information.

Materials Exchange

There are several regional materials exchanges operating throughout the U.S. According to the most recent information provided by Material Exchanges on the Web Homepage, hosted by the U.S. EPA, there are over 50 material exchanges being operated in North America. Of these, the vast majority is operated on a statewide or regional (multi-state) basis. Most are non-profit and are operated by governments, universities, chambers of commerce, and non-profit groups. A few are sub-state, regional operations and some are operated at the county level. Hall County's program is one of these.

Hall County operates a materials exchange under its EnviroShare program. This was also a recommendation of our original solid waste management plan. The basis of materials exchange is what is trash to one is treasure to another. Often it's simply a matter of matching those that want to get rid of something with those that need it. In the process, both landfill space and money are saved because no money had to be paid in landfill disposal.

At first, the normal paper-based method of conducting a materials exchange via filling out of listing forms for wanted or available listings was attempted. On a county scale, this proved to be unworkable. The weakness of paper-based listings is that they can become antiquated very quickly. Assembled into a quarterly catalog of listings, as was standard practice, the listings can become outdated virtually the instant they are put to paper. Materials' status may change quickly, negating the accuracy of printed listings.

Materials exchange is now facilitated via the EnviroShare List and other resources.

Sample Categories for listings:

- Paper
- Plastic & Rubber
- Glass
- Metal & Metal Sludges
- Wood
- Miscellaneous

EnviroShare List

A listserv (list) is an electronic mailing list that sends e-mail to all persons on the list via an email message to a single address. The basic purpose of the EnviroShare List is to provide an instant, electronic format to continue information sharing. Relevant topics include environmental, health and safety issues.

Sample Areas:

1. Training Opportunities- share information on upcoming workshops/training/certification opportunities.
2. Tips- share information you've got on environmental management.

3. Inquiries- send an inquiry to the list. Perhaps someone out there has the answer.
4. Regulations- share information on upcoming regulations of interest.
5. Materials Exchange- got a material, need a material? Post it to the list. Maybe someone on the list can use it or knows of someone who can.

EnviroShare X-change

Continuing on with the success of the EnviroShare List, the concept was expanded and named EnviroShare X-change. EnviroShare X-change consists of email lists arranged in a web fashion to promote solid waste reduction via reuse and materials matching in Hall County. In addition to the potential for waste reduction, such a network also has implications for information exchange.

Each list in this web is organized around the following sectors in Hall County:

1. EnviroShare List (business and industry);
2. Non-Profit List (nonprofits); and
3. Schools List (city/county, private, pre-school, colleges).

Community Benefits

This program allows materials and needs to match themselves. As materials become available for reuse, they can be matched directly to those sectors doing "public works" or through them to those in need, helping to make Hall County a better place to live, while keeping beneficial materials out of the landfill. The EnviroShare X-change was chosen as Hall County's way of operating a materials exchange, to turn liabilities into assets for community benefit.

Recommendations

The materials exchange component should continue to include materials matching via EnviroShare X-change and possibly via the Internet through the www.enviroshare.org web site to those non-profit groups and agencies doing "public works" in Hall County. This could provide them with needed non-financial resources to benefit the community while diverting waste from disposal. Ways to facilitate materials exchange with the general populace should also be explored.

Recycling

Recycling is the process by which waste materials are collected, processed and manufactured into useful products to be used again. As much as 80 percent of the waste stream, exclusive of problem wastes, could technically be recovered from the mixed solid waste stream by recycling and composting. However, household and business participation, the capture rate of the individual materials, and storage, collection, processing and transportation costs affect the actual rate of recycling.

Drop-off Recycling

Drop off recycling is simply the collection of recyclables by having residents drop them off at a collection site. The collection sites may be staffed or not. Materials collected at drop off recycling centers are limited only by imagination and the ability to market the materials.

Buy Back Centers

A buy back center is essentially the same as a drop off center, but with two differences: 1) They are always staffed; and 2) Residents receive payment for the materials they deliver. There are no known privately owned buy back centers operating in Hall County. There are other recyclers operating in Hall County as buy back centers, if one considers scrap metal dealers in this category. Information about these recyclers can be found in the Appendix in Table B-2.

Curbside Recycling

Curbside recycling is the collection of recyclables at the actual curbside. The system may use one or several bins for separation of materials in the home and placement at the curb. Materials that have been collected in curbside programs include, but are not limited to, glass, aluminum cans, tin cans, newspaper, plastics, used motor oil, used corrugated containers, box board, and household batteries.

Curbside pickup can be either source separated or commingled. Source separation involves having the generators place recyclable materials into, most frequently, a single bin. Bins are collected and then the materials separated into various compartments on

board the collection vehicle while still at the curb. Commingled involves the collection of recyclables without separation at the curb. Separation is left to take place later at the processing center.

Source Separated at the Curb or Commingled

"Source Separation" is the separation of materials to be recycled from waste at the point at which waste is generated, be it a household or a commercial/industrial entity. Since waste is generated wherever human activity occurs, opportunities for source separation coincide as well. Commonly, source separation has been thought of as an activity relegated to the single family household. Now, however, that mind-set is changing to include source separation in multifamily apartments, institutions (schools, banks, government offices) and businesses.

Disadvantages to source separation are that it may require the use of special vehicles or modification of existing vehicles to keep the materials separate. This adds to the expense of the program. In the case of residential curbside collection, residents are required to separate newspapers, glass, beverage cans, milk jugs, etc. prior to setting them out at the curb. Collection of source separated recyclables most often results in an "overlay" of a separate collection system for recyclables overlaid over the existing trash collection system. This results in the financing, staffing and management of two complete systems.

Advantages to source separation are the materials collected are generally cleaner, may command a higher price, are easier to market, and are more likely to retain market share should supply ever exceed demand. As more recycling programs come on line and supply exceeds the end users needs for secondary materials, those programs producing the highest quality materials will be more likely to retain their market. For example, paper mills are basically machines that need a certain amount of paper fiber per day to operate. Once mills have more material than they need, they can then be selective as to what paper they choose to accept. It would be natural to accept only the best paper, all other factors being equal.

Recovered materials are often treated in the following ways:

1) Single Stream- collected commingled (all recyclables collected from the curb in one container) and kept that way in the recycling truck;
2) Dual Stream- set out by the generator in two commingled but separate streams and collected as two streams, with one for containers and one for paper; and
3) Source Separated- set out by generator commingled and hand separated at the curb into compartments on the truck for each material.

Programs that collect and transport commingled recyclables enjoy lower collection costs due to less time required per stop but have higher processing costs. The advantages to a system which hand separates at the curb are reduced processing costs and reduced possibility of revenues from paper sorts downgraded by markets due to glass shards and plastic fibers contaminating paper. The downside is in higher collection costs due to more time required per stop. Source separation programs requiring citizens to separate materials into specific bins in the home average 30-60% participation, while programs with curbside collection of commingled recyclables average 50-80% participation, on average, for mature programs.

Single Stream

Single stream (also known as "fully commingled") recycling refers to a system in which all paper fibers and containers are mixed together in a collection truck, instead of being sorted into separate commodities (newspaper, cardboard, plastic, glass, etc.) by the resident and handled separately throughout the collection process. In single stream, both the collection and processing systems must be designed to handle this fully commingled mixture of recyclables.

What are the potential advantages to single stream?

Potential advantages of single stream may include:

- Reduced sorting effort by residents may mean more recyclables are placed at the curb and more residents may participate in recycling;
- Reduced collection costs because single-compartment trucks are cheaper to purchase and operate, collection can be automated, and collection routes can be serviced more efficiently;

- Greater fleet flexibility, which allows single compartment vehicles to be used, for refuse or recycling, providing greater fleet flexibility and reducing the number of reserve vehicles needed. (To avoid confusing customers, use a large sign/banner to distinguish when a refuse truck is being used for recycling);
- Participation and volume per household may increase and worker injuries may decrease because the switch to single stream is often accompanied by a switch from bins to cart-based collection;
- Changing to single stream may provide an opportunity to update the collection and processing system and to add new materials to the list of recyclables accepted; and
- More paper grades may be collected, including junk mail, telephone books and mixed residential paper.

What are the potential disadvantages to single stream?

Potential disadvantages of single stream recycling may include:

- Initial capital cost for:
  - new carts,
  - different collection vehicles,
  - upgrading of processing facility, and
- Processing costs may increase compared to multiple stream systems;
- Possible reduced commodity prices due to contamination of paper;
- Increased "downcycling" of paper, i.e., use of high quality fibers for low-end uses like boxboard due to presence of contaminants;
- Possible increase in residual rates after processing (due chiefly to increased breakage of glass); and
- Potential for diminished public confidence if more recyclables are destined for landfill disposal due to contamination or unmarketability.

Single stream may produce a higher rate of residuals, or those materials damaged or contaminated to the point that they are no longer recyclable, because the compaction of the commingled recyclables during collection or transport can break glass and mix different colors of glass fragments together. Broken glass may also get mixed in with paper. Mixed broken glass is generally not marketable for applications involving melting to produce new glass products, although a few new markets are emerging for this relatively low-value material.

