Understanding the Impacts of Expanding Vermont's Beverage Deposit Return Program

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By
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Over the last decade, proliferation of portable drink containers for water, juice and sports drinks has been extensive. In Vermont, the Beverage Container Law is limited to cover carbonated beverages, liquor, wine coolers, and beer containers only. Each year, approximately 170 million soft drinks are sold with a deposit, while 150 million non-alcoholic beverages including water, flavored water, juice, and energy drinks are sold without a deposit.[1] Most of these containers are ending up disposed of in landfills or as litter, while about one third are managed through existing curbside and drop-off programs.[2]

In an effort to keep up with this evolving market, several US States have updated their container deposit legislation to include these new beverage containers. In 2000 for example, California expanded its container deposit law to include a wide array of beverage containers. Today, the program has a total beverage return rate of 88 percent. In 2007, Oregon expanded its program (now at 84 percent recovery) to include water, and in 2009, both Connecticut and New York added water to their existing programs. Connecticut is likely to further expand its program to include all other non-carbonated non-alcoholic beverage containers.

In July 2011, the Massachusetts Department of Environmental Protection undertook research[3] on the impact of expansion to include water bottles in that state. It concluded that the expanded deposit system will result in no difference in price between beverages; no difference in consumer choice; and that sufficient infrastructure and capacity exists in the State to handle the additional beverage containers of an expanded program.

In October 2011, Vermont Public Interest Research Group (VPIRG) commissioned CM Consulting based in Ontario, Canada to investigate the impacts of a program expansion in Vermont. More specifically, CM Consulting researched the impacts of the expansion as they relate to the amount of increased material that will be recycled; the impact on energy savings; emission reductions; jobs; savings for municipalities; new revenue from the sale of containers for recycling as well as unredeemed deposit revenue; and primary program expenses, which include container handling fees.

[1] Sales of soft drinks: 170M units; sales of non-carbonated non-alcoholic beverages: 150M units in Vermont. BMDA 2008. http://www.container-recycling.org/bmda/

[2] The national recycling rate for PET is 21% (Source: NAPCOR 2010); glass is 33% (Source: US EPA). These rates are inclusive of deposit return containers, which have significantly higher rates than those without deposits. Therefore, it is reasonable to state that most of the containers are disposed of, and that less than 30% are managed through existing recycling systems.

[3] *Preliminary Survey: Comparison of Beverage Pricing, Consumer Choice and Redemption System Performance in Massachusetts and Neighboring* States. Massachusetts Department of Environmental Protection, July 2011.

Summary of Findings

Expanding the existing Vermont bottle bill to include wine, non-carbonated drinks, and hard cider beverages will result in increased containers redeemed and a net increase in containers recycled. The following provides a summary of some of the related impacts.

- The incremental increase between status quo recycling and deposit return expansion in terms of capturing containers for recycling, are an additional 84 million plastic bottles; 8.7 million glass bottles; and 4 million metal cans each year.

- There is a net energy savings of 179,620 MBtus from recycling the additional units collected. This energy savings is equivalent to the energy contained in 31,000 barrels of oil, worth over $3 million in crude oil cost savings. It is also equivalent to the total annual energy requirements of approximately 1,700 average US homes.

- Approximately 6,541 tons of Greenhouse Gases (GHGs) are avoided from upstream savings, equivalent to taking 1,283 cars off the road for a year.

- Increased recovery results in a total increase in material revenues worth approximately $2.3 million, of which the vast majority (over $2 million) comes from the sale of the recovered plastic bottles.

- A net increase of 100 full-time equivalent (FTE) jobs are projected in Vermont and its surrounding region from program expansion related to collection, processing, and secondary processing of recovered beverage containers.

- Garbage and litter collection, transfer and landfilling, and recycling collection, processing and transport are a cost to government, business and the public. Irrespective of the costs and service providers, reducing the number of containers which require management will reduce the cost burden. From a qualitative perspective, managing waste in Vermont is estimated to cost approximately $90-$108/ton for disposal[4].

- Last year Vermont's Agency of Transportation paid $623,700 to pick up litter on roads and interstate highways[5]. Approximately 30% of the visual litter found on roads and highways is comprised of beverage containers[6].

