



The Economic and Environmental Impact of Refundable Deposits on Beverage Containers in Texas

This paper is intended to enhance the level of understanding of beverage container recycling in the United States and the State of Texas, and to demonstrate the impact of recycling on emissions reduction and the economy. The information contained in this paper should be used to further support the inclusion of Texas State-mandated regulatory instruments for increased beverage container recycling at the state level.

Like most developed countries, the United States must reduce the generation of greenhouse gases that contribute to climate change. These reductions must come from changes in domestic systems and systems that extract, transport and manufacture materials and products for export. Among the various ways available to help achieve these reductions is recovering materials for manufacturing through recycling collection and processing. Significant reductions in energy consumption are realized when goods are manufactured from secondary, versus primary materials. Thus, recycling post-consumer goods is a necessary component of the State legislative framework being designed to address climate change.

This paper is presented by the Container Recycling Institute (CRI). CRI is a nonprofit organization that studies and promotes policies and programs that increase recovery and recycling of beverage containers, and shift the societal and environmental costs associated with manufacturing, recycling, and disposal of container and packaging waste from government and taxpayers to producers and consumers.

CRI plays a vital national role in educating policy makers, government officials and the general public regarding the societal and environmental impacts of the production and disposal of beverage containers and the need for producers to take responsibility for their packaging.

The Economic and Environmental Impact of Refundable Deposits on Beverage Containers in Texas

Understanding the impact of beverage container recycling on saving energy and reducing greenhouse gas emissions

The United States, and indeed, all nations around the world must actively participate in strategies to minimize greenhouse gas emissions. Reducing energy consumption, curtailing natural resource depletion, minimizing pollution and eliminating waste are all part of the solution. Recycling requires a small amount of effort on the parts of each link of a product's value chain, yet the total impact of these efforts can help solve this global problem. As a solid waste management strategy, recycling reduces the amount of waste sent to landfills or incinerated, but recycling in the twenty-first century is no longer merely a waste minimization tool. Mining silica or bauxite ore and drilling for petroleum and natural gas are primary extractive industries necessary for the production of glass, aluminum and plastics. Recycling post consumer goods is secondary extraction of valuable aluminum, glass and plastic containers, and the recovery of the energy embedded in those cans and bottles that was used to transform primary raw materials into consumer products in the first place. Recycling significantly diminishes all of the inputs needed to make the replacement product from virgin materials. Avoiding these "up-stream" functions means significantly reducing energy usage and associated greenhouse gas (GHG) emissions.

The Role of Recycling Beverage Containers

Every year in America, millions of tons of empty beverage containers are disposed of in garbage bins, or tossed out as litter. Communities incur considerable waste

More than \$2.9 billion worth of recyclable scrap from empty beverage containers was either buried, littered or incinerated in last year.

management and litter cleanup costs. From an economic perspective, empty beverage containers are worth a lot of money as a secondary commodity. In terms of aluminum and steel cans, plastic PET & HDPE, and glass bottles, more than \$2.9 billion in recyclable scrap was buried in a landfill, littered, or

burned in an incinerator¹ last year. This represents a loss of nearly 65 percent of potential revenues from empty containers.

¹ Based on industry-reported recycled commodity values for 2010.

Given our need to conserve energy and reduce emissions, ramping up beverage container recycling is essential. In one year alone, if Americans were to recycle 75 percent of all the aluminum, steel, PET and HDPE plastic, and glass beverage bottles sold, nearly 10 million metric tons of greenhouse gases would be avoided compared to the reductions from the current beverage container recycling rate of 35 percent (by unit). This would be equivalent to taking nearly two million cars off the road.

A significant improvement in beverage container recycling could help the United States achieve its 2020 greenhouse gas reduction target. Specifically, a 90 percent recovery rate will result in 25.2 million metric tons of avoided greenhouse gas emissions, equivalent to 1 percent of the 2020 reduction target.²

Recycling 90 percent of all beverage containers would contribute to one percent of our 2020 greenhouse gas reduction goal.

