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Methodological Brief:
The 2008 Beverage Market Data Analysis (BMDA) using 2006 data

INTRODUCTION

The Container Recycling Institute's 2008 Beverage Market Data Analysis (BMDA) is an analysis of beverage sales and recycling data for the year 2006, for beverage types and for packaging materials. Sales data are presented for all carbonated and non-carbonated beverages (excluding dairy, champagne, and wine coolers); for all traditional materials (metal, plastic, and glass), and for what we call non-traditional packaging: aseptic containers, gable-top paper cartons, and foil pouches. Recycling and environmental benefits data are presented for traditional materials only. BMDAs for all 50 states and the United States are available free of charge from the Container Recycling Institute to interested parties, by contacting Betty McLaughlin <recycle@container-recycling.org>. If you disseminate this information in any manner, we request that you credit CRI . The below pages provide a guide to what is contained in the tabs (worksheets) within each Excel file (workbook), then describe the sources and methodology used in generating the Beverage Market Data Analysis.

GUIDE TO READING AND PRINTING TABLES IN EACH OF THE TABS:

Tab "1.GalTtl" provides sales data in packaged gallons, gallons per capita, units, and units per capita for all the **beverage types**, as follows: carbonated beverages (soft drinks, beer, and sparkling water); non-carbonated non-alcoholic beverages (domestic non-sparkling water, sports drinks, fruit beverages, ready-to-drink tea, and energy drinks); and non-carbonated alcoholic beverages (wine and spirits). The BMDA excludes milk, wine coolers, champagne and sparkling wine, and frozen fruit concentrates. Average unit size in fluid ounces is also provided. Print area is pre-set, but you may want to use your "print preview" command and adjust accordingly prior to printing.

Tab "2a.UnitTtl" provides sales data in billions of units for all the above beverages, in the following packaging types: traditional containers (aluminum cans, steel cans, PET plastic bottles, HDPE plastic bottles, and glass bottles) and non-traditional containers (gable-top cartons, aseptic boxes, and foil pouches). Print area is pre-set, but you may want to use your "print preview" command and adjust accordingly prior to printing.

Tab "3a. PkgMktShr" provides packaging market share for each beverage type listed above, by percent. Totals for each row add up to 100%. Print area is pre-set, but you may want to use your "print preview" command and adjust accordingly prior to printing.

Tab "3b.BevMktShr" provides beverage market share for each packaging type listed above, by percent. Totals for each column add up to 100%. Print area is pre-set, but you may want to use your "print preview" command and adjust accordingly prior to printing.

Tab "3c.Pkg&BevMktShr" provides beverage and package market share for the entire beverage market, by percent. The sum of all the cells is 100%, in the cell in the last column of the last row.

Print area is pre-set, but you may want to use your "print preview" command and adjust accordingly prior to printing.

Tab 4. "Trad'lMatsSum" is a summary of the sales data (in billions of units) for traditional materials only. Summary per capita sales numbers, and summary market share numbers (in percent) are also provided on the far right column, and on the last row. Print area is pre-set, but you may want to use your "print preview" command and adjust accordingly prior to printing.

Tab "5.Recycling & Wasting" is organized as follows:

- **Block 1**: **SALES**: The first block of tables (running from top to bottom) on the far left provides sales data for traditional beverage containers (all beverage types) in millions of units, below that in units per capita, below that in tons, and finally in millions of lbs.

- **Block 2: EXISTING RECYCLING**: The second block of tables shows the amount of beverage containers recycled for traditional beverage containers (all beverage types), expressed in millions of units, units per capita, tons, and millions of lbs. The bottom two tables show the amount of energy savings and greenhouse gas avoidance from these recycling levels, respectively. **Note** that the recycling rates used in deriving these figures are shown. For each of the 50 states, the recycling rates used are linked to a tab called "**Modifiable rates**." The user has the option of changing the recycling rates in that tab, and all the recycling and wasting values will update automatically. If you want to re-instate the values that were originally in the cells when you received the BMDA, simply re-type what's shown in the "screen shot" into the modifiable cells. Instructions are shown within the state files.

- **Block 3: EXISTING WASTING**: The third block of tables shows the amount of beverage containers wasted (not recycled) for traditional beverage containers (all beverage types), expressed in millions of units, units per capita, tons, and millions of lbs. Wasting is sales minus existing recycling. The bottom two tables show the amount of energy required to replace these wasted containers with new containers made entirely from virgin materials, and the greenhouse gas emissions that result from that replacement production.

- **Block 4: HYPOTHETICAL RECYCLING W/UBB**: The fourth block of tables shows the amount of material that could be recycled with a container deposit system that covers both carbonated and non-carbonated beverages (an "updated bottle bill" or UBB). For the United States as a whole, a dime deposit is assumed, with an 85% recycling rate across the board. For the 50 states individually, a 75% recycling rate was used (with the exception of some existing deposit states, as noted within the files[1]). The rationale for using this rate is that 9 of the 11 existing deposit states already have a nickel deposit, and achieve recycling rates roughly averaging 75%; if legislation were to be crafted at the federal level, a dime deposit might be easier to institute nationwide than by attempting to do it piecemeal. The recycling rates are modifiable; notes within the first table in Block 4 give instructions for modification; all subsequent tabs will update automatically. Hypothetical quantities recycled are expressed in millions of units, units per capita, tons, and millions of lbs. The bottom two tables show

[1] Current recycling rate estimates were used in Iowa, Maine, Massachusetts, Michigan, and Oregon.

the amount of energy that would be saved, and the greenhouse gas emissions that would be avoided, if these recycling rates were achieved.

- **Block 5: ADDITIONAL RECYCLING = ACTUAL GAINS: HYPOTHETICAL RECYCLING MINUS EXISTING RECYCLING:** The fifth block of tables shows the amount of **additional** material that could be recycled with a container deposit system that covered both carbonated and non-carbonated beverages (an "updated bottle bill" or UBB)**.** Quantities shown (expressed in millions of units, units per capita, tons, and millions of lbs) are the **additional** amounts (***over and above existing recycling quantities)*** that could be recovered with an updated bottle bill. The bottom two tables show the amount of energy that could be saved (over and above existing energy savings at existing recycling rates), and the greenhouse gas emissions that could be avoided (over and above existing emissions avoidance at existing recycling rates), if these recycling rates were achieved.

- **Block 6: DEPOSITS INITIATED (ESTIMATED):** The sixth block contains two tables. The first is the amount of deposit money that would be initiated (paid by grocers, retailers and other resellers to the beverage distributor) if a nickel deposit were placed on all the beverages sold in that state (based on the first table in Block 1). The second table shows deposits initiated if a dime deposit were in place. All beverages and all traditional container types are displayed, so that decisionmakers can evaluate whether to include various types of beverages and packaging materials.

- **Block 7: UNCLAIMED DEPOSITS (ESTIMATED):** The seventh block contains two tables. The first is the amount of deposit money that would be unclaimed (not redeemed by the consumer for refund) if a nickel deposit were placed on all the beverages sold in that state (based on the first table in Block 1), assuming an across-the-board 75% recycling rate (for the 50 states individually). The second table shows unclaimed deposits if a dime deposit were in place, and an 85% recycling rate were achieved. All beverages and all traditional container types are displayed, so that decisionmakers can evaluate whether to include various types of beverages and packaging materials. Several deposit states escheat (turn over) these unclaimed deposits to state agencies, and use the money to help fund recycling or other environmental programs. In other states, unclaimed deposits are retained by distributors and are used to help offset the cost of administering the deposit/return system.

- **Block 8: SUMMARIZED: UNCLAIMED DEPOSITS (ESTIMATED):** The eighth block summarizes the unclaimed deposit figures presented in the Block 7 tables (for a nickel and a dime), omitting the packaging materials and grouping the beverage types in several classes: carbonated, non-carbonated non-alcoholic, non-carbonated alcoholic, all non-carbonated, and total. It also provides potential unclaimed deposits for various redemption rates, from 60% up to 95% in 5-percent increments.

Printing: due to its size, this tab does not have a pre-arranged print area. Please select the tables you wish to print using the "Set print area" command in Excel's File menu, and test it on-screen first with the "Print Preview" command prior to printing. Each table is designed to stand on its own with sources and assumptions explained.

SOURCES USED IN GENERATING THE BMDA:
These sources were used in generating CRI's 2008 Beverage Market Data Analysis (using 2006 data):

SALES:
1) National beverage sales[2] figures (in units and gallons) were derived from: "Beverage Packaging in the U.S., 2007 Edition," Beverage Marketing Corporation, December 2007; with additional purchased data from the Beverage Marketing Corporation. Regional sales numbers and market share for all beverages (except beer) were also derived from data provided by the Beverage Marketing Corporation (BMC). The seven regions CRI used correspond to the regions previously used in annual reporting by *Beverage World* magazine. The regions described by BMC are slightly different from those used by *Beverage World* in prior years, so CRI re-organized the BMC data (using state population data) in order to maintain our time series to correspond to the old *Beverage World* regions.

2) Units sold by material type[3] at the national level were also derived from the "Beverage Packaging in the U.S., 2007 Edition." Please note that for several deposit states, the sales data CRI derived for this BMDA differ significantly from sales data reported to relevant state agencies administering container deposit systems.

3) Data provided by the Beer Institute were used to assess beer packaging market shares in all 50 states individually. Traditionally this has been divided between glass bottles and aluminum cans. The year 2006 marked the first time that the Beer Institute has reported sales of beer in PET plastic bottles, so CRI incorporated that into the regional and state data.