- Collectively, litter clean-up has been estimated to cost counties, cities, States, businesses and educational institutions over $10 billion in the US[7]. Costs are estimated to range from $1,200-$2,300/ton for litter collection[8].

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[4] *Recycling and Disposal Fees.* Connecticut General Assembly, Office of Legislative Research Report, March 12, 2010. Megan Reilly, and *The Price of Solid Waste Management Services in Vermont, 2005, Overview of Survey Results.* Prepared for Vermont Department of Environmental Conservation by DSM Environmental Services, Inc, 2005.

[5] State of Vermont's Agency of Transportation, July 2010 - July 2011.

[6] *2009 Visible Litter Survey and Litter Cost Study, Final Report.* Prepared for Keep America Beautiful by MSW Consultants, 2009.

[7] Ibid.

- The deposit return program expansion will generate approximately $1.27 million in additional unredeemed revenue from discarded water, juice, sports drink, wine, and cider containers.

- The injection of 133 million new empty containers (more than three quarters of which are plastic bottles) which will be handled through redemption centers will result in the flow of additional handling fee revenue equivalent to approximately $4.66 million per year[9]. This new revenue stream will support Vermont redemption centers and support better economies of scale in handling operations. Handling cost increases are borne by distributors.

[8] Low estimate for litter removal costs is $1,200/ton based on *Economic & Environmental Benefits of a Deposit System for Beverage Containers in the State of Washington*. J. Morris, B. Smith and R. Hlavka, April 2005. High estimate for litter removal costs is $2,300 based on *2009 Visible Litter Survey and Litter Cost Study, Final Report.* Prepared for Keep America Beautiful by MSW Consultants, 2009.
[9] This is based on a "co-mingled" handling fee rate of $0.035 per unit.

About the Author

CM Consulting is founded on the principle that industry and consumers must assume greater responsibility for ensuring that the manufacture, use, reuse and recycling of products and packaging has a minimum impact on the environment.

Clarissa Morawski is a Canadian leading expert on extended producer responsibility (EPR), with a specific focus on beverage container recovery systems. Clarissa has undertaken a wide array of stewardship assignments relating to beverage containers for public and private sector clients across Canada and the US.

CM Consulting has introduced new levels of accountability and credibility to stewardship management of used beverage containers, and has applied statistical techniques to clearly delineate effective from less effective mechanisms for achieving stewardship goals.

Clarissa Morawski is a contributing editor for *Solid Waste and Recycling Magazine* and a regular contributor to *Resource Recycling* magazine. She has written over 40 articles on beverage container recovery programs for these and other publications.

Methodology

The methodology used for this analysis starts with attaining reasonable estimates for sales of non-carbonated non-alcoholic beverages; wine; and hard cider. CM Consulting relied on *Beverage Market Distribution Analysis 2008* (BMDA) available from Container Recycling Institute. The analysis estimates an 85% return rate for the newly added deposit bearing containers, which is based on the current reported rate from Vermont.

Impacts are derived using factors from existing research completed on Vermont itself, or are based on similar circumstances to Vermont's.

All efforts were made to assure that the estimates and assumptions are reasonable, conservative and transparent.

Impact on sales is not part of this analysis because there is limited to no information available on the subject. While price elasticity studies do exist, there is limited research on the impact on sales from deposits. Monitoring sales before a deposit is introduced and after is also problematic because several key factors have a direct influence on sales, such as climate, state of the economy, average wealth of the State, etc.

Estimated Impacts of Expansion of the Vermont Bottle Deposit Law

1. Waste diverted from disposal

Applying a deposit on non-carbonated beverages, wine and ciders will result in an increase in the amount of empty containers collected for recycling. The analysis assumes an existing collection rate of 24 percent (by unit) on these containers; versus 85 percent should they be collected through an expanded deposit return system.[10]

Table 1 provides sales and recovery of non-carbonated beverage, wine, and cider in Vermont. The incremental increase between status quo recycling and deposit return expansion in terms of the capture of containers for recycling, are an additional 84 million plastic bottles (3,304 tons); 8.7 million glass bottles (3,142 tons); and 4 million metal cans (59 tons).