From an energy perspective, nationwide recycling of 75 percent of all beverage containers would save nearly 185 million MBTUs of energy, equivalent to the energy contained in over 1.6 billion gallons of gasoline - enough fuel for over 3 million average passenger vehicles for one year.³

Moving Recycling Forward in Texas

Texas' existing beverage container recycling rates are very low. More specifically, CRI estimates that the beverage recovery rates are:



Beverage Container Type	Aluminum Cans	Steel Cans	PET bottles	HDPE Bottles	Glass Bottles
Recycling Rate	33%	63%	14%	21%	12%

* Recovery rate estimates are based on the average recovery rate by container type in non-deposit states. Source: CRI's *Beverage Market Data Analysis 2008*, based on 2006 data. Rate for Aluminum cans is reported by Alcoa.

A modern, comprehensive deposit-return program which is modeled on other successful programs in the United States can improve these recycling rates dramatically. For example, on average, deposit-return programs traditionally recover at least 75 percent of most beverage container types. These rates can further be improved through a series of mechanisms built into the program which provide greater incentives for consumers to return and recycle their containers.

² The 2020 GHG reduction target is equal to ~2.548 billion MTCO_{2e}, of which beverage recycling to 90 percent would contribute 1 percent of that goal (25.2 million MTCO_{2e}).

³ Energy savings calculated using: *Solid Waste Management and Greenhouse Gases – A Life-Cycle Assessment of Emissions and Sinks*, 3rd Edition, US EPA, September 2006; Avoided GHG Equivalents (MTCO_{2e}/ton): Exhibit 8-8, Avoided Energy Equivalents (MBTU/ton): Exhibit 7-8; GHG emission savings derived from US EPA Waste Reduction Model (WARM) Update August 2010. One US gallon of gasoline contains 115,000 BTUs., The average consumption per year is 502 gallons per vehicle. Sources : <http://www.fuelgaugereport.com/>

One benefit of deposit-return programs is that they do not rely on municipal revenues to fund the system. Instead, most deposit-return programs utilize material revenues and unredeemed deposits to help offset costs.

Why Municipal Curbside Programs Don't Work for Beverage Containers

The beverage industry is keen to shift the burden of collection and recycling to municipal governments, by suggesting that curbside recycling programs are the most efficient and convenient way to recycle.

While curbside recycling programs are necessary for many household generated materials (like paper and other packaging), in the case of beverage container recycling, they are simply nowhere near as effective. This is primarily due to the fact that many beverage containers are generated away from home or “on-the-go” and end-up being discarded in locations where municipal curbside receptacles do not exist (offices, bars, restaurants, public parks, beaches, bus stops, tourist sites, shopping strips and malls, etc.)

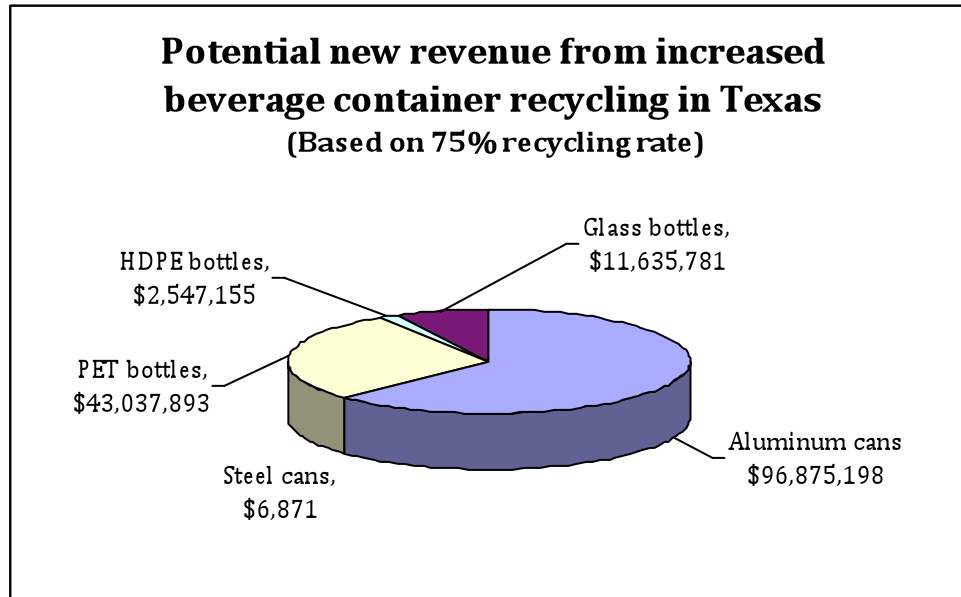
Mature curbside programs throughout America have demonstrated that on average, residential recycling programs achieve less than 35 percent recycling rates for beverage containers, and increase overall recycling costs for ratepayers.

