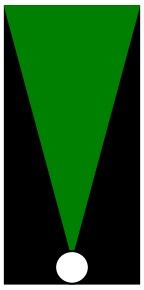
An Analysis of the Costs and Benefits of Beverage Container Recovery in Canada

CM Consulting



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This report was prepared by Clarissa Morawski and Melissa Felder of CM Consulting. Research material was attained through direct calls to program operators, a review of Canadian and US studies on system costs and performance, and on-going in-house research and analysis. Data has been referenced.

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An Analysis of the Costs and Benefits of
Beverage Container Recovery Systems in Canada

Executive Summary

This report provides an overview of Canadian beverage container recovery programs with a review of their associated costs, performance and related environmental benefits. The study presents cost estimates for the various programs as well as comparing the environmental impacts of deposit-return programs versus "optimum" and "average" curbside programs for beverage container recovery. The data used for these comparisons is based on the true container sales figures for year 2000 of non-alcohol beverages sold in British Columbia.

Key findings include:

- In British Columbia, the beverage industry incurred no cost related to the non-alcohol container recovery program in 2000.
- In 2000, Encorp Pacific (Canada), the program steward on behalf of the non-alcohol beverage industry recorded a net surplus of $5,087,318 or .63 cents/unit sold.
- In 2000, beverage consumers contributed .76 cents/unit purchased (through a Container Recycling Fee) to offset the net system costs of the deposit-return program for non-alcohol beverage containers in BC.
- In 2000, "wasting" beverage consumers (those who choose not to return containers for recycling) contributed an additional 7.2 cents/unit purchased but not returned. (a "Polluter Pay" penalty)
- In British Columbia, capture rates for 2000 were: 84% for non-alcohol aluminum cans, 73% for non-alcohol plastic bottles, 61% for non-alcohol glass bottles, 85% for alcohol containers, 94% for refillable beer bottles and 95% for beer cans.
- In 1995, a report was commissioned by the BC Ministry of Environment analyzing the cost and performance implications of curbside collection for all beverage containers in BC. The report found that the costs associated with an expanded curbside collection program related to beverage containers were: carbonated soft drinks: 1.2 cents/unit, other carbonated drinks: 5.8 cents/unit, non-carbonated drinks: 5 cents/unit, wine and spirits 8.2 cents/unit, fruit and vegetable juice: 3.9 cents/unit and milk and milk products 7.1 cents/unit. The report also states that while a deposit-return program can attain an 86% capture rate, curbside collection can only achieve a 35% capture rate. As such, landfill and litter abatement costs would increase from an estimated $2.6 million to $14 million.

In comparing the relative environmental impact of a deposit-return program to an "optimum" and "moderate" curbside collection program for beverage containers (using BC beverage sales figures), it was found that the current British Columbia beverage container recovery system (deposit-return) has far superior environmental performance in all categories investigated, despite utilizing a "best-case" recovery rate scenario for a curbside system. Specifically,

- an optimum curbside program for beverage containers in BC would recover 40% less material than the present deposit-return system (~ 8500 short tons). A moderately successful curbside program would recover 67% less material (~ 14,000 short tons) as compared to the present system in BC.
- an optimum curbside system would divert 50% less materials from landfill (occupying an additional ~ 70,000 cubic yards annually in landfill space) as compared to the present system. A moderately successful program would divert 70% less (occupying an additional ~100,000 cubic yards annually in landfill space).
- Compared to the present deposit-return program, the reduced recycling rates attributable to an optimum curbside program (and the corresponding lack of 'scavenging') would result in an estimated 46% increase in beverage container litter annually (~ 2,600,000 containers). A moderately successful curbside program would result in an estimated 69% increase in beverage containers littered annually, or ~ 4,000,000 containers compared to the present program.
- The present deposit-return program is estimated to save 180,000 barrels of oil annually by replacing virgin material with recycled material as a feedstock. The decreased recovery rates attributable to substituting the present deposit-return system with an optimum curbside collection system would result in the usage of an additional 74, 000 barrels of oil annually. A moderately successful curbside program would result in the usage of an additional 120, 000 barrels of oil annually compared to the present system.
- In British Columbia, the reduced recycling rate attributable to an optimum curbside recovery system versus the current deposit-return program is estimated to result in ~12,000 more tonnes of carbon equivalent released to the atmosphere annually as compared to the present deposit-return recovery system. A moderately successful curbside system would result in the annual release of approximately 20,000 metric tonnes of carbon equivalent compared to the present system.
- The atmospheric, waterborne and industrial emissions associated with a curbside recovery program in BC versus the current deposit-return program are estimated to result in approximately 840,110 and 6000 more tonnes of pollutants in an optimum curbside recovery scenario respectively, and 1,200,200 and 12,000 more tonnes of pollutants in an average curbside recovery scenario respectively.