Other Considerations

Single stream recycling trades partial sorting by residents for more intensive sorting at a processing center. The benefits (compared to source separation) are largely in the collection process, while the incremental costs are largely connected to processing. This can create pressure to maximize cost savings at the collection end and minimize the additional sorting costs at the materials recovery facility (MRF). If this pressure is met by capital expenditures such as automated pickup and investment in modern sorting equipment, single stream may increase the overall effectiveness of the recycling program. However, if corners are cut – e.g., by poor processing – single stream may harm recycling.

Single stream may be very suitable for some communities and not at all suitable for others. Factors to consider include hauler and MRF arrangements, markets for processed commodities, current participation rates and volumes, community characteristics (permanent vs. seasonal residents, potential of automated collection, etc.) and a host of other community-specific considerations.

The capital costs of the latest sorting machinery, needed to do the job right, require relatively high throughputs (volume of materials) at the MRF – higher than most communities can generate on their own. This may mean that the community's recyclables may have to travel much greater distances to be processed by a larger MRF in order for market quality specifications to be maintained.

Dual Stream Recycling

Dual stream recycling is a system in which all paper fibers and containers are separated and collected as two separate categories of materials. One of the primary concerns of single stream recycling has been the contamination caused by broken pieces of glass that may become embedded (under compaction) or mixed in with paper. The collected materials are commonly processed as a separate container (glass, plastic, aluminum, steel) and paper stream (newspaper, residential mixed paper, magazines, corrugated cardboard). Two collection containers would be provided to households: one for papers and one for containers.

Dual stream recycling may be thought of as a semi-commingled system. The materials are collected and processed commingled but in two separate streams.

Single Stream Versus Dual Stream

The economics of collecting recyclables as a single stream versus two streams (papers and containers separated) is compelling. A list of cost advantages is as follows:

1) Uses the same equipment that collects trash, i.e., one interchangeable fleet to buy and maintain.
2) Sets the stage for automation of collection which reduces time and eliminates injuries.
3) The truck returns when it is full, not when one compartment is full.
4) Compacting single stream material in garbage truck equipment allows for a heavier load before returning, i.e., fewer trips.
5) Residents carry one container to the curb. Participation rates increase.
6) Single stream processing equipment allows for more paper grades to be collected (OCC, mixed paper, telephone books, junk mail and all other residential paper).

The American Forest & Paper Association released the results of a study conducted by Jaakko Pöyry Consulting and Skumatz Economic Research Associates that looked at the impact single stream collection programs had on recycling operations compared to a dual stream collection program.

Among the study's findings were:

- Overall systemwide expenses increased an average of $3 per ton for paper collected in single stream programs, which includes costs for collection, processing at materials recovery facilities (MRF) and mill utilization.
- Curbside collection costs are approximately $15 per ton lower for single stream programs.
- Mills incurred increased operating and maintenance costs of approximately $8 per ton when using recovered paper from single-stream programs.
- Sorting costs at MRFs averaged $10 per ton more for single-stream recycling programs.

The Recovered Fiber Executive Committee of the American Forest & Paper Association (AFPA) funded a study that compared the contamination of single stream news (ONP) and residential mixed paper (RMP) with dual stream collection. They analyzed paper samples obtained from 60 U.S. curbside recycling programs. The final report was issued in October 2002. The overall conclusion was that single stream ONP contained 3.3% prohibitives vs. 2.0% for dual stream. However, of this, glass and fines were 0.5% for

single stream ONP vs. 0.6% for dual stream ONP. The same study also concluded that single stream RMP had 1.8% prohibitives vs. 1.1% for dual stream RMP. However, of this, glass and fines were 0.4% for single stream RMP vs. 0.2% for dual stream RMP. In spite of all the publicity, these contamination level differences have not been significant enough to curtail sales of single stream OPN or RMP. Furthermore, as time goes by, the virgin mills that are bothered by glass and other contaminants will put in cleaning systems that are currently available and have been used for many years by recycled mills. This should eliminate the contamination issue.

Case Study: Eureka Recycling

In May 2002 Eureka Recycling, in partnership with the city of Saint Paul and the Minnesota Office of Environmental Assistance (MOEA), completed a 14-month study that took a close look at five different ways to pick up recycling at the curb. The study examined how sorting method, container size and frequency of pickup affect the success of the recycling program as measured by environmental results, cost, convenience and resident satisfaction.

Table 18 -- Comparison of Program Elements of Tested Scenarios

	A. Source Separated w/ Education		B. Two-Stream Commingled		C. Two-Stream Commingled		D. Two-Stream Commingled		D. Two-Stream Commingled & Organics		E. Single-Stream	
Collection Schedule	Bi-Weekly		Bi-Weekly		Bi-Weekly		Weekly		Weekly		Bi-Weekly	
Recycling Containers	18 Gallon Bins		18 Gallon Bins		2 35 Gallon Carts		18 Gallon Bins		18 Gallon Bins 35 Gallon Carts		64 Gallon Carts	
% Increase in Tons Collected	6.20%		7.30%		32.80%		26.10%		91.60%		20.80%	
City-Wide Materials Collected	16,300 Ton/Yr		16,453		20,394		19,361		29,410		18,519	
% Material Loss During Processing**	A 1%	B 1.6%	A 6.4%	B 10.9%	A 6.4%	B 11.6%	A 6.4%	B 10.8%	A 7.5%	B 11%	A 14.2%	B 27.2%
Net Program Material Recycled*	16,317	16,039	15,400	14,660	19,089	18,028	18,122	17,270	27,204	26,175	15,889	13,482
Net Overall % Increase in Tons Recycled	5.1%	4.5%	0%	-4.5%	24.4%	17.5%	18.1%	12.5%	77.2%	70.5%	3.5%	-12.2%
Collection Cost/Tons	$60		$50		$65		$59		$80		$51	
Processing Cost/Tons	$35		$50		$50		$50		$50 (Rec) $30 (Org)		$60	
Processing Revenue/Ton	$50		$43		$44		$43		$43 $20		$33	
Net Costs/ Ton	$45		$57		$71		$66		$88		$78	
Customer Satisfaction**	N/A		80%		83%		76%		75%		87%	
Willing to Pay for Change	N/A		73%		63%		61%		54%		65%	

* Column "A" under "Material Loss During Processing" is the residual rate calculated without including mixed glass. Column "B" is the residual rate when including mixed glass as not being recycled. Eureka Recycling does not consider the use of mixed glass as an aggregate material or daily landfill cover as a recycled material. These residual rates are then applied to the total materials collected to calculate "Net Program Material Recycled"

** Percentage preference of the study method that group tested to the current source-separated program.

Based on the results of this study, Eureka Recycling recommended four main changes to improve the recycling program in Saint Paul. These conclusions are specific to Saint Paul, but may be valid in other communities as well.

The study investigated three indicators:

1. Environmental Impacts: Consider which collection method allows residents to recycle the most materials while having the least amount of materials that have to be thrown out? (Contaminated and damaged materials have to be thrown out.) Consider the recycling collection method that gets the most recycled with the least pollution.
2. Cost: Consider how much the different methods cost and how the cost of each impacts the residents' choice.
3. Convenience/Satisfaction: Consider why, how and what do people want to recycle and what would make them recycle more.

Five collection methods were developed and tested:

1. Scenario A: Source-separated collection system. Residents sorted the materials at the curb into separate categories. Collection occurred bi-weekly.
2. Scenario B: Two-stream collection using two 18-gallon blue bins. Residents sorted materials into two categories or streams: papers (including newspaper, cardboard, paper and mail) and containers (a mix of cans, glass and plastic bottles.) Collection occurred bi-weekly.
3. Scenario C: Two-stream collection, same as above, but using 35-gallon rolling carts to collect and set out their materials. Collection occurred bi-weekly.
4. Scenario D: Two-stream collection with 18-gallon blue bins and the collection of household organics (including food scraps and non–recyclable papers like pizza boxes and paper plates) in a 35-gallon rolling cart. In this neighborhood, recycling and household organics were collected every week.
5. Scenario E: Single-stream collection system using one large 60-gallon rolling cart to collect recyclables. Residents did not sort by stream. Materials were mixed together-cans, glass, plastic bottles and papers-and the entire separation took place at a recycling facility. Collection occurred bi-weekly.

Recommended Changes to Saint Paul's Recycling Program for 2004:

- Implement a "two-stream" sorting system, in which all paper is collected together in one category and all containers in another category.
- Start picking up #1 and #2 plastic bottles at the curb.
- Provide weekly collection in 18-gallon recycling bins.
- Work toward adding organics collection to the curbside program.

Multi-Family Unit Recycling

Multi-family units are basically apartment complexes. There are a number of multi-family residential areas in the planning area. Most of these occur in the larger municipalities such as Gainesville and Oakwood. The challenge in recycling in these situations is in dealing with a transient population that may feel less connection to the solid waste management system than the general population. This transient nature provides a challenge to education efforts.