National and regional gallonage data were divided by national, regional, and state population figures to get total and per capita volume sales. We used the U.S. average unit size as the standard for all regions. These figures are identical in all seven regions for all individual beverage categories (by definition), but they differ regionally in the packaging subtotals. For the seven regions, fluid ounces per capita (differs by region) was divided by average unit size (same for all regions) to get total units per capita for each beverage.

Because BMC does not define "plastic bottles" or "cans," CRI estimated market share of PET vs. HDPE for each beverage category, with assistance from NAPCOR. We assumed that polypropylene, polycarbonate, low density polyethylene, and polyvinyl chloride (PP, PC, LDPE, and PVC) were less than 1% of total market share and excluded them. CRI assumed market share of aluminum vs. steel for the relevant can categories.

Without access to regional packaging data, we had to assume that market share by package type within each beverage category was the same at the national level and in each region. The exception

[2] Beverages included: carbonated soft drinks, beer, sparkling and non-sparking water, ready to drink (RTD) tea, sports drinks, chilled and shelf-stable fruit juice and drinks, energy drinks, table wine, and spirits. Beverages excluded: milk, ground coffee, packaged [dry] tea, frozen concentrates, draft beer, fountain drinks, wine coolers, sparkling wine, champagne, and mixed drinks.

[3] Packages included: aluminum cans, steel (bimetal) cans, PET plastic bottles, HDPE plastic bottles, one-way glass bottles, refillable glass bottles; gable-top cartons, foil pouches, aseptic boxes. Packages excluded: cardboard/steel cans, cardboard [wine] boxes, kegs, PP, PC, LDPE, and PVC.

is beer, where data was available for all 50 states. Clearly, packaging choices do vary by state and region.

To compute the tonnage of material sold in all 50 states, CRI multiplied derived sales figures in millions of units (see above description) by unit-to-weight conversion factors, as follows:

Aluminum: 68,420 cans/ton. Source: the Aluminum Association.
Steel: 12,000 cans/ton. Source: CRI estimate.
PET: 26,505 botttles/ton. Sources: CRI estimate derived from NAPCOR resin sales data (in millions of lbs) divided by estimated sales (millions of units) derived from Beverage Marketing Corporation data.
HDPE: 16,000 bottles/ton. Source: CRI estimate.
Glass: 4,000 bottles/ton. Source: CRI estimate.

RECYCLING:

To compute the amount of material recycled and wasted in all 50 states, we first had to derive recycling rates, as follows. We began with reported national recycling rates for the 5 beverage container types as described below, then derived state recycling rates by category (carbonated and non-carbonated, deposit states and non-deposit states) using known population figures and derived sales figures for the 50 states, as well as known and estimated recycling rates in the 11 states with deposit systems. California is the only state to report recycling data by container type. Massachusetts, New York, and Hawaii report overall recycling rates (not broken down by container type). CRI assumed that the same rates applied for PET, aluminum, and glass. For MA and NY, we added 10% to the reported rates to account for estimated collection through curbside recycling programs (not included in deposit return data). We assumed Connecticut and Vermont's rates were similar to rates in MA and NY due to their geographic proximity. State officials in Oregon, Iowa, Michigan and Maine provided CRI with estimates of redemption in those states. We assumed that Delaware's rates were similar to that of MA and NY, and we used the national average for aluminum cans since cans are excluded from Delaware's deposit system. Generally speaking, we assumed that non-carbonated beverages in deposit states where they are not covered by the law were recycled at rates similar to those in non-deposit states.

Aluminum cans: The 2006 nationwide recycling rate reported by the Aluminum Association was 51.6%. This rate includes 7.5 billion imported scrap cans: beverage cans that were not consumed in the United States, and whose collection contributed to the domestic recycling rates of foreign countries such as Mexico and Canada. Using the standard method for computing recycling rates used by the U.S. Environmental Protection Agency, and using export and import data from the U.S. Department of Commerce for new and scrap cans, CRI adjusts Aluminum Association data, thus deriving an overall 45.2% recycling rate. Because only 5% of all aluminum cans contain non-carbonated beverages, there is only a small difference between the two rates.

Steel (Bi-metal) Cans: In the BMDA, CRI used the Steel Recycling Institute's 63% recycling rate for all beverages, all states. Only 0.025 % of the total beverage market is packaged in steel, and there are virtually no carbonated beverages packaged in steel anymore. Since consumers are recycling the other major beverage container materials at much lower rates than 63%, it is likely that steel cans are recovered mechanically by magnets at waste processing facilities rather than through consumer recycling programs.

PET plastic bottles: The American Chemistry Council (formerly the American Plastics Council) reported a U.S. PET recycling rate of 23.5% in 2006. Up until 2004, the APC reported separate recycling rates for carbonated soft drinks and for "custom" PET bottles, which included non-carbonated beverages such as water and juice, food such as ketchup, and non-food items such as shampoo.

HDPE: The American Chemistry Council (formerly the American Plastics Council) reported a U.S. HDPE combined recycling rate of 26.4% in 2006 (natural and pigmented HDPE). There are 3 deposit states that cover non-carbonated beverages including those packaged in HDPE. California, with 14% of the nation's population, reported a 59% recycling rate for HDPE in 2006. Hawaii reported an overall redemption rate of 68% for HDPE while Maine's overall rate was estimated by state officials at 83%. After adjusting for these rates, CRI estimated an overall HDPE recycling rate in the remaining 47 states at 21%.

Glass bottles: CRI used the national glass recycling rates as reported by the U.S. EPA's Office of Solid Waste and Emergency Response. They reported that the 2006 recovery rate for beer and soft drink bottles (presumed to be carbonated) was 30.7%, and that the rate for wine and liquor bottles (non-carbonated) was 15%. These figures were adjusted using known and estimated recycling rates in the deposit states.

ENVIRONMENTAL IMPACTS OF CONTAINER RECYCLING AND WASTING

Energy: When a container is wasted--or landfilled--it must be "replaced" with a new container made from 100% virgin materials. The amount of energy saved through recycling—or wasted when containers are landfilled--is the difference between the amount of energy required to produce containers from 100% virgin materials and the amount required to produce containers from 100% recycled materials. The per ton energy values (in MBTUs per ton) used in the BMDA were as follows:
Aluminum cans: 207
Steel cans: 20
PET plastic bottles: 53
HDPE plastic bottles: 51
Glass bottles: 9

Source of energy values are from Exhibit 7-8: Energy Consumed/Avoided for MSW Management Options Compared to Landfilling (Million Btu/Ton) in "Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks." 3rd Edition. U.S. Environmental Protection Agency, 2006.

The energy values are then multiplied by the tonnages wasted and recycled for each material. The results at the state and national levels (in trillions of BTUs) are compared to the number of average American homes that could be supplied with that amount of energy (based on 95 Mbtu/household in 2005. The source of average residential energy consumption is Table US1. Total Energy Consumption, Expenditures, and Intensities, 2005. U.S. DoE, Energy Information Administration: http://www.eia.doe.gov/emeu/recs/recs2005/hc2005_tables/c&e/detailed_tables2005c&e.html

Greenhouse gas emission: When a container is wasted--or landfilled--it must be "replaced" with a new container made from 100% virgin materials. The amount of greenhouse gases avoided through recycling is the difference in emissions from producing containers with 100% virgin materials versus

100% recycled materials. The per ton emissions factors (in metric tons of carbon equivalent, or MTCE, per ton) used in the BMDA were as follows:

Aluminum cans: 3.96
Steel cans: 0.49
PET plastic bottles: .54
HDPE plastic bottles: .48
Glass bottles: 0.08

Greenhouse gas emissions factors were derived from Exhibit 2-2: GHG Emissions from the Manufacture of Selected Materials (MTCE per ton of product) in "Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks." 3rd Edition. U.S. Environmental Protection Agency, 2006.

The greenhouse gas emissions factors are then multiplied by the tonnages wasted and recycled for each material. The resulting emissions at the state and national levels (in metric tons of carbon equivalent, or MTCE) are compared to the number of average passenger cars that might be taken off the road (based on 1.5 MTCE per car per year). Source: Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle, U.S. EPA: http://www.epa.gov/OMS/climate/420f05004.htm#key.

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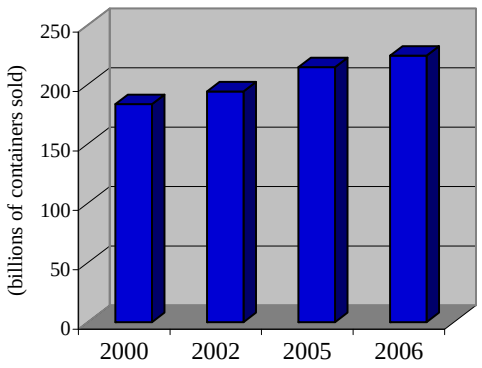
Wasting and Recycling Trends:
Conclusions from CRI's 2008 Beverage Market Data Analysis

The Container Recycling Institute's Beverage Market Data Analysis (BMDA) tracks U.S. sales of carbonated beverages[1]; non-carbonated, non-alcoholic beverages[2]; and wine and spirits.[3] Three pronounced trends in American beverage consumption and recycling patterns have emerged since CRI's first BMDA looked at year 2000 data: overall sales growth, non-carbonated sales growth, and stagnating recycling rates—all of which lead to increasing wasting. This paper will discuss all three.