- In 1998, a study was undertaken by Angus Reid for McConnell Weaver – *The Deposit Program in BC: Attitudes and Behavior.* The study states: "There is a high level of support for the deposit program across the province of BC. Almost all (96%) of British Columbians think the deposit program is a good idea. The main reason for their support of the program is that the program gives people an incentive to recycle. The inconvenience of returning containers for the deposit appears to be only a minor concern"

An Analysis of the Costs and Benefits of
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in Canada

Background:

The past decade has seen tremendous growth in the area of producer responsibility related to beverage container recovery in Canada. Today six of ten provinces in Canada have full deposit-return programs for all beverages except milk: British Columbia (BC), Alberta (AB), Saskatchewan (SK), New Brunswick (NB), Nova Scotia (NS), and Newfoundland & Labrador (NF). Quebec (QC) maintains a deposit-return program for beer and soft drinks, and Prince Edward Island (PEI) a refillable program (deposit-return) for beer and soft drinks.

Canadian beverage container recovery programs vary considerably relating to key elements of program design. These include: who bears financial responsibility (who pays); who operates the system; and how the collection infrastructure is developed (return to depot, return to retail or curbside collection).

Given the considerable differences in the design of the various container recovery programs, there has been no clear analysis of what the "real" system costs are and who bears those costs.

The following report attempts to provide an overview of Canadian beverage container recovery programs with a review of the costs, performance and other associated environmental benefits.

Provided in this report:

1) **Income statements** (where available – BC, AB, SK, NS, NF) of current deposit-return programs for the last operating fiscal year (2000-2001 or 2000)
2) **Cost analysis** of these programs. Costs are broken down and presented in the following categories:
    - Net system cost/unit to manufacturers
    - Net system cost/unit before unredeemed deposit revenue
    - Net system cost/unit after unredeemed deposit revenue
    - Net system cost/unit to recycling consumers (consumer that return containers)
    - Additional net system cost/unit to consumers choosing not to return containers (forfeiting their deposit)
    - Non-system related costs to consumers per unit (unused recycling fees, half-backs, environmental handling charges etc.)

3) **Recovery rates** for beverage containers in **deposit-return** jurisdictions
4) **Cost estimates** of **curbside collection** for beverage containers (using data from existing studies)
5) **Recovery rates** for beverage containers in **curbside collection** jurisdictions (using Ontario and Manitoba data)
6) **Environmental benefits** of deposit-return programs vs curbside programs

   Specifically:

   - impact on the amount of beverage containers recycled and landfilled
   - impact on litter
   - impact on energy, greenhouse gas emissions (GHG), and atmospheric, waterborne and industrial emissions

7) Identification of **information gaps** that exist and need to be addressed through in-depth research and analysis

1. Costs analysis of deposit-return programs in Canada

There are currently six provinces operating expanded deposit-return programs for all beverage containers except for milk products (BC, AB, SK, NS, NB, NF). Quebec maintains a deposit-return program for beer and soft drinks and PEI a refillable (deposit-return) program for beer and soft drinks.