For the most part, collection service is provided through landlords contracting with a private hauler or hauling refuse themselves to the county landfill. This serves to separate generators from the system and their interaction with it.

Another limitation in dealing with multi-family units is that there may be physical limitations in storage of recyclables in the household and on the property. Smaller household containers can help get around space problems in the home. However, the other problem of space limitations remains outside the residence. In larger complexes, it is not practical for everyone to place a container at curbside. A central storage location may be better and may also reduce the possibility of containers being stolen.

Mandatory vs. Voluntary Recycling

In general, mandatory recycling programs enjoy a higher participation rate than those that are voluntary. The Institute for Local Self Reliance, in its 1990 study of 16 mandatory programs found an average participation rate of 90 percent and among 6 voluntary programs 54 percent. The same study also found some voluntary programs, with higher participation rates than some mandatory ones. This indicates that mandatory alone is not always enough. Other literature sources provide a participation range of 50 to 98 percent for mandatory programs.

Most mandatory programs have ordinances that have as penalty provisions non-pickup of refuse containing recyclables and/or fines. A good number of ordinances also have enforcement provisions for waste haulers, such as fines and loss of disposal privileges.

Many mandatory programs are mandatory in name only, that is, the knowledge that a program is mandatory (at least early on) is incentive enough, without enforcement. Enforcement, in fact, can be troublesome. For example, the non-pickup of refuse penalty is easier to enforce in programs where municipal refuse collection exists, more difficult where refuse collection is contracted, and most difficult where collection is private, free enterprise. The reason is simple-- the extent of detachment of enforcers (government) to enforcement (haulers). The same principle follows through to fining, which requires that haulers record and report violations to the entity having management authority. No matter what enforcement mechanisms are in place, if a municipality is sincere in its wishes to fully enforce a mandatory ordinance, it should probably plan on some direct policing.

Other Factors Affecting Participation Rates

There are many factors which affect curbside recycling participation rates, such as demographics, community spirit, volume based or weight based disposal fees, provision of containers, convenience, program maturity, frequency of collection, and method of calculating the participation rate.

Generally, curbside programs which have achieved the highest material recovery rates are those where:

- collection of recyclables occurs once a week and coincides with regular refuse pick up;
- material separation and preparation are made as convenient as possible for the householder; and
- the program is properly advertised and promoted on a regular, ongoing basis.

Mixed Waste Processing

Mixed waste processing systems process raw untreated MSW to yield recyclables. The main advantage to this system is the ease of implementation. It avoids the classic problem of any new program requiring citizen participation, i.e., resistance to change. Since no

change is required, on the part of householders, there is no need for an expensive education program. There are no separate collection schedules to remember and no need to learn how to prepare recyclables. There are no separate containers to buy or store. To the residents, everything is status quo, even after the program has been implemented. Another advantage is that the same collection schedules, routes and equipment can be used.

However, such a program also avoids a classic problem of our modern society– wastefulness. It does nothing to teach people about conservation or wise use of natural resources. There is no incentive to change from destructive to constructive habits, no incentive to reduce waste, and no incentive to buy recyclable packaging.

Because there is no source separation, contamination is more of a problem. Some materials may be contaminated to the point where they cannot be recycled, e.g., soiled or wet newspaper, partially full peanut butter jars, etc. For this reason, these systems are often coupled with composting operations in order to divert these normally recyclable materials from disposal.

Processing costs are high because the total, unsorted waste stream must be processed. It is very labor and equipment intensive. Facilities may have to be three to four times larger than facilities handling only recyclables. Environmental impacts of such a facility would also be greater as all trucks must be routed to the facility resulting in traffic impacts. Also, potential problems with noise, odors and vector control would have to be addressed.

Due to the unsorted nature of the incoming refuse, contamination of the compostable fraction is also more likely. Items such as household hazardous waste, used motor oil, household batteries, and others may cause contamination of the compost if methods are not put in place to address their removal up front. The contamination potential would be further exacerbated by shredding or grinding of the compostable fraction, a common practice to assist decomposition, in advance of the composting process.

Processing Systems

Regardless of the collection system employed, some processing will be required to make materials marketable. Processing basically accomplishes two purposes--contaminant removal, and densification.

Contaminant removal takes the form of further separation of materials (separation of dissimilar materials and separation from contaminants) and/or some sort of cleansing. Densification may be accomplished through compaction (baling), breaking/crushing (glass) or granulation (plastics). Processing is necessary to improve the economics of transport to market and to present the materials in a form whereby they may be utilized in a manufacturing process. Some materials may require additional processing by the end user.

Materials for recycling will require between one and three processing steps prior to reuse. Processing may occur in the household, at an intermediate processing facility, or broker, and prior to use in a manufacturing process. Each one of these steps requires energy and materials and generates some waste, with its attendant environmental impacts.

Recycling In Hall County

As recommended in the 1993 Comprehensive Solid Waste Management Plan, Gainesville, Oakwood, Flowery Branch, and Clermont have implemented curbside recycling programs. These all use the source separated approach.

Clermont

Clermont operates a once per week voluntary curbside recycling program utilizing municipal staff and a compartmentalized trailer. Rigid bins (one per household) and a curbside sort are used. Sorted recyclables are delivered to the Hall County Recycling Center.

Clermont reported 8.67 tons of recyclables collected in 2003. A total of 177 tons of waste was estimated disposed in 2003. This yields an approximate 4.7 % of the waste being diverted via the city's curbside recycling program.

Flowery Branch

Flowery Branch operates a once per week voluntary curbside recycling program utilizing a contracted recycler and 18 gallon curbside bins. Recyclables are collected once per week using a curbside sort.

Table 19 -- 2003 Recycling Tons for Flowery Branch

Month	***Tons***
January	1.15
February	1.08
March	1.23
April	1.13
May	1.05
June	1.2
July	1.05
August	1.05
September	1.2
October	1.2
November	1.2
December	1.5
Total	**14.04**

A total of 1,015 tons of waste was estimated disposed in 2003. This yields an approximate 1.4% of the waste diverted via the city's curbside recycling program.

Gainesville

Gainesville operates a voluntary curbside recycling program utilizing a contracted recycler and rigid curbside bins. Recyclables are collected once per week using a curbside sort.

Table 20 -- 2003 Recycling Tons for Gainesville

Month	***Tons***
January	53
February	49
March	53
April	57
May	65
June	53
July	51
August	49
September	58
October	58
November	57
December	63
Total	**666**

A total of 8,120 tons of waste was estimated to be disposed in 2003. Therefore, an estimated 8.2 % of the waste bound for the county landfill was diverted via the city's curbside recycling program.

The City should be able to consistently attain 20 percent diversion by increasing the participation rate and adding to the list of acceptable materials. There are concerns, however, regarding waste reduction progress among the Hispanic population that may stem from cultural differences and inadequate communication efforts.

Current (2004) costs for the City's recycling program are $3.30/household/month as per the BFI contract.

Gillsville

Gillsville does not offer a recycling program. Residents may use the county's compactor sites.

Lula

Lula does not offer a recycling program. Its residents may use the county compactor sites if they wish.

Oakwood

Oakwood operates a once per week mandatory curbside recycling program utilizing municipal staff and a compartmentalized trailer. Rigid bins (one per household) and a curbside sort are used. Sorted recyclables are delivered to the Hall County Recycling Center.

The total recycling for the City of Oakwood for 2003 was 17.65 tons. A total of 415 tons of waste was estimated disposed in 2003. This yields an approximate 4.1% of the waste bound for the county landfill being diverted via the city's curbside recycling program.

Hall County

Currently Hall County is collecting recyclables in custom-designed roll off containers or trailers located at all the compactor sites and the County Government/Education Building (see Table B-2 in the Appendix for locations). The custom-designed roll off containers have separate bins for each category of recyclable material. Trailers are used for collection of corrugated cardboard at all compactor sites and county office buildings. They are also used at the County Government/Education Building for collection of containers. Recyclables are transported to an intermediate processing center (IPC) located at 1008 Chestnut Street, in Gainesville. At the IPC, the recyclables are processed and placed on transfer trailers (provided by recyclers) for shipment. The newspaper is collected at all the sites located in Appendix Table B-1 by SP Recycling Corporation.

White goods (appliances, etc.) are collected and stored at the county landfill and eventually recycled by a private contractor on a monthly basis.

As previously noted, there are other recyclers operating in Hall County that deal mostly with scrap metals. Information about these recyclers can be found in the Appendix in Table B-2.

Processing/Recovery Centers

Hall County operates an intermediate processing center (IPC) at 1008 Chestnut Street in Gainesville. An IPC essentially processes source separated recyclables. The facility is located in an industrial area less than one half mile from I-985, which is nearly ideal from an operational and transportation standpoint.

The facility accepts glass, aluminum cans, aluminum foils, steel cans, corrugated cardboard, newspaper, office paper, computer paper, mixed paper, junk mail, magazines, bound books, HDPE and PETE plastics, used motor oil, grease (used cooking oil), and portable rechargeable batteries. The Resource Recovery Division manages the Hall County Recycling Center with labor provided by a county inmate work detail from the Hall County Correctional Institution. Materials are hand-sorted.