Fig. 1. Growth in Packaged Beverage* Sales, 2000 to 2006

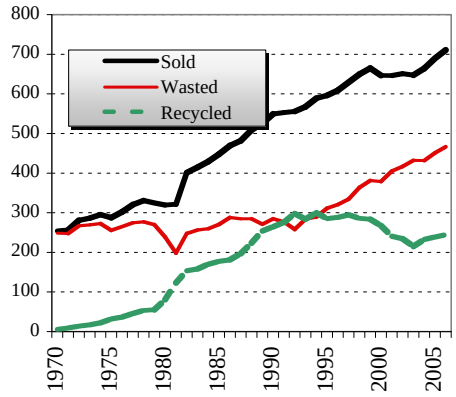


* Includes all rigid bottles and cans (except dairy beverages). Excludes aseptics, cartons, and pouches.

Growth of Packaged Beverage Sales

Sales of **traditional containers**[4]--have grown dramatically: from 182 billion units sold in 2000 to 215 billion sold in 2006 (Figure 1 and Table A-1 in Appendix A). Part of this 33-billion unit increase is due to U.S. population growth from 281 million people in 2000 to almost 300 million in 2006. Growth can also be attributed to increasing per capita consumption. The average American drained the contents of 721 bottles and cans in 2006—a startling 2 per person per day--compared to about 645 in 2000. Historic figures CRI has tracked show per capita consumption of 319 in 1980, and an estimated 254 in 1972 (Figure 2).

Fig 2. Per Capita Beverage Sales, Recycling & Wasting, 1970-2006



Non-carbonated beverage sales accounted for 95% of the growth in total sales from 2000 to 2006. This growth can be attributed to Americans' search for beverages perceived to be healthier than carbonated soft drinks—whose sales have gone flat like day-old cola--and to the increasing availability of non-carbonated drinks in convenience stores, vending machines, non-food retailers like sporting goods stores, and many other public places.

The lion's share of the non-carbonated sales increase comes from PET (polyethylene terephthalate) plastic water bottles. Almost 36 billion were sold in

[1] Defined as soft drinks (soda), sparkling water, and beer.

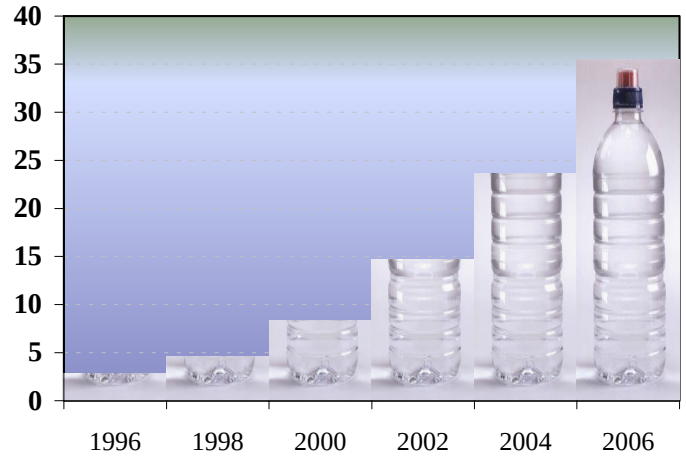
[2] Defined as still (non-carbonated) water, fruit juices and drinks (excluding frozen), energy drinks, sports drinks, and ready-to-drink tea. Approximately 18 billion dairy beverages have been excluded from our analyses, but may be included in future years.

[3] Champagne, sparkling wine, and wine coolers are not included in reported data.

[4] Traditional beverage containers are defined as refillable and one-way glass bottles, PET and HDPE plastic bottles (excluding milk jugs), steel (bi-metal) cans, and aluminum cans.

2006—up from 30 billion sold in 2005, about 12 billion in 2000, and less than 3 billion a decade ago (Figure 3).

Fig 3. U.S. Plastic Bottled Water Sales, 1996-2006*



* Defined as domestic, non-sparkling water packaged in plastic, Š 1 gallon.
Derived from Beverage Marketing Corporation data, 2002-2007.

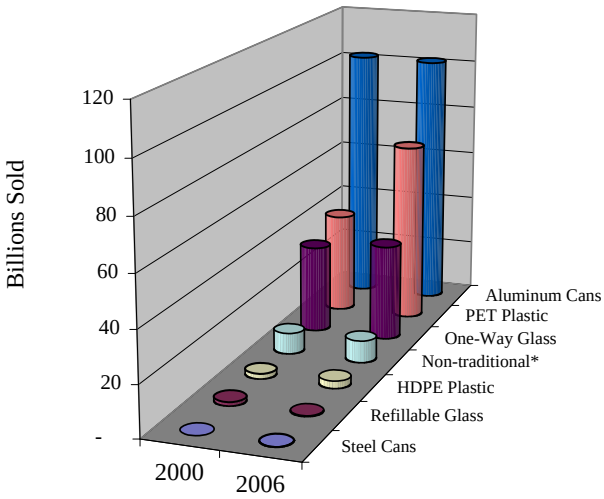
The next biggest non-carbonated sellers are fruit beverages: bottle and can sales increased slightly from 7.3 to 7.8 billion from 2000 to 2006. Sales of ready-to-drink tea in bottles and cans increased slightly, from 4.6 to 5.8 billion. Those numbers are twice as large when non-traditional containers are added in. Sales of sports drinks rose by 3 billion during the period, from 2.5 to 5.5 billion. Energy drinks were little more than a novelty in 2000 (160 million sold); by 2006 sales had reached almost 3 billion.

When **non-traditional containers** are counted, 224 billion packaged beverages were sold in the U.S. in 2006, up from 190 billion in 2000 (Table A-2 in Appendix A). This equates to 750 bottles and cans sold per capita: more than three times as much as the average person consumed in 1972 (254 units).

Market share by container type

Of these 224 billion beverage containers sold, the vast majority (96%, or 215.3 billion units) were traditional bottles and cans. This figure is up 10 billion from bottle and can sales just one year previously (205.7 billion sold in 2005). An estimated 45% (102 billion) were packaged in aluminum cans; 17% (38 billion) were sold in one-way, non-refillable glass bottles; 32% (72 billion) were sold in PET plastic bottles; and 1% (3 billion) were sold in HDPE (high density polyethylene) plastic bottles. Only 4% (9 billion) were sold in non-traditional packages, divided roughly equally among aseptic multi-material drink boxes, gable-top cartons, and foil pouches. Bi-metal (steel) cans and refillable glass bottles together comprise less than one half of 1% of the total beverage market.

Fig. 4. Growth of Containers by Material, 2000 and 2006



* Non-Traditional containers include aseptic boxes, gable-top cartons, and foil pouches.

As Figure 4 shows, sales growth of PET plastic bottles since 2000 dwarfs the changes in the other package types. Aluminum cans remain the largest single package type, holding strong due to beer sales, and to a slowing of the substitution of PET for aluminum cans in the soft drink market.

Market share by beverage type

68% of the 224 billion beverages sold in 2006 were **carbonated** (Table A-2, Appendix A):

- **Soft drinks** lost market share from 48% in 2000 to 39% in 2006, although total sales declined by less than 3 billion units (from 90.4 billion to 88 billion).
- **Beer** lost 3 percentage points in market share, despite modest growth of 3.5 billion units (from 59.5 billion to 63.3 billion). In 2006, beer comprised 28% of the beverage market.
- **Sparkling water** remains at less than 1% of the market, with sales of about 1.5 billion.

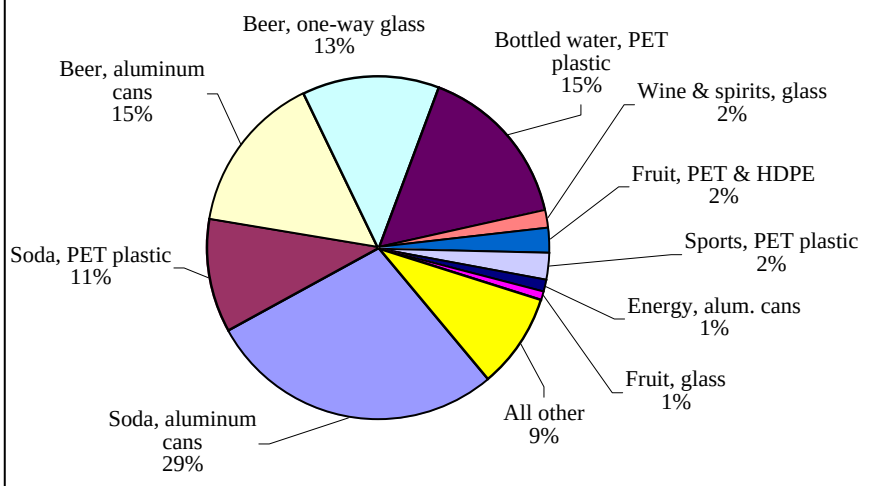
All three beverages suffered market losses to **non-carbonated beverages**. Total sales of non-carbonated beverages in all container types ballooned from 38.8 billion in 2000 – 20% of the market – to 71.5 billion sold in 2006—32% of the market (Table A-2, Appendix A). While all non-carbonated beverages saw some increase, the explosion in packaged beverage growth is in still water. In 2006, sales of bottled water equaled all other non-carbonated beverages combined.

- **Domestic non-sparkling still water** sales in sizes of 1 gallon and under went from 6% of the total market in 2000 (11.7 billion) to 16% of the market in 2006 (35.8 billion sold).
- **Sports drinks** comprised 1% of the market in 2000 (2.5 billion sold), and had doubled that to 2% of the market (5.5 billion) in 2006.
- **Fruit beverages** made only slight gains in sales (15.5 billion sold in 2000, 16.4 billion in 2006), but declined from 8% to 7% in total market share.
- **Ready-to-drink tea** also saw modest sales gains (4.8 billion in 2000, 6.1 billion in 2006), and its market share held steady at 3%.
- **Energy drinks** were a relatively new category, with sales of just under 3 billion units, or about 1% of the total beverage market in 2006.
- **Wine and spirits** sales grew modestly (4.1 billion in 2000, 4.8 billion in 2006), holding steady at 2% of the total beverage market.