Table 1: Sales and recovery of non-carbonated beverages, wine and ciders in Vermont

	Aluminum cans	PET bottles	HDPE	Glass bottles	Total
Units Sold (1)	8,719,917	122,834,160	8,449,245	16,652,229	156,655,550
Units collected (Status Quo)	3,400,767	25,795,174	1,774,341	5,495,236	36,465,518
Estimated units recovered with expansion	**7,411,929**	**104,409,036**	**7,181,858**	**14,154,395**	**133,157,218**
Tons available for recycling	**127**	**4,634**	**528**	**6,042**	**11,332**
Tons collected (Status Quo)	**50**	**973**	**111**	**1,994**	**3,128**
Estimated tons recovered with expansion	**108**	**3,939**	**449**	**5,136**	**9,632**
Status Quo recovery rates (by unit) (2)	**39%**	**21%**	**21%**	**33%**	**24% by unit; 27% by weight**
Estimated recovery rate with expansion	**85%**	**85%**	**85%**	**85%**	**85% by unit; 85% by weight**
Estimated NET increase in tons recovered from expansion	**59**	**2,966**	**338**	**3,142**	**6,505**

(1) Sales figures are from BMDA 2008.

(2) Recovery rate for aluminum is derived by adding 5 points to the 2006 BMDA rate for aluminum cans. 5 points are added because of a national 5% increase in aluminum recovery rate (incl. BB and Non-BB states) from 2006 to 2010. EPA Facts and Figures.

(2) Recovery rate for PET is based on national 2010 data from NAPCOR and EPA. Both data sets include bottle bill states so it is likely that the national non-deposit rate may be lower.

(2) Recovery rate is based on 2006 BMDA data. Did not utilize 2010 EPA data because it was assumed to have a large percentage of containers that are not beverage containers.

(2) Recovery rate for glass is based on 2010 national rate for glass from EPA. Includes BB and non-BB states.

[10] 24% represents the collective collection rate for aluminum, PET, HDPE and glass beverage containers by unit as reported in the table above. This collective rate is also consistent with the national average collection rate for beverage containers in non-deposit programs in the US. Source: CRI: http://www.container-recycling.org/facts/all/data/recrates-depnon-3mats.htm

2. Energy saved and greenhouse gas emissions avoided from increased recycling of beverage containers

Recycling plastic, glass and aluminum beverage containers saves a lot of energy. Significantly less energy is required to produce a commodity made from recycled material because all the primary resource extraction functions are avoided.

For example, using recycled PET plastic resin to make new products instead of virgin plastic avoids crude oil, natural gas, and petroleum gas extraction, refining, processing and Olefin production.

In the case of glass bottles, using recovered glass cullet to make new bottles instead of virgin raw materials avoids glass sand and feldspar mining. Savings also occur at the product manufacturing stage because less energy is required for material conversion equipment. Furnaces can be turned down when glass bottle manufacturers use old bottles instead of virgin raw materials.

Collectively, these avoided "upstream activities" result in energy savings and related greenhouse gas (GHG) emission reductions. Using the US EPA's well-known Waste Reduction Model (WARM), these savings can be quantified.

Table 2 provides the energy and GHG emission reductions related to the incremental increase in recycling which will occur from a program expansion to include non-carbonated, wine, and cider beverages.

There is a net energy savings of 179,620 MBtus from recycling the additional units collected. This energy savings is equivalent to the energy contained in 31,000 barrels of oil[11], worth over $3 million in crude oil cost savings[12]. It is also equivalent to the total annual energy requirements of approximately 1,700 average US homes[13]. In addition, approximately 6,541 tons of GHGs are avoided from upstream savings, equivalent to taking 1,283 cars off the road for a year[14].