Materials are accepted on a voluntary basis. No fees are paid for receipt of materials. The bulk of the materials come from the county's recyclables collection areas located at compactor sites throughout the county. Some materials are also brought in by the public, businesses, certain cities within Hall County, and some surrounding local governments. All materials are processed on site, except newspaper, which is collected by SP Recycling Corp. for processing at their Lawrenceville location and used motor oil, which is pumped aboard a tanker truck from each collection tank location and hauled by Universal Refining of Peachtree City. An estimated 3,607 of the total 3,647 tons recycled in 2003 is estimated to be Hall County sources (excluding cities and sources outside the county) or approximately 5.1% of the total waste bound for the county landfill.

Taken as a percentage of waste diverted from the total residential waste collected via compactor sites—on an equal footing with the analysis done elsewhere for the cities—the diversion rate stands at approximately 9.1 %.

Private processing/recovery centers consist of scrap metals dealers, which are sometimes overlooked when one thinks about recycling. Such establishments also buy scrap and surplus materials for recycling or reuse. See Table B-2 in the Appendix for scrap metal dealers.

Table 21 -- Summary of Public Recycling Programs--2003

Local Government	Program Type	Waste Tons Collected	Tons Diverted	Percent Diverted
Clermont	Public, voluntary curbside	177	8.67	4.7%
Flowery Branch	Privatized, voluntary curbside	1,015	14.04	1.4%
Gainesville	Privatized, voluntary curbside	8,120	666	8.2%
Gillsville	None	68	0	0
Hall County, compactors only (1)	Public, voluntary drop off	26,934	2,705 (est.)	9.1%
Hall County, all in-county (2)	Public, voluntary drop off	26,934	3,607 (est.)	13.4%
Lula	None	401	0	0
Oakwood	Public, mandatory curbside	415	17.65	4.1%
Totals		37,321	4,313.36	10.4%

(1) Includes only recycled tons collected from compactor sites.

(2) Includes all recycled tons accepted from sources from within Hall County, excluding that received from Hall County municipalities.

Upgrades to Hall County Recycling Center

Since the 1993 Plan, upgrades were made as planned to the Hall County Recycling Center. These included a horizontal extrusion baler, conveying equipment, custom compartmentalized recycling roll off containers, building addition, glass crusher and

other items. The facility currently operates under capacity and has excess processing capacity remaining.

Hall County Study

During 1994 and 1995, the Hall County Resource Recovery Division completed an analysis of the county's residential waste stream and residents' recycling practices.

Due to changing market forces, Hall County has lost some recycling tonnage from commercial and industrial sources, most notably corrugated cardboard. The waste Hall County can control—residential waste from compactor sites—represents a resource for additional recyclable tonnage.

Since the majority of local governments in the county provide waste collection services for residential waste, that which is leaving the county is largely commercial and industrial waste. This means that the relative percentage of residential waste has increased from when the waste stream was surveyed in 1991 during the development of the original Comprehensive Solid Waste Management Plan. This also means that greater impact on the amount of waste disposed at the county landfill can now be obtained by focusing on the reduction of residential waste. This assertion is further bolstered by the foregoing source of waste survey.

Knowing the amount of each material being recycled from compactor sites and armed with the data developed by the waste sort, it is possible to calculate recovery rates for each material.

Good recovery rates exist for newspaper and corrugated cardboard. Over 60 percent of available newspaper and corrugated cardboard is being recovered for recycling. It is believed that recovery rates for corrugated cardboard are actually higher. Because brown kraft paper grocery bags are recyclable with corrugated cardboard, these were also weighed with corrugated cardboard. It is believed that many residents may not be aware the two materials are compatible. Grocery bags can also more easily be stuffed in a trash bag. These two factors together may account for lowered recovery rates for this material.

It should be noted that since the completion of this study, the market share for paper grocery bags has been largely supplanted by plastic.

The data show that, at the time of the study, Hall County was attaining an approximate 28% capture rate on those recyclables then accepted for recycling at compactors (glass, HDPE, PETE, magazines, newspaper, corrugated cardboard, aluminum cans, steel cans). The recycling program is achieving approximately 14 percent diversion of materials from disposal at the compactor sites. An 80 percent capture rate on those materials currently accepted for recycling would yield a diversion rate of nearly 39 percent or more than double the current rate. Many programs that institute volume based rates experience recycling increases of 40 percent or so.

Conclusions

Due to the exportation of commercial and industrial waste by private waste haulers, the relative percentage of residential waste disposed of in Hall County has increased. Therefore, reductions in residential waste are more effective in reducing the waste stream bound for disposal in Hall County, or more specifically, bound for the Candler Road Landfill.

Instituting volume-based rates will increase recycling. The question is whether we can handle the increased pressures on our hauling system, as it currently exists. Since recyclables are handled in an uncompacted state, every recyclable item diverted from the waste stream represents an item diverted from a compacted to uncompacted state. The increase in number of pulls on roll off containers will therefore increase. We must use this knowledge in making any changes to our current system.

A random waste sort was conducted on waste taken from the Hall County compactor sites in November 1994, January 1995 and July 1995 in an attempt to determine what percentage of each material was left in the waste stream that was not being recovered at the time of the survey. Table 22 shows the results.

TABLE 22 -- Recyclables Recovery

Type Material	Percent Composition	Amount currently recovered per year from all 10 sites in tons (estimated)	Amount disposed of per year from all 10 sites in Tons*	Percent Recovered	Revenues from items currently recovered from all sites	Total revenues that could be made if 80% of what is left in trash as sites were captured.
Glass (clear, brown, green)	8.5	325	1244	20.7	$11,050	$44,887
HDPE #2 Natural	0.6	35	88	28.5	$14,000	$42,160
HDPE #2 Colored	0.6	20	88	18.5	$6,000	$27,120
PETE #1 Mixed	1.6	40	234	14.6	$20,000	$113,600
Magazines	3.7	175	541	24.4	$5,250	$18,234
Newspaper	5	1173	732	61.6	$76,245	$114,309
Corrugated Cardboard	2.1	450	307	59.5	$63,000	$97,384
Aluminum Bev. Cans	1.7	35	249	17.6	$42,000	$281,040
Tin Cans	3.8	60	556	9.7	$1,800	$15,144
Various Mixed Plastics	9.9	0	1448	0	$0	$0
Box board	5	0	732	0	$0	$0
Yard Trimmings	0.7	0	102	0	$0	$0
Recyclable Mixed Paper	2.6	0	380	0	$0	$0
Non Rec. Mixed Paper	13.2	0	1931	0	$0	$0
Non Recyclable Glass	0.8	0	117	0	$0	$0
Organics	20.3	0	2970	0	$0	$0
Textiles	6.4	0	936	0	$0	$0
Other Mixed Metals	0.9	0	132	0	$0	$0
All Other Materials	12.6	0	1843	0	$0	$0
TOTALS	100	2313	14630		$239,345	$753,878

*** FY 1995**

Problem Wastes

Special Management Items

White Goods

Hall County provides a collection area at its landfill for the separate collection and recycling of white goods. Chlorofluorocarbons (CFC's) are evacuated and collected from appliances by a certified recycler. CFC's are known to be detrimental to upper level ozone and are prevented from being knowingly released into the atmosphere by federal legislation. White goods are recycled for their metals content.

Lead Acid Batteries

Lead acid batteries are prohibited from disposal in Georgia's landfills. Therefore, similar to white goods, these are accepted at a separate area at the landfill property for recycling. When found in waste delivered to the tipping floor of the receiving building, they are separated by workers and deposited at the battery recycling area. State law also requires battery retailers to accept customers used batteries for recycling at point of transfer, i.e., sale.

Tires

In 1990, Hall County implemented a ban on scrap tires entering the landfill.
Scrap tires, like all solid waste, come in a steady stream. Their waste generation is estimated at one tire per person per year. In Hall County alone that amounts to over 150,000 tires per year.

Uncovered tires pose a fire hazard and provide habitat for rodents and insects. Covered, whole tires tend to float to the surface of the landfill and recovering becomes necessary. Grinding, shredding, chopping, or slitting will solve the floating problem.

In recent years, the state of Georgia has placed an emphasis on proper management of scrap tires by cleaning up illegal tire piles and providing grant funding to local governments for local enforcement and education programs. The proper handling of scrap tires is now heavily regulated.

However, the funds and funding mechanism for this program have been placed in jeopardy. The Georgia Legislature has failed to appropriate funds to the Solid Waste Trust Fund, choosing instead to use them to balance the State budget. In addition, the $1.00 per tire fee assessed at point of sale is set to sunset in 2005. It is important for all local governments in Hall County to support continued funding for proper management of scrap tires in Georgia. Past experience has shown that discontinuing funding will result in a return of problems, such as illegal tire piles.

Hall County has developed educational materials with state grant monies detailing the options for management of scrap tires in Hall County. Residents are urged to let their tire retailer handle their used tires. The second option is to take them to the tire recycling area at Hall County landfill. The county contracts with a tire recycler for proper handling.