The systems vary from province-to-province. Each system has a series of unique features, which is important to understand when reviewing their associated costs. Table1.1 provides an overview of beverage container recovery by province, specifically, who is responsible for the system and what the collection infrastructure looks like.

PROVINCES	BC	AB	SK	MB	ON	QC	NS	NB	NF	PEI
Collection system	**DEPOT & RETAIL**	**DEPOT**	**DEPOT**	**CURBSIDE**	**CURBSIDE**	**RETAIL**	**DEPOT**	**DEPOT**	**DEPOT**	**DEPOT & RETAIL**
OPERATORS										
Beverage Industry (directly or through a third-party representative organizaiton)	Encorp Pacific, Liquor Distribution Branch, Brewers Distributors Ltd.	Alberta Beverage Container Recovery Corp (ABCRC)				Beer Industry, Soft-Drink Industry (BGE)		Encorp Atlantic, Rayan Industries	NewBRI (until Jan 2002)	Soft-Drink Industry, PEI Liquor Commission
Provincial Government										
Municipal Government				containers generated in the residential stream	containers generated in the residential stream	new age, water and liquor containers generated in the residential stream				new age, water and liquor containers generated in the residential stream
Not-for-Profit (non-government)			SARCAN				Resource Recovery Fund Board (RRFB)		The Multi-Materials Stewardship Board will take-over operational responsibility on Jan 1, 2002.	

Table 1.1 Beverage Container Recovery in Canada – Collection and Operators

The costs for the deposit systems vary dramatically in how they have been reported to date. The variations in costs seem to be a result of how costs have been reported, versus the actual cost differences in program design. The primary cost factors that affect the system costs from program to program in Canada are:

- The level of the handling fees
- If unredeemed deposit revenue is used to offset system costs
- If additional revenue generated from eco-fees and half-backs are used to subsidize other non-related systems (municipal waste diversion, market development, provincial environmental activities)

- Transportation distances from collection to processing to market
- Economies of scale

1.1 Who Pays

In an effort to understand the various costs and who bears them, a cost analysis was undertaken for programs where cost and revenue data is available. Cost have been broken down according to:

- Net system cost/unit to manufacturers
- Net system cost/unit before unredeemed deposit revenue
- Net system cost/unit after unredeemed deposit revenue
- Net system cost/unit to recycling consumers (consumer that return containers)
- Additional net system cost/unit to consumers choosing not to return containers (forfeiting their deposit)
- Non-system related costs to consumers per unit (unused recycling fees, half-backs, environmental handling charges etc.)

Table 1.2 and Figure 1.1 provide a summary of cost analysis to stakeholders of the various deposit-return programs. (Note: The following programs were not available for a cost analysis: NB, BC wine & liquor and all Canadian domestic beer recovery programs. The financials for these programs are considered as proprietary. Ontario and Manitoba cost figures cannot be broken down by container type due to their respective commingled collection systems.)

Beverage Industry: Direct system related cost/unit sold or profit/unit sold to the beverage industry – brandowners or distributors.

Provincial Government: Direct system related costs incurred by the Provincial government.

Municipal Government: Direct system related costs incurred by municipal authorities/taxpayers. Note: container disposal costs are always a cost to municipalities/taxpayers. These costs are not discussed in this report.

Recycling Consumer: Direct system cost/unit purchased to the beverage consumer that returns containers. These costs can be part of an up-front non-refundable eco-fee, container recycling fee (CRF) or the half-back portion of the refund.

Wasting Consumer: Additional system cost/unit purchased to the beverage consumers that choose not to return their container. These costs are generally quite high because they are equal to the value of the deposit. While theses costs vary from container to container depending on the level of the deposit, the cost/unit shown is an average.