[11] One barrel of oil contains 5.8 MBTUs of energy. Source: U.S. Energy Information Administration www.eia.com
[12] Value of a barrel of crude oil on Dec 6, 2011 is $101.08 (US$). Source: Bloomberg.com
[13] Annual U.S. household energy use is approximately 107 MBTUs/household. Source: Us Energy Information Agency www.eia.com
[14] The average US passenger vehicle emits 5.1 tons of $MTCO_2E$/year. Source: US Environmental Protection Agency

Table 2: Avoided energy use and GHG equivalents if non-carbonated beverages and wine are added to the deposit system in Vermont

	Aluminum cans	PET bottles	HDPE	Glass bottles	Total
Energy saved from status quo recovery (MBTUs)	10,286	51,931	294	5,284	**67,795**
Energy saved from anticipated higher recovery rate (bottle bill expansion) (MBTUs)	22,419	210,197	1,189	13,610	**247,415**
Estimated additional energy saved from expansion of Vermont bottle bill (MBTU's)	**12,133**	**158,266**	**896**	**8,326**	**179,620**
Greenhouse Gases (GHGs) avoided from status quo recovery (MTCO2e)	678	1,518	35	638	**2,870**
GHGs avoided from anticipated higher recovery rate (MTCO2e) (bottle bill expansion)	1,479	6,145	144	1,643	**9,411**
Estimated additional GHGs avoided from expansion of Vermont bottle bill (MTCO2e)	**800**	**4,627**	**108**	**1,005**	**6,541**

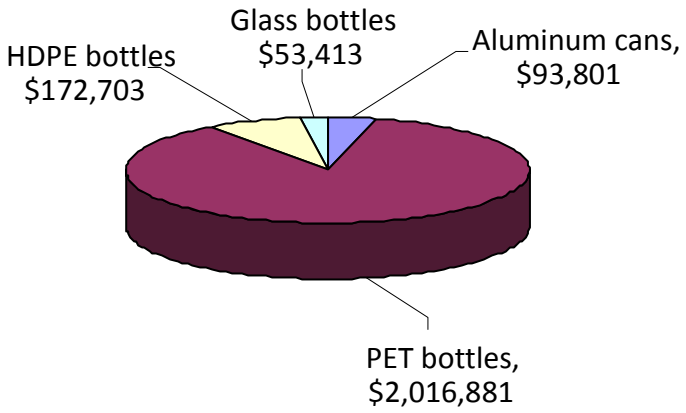
Avoided Energy per ton (MBTU/ton) avoided GHG equivalents are from EPA

3. Increased material revenue from container collection and recycling

Increasing the recovery and recycling of high quality clear and colored glass, PET and HDPE bottles, and aluminum cans means more revenues from the sale of these material commodities. The following values were used to assess the impact on material revenues from increased recycling: glass at $17 per ton, aluminum at $1,600, PET at $680, and HDPE at $511 per ton[15].

Increased recovery results in a total increase in material revenues of approximately $2.3 million, of which the vast majority (over $2 million) comes from the sale of the recovered PET. This revenue is used directly by distributors to off-set their cost of transport and processing of empty containers. Usually, the service provider retains these revenues themselves.

Figure 1: Estimated Additional Material Revenue from Program Expansion in Vermont (Total: $2.3M)



[15] The PET rate of $680 per ton is based on the February monthly low of $0.343 per lb at Plastics Technology (www.petonline.com); HDPE is from the StewardEdge "Price Sheet" average for 2011; aluminum and glass values were derived from end-users.

4. Impact on jobs from increased recycling

The economic benefits of recycling as it relates to job creation are well known. That waste recovery generates jobs (as compared to disposal) is intuitive. Effectively, the business of resource extraction (mining and oil drilling) and material conversion is transferred "above ground" to where recyclables are collected, transported, processed, and converted into raw materials for manufacturers. Equipment and energy costs for resource extraction are replaced by labor costs associated with resource recovery.

This year alone several studies have been released which examine the direct job impacts from increased recycling over disposal[16]. In December 2011, the Container Recycling Institute released a study *Returning to Work - Understanding the Domestic Jobs Impacts from Different Methods of Recycling Beverage Containers, 2011.* The study provides detailed job factors for the various stages of handling required for beverage containers which run through container deposit return and curbside programs, and disposal to landfill. These factors (as shown in Table 3) provide reasonable estimates for the total full time equivalent employment increases related to the increased handling of the containers. The analysis identifies:

1) ***Direct jobs***: These jobs are directly related to the tonnage throughput from the beverage containers.
2) ***Indirect jobs***: these jobs result from the direct economic activity related to supplying collection and processing industries in the region. For example, in the case of beverage container redemption, these jobs would come from the industries that supply redemption centers with equipment like totes; bags; heat; hydro; insurance; accounting services etc.
3) ***Induced jobs***: These jobs come from the purchases made by employees from the collection or processing business (the direct jobs), who spend their earnings on goods and services in the region.