Used Motor Oil

The 1993 plan recommended collecting and recycling the estimated 98,625 gallons of DIY (do it yourself) used oil in 1992 and the projected 120,322 gallons of used oil by 2002. The method chosen was the placement of used oil collection containers at each compactor site and the recycling center on Chestnut Street. As of 2004, there are total of 14 collection sites maintained by Hall County. Amounts collected ranged from 10,850 gallons in 1994 to 45,810 gallons in 2003 for an increase of 422 percent since the program's inception. The volume collected continues to grow each year.

Should Hall County move forward with conversion to curbside collection in selected areas, the county should monitor any adverse impacts on volume of used oil collected. Should the volume of used oil collected be adversely affected, the county should investigate alternatives to recover the lost volume, including but not limited to, curbside collection, new drop off locations in affected areas and private sector efforts. Curbside recycling should be included in the recommended collection system analysis.

Alabama's longstanding and successful, Project R.O.S.E. (Recycled Oil Saves Energy), provides several examples of metropolitan areas collecting used oil at the curb with regular garbage pickup. These communities include Tuscaloosa, Huntsville, Athens, and Decatur. Residents place used oil in a clear leak proof container, then leave it alongside garbage containers at the curb. City sanitation workers transfer the used oil to a holding tank at city facilities where it is picked up for recycling. Garbage trucks are typically retrofitted with storage racks for this collection option.

According to a 1989 brochure from EPA, some other communities that were collecting oil at the curb at the time include:

- Five cities in California
- Minnesota Metropolitan area
- Haddonfield, NJ
- Mount Olive, NJ
- Hamburg, NY
- Cary, NC
- Over 100 communities in Oregon
- Columbia, MO

Regular or periodic curbside collection is certainly an option.

Household Hazardous Waste

Hall County has developed a brochure on the topic of how to manage common household chemicals such as paint, anti-freeze, gasoline, used motor oil and batteries. In keeping with the national standard, paint appears to be the most common item in this category among Hall County residents.

Both Gainesville and Hall County Solid Waste Divisions have noted that paints can be a problem. Cans sometimes break in packer trucks or compactor containers, and may leak out of moving trucks onto the public's vehicles. Both indicate paint is not a big enough concern to justify the cost of doing something else, however.

A collection program to handle paint and related products (stains, paint thinner, varnish, etc.) had been investigated by the Hall County Resource Recovery Division and the

Environmental Management Committee of the Greater Hall Chamber of Commerce. It was determined that the cost for one single day event could be on the order of $30,000. A workable funding mechanism could not be found to host a conventional collection event. See Disposal Element for additional discussion of handling of paints under "Special Management Items".

For now, the County provides recommendations for proper management of household hazardous waste from a publication by the Pollution Prevention Assistance Division entitled "Guide to Best Management Practices for Household Hazardous Waste and Radon".

Electronics

Electronics products have gained some attention in recent years both due to the growth of the personal computer and ancillary equipment market, and the rate at which the technology becomes antiquated and the search for the next significant source of heavy metals in the waste stream. Now that lead acid batteries have been banned from landfills and enjoy a very high recycling rate and mercury use has been highly reduced in alkaline batteries and fluorescent tubes, the focus has changed to electronics as the next major source of heavy metals. Lead, mercury, cadmium and chromium comprise some of the metals of concern found in electronics.

In the United States alone, 20 million or more PCs became obsolete each year, meaning more than 315 million computers will have been disposed by 2004. Computers, TVs and other electronic equipment account for 220 million tons of waste each year in the U.S., of which more than 10% goes straight to landfills (a percentage quickly climbing). As much as 80% of the PCs and other e-waste collected for recycling in the U.S. happens to end up in Asia — where it may be unsafely disposed.

Along with Athens/Clarke and Rome/Floyd Counties, Hall County held a one-day collection event on November 17, 2001 for recycling of PC's, televisions and VCR's. The three jurisdictions were each granted $10,000 by the Georgia Department of Community Affairs for the event as part of a pilot project to obtain experience in this new

area of recycling. Hall County had a total of 121 participants bring in an estimated 13,900 pounds of electronics for recycling at its one-day event. Based on the estimated population of 139,000 at that time, the generation rate was 0.1 pounds per person. Virtually all of the $10,000 was spent on advertising, operating supplies and contractor's fees required for the event. This information could be used as a rough guide for future events.

Some states have enacted legislation banning disposal of certain electronics waste such as computer monitors. Other states, such as Georgia, have established ad hoc committees to investigate the issues and make management and/or legislative recommendations based on their findings.

The National Electronics Product Stewardship Initiative (NEPSI) is a group coordinating an agreement among governments, manufacturers and environmentalists on a nationwide electronic-waste recycling program. Perhaps the biggest issue so far is how to pay for a national recycling program. In March 2002, the group agreed in principle on the concept of a "front-end" fee on PC users, i.e., an extra amount to finance its so-called "end-of-life" costs. Some feel the upfront fee will be less a deterrent to recycling and safe disposal than the current back-end charges (by most recyclers and manufacturers), which may act as a disincentive.

While they don't disagree, representatives of the manufacturers are sensitive about the amount of such a fee. Even adding $25 to $30 to the price tag of PC or other electronic device could hurt sales or be unevenly applied by different importers, big-name brands or other manufacturers. In the meantime, manufacturers may act to make a bigger contribution by designing new products with lesser amounts of lead, mercury and other toxic materials.

It is unclear how electronics will be managed in Georgia, as this is a developing and changing issue both nationally and locally. It is enough at this point to monitor

developments and be open to the possibility of and opportunities for separating selected electronics materials for recovery via reuse and recycling.

Organics and Yard Trimmings Management

Composting is the natural decomposition of organic material by microbial activity under aerobic conditions. It occurs naturally and unaided all the time in our natural world. It can also be made to occur under controlled conditions as a means of waste reduction to produce a usable product, in the form of a soil additive. The end product is a humus material, which increases moisture retention in sandy soils and porosity in clay soils. This material may have valuable agronomic uses. Studies have shown that compost may keep plants free from root rot and other fungal diseases. Compost helps promote plant root development, thus increasing a plant's resistance to drought and wind stress. Waste products in the composting process are heat, water and carbon dioxide. Volume reduction ranges from 40 to 75 percent of original volume.

Factors affecting the compost decomposition rate are the carbon/nitrogen ratio, moisture content, oxygen, and internal temperature. Carbon provides energy for the microorganisms and is released into the atmosphere in the form of carbon dioxide. A beginning carbon/nitrogen ratio of 25:1 to 30:1 is recommended. Table 23 illustrates average carbon/nitrogen ratios for selected materials.

Table 23 --Carbon/Nitrogen Ratios Of Common Composting Materials

Food waste	15:1	Leaves	60:1
Wood	700:1	Fruit waste	35:1
Sawdust	500:1	Rotted manure	20:1
Straw	80:1	Cornstalks	60:1
Grass clippings	19:1	Alfalfa hay	12:1
Broiler litter	11:1	Hen manure	6:1
Pullet litter	18:1		

References: Hall County Cooperative Extension Service, 1990
University of Georgia, Cooperative Extension Service, 1991

Moisture is needed by microorganisms for growth. An easy test for moisture content is to grasp a sample of the composting material. It should have the feel of a damp sponge, and when squeezed no free moisture should be wrung out. Excessive moisture can lower temperatures and oxygen levels, resulting in odor problems.

Adequate oxygen penetration into the decomposing mass is needed to maintain aerobic biological conditions and hasten decomposition. Oxygenation is used to increase microbial activity and thus raise temperatures.

Internal temperature of the composting material affects the rate of decomposition and destruction of pathogens and weed seeds. Temperatures should range from 130^{o} F to 150^{o} F for best results. Most weed seeds are inactive at 150^{o} F to 160^{o} F, and at these temperatures pathogens and fly larvae are almost completely destroyed.

Home Composting

Home composting can be a key component of waste reduction. Many areas, notably Seattle and several local governments in Georgia, have made home composting units

(bins and other enclosures) available to residents in a coordinated effort. Many vendors of such units are more than willing to assist in this regard.

Home composting may also be done without the use of commercially made bins. In fact, it can be done with no bin at all. However, a bin does help to maintain a neater appearance, maintain a higher pile to generate higher internal temperatures and keep out unwanted animals.

Preprocessing

Many times, preprocessing of wastes in advance of composting is desirable. One of the most common preprocessing methods is to chip wastes. A chipper may be used to chip woody wastes such as small tree limbs and brush.

A tub grinder may be used to grind organic wastes such as brush, leaves, grass, pallets, construction waste wood, and tree limbs. Tub grinders consist of a rotating tub into which materials to be processed are loaded. Beneath the rotating tub is a high-speed hammermill. Tub grinders may be useful in further size reducing pre-chipped wastes or can handle a variety of unprocessed wastes.