Curbside recycling for most beverage containers is also expensive. Costs of door-to-door collection, processing of highly commingled (mixed) and compacted material, and litter abatement are expensive, and the revenue generated from these lower quality commodities is significantly lower than source separated “clean” containers which are collected through deposit-return systems.

As such, ten US states and most Canadian provinces have opted for comprehensive deposit-return programs in addition to municipal curbside recycling programs. In some cases, like California or the Province of Nova Scotia, the deposit-return program financially supports municipal curbside recycling.

Moving recycling forward in Texas requires investigating a modern, efficient deposit-return program which utilizes best practices from other operating systems in North America. Modern deposit-return programs are proven to be highly effective, low-cost, equitable, and supported by the general public. Consider the benefits from increased container recycling in Texas (see table on page 6):

- Increasing the recovery rate on aluminum cans from 33 percent ; glass bottles from 12 percent ; and PET bottles from 14 percent (status quo) to 75 percent through a modern, comprehensive deposit-return system would generate an additional \$154 million in can, glass, and PET commodity revenues for the State.



- Recycling 75 percent of all aluminum, steel, PET, HDPE and glass beverage containers in Texas would divert an additional 647,000 tons of waste from disposal.
- Increasing beverage container recycling to 75 percent in Texas would lead to the avoidance of over 1 million metric tons of greenhouse gas emissions – equal in pollution mitigation to taking over 200,000 cars off the road for one year⁴.
- Increasing beverage container recycling to 75 percent in Texas would enable savings of an additional 19.3 million MBTUs of energy – equivalent to the energy contained in over 168 million gallons of gasoline⁵, or about 3.3 million barrels of crude oil⁶ - worth today over \$290 million⁷.

⁴ Each US auto generated about 5.23 MTCO₂e per vehicle per car. <http://www.epa.gov/cleanenergy/energy-resources/refs.html#vehicles>

⁵ There are 115,000 BTUs of energy contained in a gallon of gasoline: bioenergy.ornl.gov/papers/misc/energy_conv.html

⁶ There are 5.8 MBTUs of energy contained in a barrel of crude oil. Source: Ibid.,