Non-system related costs: Several programs in Canada use Environment Handling Charges (EHCs), Container Recycling Fees (CRFs) or Half-Back schemes to generate additional revenue. While this revenue may be generated from the beverage container consumer, it does not necessarily mean that it is being used to offset the system costs associated with operating the program that year.

Excess revenues may be used to build-up a reserve fund for operating deficits in other years, fund other environmental initiatives, or fund non-environmental initiatives. These consumer costs are therefore referred to as "Non-system related costs".

Table 1.2 Beverage Container Recovery in Canada

Who Pays What

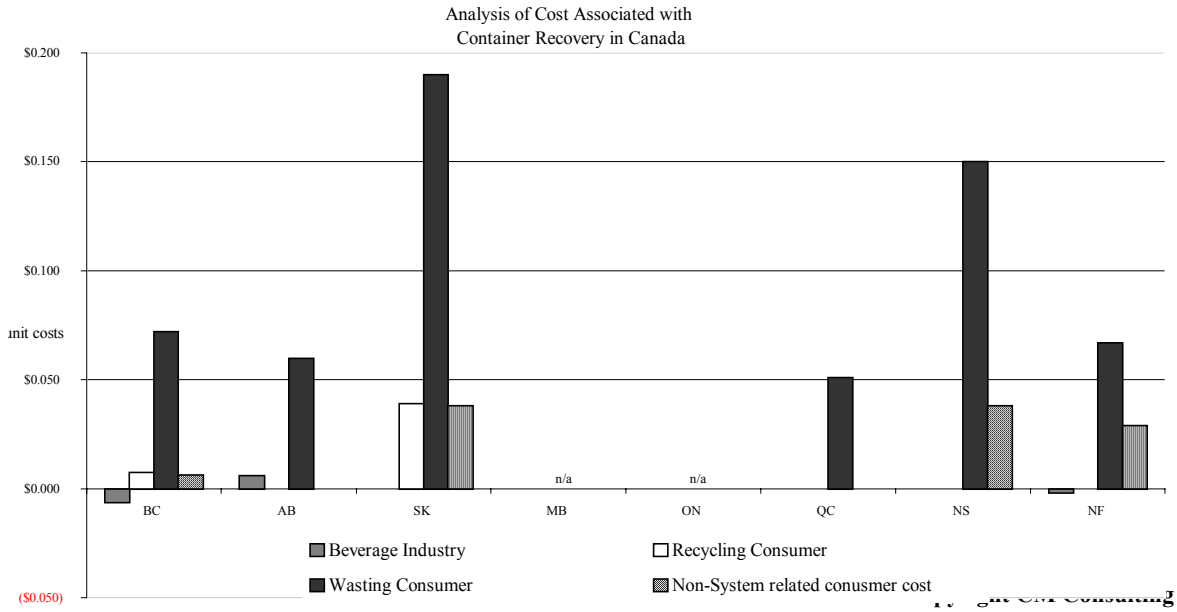
Stakeholders	BC	AB	SK	MB	ON	QC	NS	NF
	per unit sold	per unit sold	per unit sold	per unit sold		per unit sold	per unit sold	per unit sold
Beverage Industry	($0.006)	$0.006	-	-	-	$0.005	-	($0.002)
Provincial Government	-	-	-	-	$5,000,000	-	-	-
Municipal Government	-	-	-	20% of the net costs of recycling	100% of the net costs, minus $5,000,000 for Liquor bottle recycling.	-	-	-
Recycling Consumer	$0.008	-	$0.039	$0.02*	-	-	-	-
Wasting Consumer	$0.072	$0.060	$0.190		-	$0.051	$0.150	$0.067
Non-System related conusmer cost	$0.006	-	$0.038	n/a*	-	-	$0.038	$0.029

*In Manitoba, part of the revenue generated from the 2-cent levy on beverage containers subsidizes recovery of other materials in the municipal waste stream. The portion of revenue dedicated to beverage container recovery is unavailable.