A drawback to tub grinders is the tendency for the hammers to require frequent replacing or resurfacing. This may be expensive in materials, labor and lost grinding time. Materials such as leaves tend to cause rapid wear due to the relatively large amounts of grit they contain. Tub grinders are also prone to damage by metal contaminants that may be found in the waste.

High torque shredder/grinders may also be used to process yard wastes. Some grinders use slowly rotating augers. These need to be resurfaced or replaced less frequently than hammers in tub grinders. However, particle size may not be as uniform or small as that produced by tub grinders.

The main goal of preprocessing is to reduce the size of the material being composted. Size reducing the material has the benefit of increasing the surface area for microbes to inhabit, thus increasing their populations and hastening the composting process. Preprocessing can also serve to mix materials. Mixing is also beneficial in creating uniformly favorable conditions throughout the composting mass.

Preprocessing may also be an end in itself if the material is to be used for mulching. Medium and fine textured mulches are less likely to be blown by wind, becoming seated on the landscape better than course materials. Mulches help conserve moisture, insulate plants against temperature extremes and help control weeds. They also decompose and add nutrients to the soil.

Markets

Marketing of compost should be considered up front when planning a project. Local government should have some involvement in marketing, even under a full-service contract. A year should be allowed to develop a marketing program. Give-away programs may help move compost, but to the extent possible, compost should be sold. If residents pay for compost, they are more likely to see it as a valued product. Markets for compost include landscaping (public and private) projects and horticultural uses. The agricultural community represents a largely untapped market for compost. Horticultural and agricultural interests are likely to have more stringent quality standards.

Like recycling, composting should not be looked upon as a money making proposition. Experts recommend that for budgeting purposes, local governments project zero dollars from the sale of compost. In Wesley Hills, MA, for example, efforts are made to sell the 4,000 to 5,000 tons of yard waste compost produced each year, but much of it goes to community projects or is donated to various groups.

Municipal Composting

As a municipal program, composting is most likely to be of the low-tech windrow approach. Front-end loaders are commonly used to turn and aerate the composting

material. This material is most likely to be leaf and yard waste. Such waste tends to be high carbon, low moisture material. It does not tend to attract vectors or cause objectionable odors. High moisture, high nitrogen materials such as grass clippings can cause objectionable odors if allowed to clump and become anaerobic. To avoid this, the material must be preprocessed to ensure the clippings are evenly mixed with more carbonaceous materials.

Central Yard Waste Composting

Central yard waste composting is the composting of leaf and yard waste at a centralized facility. It may be publicly or privately operated. It is likely to be a "low tech" approach, commonly composted outside using windrows. It presents a low probability for odor problems; however, care must be taken to break apart grass clumps to avoid these areas becoming anaerobic. According to the Solid Waste Composting Council (SWCC), there are approximately 1,400 central yard waste composting projects currently operating in the U.S. Some have been in existence for over a decade. According to Franklin Associates, on average more than half of total yard waste may be grass clippings. No central yard waste composting is being practiced in the planning region. Yard wastes may be collected for composting either loose or in some form of container at the curb. With container collection, yard waste may be placed in paper or plastic bags or some type of rigid bin. Such a collection method offers the advantage of using existing refuse equipment for collection. A disadvantage is distribution of bags or bins to residents. Loose leaves can also be collected using special equipment such as "pincer" type buckets attached to front-end loaders or skid steer loaders. Vacuum machines can also be used.

In-Vessel Composting

In-Vessel composting implies composting indoors using specially designed enclosures. These enclosures may be of various types, such as rotating tubes or concrete stalls. This method is likely to use forced aeration along with mechanical turning. In-vessel systems offer greater control of the entire process since it is done in a closed environment free from outside environmental fluctuations such as precipitation and temperature. Such systems may also be more energy dependent, i.e., energy is required for forced aeration

and mechanical turning. The advantage is that these systems produce a finished compost in the least amount of time. They also offer greater odor control by regulating oxygen levels, moisture levels, and by using biofilters or other "scrubbers" to remove any objectionable odors released to the environment. As of 2003, no in-vessel composting is being done in the planning region.

Municipal Solid Waste (MSW) Composting

Most facilities compost yard waste, but increasing numbers are focusing on MSW. In general, these are higher technology facilities processing mixed MSW as their feedstock. MSW composting may, of course, also be done on a home composting level.

There is considerable debate regarding source separation versus non-source separation MSW composting. Some feel that not enough research has been done to definitely say whether source separation or non-source separation has the least environmental impact and the lowest total cost. Opponents of mixed MSW composting (sometimes called "mass composting") argue that such an approach circumvents the need for source separation and preprocessing of compostable components. Supporters of mixed MSW composting point toward the ability to compost the largest fraction of the 60 percent of the waste stream that is compostable, and that it therefore offers the greatest diversion of waste from landfills. Common arguments for and against mixed MSW composting are summarized below:

For:

1. Source separation of compostables is unnecessary.
2. Avoiding separate collections results in cost savings.
3. Environmental impacts of separate collections are avoided.
4. Mixed MSW composting plants can recover recyclables.
5. Mixed MSW composting plants can produce marketable compost.
6. The largest fraction of MSW is composted and therefore offers the greatest waste diversion.

Against:
1. Recycling materials that can be recycled may be a higher use than composting them.
2. Our throwaway mentality will be reinforced since manufacturers and consumers might find generation of "compostable" discards acceptable.
3. Mixed MSW composting may produce an inconsistent product of questionable quality and limited marketability.
4. There is a question whether current technologies adequately remove non-compostables, recyclables, and hazardous components.
5. Source separation produces higher quality compost.
6. Mixed waste composting provides an easy solution that will weaken reduction and recycling efforts.

The usual approach with mixed MSW composting is to screen out the non-compostable fraction, such as metals and plastics, at the back end. Both supporters and opponents agree that the composting process benefits from front-end separation. Where they differ is on the degree of separation. Table 24 shows data from an unpublished paper by l'Hermite of concentrations of seven heavy metals in composts produced in Germany from mixed MSW, from separate collection and from tree and shrub prunings and agricultural wastes.

Mixed MSW composting systems that preprocess incoming wastes by mechanical grinding or shredding should be avoided. Such systems offer the greatest risk of contamination because contaminants may be liberated into the compost. Items such as dry cell batteries and aerosol cans, if shredded, may provide an avenue of contamination. It is not clear whether the analysis presented in Table 24 represents results from a system that utilized shredding of incoming mixed MSW.

Table 24 -- Effect of Source Separation on Heavy Metal Concentration in Composts

	Compost (dry weight)						
Feedstock	Cd	Zn	Pb	Cu	Cr	Ni	Hg
Source Separated MSW	408	133	33	36	29	nd*	1
Central Separated MSW	1570	513	274	71	45	2.4	5.5
Prunings and Agricultural Compost	80	27	22	16	21	<1	<1

Reference: l'Hermite. From "Source Separation and MSW Compost Quality" by C.G. Golueke and L. F. Diaz, 1991, BioCycle

*nondetectable

Co-composting

Co-composting is the simultaneous composting of one or more waste streams with sludge from wastewater treatment facilities or some other nitrogen rich material. The sludge provides the moisture and nutrients, while the other wastes provide the bulking agent. A 3:1 ratio of bulking agent to sludge is recommended.

When mixing different waste streams, contamination, especially from sludge is a possibility. A study for EPA by the County Sanitation Districts of Los Angeles County of 498 sludge products revealed the products free of pathogenic viruses and viable ova. The pathogenic bacteria of Salmonella and Yersenia were detected in a significant number of the sampled products. However, in the same report researchers found no evidence of anyone getting sick from using a sludge compost-based product.

Organics or Yard Trimmings Management in Hall County

Clermont

Clermont does not provide collection of yard waste to its residents. As a result, residents must self manage. Local officials speculate that many residents burn yard trimmings in the fall. There seem to be no feelings among residents to indicate burning as a problem. Most homes are on one acre lots, as required by the Town. This may help to facilitate on-site management. Most subdivisions don't have a lot of trees to create leaves. Grass clippings are not an issue locally.

Clermont should review its local ordinances to ensure it has a requirement that yard trimmings not be placed in or mixed with municipal solid waste and should encourage home composting.

Flowery Branch

Flowery Branch provides weekly collection of yard trimmings on Monday. Mulch is produced and made available to residents.

Gainesville

Some passive composting is practiced by cities such as Gainesville that pile the leaves collected at curbside to compost on their own. Yard trimmings are chipped when possible. Both mulch and leaf compost are made available to residents free across the street from the Sanitation office on Altavista Road. Much of the wood mulch is from the streets department, as a result of right-of-way maintenance and trees across roads and storm damage. Larger limbs and tree parts that are collected by the streets department are deposited at Altavista for residents to get for firewood. What is left gets chipped by the streets department. The yard trimmings collected by sanitation are materials put out at curbside from yard maintenance and storm debris that comes down on resident's property. Gainesville participates in the annual Bring One for the Chipper program to chip Christmas trees into useful mulch.

Gillsville

Gillsville does not provide for collection of yard trimmings. Residents self manage.

Lula

Yard trimmings are chipped by municipal staff at the curbside once per month. Mulch is made available to residents.