Market share by beverage and container type combined

Carbonated soft drinks in aluminum cans has held steady as the single largest component of the total beverage market in 2006 at 28%—63 billion units sold (Figure 5). For the first time, sales of PET plastic water bottles and aluminum beer cans are nearly tied with 15% market share each: 35 billion water bottles and 34 billion beer cans. Beer in one-way glass bottles comprised 13% of the market (29 billion) and carbonated soft drinks in PET bottles comprised 11% of the total market (24 billion sold) in 2006.

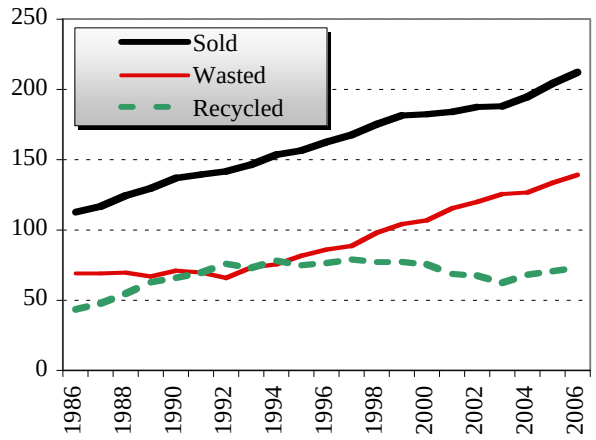
Fig. 5. Market Share by Beverage and Package, 2006



Recycling and Wasting Trends, and Environmental Impacts

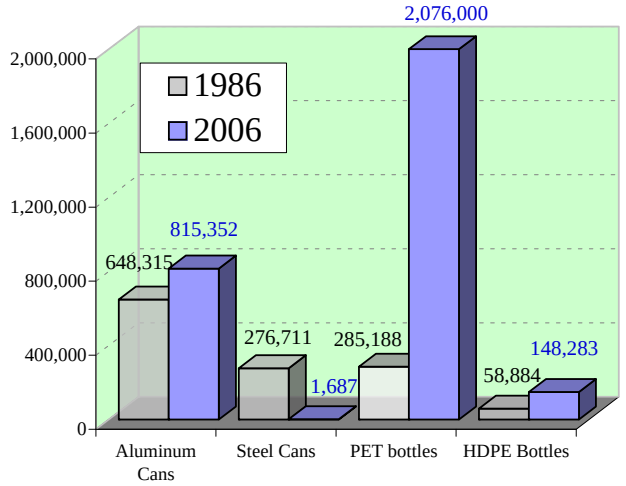
In 2006, two out of every three bottles and cans sold in the United States were not recycled. This 34% overall recycling rate is down from the overall rate of 41% in 2000, and down twenty percentage points from the all-time high of 54% in 1992. From the late 1980's until the mid-90's, recycling rates rose nationwide as curbside collection was instituted. By 2001, there were almost 10,000 curbside collection programs across the United States; the number then plateaued as local budgetary pressures constrained the adoption of additional programs. This reliance on local property taxes to fund materials recovery has stagnated both private sector recycling infrastructure investments, and commitments to using recycled content in manufacturing. Ironically, as access to curbside collection increased throughout the late 90s, recycling rates for all three major beverage container materials began to decline, and have continued to do so. This decline is due to the increase in consumption of beverages away from home, and in public places where there are few available collection outlets for recycling.

Fig. 6. Beverage Sales, Recycling & Wasting, 1986-2006



In 1996, 86 billion bottles and cans were wasted (i.e., not recycled) in the United States, up from 69 billion wasted a decade earlier (Figure 6). By 2006, 141 billion of the 215 billion bottles and cans sold were wasted—almost 10 million tons of wasted aluminum, plastic, and glass (Table C-1, Appendix C). Figure 7 shows the tonnage of containers wasted from 1986-2006, by material.

Fig. 7. Beverage Containers Wasted: 1986 and 2006 (tons)



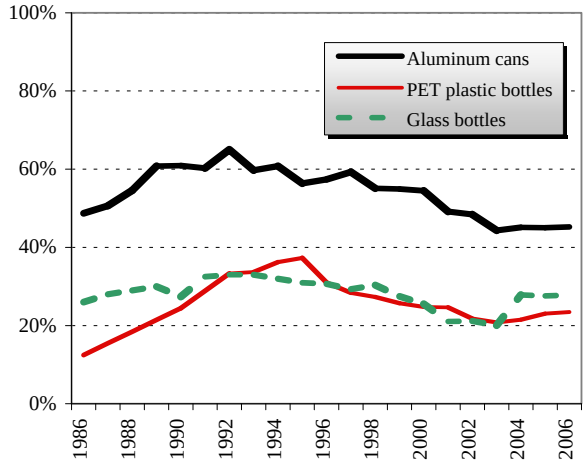
Dairy beverages excluded. Glass bottles are not shown here due to differences in scale. CRI estimates of glass wasting 1986 and 2006 were almost identical: 6.91 million and 6.96 million tons, respectively. See notes and sources in Appendix C.

But the national overall figures do not tell the whole story. There are significant differences in recycling rates among packaging types, and recycling rates vary by collection method. The 11 U.S. states with container deposit legislation[5] (CDL), home to 29% of the U.S. population, consistently recycle containers that are covered under their laws at rates between 66 – 96%. The 39 states without deposit programs (71% of the population) average 35% recycling rates for aluminum cans, 14% for PET plastic, and 12% for glass bottles. Only 3 out of the 11 deposit states cover non-carbonated beverages in their laws, resulting in average recycling rates for fizzy drinks that are 3-8 percentage points higher

[5] California, Connecticut, Delaware, Hawaii, Iowa, Massachusetts, Maine, Michigan, New York, Oregon, and Vermont.

than the average recycling rates for non-fizzy drinks (Table B-1, Appendix B). The next section will provide detail for each container type, including the energy and greenhouse gas impacts of America's failure to recycle two thirds of all beverage containers sold.

Fig. 8. Aluminum, Plastic, and Glass Recycling Rates, 1986-2006

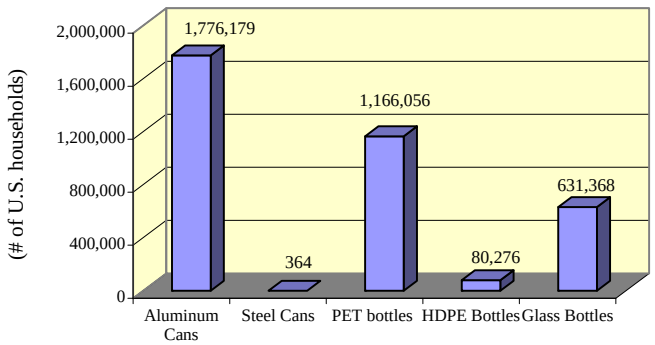


Aluminum cans are the most-recycled major container type in the United States, with a 45% U.S. recycling rate (Figure 8). This rate is down nine percentage points from the 54.5% aluminum can recycling rate in 2000, and it is down twenty percentage points from the peak of 65% in 1992. Using redemption data reported by deposit states, CRI has estimated that the average aluminum can recycling rate in the nation's 11 states with deposit systems is 76%, and less than half that in the non-deposit states at only 35% (Table B-1, Appendix B).

Using electricity to process primary aluminum from bauxite ore is very energy-intensive, and also results in the emissions of greenhouse gases. When cans are recycled, huge energy savings are realized, while greenhouse gas emissions are dramatically reduced. In 2006, 673 thousand tons of aluminum cans were recycled nationwide, saving 139 trillion BTUs of energy: an amount equivalent to the total residential energy consumption of about 1.5 million American homes (Figure 8 and Table C-3, Appendix C). This recycling also avoided the emission of 2.7 million metric tons of carbon equivalent (MTCE) of greenhouse gases (Appendix E, Table E-3).

However, the environmental impacts from wasting 55% of the cans sold were even greater. Had the 815 thousand tons of wasted aluminum cans been recovered and made into new cans, the energy saved by using recycled vs. virgin aluminum would have been the equivalent to 169 trillion Btus (Appendix C Table C-4,). This amount is sufficient to supply the total energy needs of 1.8 million American homes for a year (Figure 9 and Table C-4, Appendix C). Had these 815 thousand tons of cans been recycled, an estimated 3.2 million metric tons of carbon equivalent (MTCE) of greenhouse gas emissions would have been avoided—an amount equivalent to taking over 2 million cars off the road (Table E-4, Appendix E). For a comparison of greenhouse gas impacts of the different container materials, see Figure 12 and Table E-4, Appendix E.

Fig. 9. Energy Required to Replace Beverage Containers, 2006 (number of U.S. households' equivalent energy usage)



Assumes 95 Mbtu per household per year. See further notes and sources in Appendix C.

Overall **steel** beverage can sales are low, so the energy and greenhouse gas impacts of steel wasting were also comparatively low: 35 billion Btus in replacement energy, enough to

supply the needs of about 364 American homes for a year), and 826 MTCE of associated greenhouse emissions.