**In Quebec, the soft-drink industry pays half a penny to their program operator Boisson Gasseuse Environment on each container sold.

This does not include revenues associated with material sales or costs incurred from transport, storage and processing. Depending on material revenues, the soft-drink industry's total cost may be higher or lower than the .5-cent/unit. The additional costs and revenue data was not available for this analysis.

Figure 1.1



1.2 Net System Costs

While some programs use the unredeemed deposit revenue to help offset costs (BC, AB, QC) other programs like SK put unredeemed deposit revenue into Provincial general revenues. In half-back programs like NS and NF, unredeemed deposit revenue is combined with the half-back revenue to offset system costs and fund non-system related programs.

1.2.1 Treatment of Unredeemed Deposits

There is great debate over the treatment of unredeemed deposit revenue. The consumers who choose not to return their containers for recycling or refill voluntarily pay unredeemed deposit revenue. It can be viewed as a source of revenue, which exploits consumer negligence in order to subsidize the cost of managing all containers (polluter pays). However, if the unredeemed deposit is used as additional revenue to offset system costs, it can become a disincentive to the system operators to increase recovery rates. Reduced returns result in higher revenues. This is especially relevant if the program is operated and funded by the private sector.

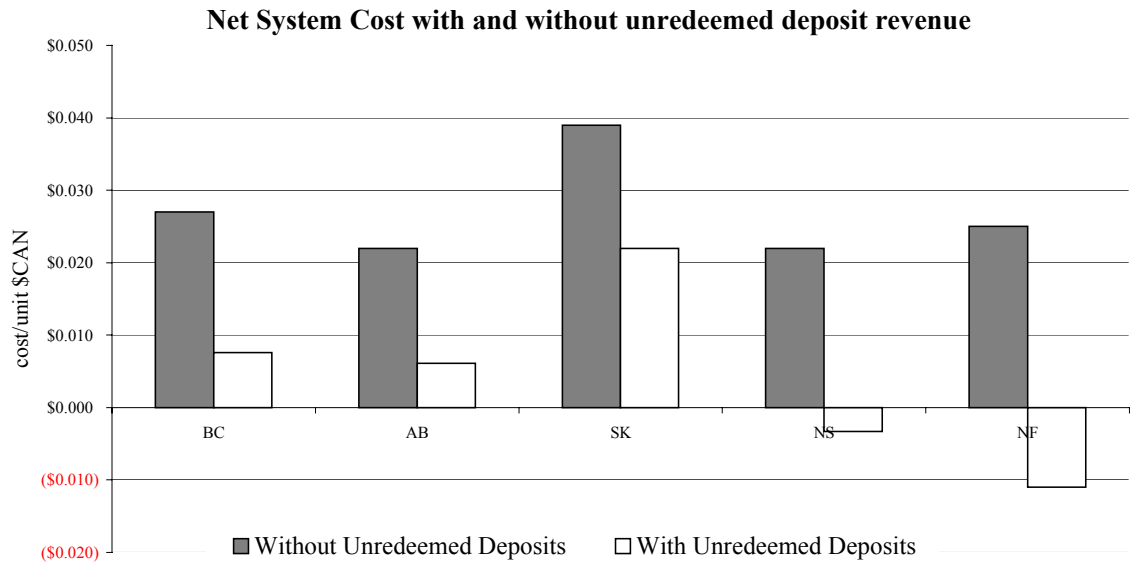
The unredeemed deposit money can also be viewed as a cost to the beverage container consumer (polluter pays) which varies greatly depending on the level of the deposit and return rates. Considering the volatility of the unredeemed deposits, calculating net costs without the unredeemed deposits as revenue provides a clearer picture of the system's efficiency relative to other programs.

Table 1.3 and Figure 1.2 provide a summary of the program "net system cost"/unit before unredeemed deposits and after unredeemed deposits. Quebec is not presented in this table because some of the revenue and expense information is not available. It should be noted that net system costs in the Atlantic Provinces after unredeemed deposits run a small surplus. This is due to the greater value of the deposits ($.10 and $.20) in the east vs ($.05 and $.20) in the west of Canada.