⁷ On February 8, 2010, crude oil was valued at \$87/barrel. Source: Bloomberg

**ENERGY SAVINGS, GREENHOUSE GAS REDUCTION AND FINANCIAL BENEFITS
FROM INCREASED BEVERAGE CONTAINER RECYCLING IN TEXAS**

	Aluminum cans	Steel cans	PET bottles	HDPE bottles	Glass bottles	Total
Estimate of number of units sold	8,916,015,460	2,844,000	5,267,656,710	179,248,000	2,955,116,000	17,320,880,170
Estimate of number of units collected	2,942,265,260	1,788,000	737,448,615	37,632,000	354,612,000	4,073,745,875
Units per ton	68,420	12,000	26,505	16,000	4,000	-
Tons available for recycling (based on BMDA 2006)	130,313	237	198,742	11,203	738,779	1,079,274
Tons collected (based on BMDA 2006)	43,003	149	27,823	2,352	88,653	161,980
Tons wasted (garbage/disposal)	87,310	88	170,919	8,851	650,126	917,294
Current recycling rates (based on units)	33%	63%	14%	21%	12%	24%
Current recycling rates (based on weight)	33%	63%	14%	21%	12%	15%
Total recovery at 75% recovery rate (in tons)	97,735	178	149,057	8,402	554,084	809,456
Potential recovery gains at 75% (in tons) (potential- status quo)	54,732	29	121,234	6,050	465,431	647,476
Avoided ENERGY per ton (MBTU/ton) (Source: EPA)	206.95	20.49	53.36	51.43	2.65	-
Energy saved with 75% recycling (MBTU)	20,226,207	3,642	7,953,655	432,128	1,468,323	30,083,954
Energy saved from status quo recycling (MBTU)	8,899,471	3,053	1,484,635	120,963	234,930	10,743,053
Un-tapped energy savings through increased recycling to 75% (MBTU) (potential - status quo)	11,326,736	589	6,469,020	311,164	1,233,393	19,340,901
Avoided GHG equivalents (MTCO2E)/ton (Source: EPA)	13.65	1.84	1.56	1.42	0.32	-
Avoided GHGs from recycling 75% of beverage containers (MTCO2e)	1,334,079	327	232,528	11,931	177,307	1,756,173
Avoided GHGs from status quo recycling (MTCO2e)	586,991	274	43,404	3,340	28,369	662,378
Un-tapped GHG avoidance through increased recycling to 75% (MTCO2e)	747,088	53	189,124	8,591	148,938	1,093,795
Value of empty beverage containers (average \$/ton) - based on industry reported commodity values for 2010	\$ 1,770	\$ 239	\$ 355	\$ 421	\$ 25	-
Total value of recyclable beverage containers at 75%	\$ 172,990,508	\$ 42,482	\$ 52,915,058	\$ 3,537,347	\$ 13,852,106	\$ 243,337,501
Estimate of revenues gained from status quo recycling beverage containers	\$ 76,115,310	\$ 35,611	\$ 9,877,165	\$ 990,192	\$ 2,216,325	\$ 89,234,603
Un-tapped revenue from the sale of beverage containers from increased recycling to 75%	\$ 96,875,198	\$ 6,871	\$ 43,037,893	\$ 2,547,155	\$ 11,635,781	\$ 154,102,898

Recycling Containers is good for the Manufacturing Sector

When manufacturers use secondary feedstock like empty bottles and cans, costs associated with sourcing, extracting, processing and shipping raw virgin materials are eliminated. Manufacturers are able to reduce their need for primary feedstock and gain both environmental benefits and cost savings. For example, using recycled aluminum cans to make new cans means avoiding limestone, salt and bauxite mining; it also eliminates the need for caustic soda, chlorine, alumina, crude oil, petroleum coke, and anode production. Making a new can from a recycled can saves 95 percent of the energy and related emissions.⁸

In today's uncertain economy, producers of products and packaging can benefit greatly from the efficiencies gained from using recycled instead of virgin feedstock. Increasing the supply by nearly 650,000 new tons for recycling (from a 75 percent beverage container recovery rate), and maintaining a high quality of empty beverage containers for domestic recycling is an important step towards economic recovery and stimulus.

Real Economic and Socio-economic Benefits from Recycling

The value of recycling goes far beyond commodity-based revenues and energy conservation. Recycling infrastructure investment will create jobs in Texas that cannot be outsourced. A state beverage container deposit-return system would create 'green jobs' for Texans. In 2007, the United States generated \$236 billion in revenues from recycling and ancillary services; creating some 1 million jobs – all contributing about 2 percent of the US GDP⁹. Mandates for increased recycling helped create 1,800 new jobs in Massachusetts, 4,684 in Michigan, 3,800 in New York, and 14,000 in California. In addition, these are jobs that employ local drivers, plant and equipment construction, technicians, low-skilled labor, and administrative and management positions.