PET plastic bottles had a 23.5% recycling rate in 2006, compared to 24.8% in 2000. This rate is down from a peak of 37.3% in 1995. Using data from selected container deposit states, CRI has extrapolated that the nationwide recycling rate for non-carbonated beverages in PET bottles was 21.5%, and the nationwide rate for carbonated beverages was 27%. Estimated recycling rates in deposit and non-deposit states are higher and lower, respectively (Table B-1, Appendix B).

An estimated 636 thousand tons of PET plastic beverage bottles were recycled nationwide in 2006, saving the energy equivalent of 34 trillion BTUs (Table C-3, Appendix C), and avoiding 343 thousand MTCE of greenhouse gas emissions (Table E-3, Appendix E). More than three times as much PET was wasted, however: 2 million tons. This is more than twice the amount of aluminum cans wasted. Recycling these PET bottles instead of wasting them would have saved the energy equivalent of 111 trillion Btus—an amount sufficient to supply the total energy needs of 1.2 million American homes for a year (Table C-4, Appendix C). Had these two million tons of wasted PET bottles been recycled instead, an estimated 1.1 million MTCE of greenhouse gas emissions would have been avoided--equivalent to taking about three quarters of a million cars off the road (Table E-4, Appendix E).

HDPE plastic bottles were recycled at a reported 26.4% rate nationwide in 2006. This rate includes pigmented and natural resin, and beverage and non-beverage containers. After adjusting for known and estimated HDPE recycling rates in the three states where non-carbonated beverages are included in deposit systems (California, Hawaii, and Maine)[6]. CRI derived an overall HDPE recycling rate of 21% in the remaining 47 states. An estimated 38 thousand tons of non-dairy HDPE beverage bottles were recycled in 2006, saving the energy equivalent of 2 trillion BTUs (Table C-3, Appendix C), and avoiding 18 thousand MTCE of greenhouse gas emissions (Table E-3, Appendix E).

Almost 4 times as much HDPE was wasted, however: 148 thousand tons--or 2.4 billion containers.[7] Recycling the 2.4 billion non-dairy HDPE jugs instead would have saved the energy equivalent of almost 8 trillion Btus: an amount sufficient to supply the total energy needs of 80 thousand American homes for a year (Table C-4, Appendix C). An estimated 71 thousand MTCE of greenhouse gas emissions were associated with replacing wasted non-dairy HDPE jugs with new ones (Table E-4, Appendix E).

Glass was recycled at an average rate of 27.8% in 2006. According to the U.S. EPA. 30.7% of beer and soft drinks bottles were recovered, and 15% of wine and liquor bottles were recovered. This recycling saved the energy equivalent of 23 trillion BTUs (Table C-3, Appendix C), and avoided 214 thousand MTCE of greenhouse gas emissions (Table E-3, Appendix E).

CRI has calculated that almost 7 million tons of glass were wasted in 2006, squandering the energy equivalent of about 60 trillion Btus: enough to to supply the needs of 631 thousand American homes for a year (Table C-4, Appendix C). For the last twenty years, glass bottle wasting has fluctuated

[6] No carbonated beverages are packaged in HDPE.

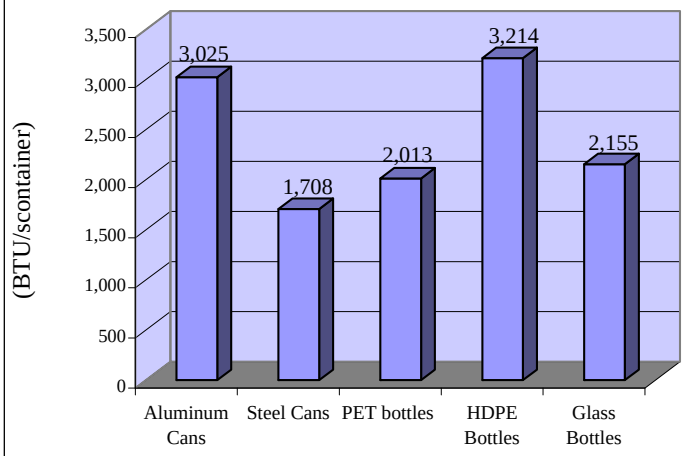
[7] CRI does not include dairy products in its BMDA. However, it is instructive to note that the 6 billion HDPE milk jugs sold in 2006 represent an additional 168 thousand wasted tons of HDPE. When non-beverage HDPE is included, total HDPE wasting was about 1.3 million tons.

between 6 and 7 million tons per year. About 560 thousand MTCE of greenhouse gasses are associated with replacing these wasted bottles annually (Table E-4, Appendix E).

Summary of Energy Impacts

Almost 10 million tons of containers were wasted in 2006. In replacing the 141 billion bottles and cans that were wasted—landfilled and incinerated—with new containers made from virgin materials, the energy equivalent of 347 trillion BTUs was consumed: **enough to meet the total residential energy needs of over 3.7 million American homes** (Table C-4, Appendix C). Almost 5 million tons of greenhouse gasses (MTCE) were emitted in the process of replacing these 141 billion wasted bottles and cans with new ones: **a quantity equivalent to the emissions generated by 3.3 million cars in one year** (Table E-4, Appendix E).

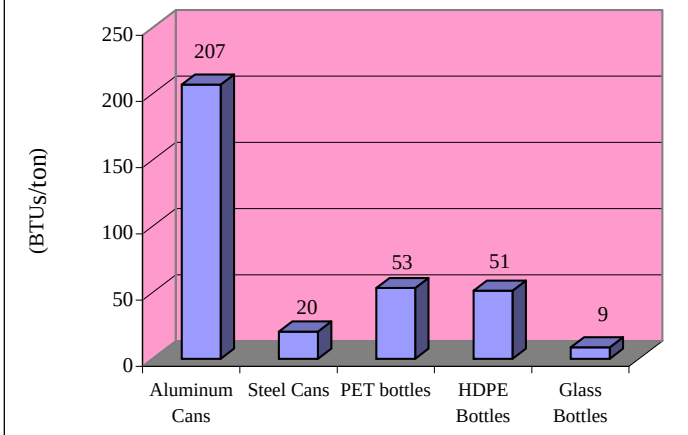
Fig. 10. Energy Required to Replace Beverage Containers, 2006 (BTUs/container)



See notes and sources in Appendix C.

Although glass dwarfs the other container materials in terms of *tons* wasted, it accounted for only 17% of the total energy impact of wasting beverage containers in the U.S. in 2006. Aluminum cans accounted for 49% of the total energy used to replace wasted containers, wasted PET bottles accounted for 32% of the energy impacts, and HDPE jug[8] wasting accounted for 2% of the total energy impacts (Table C-4, Appendix C). In terms of relative greenhouse gas impacts, ending aluminum waste is even more urgent: wasted aluminum accounted for 65% of total greenhouse gas impacts, compared to 23% for PET and 11% for glass (the proportional impact of HDPE and steel was negligible).

Fig. 11. Energy Required to Replace Beverage Containers, 2006 (BTUs/ton))



See notes and sources in Appendix C.

Although aluminum cans are the lightest of the container types,[9] they are also the most energy-intensive to produce: whether measured per container[10] (Figure 10) or per ton (Figure 11). Since the energy required to produce aluminum from virgin resources is so high, and the recycling

[8] Were dairy beverages included, the energy and greenhouse gas impacts of HDPE wasting would be three times as high as it is today.

[9] Aluminum cans have an average weight of 34 cans per pound, compared to about 6 steel cans per pound, 14 PET bottles per pound, 8 HDPE jugs per pound, and roughly 2 glass bottles per pound.

[10] When the amount of energy required to produce a ton of material (Figure 11) is divided by the number of containers per ton of material (ie. container weight), the result is the energy required per container (Figure 10).

rate remains around 50%, aluminum beverage can wasting continues to exact a high environmental toll. Much the same can be said for PET bottles: the benefits of producing a relatively lightweight container have been offset by skyrocketing sales, extremely low recycling rates, and high energy requirements.

Although lightweighting gains have been made for all containers (more cans or bottles are now produced per pound of material than was the case 20 years ago), these gains are negated by huge increases in per capita consumption, total beverage sales increases, and shrinking recycling rates. All of these factors lead to vastly more container material being wasted than ever before (Figure 8).

To realize meaningful energy savings and to reduce greenhouse gas emissions associated with beverage consumption, beverage container recycling must dramatically increase across the country. Assuming that American beverage consumption continues to follow current growth trends, and that the beverage industry maintains something close to its current packaging mix, including its marketing of single serve packages, it is increasingly important to implement systems for recovering and recycling beverage containers.

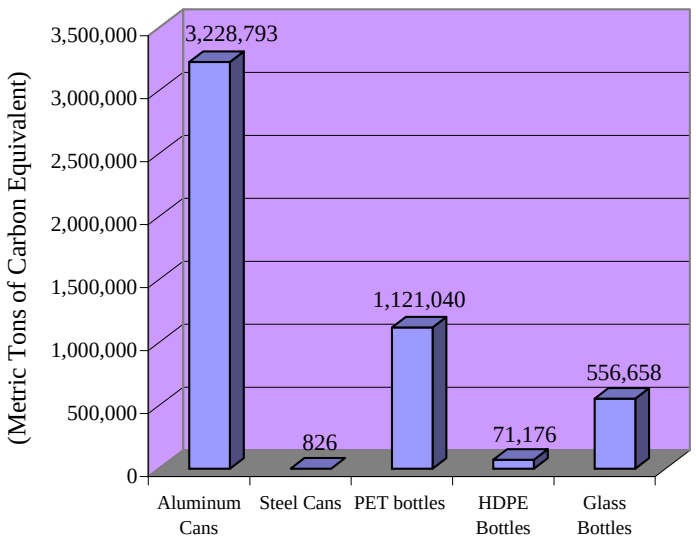
Benefits from Implementing Deposit and Return Systems Across the United States

Since 1991, CRI has documented that container deposit legislation (CDL) that places a 5-10¢ deposit on selected beverages, are the most effective form of recovering containers for recycling.[11] Twenty-nine percent of the U.S. population lives in the nation's eleven deposit states where container recycling rates range between 66% and 96%--compared to the 34% overall national average recycling rate. Without these 11 deposit programs in place, the overall container recycling rate would be much lower: perhaps as low as 15% for PET and HDPE, 35% for aluminum cans, and 15-20% for glass.