The analysis in Table 3 shows expanding the existing deposit return program would require additional labor associated with collecting, processing and secondary processing of the containers. It is estimated that these new materials[17] flowing through businesses will create 100 full time equivalent (FTE) employees in Vermont and its surrounding region.

Table 3: Estimated additional jobs from increased net recycling due to program expansion.

	Material throughput in tons	FTEs per 1000 tons (1)	US 2011 DIRECT recycling industry employment, in FTEs	Combined Indirect/Induced FTEs per direct FTE (2)	TOTAL Indirect and Induced employment	TOTAL additional employment in FTEs
Collection for additional containers cap	6,505	**7.34**	48	0.7	33	**81**
MRF Operations	6,505	**0.56**	4	0.7	3	**6**
Secondary Processing Glass	3,142	**0.37**	1	1.0	1	**2**
Secondary Processing PET	2,966	**2.00**	6	0.8	5	**11**
TOTAL			**58**		**42**	**100**

NOTE: Some numbers may not add up due to rounding.

(1) FTEs/1000 tons multipliers source: *Returning to Work: Understanding the Domestic Jobs Impacts from Different Methods of Recycling Beverage Containers.* CRI, 2011.

(2) Direct FTEs, indirect and induced FTEs per direct FTE source: *Recycling Economic Information Study Update: Delaware, Maine, Massachusetts, New York, and Pennsylvania. FINAL REPORT. February, 2009.* To avoid any double counting, the indirect job factor was reduced by half.

[16] *More Jobs, Less Pollution: Growing the Recycling Economy in the US*. Tellus Institute & Sound Resource Management, 2011.

[17] New materials refers to the additional recycling of containers, net of existing recycling efforts.

5. Savings to the State, cities, counties, businesses and educational institutions from reduced recyclables to collect, dispose of, and collect as litter.

Most of the beverage containers which do not carry a deposit, like those used for water, juice, sports drinks, wine, and cider, are currently disposed of in garbage bins, littered, or recycled primarily through private subscription programs.

Container Recycling Institute reports that deposit-return reduces littering of used beverage containers by 70%-80% (by volume), and total littering by 30%-40%[18]. In Hawaii, where a deposit-return program was introduced in October 2002, the amount of metal cans, plastic and glass bottles in the litter stream were reduced by 39% (on a unit count basis) five years after the deposit return program was introduced[19].

Litter is also found in waterways and marine life. Underwater cleanups show that beverage container litter makes up about 20% of marine debris (on a unit basis).

Costs associated with the impact of beverage container litter on tourism, farm livestock, farm equipment, marine life and aquatic systems cannot be estimated financially, but they should be considered as additional problems associated with beverage container litter.

Increased litter means increased costs, and far too often these costs are underestimated. A recent study by Keep America Beautiful[20], estimates that over $10 billion is spent collectively in the US by State governments; cities; counties; educational institutions and private businesses to clean up land-based litter each year. Vermont's Agency of Transportation alone spent $623,700 last year to pick up roadside litter in the State.

Garbage and litter collection, transfer and landfilling, and recycling collection, processing and transport are a cost to governments, businesses and the public. Irrespective of the costs and service providers, reducing the number of containers which require management will reduce the cost burden.

Estimating these savings involves a deep understanding of the existing waste management infrastructure in Vermont and how reduced throughput would impact costs. This analysis is beyond the scope of this study. However, from a qualitative perspective, materials management in Vermont is estimated to cost approximately $90-$108/ton for disposal[21] and $1,200-$2,300/tons for litter collection[22].

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[18] Source 1: Container Recycling Institute (CRI); Source 2: *Deposit Return Systems for Packaging Applying International Experience to the UK*, Peer Review, Report prepared for Defra by Oakdene Hollins Research & Consulting, 2005: states with deposit return systems seem to achieve a reduction of the order of 33%-38% in total litter.