Oakwood

Limbs are chipped and mulch given back to residents. Oakwood has a mulch site near the community building adjacent to the city park on Allen and Railroad Streets. Mulch is made available to residents.

Hall County

Home Composting

In March of 1992, Hall County received a grant from the Department of Community Affairs (DCA) to construct a home composting demonstration site, which was located at Elachee Nature Science Center. The demonstration site has helped provide a useful resource in helping to spread the word about home composting. There is a strong association between home composting and gardening. As a result, it is likely to be much more prevalent in rural areas.

Mulching

Hall County participates in the annual Bring One for the Chipper program to chip Christmas trees into useful mulch. Hall County has chippers used in right of way clearing and maintenance. The mulch is provided free to area residents. Hall County could review the need of offering periodic grinding of yard trimmings as a service to residents and as an alternative to disposal.

Composting

Composting has been studied and promoted by the Chestatee-Chattahoochee Resource Conservation and Development Council, Inc., using funding from federal, state and local

sources. The focus has been the evaluation and demonstration of on-farm composting of poultry litter and dead birds.

Guidelines have been developed for composting dead birds as an alternative to pit disposal. It can also provide poultry producers an alternative method of utilizing large quantities of poultry manure.

The use of poultry manure as a nutrient source can be used to enhance the composting process. It increases pH, decreases the C/N ratio and increases bulk density. Bulk density is an indicator of the degree of decomposition, as it reflects the decrease in particle size. Table 25 illustrates the results of a study conducted in Alachua County, FL. The study showed that higher temperatures were maintained for a longer time when poultry manure was added to yard waste.

Table 25 -- Properties of Co-Composted Yard Waste and Poultry Manure after Composting for 16 Weeks and Curing for 3 months

Treatment*	pH	C/N	Bulk Density g/cm3
9:1	6.7	1:28	0.25
10:0	6.4	1:41	0.21
3:1	7.2	1:24	0.34

*9:1 = 9 parts yard waste and 1 part poultry manure (volume basis typical for each)
Reference: Alachua County, Florida, 1991

The use of poultry manure can carry with it certain management problems such as flies and odors. Odor problems can be controlled by not storing poultry manure at the site and incorporating it into the yard waste as soon as it arrives. Frequent turnings of twice per week also help. The Florida study showed flies to be a problem at the 25 percent level of poultry manure; however, fly larvae were never present when 10 percent poultry manure was used.

As called for in the County's Comprehensive Solid Waste Management Plan, in July 1997, Hall County embarked on a grant-funded project to combine waxed coated corrugated cardboard (WCC) and broiler litter into a composting project. The previous solid waste plan had identified sources of wax coated corrugated cardboard as primarily from poultry processing, the county's largest employer. Prior to beginning this project, a small pilot project was conducted. It was found that the coated cardboard and poultry waste provided a mixture feasible for composting. A work group of the Comprehensive Solid Waste Management Plan Implementation Committee was formed to oversee the planning and implementation of this project. The workgroup included representatives from the poultry industry, as well as local governments and UGA.

Leading up to the project, the work group looked into various options for dealing with wax coated corrugated cardboard boxes. Options considered included recycling, energy recovery (incineration) and composting. Composting was felt to be the best option, as it offered a measure of local control.

Once this option was decided upon, a pilot study was conducted. UGA was enlisted to conduct laboratory testing of various mixtures. WCC was shredded and mixed with poultry manure to speed the composting process.

A field study was also conducted involving the setting out of shredded WCC/poultry manure in a row about 4 feet high by 16 feet wide by 300 feet long. A contractor was hired to compost the material. The pilot proved the feasibility of producing finished compost in about 3 months. The finished compost was tested in a laboratory and found to be of very good quality.

The selected site for the full-scale project was the Allen Creek Landfill, which at that time had been closed for nearly two years. The site opened on May 10, 1999. In addition to WCC, yard trimmings were also accepted at the site and turned into useful wood mulch. Hours of operation were Monday through Saturday 8 a.m. to 4 p.m.

A horizontally fed grinder with a 200 horsepower industrial diesel engine was purchased for use on the project. Unfortunately, due to unforeseen technical problems involving equipment and site limitations, the project was discontinued in September 1999.

Lessons learned:

1. A differential of five dollars is enough to provide generators of WCC (wax coated corrugated) incentive to separate and bring the material to a recovery facility.
2. People will pay $5 per ton for wood mulch.
3. There was a good balance between wood waste coming in and mulch going out.
4. The grinder was not adequate to keep up with demand.
5. The grinding of WCC produced a lot of airborne dust (paper fibers) that clogged the radiator and air filter on the grinder.
6. The toughness of the WCC and airborne dust interacted to cause overheating of the grinder's engine unless closely monitored.
7. The roughly 3.5 acre site was not large enough for the project.
8. Applying gravel to the composting pad was a mistake, as it became incorporated into the compost with turning.

Waste Reduction in Times of Disasters

For discussion of waste reduction in times of disasters see "Solid Waste Management In Times of Disasters" within the Education and Public Involvement Element.

Needs/Goals

Adequacy of Waste Reduction Program

While the waste sources that contribute waste to the county landfill have definitely changed from the 1993 plan, going from heavily weighted to commercial/industrial (85%) to weighted towards residential (53%) in 2003, Table 5 shows that overall, the residential portion still remains at approximately 15%. If the goal were to be reduction in the amount of waste disposed at the county landfill, in order to extend its life, one might concentrate more on residential waste reduction activities. However, if the goal were to be working toward achieving the State's reduction goal, as was the case with the 1993 plan, concentration solely on residential programs will not achieve the State's 25% per capita waste disposal reduction goal.

State's Per Capita Waste Disposal Reduction Goal

The Commissioner of the Georgia Department of Community Affairs in 1997 asked the State Attorney General for an opinion as to whether the State's waste reduction goal, which was based on the date of July 1, 1996, was still in effect. The Attorney General's Office issued the following official opinion on July 11, 1997:

> "Therefore, it is my official opinion that the essential intent of Code Subsection 12-8-21(c) is the reduction of solid waste by 25 percent. This goal remains effective in applying related requirements of the 'Georgia Comprehensive Solid Waste Management Act,' notwithstanding that the goal was originally expressed in terms of a calendar date which has passed. Jurisdictions which met the goal should continue the process of maintaining it; jurisdictions which did not meet the goal should continue the effort to reach it."

The date was ruled to be part of the goal but not the end of it. The Subsection that sets this goal is a part of the "Georgia Comprehensive Solid Waste Management Act".

The state's waste reduction goal plays a part in several requirements of the Act. These include:

1. Each city and county must have a program in its solid waste management plan for meeting the goal;
2. No permit, grant or loan may be issued for a municipal solid waste disposal facility unless the host jurisdiction and other jurisdictions which will contribute waste are actively involved in and have a strategy for meeting the goal;
3. Permits for solid waste handling and for solid waste handling facilities are similarly conditioned; and
4. Local jurisdictions and the Department of Community Affairs are required to report on progress toward meeting the goal.

Table 16 shows the current estimated per capita generation rate at 8.79 lbs/person/day. The base year 1992 per capita waste generation was an estimated 6.41. To achieve the 25% reduction from the recognized base year or a decrease to 4.8 lbs/person/day would take a total reduction of nearly 4 lbs. or a 45% reduction from the current generation rate. It is believed that the base year waste generation rate may be flawed is as much as the data on out of county waste exports was lacking or its existence unknown during

development of the initial plan, and scales were not in place at all disposal facilities during all of the base year.

That being said, the reduction goal established by the state is a statewide goal to be measured and achieved on a statewide basis. Therefore, focusing on transferring this to a countywide basis is not what the Act requires. So long as the planning area has a meaningful reduction strategy in effect and is actively engaged in implementing it, the requirement is being met. The reduction measures outlined herein should be adequate to meet that goal.

Reduction Activity Summary

Previous to March 1992, Hall County Government contracted with private firms for recycling collection and/ or processing. In some instances, the County hauled recyclables (newspaper) to private processing facilities. This changed on March 6, 1992 when the County took on collection, processing, and marketing of all recyclables. From late July 1991 to March 6, 1992, Hall County contracted with Sonlight Recycling and Recovery for recycling services.

Other considerable reduction efforts are ongoing among area businesses and scrap metal dealers. These are, however, difficult to document since they are not government programs, and wastes they process may be imported from outside the planning area. Tables 26 through 30 summarize reduction efforts from inception to 2003.