CRI has estimated that if a modest ten cent deposit were placed on all carbonated and non-carbonated beverages[12] (excluding dairy) throughout the United States, an 80-90% recycling rate could be achieved across the board.

With such a hypothetical national deposit system in place, achieving an 85% recycling rate across the board (in contrast to today's overall recycling rate of 34%), significant energy savings and greenhouse

Fig. 12. Greenhouse Gas Emissions from Replacing Wasted Containers, 2006



See notes and sources in Appendix C.

[11] "The 10¢ Incentive to Recycle," 4th Ed., by Jenny Gitlitz & Pat Franklin. Container Recycling Institute, July 2006.

[12] In our Beverage Market Data Analysis (for the U.S. and for all 50 states) CRI has referred to a deposit system that includes carbonated and non-carbonated beverages as an Updated Bottle Bill (UBB), because beginning in 1971, traditional deposit systems have only covered carbonated beverages. Maine and California both updated their deposit systems to cover non-carbonated beverages, and Oregon's law includes water as of January 2009. When Hawaii implemented its new deposit law in January 2005, non-carbonated beverages were included from the start.

gas emissions reductions could be realized. Assuming an 85% recycling rate across the board, the **additional** quantities of material recovered (over and above containers recovered in 2006) would be as follows: 592 thousand tons of additional aluminum, 995 tons of additional steel, 1.7 million tons of additional PET, 120 thousand tons of additional HDPE, and 5.5 million additional tons of glass. Combined, this almost 8 million tons of additional recycling resulting from a nationwide dime deposit would save the energy equivalent of over 265 trillion BTUs—an amount equivalent to the annual residential energy consumption of 2.8 million American homes. Increased recycling of aluminum, PET, and glass would account for 46%, 34%, and 18% of the total energy savings, respectively (Table D-4, Appendix D).

This additional recycling would also prevent an estimated 3.7 million tons (MTCE) of greenhouse gas emissions that now result from replacing wasted containers with brand new containers made from virgin materials—an amount equivalent to taking 2 and half million cars off the road. Increased aluminum can recycling would account for 63% of this savings, and increased PET and glass recycling would account for 24% and 12% of the reductions, respectively (Table F-4, Appendix F).

Conclusion

Americans' thirst for single-serving beverages appears to be unslaked, as sales growth has steadily increased for more than three decades. In recent years, packaged beverage sales rose from 190 billion units in 2000 to 224 billion in 2006. The widespread adoption of bottled water beginning in the mid-1990s has contributed most to rising per capita and total sales. While this sales growth has been underway, the overall national container recycling rate declined from a peak of 54% in 1992, to 34% today. Together, these trends have contributed to the unabated waste of energy-intensive aluminum and plastic, and to continued glass wasting. In 2006, 815 thousand tons of aluminum cans, 2.2 million tons of plastic bottles, and about 7 million tons of glass bottles were landfilled or incinerated. The failure to recycle two out of every three containers sold in the United States has broad environmental impacts, because bottles and cans that are wasted must be replaced with new containers made from virgin materials whose extraction and processing require more energy—and generate more pollutants—than making containers from recycled material. Replacing the 141 billion containers wasted in 2006 (10 million tons of wasted material) with new containers made from virgin materials required the energy equivalent of almost 350 trillion BTUs, and generated about 5 million tons of greenhouse gas emissions.

Were a 10¢ container deposit adopted across the United States, the overall recycling rate would be likely to increase from 34% to about 85%, resulting in the additional recycling of about 8 million tons of bottles and cans. Under such a scenario, about 265 trillion BTUs of energy would be saved—an amount equivalent to the annual consumption of 2.8 million American homes. Increased recycling would also reduce greenhouse gas emissions by about 3.7 million tons (MTCE), which would have the same impact as taking 2.5 million average passenger vehicles off the road.

Other benefits of increased recycling include reduced pressures on landfills and incinerators; local job creation in the recycling sector; and fewer injuries to people, domestic animals, and wildlife from littered bottles and cans. Finally, a national deposit system would shift the burden of paying to recycle ever-increasing quantities of discarded containers away from the municipal taxpayer, and onto beverage producers and consumers.

Appendix A: Sales by Beverage Type, 2000-2006

Table A-1. Beverage Sales in the U.S., 2000-2006 (Traditional Packaging Only)*

	2000		2002		2005		2006	
Beverage Type	billion units	market share	billion units	market share	billion units	market share	billion units	market share
1. Carbonated								
Carbonated Soft Drinks	90.4	50%	88.6	48%	88.6	43%	88.0	41%
Beer	59.5	33%	59.7	32%	61.7	30%	63.3	29%
Domestic Sparkling Water:	1.2	1%	1.6	1%	1.4	1%	1.5	1%
1. Subtotal, carbonated	**151.2**	**83%**	**149.9**	**81%**	**151.7**	**74%**	**152.7**	**71%**
2a. Non-carbonated, non-alcoholic								
Domestic Non-Sparkling Water (Š1 gal)	11.7	6%	16.8	9%	29.8	15%	35.8	17%
Sports Drinks	2.5	1%	3.5	2%	4.8	2%	5.5	3%
Fruit Beverages	7.3	4%	7.9	4%	7.9	4%	7.8	4%
Ready-to-drink Tea	4.6	3%	3.5	2%	4.5	2%	5.8	3%
Energy Drinks*	0.2	0%	0.5	0%	1.8	1%	2.8	1%
2a. Subtotal, non carbonated, non-alcoholic	26.3	14%	32.2	17%	48.9	24%	57.8	27%
2b. Non-carbonated, alcoholic								
Domestic Table Wine	2.2	1%	1.9	1%	2.6	1%	2.6	1%
Spirits (Liquor)	1.9	1%	2.0	1%	2.6	1%	2.2	1%
2b. Subtotal, Non-carbonated alcoholic	4.1	2%	4.1	2%	5.1	2%	4.8	2%
2. Subtotal, Non-carbonated	**30.4**	**17%**	**36.3**	**19%**	**54.0**	**26%**	**62.6**	**29%**
TOTAL	**181.6**	100%	**186.2**	100%	**205.7**	100%	**215.3**	100%

* Bottles and cans. Does not include sales of non-traditional containers (aseptics, cartons, pouches).

Table A-2. Beverage Sales in the U.S., 2000-2006 (All Packaging Types Included)*

	2000		2002		2005		2006	
Beverage Type	billion units	market share	billion units	market share	billion units	market share	billion units	market share
1. Carbonated								
Carbonated Soft Drinks	90.4	48%	88.6	46%	88.6	41%	88.0	39%
Beer	59.5	31%	59.7	31%	61.7	29%	63.3	28%
Domestic Sparkling Water:	1.2	1%	1.6	1%	1.4	1%	1.5	1%
1. Subtotal, carbonated	**151.2**	**80%**	**149.9**	**77%**	**151.7**	**71%**	**152.7**	**68%**
2a. Non-carbonated, non-alcoholic								
Domestic Non-Sparkling Water (Š1 gal)	11.7	6%	16.8	9%	29.8	14%	35.8	16%
Sports Drinks	2.5	1%	3.6	2%	4.8	2%	5.5	2%
Fruit Beverages	15.5	8%	16.3	8%	16.9	8%	16.4	7%
Ready-to-drink Tea	4.8	3%	3.7	2%	4.7	2%	6.1	3%
Energy Drinks	0.2	0%	0.5	0%	1.8	1%	2.8	1%
2a. Subtotal, non carbonated, non-alcoholic**	34.7	18%	40.8	21%	58.1	27%	66.6	30%
2b. Non-carbonated, alcoholic								
Domestic Table Wine	2.2	1%	1.9	1%	2.6	1%	2.6	1%
Spirits (Liquor)	1.9	1%	2.0	1%	2.2	1%	2.2	1%
2b. Subtotal, Non-carbonated alcoholic	4.1	2%	3.9	2%	4.7	2%	4.8	2%
2. Subtotal, Non-carbonated	**38.8**	**20%**	**44.7**	**23%**	**62.8**	**29.3%**	**71.5**	**31.9%**
TOTAL	**190.0**	100%	**194.6**	100%	**214.5**	100%	**224.2**	100%

* Includes sales of bottles and cans, as well as non-traditional containers (aseptics, cartons, pouches).