Nation-wide Beverage Container Recycling Enhancement Requires State Leadership

Across most of the United States, municipalities bear the responsibility for beverage container recycling, beverage container litter, and disposal. Local budgetary pressures, exacerbated by the economic downturn, have constrained the expansion of existing recycling programs and the adoption of new ones. 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. Without a State mandate, many municipal recycling programs with limited budgets will opt to curtail or delay implementing recycling programs. Many of these communities have very limited investment in efficient capital, and are

⁸ Source: Novelis

⁹ Business Week

inexperienced in commodity brokering and social marketing. Consider that in 2006 there were 8,660 curbside recycling programs in the US, down from 8,875 programs in 2002¹⁰.

Developing a Strategy for Increased Beverage Recycling

States like Texas are well positioned to change the status quo, because they have jurisdiction to legislate the various elements required to improve beverage container recycling, including awarding financial assistance through grants. In late 2006, the United States Government Accountability Office (GAO) released a report entitled; *Recycling: Additional Efforts Could Increase Municipal Recycling*. The research reported findings from interviews with recycling coordinators from across the United States, including summaries of the primary practices required to increase municipal recycling. These include: making recycling more convenient, offering financial incentives for recycling through user-fees on garbage and/or incentive-based schemes like deposit-return systems and RecycleBank, and conducting public education and outreach.

Meeting Targets: Case Studies

In spite of the overall low recovery rates for beverage container recovery, some states *are* meeting high recycling targets through a combination of collection systems. While each system is different, common to all successful programs are State and/or municipal mandates.

California's many state-wide recycling initiatives have supported their achievement of a 65 percent diversion rate for 2009.¹¹ Among the varied recycling and composting programs is the innovative California Redemption Value (CRV) deposit-return program, which has an overall recovery rate of 82 percent. (91 percent for aluminum cans, 73 percent for PET plastic bottles, and 80 percent for glass bottles)¹². Expanded in 2000 to redeem more beverage container categories, the California deposit-return system is considered by many as state-of-the-art in terms of system design and stakeholder equity. The California model offers convenient collection centers known as "convenience zones" within a half-mile radius of a beverage retailer. In addition, the program allocates funds for market development and municipal payments.

In addition to the beverage container program, California's state-administered grant programs for municipalities, industry and entrepreneurs funds new opportunities to collect separated materials for recycling. For example, the CalRecycle also offers a financial incentive to any program operator for municipal recycling to improve the quality and marketability of glass beverage container material. CalRecycle will pay

¹⁰ Biocycle Magazine, 2006

¹¹ Calrecycle. Larry Stevens

¹² Calrecycle, *California's Beverage Container recycling and litter reduction fact sheet. 2009*

quality incentive payments for some recyclable materials (like glass bottles) which are substantially free of contamination for recycling. Most municipalities also offer convenient curbside and drop-off recycling services for packaging and paper generated in households.

At the state level, **Oregon** has implemented a variety of regulated initiatives that promote beverage container recycling. State regulations mandate recycled content for glass, newsprint and telephone directories¹³; and container deposit legislation for beer, carbonated drinks, and water¹⁴. Curbside recycling is offered to about 75 percent of the residential sector. Together this hybrid program recovers about 81 percent of all deposit bearing containers. 77 percent of beverage containers are captured through the bottle bill and 4 percent¹⁵ through curbside recycling. Non-deposit containers collected through municipal curbside programs are recovered at a rate of 35 percent¹⁶. The state also offers financial grants to local governments for waste recovery projects.

Canada's largest province of **Ontario** (population 13 million) utilizes a hybrid model of comprehensive mandated curbside recycling which is partially funded by industry, as well as a deposit-return program for all alcoholic beverage containers. The curbside program, which is offered to 99 percent of the province's residents, recovers about 46 percent of all aluminum cans and 50 percent of plastic beverage bottles, while the provincial deposit-return program for beverage alcohol containers collects 82 percent of aluminum cans and 96 percent of glass bottles¹⁷.