[19] *The Activities of the deposit Beverage Container Program, Report to the Twenty-Fifth Legislature State of Hawaii 2009*, Prepared by State of Hawaii Department of Health, 2008.

[20] *2009 Visible Litter Survey and Litter Cost Study, Final Report.* Prepared for Keep America Beautiful by MSW Consultants, 2009.

[21] *Recycling and Disposal Fees.* Connecticut General Assembly, Office of Legislative Research Report, March 12, 2010. Megan Reilly, and *The Price of Solid Waste Management Services in Vermont, 2005, Overview of Survey Results.* Prepared for Vermont Department of Environmental Conservation by DSM Environmental Services, Inc, 2005.

[22] Low estimate for litter removal costs is $1,200/ton based on *Economic & Environmental Benefits of a Deposit System for Beverage Containers in the State of Washington*, J. Morris, B. Smith and R. Hlavka, April 2005. High estimate for litter removal costs is $2,300 from *2009 Visible Litter Survey and Litter Cost Study, Final Report.* Prepared for Keep America Beautiful by MSW Consultants, 2009.

6. New unredeemed deposit revenue

For consumers that choose to discard their container, their deposit is forfeited. Known as "polluter pays", deposit return not only financially rewards redemption, but it penalizes non-redemption.

Specifically, this penalty is either 5 or 15-cents per beverage container not redeemed. The unredeemed revenue can be used to help off-set system costs directly (i.e., use unredeemed revenue to help pay handling fees and processing costs), or used by the State to finance other waste reduction related activities.

Irrespective of how the money is used, the deposit return program expansion will generate approximately $1.27 million in additional unredeemed revenue from discarded water, juice, sports drink, wine and cider containers.

Table 4: Additional Unredeemed Deposits due to program expansion.

5-cent unit sales (in units) (1)	149,936,758
15-cent unit sales (in units) (1)	6,718,793
Returns of 5-cents (in units) based on 85% returns	127,446,244
Returns of 15-cents (in units) based on 85% returns	5,710,974
Unredeemed Deposits	$ 1,275,699

(1) Sales are from BMDA 2006.

7. New handling fee revenue for redemption centers

The injection of 133 million new empty containers (more than three quarters of which are plastic bottles) which will be handled through redemption centers, will result in the flow of additional handling fee revenue equivalent to approximately $4.66 million per year[23]. This new revenue stream will support Vermont redemption centers and support better economies of scale in handling operations.

Handling cost increases are borne by distributors. In addition, most distributors hire a third party to manage the transport and processing costs associated with their beverage containers. Under the privately negotiated contract between the distributor and the third party, revenues from the sale of empty containers (worth about $2.3 million per year) typically go to the third party.

Given that there is already an existing program which manages over 400 million beverage containers each year in Vermont, there will be limited to no requirements for increased capital investments, because the collection infrastructure is already in place.

Table 5 provides a breakdown of returns and the associated handling fees (based on the commingled rate of $0.035 per unit handled).

Table 5: Additional Handling Fees due to program expansion in Vermont		
Beverage containers added to bottle bill in units		133,157,218
Handling fee per container	$	0.035
Total additional handling fees	$	4,660,503

[23] This is based on a "co-mingled" handling fee rate of $0.035 per unit.

8. Why municipal curbside programs don't work for beverage containers

Whenever the question of a bottle bill expansion comes up, so too does the suggestion that these additional containers would be more "efficiently" collected through the residential recycling program, suggesting that one bigger system is better than two.

While curbside recycling programs are necessary for many household-generated materials (like paper and other packaging), when it comes to beverage container recovery, they are nowhere near as effective. This is because "on-the-go" beverage containers are usually consumed and discarded in locations where there is no immediate recycling access (offices, bars, restaurants, public parks, beaches, bus stops, tourist sites, shopping strips and malls, etc.). No matter how effective the residential recycling program, if the container is consumed away-from-home, it will likely not get recycled.

This is further supported by data from states across the country, where recycling rates for beverage containers in non-deposit programs are usually less than 25%. This is in stark contrast to recycling rates for containers in deposit return programs which are generally greater than 75%[24].

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. 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.

[24] Source: Container Recycling Institute (CRI)