Appendix B. Recycling Rates by Class

Table. B-1. Year 2006 Recycling Rates in the United States					
	Beverage/ Package	**Aluminum cans**	**PET plastic bottles**	**Glass bottles**	**Total, 3 materials**
11 Deposit States	Carbonated	78.7%	71.2%	72.7%	**76.1%**
	Non-carbonated	49.3%	35.2%	36.4%	**36.9%**
	Average	**75.8%**	**44.4%**	**63.6%**	**61.4%**
39 Non-Deposit States	Carbonated	35.1%	13.6%	12.4%	**24.2%**
	Non-carbonated	35.1%	13.6%	12.4%	**24.2%**
	Average	**35.1%**	**13.6%**	**12.4%**	**24.2%**
U.S. Total/Average	Carbonated	45.4%	27.0%	29.4%	**36.9%**
	Non-carbonated	42.1%	21.5%	21.4%	**29.0%**
	Average	**45.2%**	**23.5%**	**27.8%**	**34.7%**

Notes and sources:

Methodology: CRI began with reported national recycling rates for the 5 beverage container types as described below, then derived recycling rates by category (carbonated and non-carbonated, deposit states and non-deposit states) using known population figures and derived sales figures for the 50 states, as well as known and estimated recycling rates in the 11 states with deposit systems. California is the only state to report recycling data by container type. Massachusetts, New York, and Hawaii report overall recycling rates (not broken down by container type). CRI assumed that the same rates applied for PET, aluminum, and glass. For MA and NY, we added 10% to the reported rates to account for estimated collection through curbside recycling programs (not included in deposit return data). We assumed Connecticut and Vermont's rates were similar to rates in MA and NY due to their geographic proximity. State officials in Oregon, Iowa, Michigan and Maine provided CRI with estimates of redemption in those states. We assumed that Delaware's rates were similar to that of MA and NY, and we used the national average for aluminum cans since cans are excluded from Delaware's deposit system. Generally speaking, we assumed that non-carbonated beverages in deposit states where they are not covered by the law were recycled at rates similar to those in non-deposit states.

Aluminum cans: The 2006 nationwide recycling rate reported by the Aluminum Association was 51.6%. This rate includes 7.5 billion imported scrap cans: beverage cans that were not consumed in the United States, and whose collection contributed to the domestic recycling rates of foreign countries such as Mexico and Canada. Using the standard method for computing recycling rates used by the U.S. Environmental Protection Agency, and using export and import data from the U.S. Department of Commerce for new and scrap cans, CRI adjusts Aluminum Association data, thus deriving an overall 45.2% recycling rate. Because only 5% of all aluminum cans contain non-carbonated beverages, there is only a small difference between the two rates.

Steel (Bi-metal) Cans: In the BMDA, CRI used the Steel Recycling Institute's 63% recycling rate for all beverages, all states. Only 0.025 % of the total beverage market is packaged in steel, and there are virtually no carbonated beverages packaged in steel anymore. Since consumers are recycling the other major beverage container materials at much lower rates than 63%, it is likely that steel cans are recovered mechanically by magnets at waste processing facilities rather than through consumer recycling programs.

PET plastic bottles: The American Chemistry Council (formerly the American Plastics Council) reported a U.S. PET recycling rate of 23.5% in 2006. Up until 2004, the APC reported separate recycling rates for carbonated soft drinks and for "custom" PET bottles, which included non-carbonated beverages such as water and juice, food such as ketchup, and non-food items such as shampoo.

HDPE: The American Chemistry Council (formerly the American Plastics Council) reported a U.S. HDPE combined recycling rate of 26.4% in 2006 (natural and pigmented HDPE). There are 3 deposit states that cover non-carbonated beverages including those packaged in HDPE. California, with 14% of the nation's population, reported a 59% recycling rate for HDPE in 2006. Hawaii reported an overall redemption rate of 68% for HDPE while Maine's overall rate was estimated by state officials at 83%. After adjusting for these rates, CRI estimated an overall HDPE recycling rate in the remaining 47 states at 21%.

Glass bottles: CRI used the national glass recycling rates as reported by the U.S. EPA's Office of Solid Waste and Emergency Response. They reported that the 2006 recovery rate for beer and soft drink bottles (presumed to be carbonated) was 30.7%, and that the rate for wine and liquor bottles (non-carbonated) was 15%. These figures were adjusted using known and estimated recycling rates in the deposit states.

Appendix C. Energy Impacts of Existing Recycling and Wasting (2006)

Table C-1. Beverage Container Sales, Recycling, and Wasting in the U.S., 2006 (billions of units)

	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles	Total
Sold (billions)	101.9	0.1	71.9	3.0	38.6	**215**
Recycled	46.1	0.0	16.9	0.6	10.7	**74**
Wasted	55.8	0.0	55.0	2.4	27.8	**141**

Source: "2006 Beverage Market Data Analysis," The Container Recycling Institute, 2008. Sales derived from: "Beverage Packaging in the U.S., 2007 Edition," Beverage Marketing Corp., December 2007; with additional data from BMC and the Beer Institute. See Appendix A for notes on sources for U.S. average recycling rates. Wasting is sales minus recycling.

Table C-2. Beverage Container Sales, Recycling, and Wasting in the U.S., 2006 (tons)

	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles	Total
Sold	1,488,744	4,608	2,712,000	186,742	9,638,516	**14,030,611**
Recycled	673,393	2,922	636,000	38,459	2,680,285	**4,031,059**
Wasted	815,352	1,687	2,076,000	148,283	6,958,230	**9,999,552**
Weight based on: containers produced per pound (a)	34	6	13	8	2	**n/a**
Containers produced per ton of material (= # of containers/lb * 2,000 lbs/ton)	68,420	12,000	26,505	16,000	4,000	**n/a**

(a) Sources for containers/lb: Aluminum: Aluminum Association. Steel, HDPE, glass: CRI estimates. PET: CRI estimate derived from NAPCOR resin sales data (in millions of lbs) divided by estimated sales (millions of units) derived from Beverage Marketing Corporation data.

Table C-3. Energy Saved by Recycling in 2006 ("Existing Recycling")*

	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles	Total
MBTu per ton (b)	207	20	53	51	9	**n/a**
BTUs per container (c)	3,025	1,708	2,013	3,214	2,155	**n/a**
Energy saved through recycling in 2006 (trillion BTU)	139	0.1	33.9	2.0	23.1	**198**
Equivalent number of households' annual energy use (d)	1,466,933	630	357,231	20,820	243,201	**2,088,815**

* When a container is wasted--or landfilled--it must be "replaced" with a new container made from 100% virgin materials. The amount saved through recycling is the difference between the amount of energy required to produce containers from 100% virgin materials and the amount required to produce containers from 100% recycled materials.

(b) Source: Exhibit 7-8: Energy Consumed/Avoided for MSW Management Options Compared to Landfilling (Million Btu/Ton) in "Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks." 3rd Edition. U.S. Environmental Protection Agency, 2006.

(c) = MBTu per ton divided by number of containers per ton.

(d) Average residential energy consumption in 2005: 95 (Mbtu/household)

Source of average residential energy consumption: Table US1. Total Energy Consumption, Expenditures, and Intensities, 2005. U.S. DoE, Energy Information Administration. http://www.eia.doe.gov/emeu/recs/recs2005/hc2005_tables/c&e/detailed_tables2005c&e.html

Table C-4. Energy Required to "Replace" Wasted Containers* in 2006

	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles	Total
MBTu per ton (b)	207	20	53	51	9	**n/a**
BTUs per container (c)	3,025	1,708	2,013	3,214	2,155	**n/a**
Energy required to replace wasted containers (trillion BTU)	169	0.035	111	7.6	60	**347**
Equivalent number of households' annual energy use (d)	1,776,179	364	1,166,056	80,276	631,368	**3,654,243**
Proportion of total energy impact	49%	0%	32%	2%	17%	**100%**

(b, c, and d) See notes and sources in Table 5 above.

Appendix D. Energy Savings from Additional Recycling with a National Deposit System

Table D-1. Hypothetical Recycling and Wasting* With National Deposit System (using 2006 sales figures) (billions of units)

	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles	Total
Sold (billions)	101.9	0.1	71.9	3.0	38.6	**215**
Recycled	86.6	0.0	61.1	2.5	32.8	**183**
Wasted	15.3	0.0	10.8	0.4	5.8	**32**

Source: "2006 Beverage Market Data Analysis," The Container Recycling Institute, 2008. Sales derived from: "Beverage Packaging in the U.S., 2007 Edition," Beverage Marketing Corp., December 2007; with additional data from BMC and the Beer Institute. See Appendix A for notes on sources for U.S. average recycling rates. Wasting is sales minus recycling.

* Hypothetical recycling and wasting quantities are based what would be recycled and wasted--hypothetically--if there was a national container deposit system with a 10¢ deposit on all beverages, achieving an 85% across-the-board recycling rate. Year 2006 sales figures are used as the basis for the computation.

Table D-2. Hypothetical Recycling and Wasting* With National Deposit System (using 2006 sales figures) (tons)

	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles	Total
Sold	1,488,744	4,608	2,712,000	186,742	9,638,516	**14,030,611**
Recycled	1,265,433	3,917	2,305,200	158,731	8,192,738	**11,926,019**
Wasted	223,312	691	406,800	28,011	1,445,777	**2,104,592**
Weight based on: containers produced per pound (a)	34	6	13	8	2	**n/a**
Containers produced per ton of material (= # of containers/lb * 2,000 lbs/ton)	68,420	12,000	26,505	16,000	4,000	**n/a**

(a) Sources for containers/lb: Aluminum: Aluminum Association. Steel, HDPE, glass: CRI estimates. PET: CRI estimate derived from NAPCOR resin sales data (in millions of lbs) divided by estimated sales (millions of units) derived from Beverage Marketing Corporation data.

* Hypothetical recycling and wasting quantities are based what would be recycled and wasted--hypothetically--if there was a national container deposit system with a 10¢ deposit on all beverages, achieving an 85% across-the-board recycling rate. Year 2006 sales figures are used as the basis for the computation.