Currently there are ten US states that offer deposit-return for a variety of beverage containers, which include: **California, Hawaii, Connecticut, Iowa, Maine, Massachusetts, Michigan, New York, Oregon, and Vermont**. These states rank as leaders in America in terms of setting the bar for high recovery rates and, in some cases, very high recovery. More specifically, the leaders include: Michigan at 97 percent; Maine at 93 percent; Vermont at 85 percent; Iowa at 86 percent; Oregon at 84 percent; Hawaii at 76 percent; California at 82 percent; and New York at 70 percent.¹⁸ Not only do deposit states lead in terms of high recovery rates, but in general, they also supply recyclers with the highest quality scrap material compared with any other type of recycling program in the US, which improves overall efficiency in terms of processing and re-manufacturing.

These examples illustrate that recycling greater numbers of beverage containers is possible through a variety of programs that can be designed in a way to reflect consumption patterns and meet the needs of cities, states and the nation.

¹³ Statute: ORS 459A

¹⁴ Statute: ORS 459A.700

¹⁵ 2005 data, prepared on January 15, 2008 by Oregon Department of Environmental Quality

¹⁶ Ibid.

¹⁷ *Responsible Stewardship 2009-2010*, The Beer Store

¹⁸ Bottle Bill.org

Information Sources

RECYCLING FIGURES

Beverage Market Data Analysis 2006 – Container Recycling Institute

ENERGY AND GHG SAVINGS

Solid Waste Management and Greenhouse Gases – A Life-Cycle Assessment of Emissions and Sinks, 3rd Edition, US EPA, September 2006; GHG emission savings derived from US EPA Waste Reduction Model (WARM) Update August 2010

VALUE OF EMPTY BEVERAGE CONTAINERS

Aluminum price is \$1770/ton for baled aluminum: Source Evermore Recycling, Feb 2011
Steel price is \$239/ton - average rate for 2010, Source: Steward Edge Price Sheet
PET price is \$355/ton - average rate for 2010, Source: Steward Edge Price Sheet
HDPE price is \$421/ton - average rate for 2010, Source: Steward Edge Price Sheet
Glass price is based on the value of amber glass as representative of an average price for secondary clean glass: Flint: \$30, Amber: \$25, Green: \$5, Mixed: \$5 to negative \$60 depending on quality.
Source: Strategic Materials.

STATS USED FOR ENERGY CONVERSION CALCULATIONS

There are 115,000 BTUs of energy contained in a gallon of gasoline
There are 5.8 MBTUs of energy containers in a barrel of crude oil. Source:
bioenergy.ornl.gov/papers/misc/energy_conv.html

LIGHTING

Average lighting consumption per household in the USA is 940kwh.
Source: Residential Consumption of Electricity by End Use, 2001, End-Use Consumption of Electricity 2001, www.eia.doe.gov
The national average heat rate is about 10,722 BTU per kWh of delivered electricity.
Therefore, each household consumes about 10 MBTUs of electricity per year in delivered electricity.
(0.010722 MBTUs * 940 kwh = 10 MBTUs)

HOME HEATING

The average American home in a moderate climate uses about 50 MBTUs of energy for heating per year.
Source: U.S. Department of Energy – Energy Efficiency and Renewable Energy – Industrial Technologies Program

EMISSIONS FROM CARS :

Each US auto generates about 5.23 MTCO_{2e} per vehicle per car per year.
<http://www.epa.gov/cleanenergy/energy-resources/refs.html#vehicles>

GASOLINE

One US gallon of gasoline contains 115,000 BTUs. Source:
http://bioenergy.ornl.gov/papers/misc/energy_conv.html
Value : \$4.06 per gallon of mid-level unleaded gas. Source : <http://www.fuelgaugereport.com/>
The average consumption per year is 502 gallons per vehicle. Source : EPA – Gateway calculator

OIL

5.8 million BTUs per barrel of crude oil
Value of a barrel of crude oil : \$87 (February 8 2010, Source Bloomberg)