Table 26
Hall County Recycling Statistics for
March 1989 to June 1989

Commodity	Tons Recovered	% of Total
Newspaper	204.47	100
TOTAL	204.47	100

Table 27
Hall County Recycling Statistics for FY 1990
(July 1989 to June 1990)

Commodity	Tons Recovered	% of Total
Aluminum	4.65	0.5
Glass	4.98	0.5
Misc. Paper	5.57	0.5
Newspaper	800.09	80.1
Scrap Metal	184.06	18.4
TOTAL	999.35	100.0

Diversion Rate= 999.35 Recyclable Tons / 153,598.86 Total Waste Tons X 100 = 0.65%

Table 28
Hall County Recycling Statistics for FY 1991
(July 1990 to June 1991)

Commodity	Tons Recovered	% of Total
Aluminum	9.63	0.6
Glass	73.01	4.7
Misc. Paper	6.00*	0.4
Newspaper	1116.93	71.7
Scrap Metal	351.96	22.6
TOTAL	1557.53	100.0

Diversion Rate = 1557.53 Recyclable Tons / 117,451.70 Total Waste Tons X 100 = 1.3%
*Estimated

Table 29
Hall County Recycling Statistics for FY 1992
(July 1991 to June 1992)

Commodity	Tons Recovered	% of Total
Aluminum	25.00*	0.8
Corrugated Cardboard	42.63	1.4
Glass	305.00*	10.2
Misc. Paper	10.00*	0.3
Newspaper	1,209.80	40.4
Plastics	50.00*	1.7
Scrap Metals	354.05	11.8
Waste Tires	1,000.00	33.4
TOTAL	2,996.48	100.0

Diversion Rate = 2,996.48 Recyclable Tons / 116,272.73 Total Waste Tons X 100 = 2.6%
*Includes some estimated weights due to incomplete record keeping during transition from contracted, privately provided service to publicly provided service.

Table 30 shows an apparent disparity in growth rates between the increase in waste tons and recyclable tons collected from Hall County compactor sites. Assuming the rate of recycling among county residents were to remain more or less constant, the rates of growth should track more consistently. However, the data show this not to be the case. There must be factors at play that create this phenomenon.

As explained in the Collection Element, the rate of overall recycling at compactors has lagged behind the growth in waste disposal. The impact of a full compactor is negligible to the waste disposal customer. However, the same cannot be said about the impact a full recycling bin has on a customer who has made the extra effort to recycle. The impact is one of definite negative reinforcement. The result of such negative reinforcement may be the cessation of recycling in the affected household. By comparison, even if the compactor is full, the customer disposing of waste is instructed to leave the trash bag(s)

on the ground near the compactor unit. Since the customer was able to achieve the desired end result of getting rid of their trash, there is no negative reinforcement and, consequently, no impact on their future use of the compactor sites for waste disposal. Further reinforcement of this view is provided by comparing growth in tons of trash and growth in tons of recyclables (see Table 30).

Recommendation

The constraints that are currently placed on the collection of recycling roll offs by adhering to a set collection schedule has a tendency to act as an arbitrary limit on growth. If Hall County desires to increase its recycling rate and offer improved customer service to residents participating in recycling, collection frequency of recycling roll offs should be increased by changing from collection as determined by a set schedule to collection on an as needed basis.

Table 30 --Comparison Of Waste Tons And Recyclable Tons From Compactor Sites

Year	Waste Tons	Recycling Tons(1)	OCC	Total Recyclables
1995	14,914	2,238	524	2,762
1996	15,930	2,316	565	2,881
1997	18,837	2,405	627	3,032
1998	19,762	2,459	687	3,146
1999	20,942	2,49	754	3,251
2000	23,161	2,640	782	3,422
2001	24,730	2,461	1,403	3,863
2002	25,720	2,453	1,238	3,692
2003	27,145	2,468	1,179	3,647

(1) Excludes corrugated cardboard

Corrugated cardboard was excluded from Table 30 to isolate the comparison to those recyclables collected in roll off containers with waste collection.

Targeted Reduction Activities

In order to be effective at reducing the overall waste generation rate, as discussed previously, it will still be important to promote and assist with waste reduction in the

commercial/industrial sectors, as well as construction and demolition wastes, which are likely due, in large measure, to commercial activity (construction and demolition contractors). While it is true that many in the business community, especially manufacturers, have made great strides in reducing their waste output, the data in Table 5 show there is apparently much work in this area left to do. Even though waste reduction strategies should target these areas, reduction that can be realized in the residential sector should not be ignored, especially if they can be obtained relatively quickly and easily. Residential waste reduction will result in life extension to the county landfill, which is now weighted toward residential waste.

Needs/Goals Summary

Possible strategies for obtaining increased waste reduction in the targeted commercial and industrial sectors could include:

1. Greater presence of EnviroShare program
2. Cooperative marketing of recyclable materials, within EnviroShare program.
3. Partnering with others offering reduction assistance to the target sectors. P2AD, GA Tech, UGA, others.
4. Increased education on advantages of waste reduction on improved competitiveness.
5. Increased aggressiveness in waste reduction targeted to businesses. This could take the form of collection of corrugated cardboard, and possibly other materials, provided by Resource Recovery Division. Rome/Floyd and Athens/Clarke have done this. Service could be provided to those businesses that are not currently being serviced by private sector recyclers, so as not to be seen as competing with the private sector. Former County Commissions have established such a policy. It is not known whether the County Commission still holds to this policy. Many businesses are not recycling key, easily recycled materials such as corrugated cardboard, perhaps due to their being too small to recycle via the private sector or due to lack of storage space to

store material for a week or more at a time. A public sector effort might be able fill a need.

Possible strategies for obtaining increased reduction of residential waste for Hall County and its municipalities could include:

1. Increased education. There are concerns regarding waste reduction progress due to cultural differences and communications challenges when addressing the Hispanic community. This is especially the case for Gainesville, which has a large Hispanic population.

2. Providing residents with recycling and/or composting bins

3. PAYT/curbside recycling. PAYT and curbside recycling should be included in the recommended collection system analysis.

4. Increased aggressiveness in waste reduction targeting residents.
   This could be done by offering to buy (commonly referred to as "buy back") certain materials that are accepted at the Hall County Recycling Center. This has been done by Rome Floyd and Gwinnett County. Buy back could be limited to materials that are not already being sought by private recyclers in Hall, in order to avoid competing with the private sector, if that were a concern.

5. Increase collection frequency of recycling roll offs by changing from collection as determined by a set schedule to collection on an as needed basis.

Additional Needs/Goals

1. Drop and swaps are one-day events that can be offered for the purpose of reusing items such as paints and furniture. Such programs have been successful in other areas. The same could also be done with household hazardous wastes on a more limited basis. Drop and Swaps could be advertised via local media resources (see Education Element) and conducted

one Saturday in the spring and one in the fall by Resource Recovery and Keep Hall Beautiful. Based on response, the program could be offered more often.

2. Require private haulers to offer recycling service to their customers. Explore options for enforcing this requirement, such as through business licensing. Meet with private haulers as issues affecting them arise. Private haulers could be required to offer recycling service to their customers. An ordinance requiring that haulers comply must be passed by the County and all municipalities. The ordinance could be enforced by requiring compliance in order to receive a business license.

3. Continue and expand the drop off programs at county compactor sites. Add opportunities for recycling of other materials as feasible.

4. Provide used oil collection in municipalities for use by residents. Drop off areas should be located such that municipal personnel can supervise the facility. The alternative of requiring businesses who sell motor oil to participate with local governments in the program seems to compliment the activities of other types of businesses in working toward the goal of reuse, reduce or recycle. Businesses need to be involved to the point of having a significant role and commitment to the program. Experience has shown in many cases that the business leaders will accept the responsibility for protecting the environment and in many cases can provide meaningful input to local governments in developing programs. A public/private partnership for DIY used oil recycling should be considered as the alternative that should be implemented by Hall County municipalities.

   Each municipality offering solid waste collection would provide a location for DIY used oil to be collected. The location for a collection container and the container, including maintenance around the site and quality control, would be provided by the municipality. Hall County would provide collection containers at the 13 compactor sites located throughout the county for

residents in the unincorporated areas and offer to include all municipal collection containers in a contract with a used oil recycler. Municipalities would participate in the cost/revenues of the county contract with a used oil hauler.

A committee of retail business managers who sell motor oil would be appointed by elected officials to develop a program for offering recycling opportunities to include incentives and an educational program.

5. Review the need of upgrades to Hall County Recycling Center at 1008 Chestnut Street to accommodate additional volume. The services of a design firm familiar with layout of facilities for sorting commingled recyclables should be enlisted in the design of sorting lines or other improvements.

6. Explore the feasibility of alternatives to wax coated corrugated cardboard that contributes toward waste reduction. As part of the EnviroShare program, packaging alternatives to coated corrugated cardboard would be explored.

7. Encourage home composting via implementation of home composting bin distribution program and utilization of the regional demonstration site at Elachee Nature Science Center. Low cost or free home composting bins are available in the form of surplus and discarded pallets. Hall County and municipalities would be encouraged to distribute bins.

8. Hall County should review the need of offering periodic grinding of yard trimmings as a service to residents and as an alternative to disposal. Research via surveys and other methods could be pursued to determine if sufficient need and interest exists.

9. Examine requiring building codes for including recycling considerations into new building design. New buildings (office buildings, apartment complexes,

etc) could be required to include design considerations for recycling. Considerations would include adequate areas for storage of recyclables. Ordinances should be passed by the county and all municipalities to include these requirements in building codes for applicable buildings.

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