Table D-3. Hypothetical Energy Savings With a National Container Deposit System*

	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles	Total
MBTu per ton (b)	207	20	53	51	9	**n/a**
Hypothetical energy savings with 85% recycling (trillion Btu)	262	0	123	8	71	**464**
Equivalent number of households' annual energy use (c)	2,756,645	845	1,294,794	85,932	743,383	**4,881,600**

* Hypothetical energy savings are those achieveable through an across-the-board 85% recycling rate.

(b) Source: Exhibit 7-8: Energy Consumed/Avoided for MSW Management Options Compared to Landfilling (Million Btu/Ton) in "Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks." 3rd Edition. U.S. Environmental Protection Agency, 2006.

(c) Average residential energy consumption in 2005: 95 (Mbtu/household)

Source of average residential energy consumption: Table US1. Total Energy Consumption, Expenditures, and Intensities, 2005. U.S. DoE, Energy Information Administration. http://www.eia.doe.gov/emeu/recs/recs2005/hc2005_tables/c&e/detailed_tables2005c&e.htm

Table D-4. Additional Tons Recovered and Energy Saved With a National Container Deposit System*

	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles	Total
Additional tonnage recovered (=Table D-1 minus Table C-1)	592,040	995	1,669,200	120,272	5,512,453	**7,894,960**
Additional energy saved* over & above existing savings (trillion BTU)	123	0	89	6	48	**265**
Equivalent number of households' annual energy use (d)	1,289,713	215	937,563	65,111	500,183	**2,792,785**
Proportion of total additional savings	46%	0%	34%	2%	18%	**100%**

* "Additional" Energy Savings is the difference between **existing** energy savings (see Table C-3) and hypothetical energy savings (Table D-3) under a national container deposit system achieving an 85% across-the-board recycling rate.

(d) Average residential energy consumption in 2005: 95 (Mbtu/household)

Appendix E. Greenhouse Gas Emissions from Existing Recycling and Wasting (2006)

Table E-1. Beverage Container Sales, Recycling, and Wasting in the U.S., 2006 (billions of units)

	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles	Total
Sold	101.9	0.1	71.9	3.0	38.6	**215**
Recycled	46.1	0.0	16.9	0.6	10.7	**74**
Wasted	55.8	0.0	55.0	2.4	27.8	**141**

Source: "2006 Beverage Market Data Analysis," The Container Recycling Institute, 2008. Sales derived from: "Beverage Packaging in the U.S., 2007 Edition," Beverage Marketing Corp., December 2007; with additional data from BMC and the Beer Institute. See Appendix A for notes on sources for U.S. average recycling rates. Wasting is sales minus recycling.

Table E-2. Beverage Container Sales, Recycling, and Wasting in the U.S., 2006 (tons)

	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles	Total
Containers produced per pound of material (a)	34	6	13	8	2	**n/a**
Containers produced per ton of material (= # of containers/lb * 2,000 lbs/ton)	68,420	12,000	26,505	16,000	4,000	**n/a**
Sold	1,488,744	4,608	2,712,000	186,742	9,638,516	**14,030,611**
Recycled	673,393	2,922	636,000	38,459	2,680,285	**4,031,059**
Wasted	815,352	1,687	2,076,000	148,283	6,958,230	**9,999,552**

(a) Sources for containers/lb: Aluminum: Aluminum Association. Steel, HDPE, glass: CRI estimates. PET: CRI estimate derived from NAPCOR resin sales data (in millions of lbs) divided by estimated sales (millions of units) derived from Beverage Marketing Corporation data.

Table E-3. Greenhouse Gas Emissions Avoided* by Recycling in 2006 ("Existing Recycling")

	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles	Total
Metric tons of carbon equivalent (MTCE) per ton (b)	3.96	0.49	0.54	0.48	0.08	**n/a**
Tons of material recycled in 2006	673,393	2,922	636,000	38,459	2,680,285	**4,031,059**
Greenhouse gases avoided through recycling (MTCE)	2,666,635	1,432	343,440	18,460	214,423	**3,244,390**

* When a container is wasted--or landfilled--it must be "replaced" with a new container made from 100% virgin materials. The amount of greenhouse gases avoided through recycling is the difference in emissions from producing containers with 100% virgin materials versus 100% recycled materials.

(b) Derived from Exhibit 2-2: GHG Emissions from the Manufacture of Selected Materials (MTCE per ton of product) in "Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks." 3rd Edition. U.S. Environmental Protection Agency, 2006.

Table E-4. Greenhouse Gases Emitted from "Replacing" Wasted Containers*

	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles	Total
Metric tons of carbon equivalent (MTCE) per ton (b)	3.96	0.49	0.54	0.48	0.08	**n/a**
Tons of material wasted in 2006	815,352	1,687	2,076,000	148,283	6,958,230	**9,999,552**
Greenhouse gas emissions due to wasting (MTCE)	3,228,793	826	1,121,040	71,176	556,658	**4,978,494**
Number of cars' equivalent emissions (c)	2,166,975	555	752,376	47,769	373,596	**3,341,271**
Proportion of total greenhouse gas impact	65%	0%	23%	1%	11%	**100%**

* When a container is wasted--or landfilled--it must be "replaced" with a new container made from 100% virgin materials. The amount of greenhouse gases emitted through "replacement" production is the difference in emissions from producing containers with 100% virgin materials vs. 100% recycled materials.

(b) See note b in Table E-4 above.

(c) Emissions from an average passenger car: 1.5 MTCE per year

Source: Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle, U.S. EPA: http://www.epa.gov/OMS/climate/420f05004.htm#key

Appendix F. Avoided Greenhouse Gas Emissions from Additional Recycling with a National Deposit System

Table F-1. Hypothetical Recycling and Wasting* With National Deposit System (using 2006 sales figures) (billions of units)

	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles	Total
Sold (billions)	101.9	0.1	71.9	3.0	38.6	**215**
Recycled	86.6	0.0	61.1	2.5	32.8	**183**
Wasted	15.3	0.0	10.8	0.4	5.8	**32**

Table F-1 is identical to Table D-1, for convenience of the reader. Source: "2006 Beverage Market Data Analysis," The Container Recycling Institute, 2008. Sales derived from: "Beverage Packaging in the U.S., 2007 Edition," Beverage Marketing Corp., December 2007; with additional data from BMC and the Beer Institute. See Appendix A for notes on sources for U.S. average recycling rates. Wasting is sales minus recycling.

* Hypothetical recycling and wasting quantities are based what would be recycled and wasted--hypothetically--if there was a national container deposit system with a 10¢ deposit on all beverages, achieving an 85% across-the-board recycling rate. Year 2006 sales figures are used as the basis for the computation.

Table F-2. Hypothetical Recycling and Wasting* With National Deposit System (using 2006 sales figures) (tons)

	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles	Total
Sold	1,488,744	4,608	2,712,000	186,742	9,638,516	**14,030,611**
Recycled	1,265,433	3,917	2,305,200	158,731	8,192,738	**11,926,019**
Wasted	223,312	691	406,800	28,011	1,445,777	**2,104,592**
Weight based on: containers produced per pound (a)	34	6	13	8	2	**n/a**
Containers produced per ton of material (= # of containers/lb * 2,000 lbs/ton)	68,420	12,000	26,505	16,000	4,000	**n/a**

Table F-2 is identical to Table D-2, for convenience of the reader.

(a) Sources for containers/lb: Aluminum: Aluminum Association. Steel, HDPE, glass: CRI estimates. PET: CRI estimate derived from NAPCOR resin sales data (in millions of lbs) divided by estimated sales (millions of units) derived from Beverage Marketing Corporation data.

* Hypothetical recycling and wasting quantities are based what would be recycled and wasted--hypothetically--if there was a national container deposit system with a 10¢ deposit on all beverages, achieving an 85% across-the-board recycling rate. Year 2006 sales figures are used as the basis for the computation.

Table F-3. Hypothetical Greenhouse Gas Emissions Avoided With a National Container Deposit System*

	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles	Total
Metric tons of carbon equivalent (MTCE) per ton (b)	3.96	0.49	0.54	0.48	0.08	**n/a**
Hypothetical greenhouse gases avoided with 85% recycling (MTCE)	5,011,114	1,919	1,244,808	76,191	655,419	**6,989,451**
Number of cars' equivalent emissions (c)	3,363,164	1,288	835,442	51,135	439,879	**4,690,907**

* Hypothetical greenhouse gas emissions avoided are those achieveable through an across-the-board 85% recycling rate.

(b) Derived from Exhibit 2-2: GHG Emissions from the Manufacture of Selected Materials (MTCE per ton of product) in "Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks." 3rd Edition. U.S. Environmental Protection Agency, 2006.

(c) Emissions from an average passenger car: 1.5 MTCE per year

Source: Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle, U.S. EPA: http://www.epa.gov/OMS/climate/420f05004.htm#key

Table F-4. Additional Greenhouse Gas Emissions Avoided with a National Container Deposit System *

	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles	Total
Additional greenhouse gas emissions avoided* over and above existing avoidance (MTCE)	2,344,478.77	487.75	901,368.00	57,730.49	440,996.25	**3,745,061**
Number of cars' equivalent emissions (c)	1,573,476	327	604,945	38,745	295,971	**2,513,464**
Proportion of total greenhouse gas impact	63%	0%	24%	2%	12%	**100%**

* "Additional" Greenhouse Gas Emissions Avoided is the difference between **existing** GHG avoidance (see Table E-3) and hypothetical GHG avoidance (Table F-3) under a national container deposit system achieving an 85% across-the-board recycling rate.

(c) Emissions from an average passenger car: 1.5 MTCE per year

Source: Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle, U.S. EPA: http://www.epa.gov/OMS/climate/420f05004.htm#key