Table 1.3 Net System Cost with and without unredeemed deposit revenue

	BC	AB	SK	NS	NF
	per unit sold	per unit sold	per unit sold	per unit sold	per unit sold
Without Unredeemed Deposits	**$0.027**	**$0.022**	**$0.039**	**$0.022**	**$0.025**
With Unredeemed Deposits	**$0.008**	**$0.006**	**$0.022**	**($0.003)**	**($0.011)**

Figure 1.2



The following five pages provide a detailed revenue and expense summary of each provincial program as reported by the operating agency. The analysis identifies the various stakeholders in the program and their associated costs. Also provided are "net system costs"/unit recovered with, and without unredeemed deposit revenue.

Non-Alcohol Beverage Container Recovery in British Columbia		
January 1st-December 31st, 2000		
Revenues	**Encorp Pacific (Canada)**	**Notes**
Revenues from deposits	$ 52,774,445	Deposit levels are: $.05, $.20
Container recycling fees (CRF)	$ 11,262,802	Recycling fees are fees charged directly to consumers at the point of purchase. The fees were introduced in 1999: aluminum cans: $.01, Plastic: $01, $.02, $.05, glass: $.03, $.07, bi-metal $.02, gable top: $.01, aseptic: $.01, drink pouch: none., bag-in-a-box: $.04
Sale of recyclable materials	$ 11,788,165	
Other	$ 468,863	
TOTAL	**$ 76,294,275**	
Expenses		
Handling fees for deposit-bearing containers	$ 22,957,032	Handling fees are: Al cans: $.03, bi-metal<1L: $.03, pouches, tetra pak/gable top<500ml: $.03, plastic<1L: $.04, bi-metal>1L: $.05, tetra pak/gable top>501ml: $.05, glass<1L: $.06, plastic>1L: $.07, glass>1L:$.11
Deposits returned to consumers	$ 36,822,543	There is $15,951,902 left over as "unredeemed deposits"
Transportation and processing	$ 6,716,953	
Depot operations	$ 597,269	
Administration	$ 2,135,801	
Consumer awareness	$ 1,753,056	
Research and Development	$ 163,533	
Amortization	$ 60,770	
TOTAL	**$ 71,206,957**	
Source: Encorp Pacific (Canada) 2000 annual report		
ANALYSIS		
Net system <u>surplus</u> to beverage industry *Encorp's governance model does not permit it to operate at a loss nor to accumulate a surplus or to pay it out to its members. The policy is that any operating revenues would be used only for public education, to stabilize fees and to moderate future increases.*	**$ (5,087,318)**	Net system cost/surplus is calculated by subtracting revenues from expenses. $71,206,957-$76,294,275= **$5,087,318 surplus**
Net system <u>SURPLUS</u> TO THE BEVERAGE INDUSTRY per container sold	**(.63 cents)**	Net system cost (surplus) per container sold is calculated by dividing the net system cost/(surplus) by the total containers sold: $5,087,318/ 812,877,389= **.63 cents/unit surplus sold**
Net system cost without unredeemed deposit revenue	**2.7 cents**	Even though in BC Encorp Pacific uses unredeemed deposit revenue to off-set their costs, a system cost before unredeemed deposits can be attained. This cost is represented only for program to program comparisons. Total expenses minus material revenues and "other" revenue divided by the containers sold = $22,127,386 / 812,877,389 = 2.7 cents/unit sold. (containers sold is calculated by dividing the units returned by their material recovery rate)
Net system cost with unredeemed deposit revenue	**.76 cents**	Further subtract the unredeemed deposits ($15,951,902) as an additional revenue source and divide by the number of containers sold: $6,175,484/ 812,877,389 = .76 cents/unit.
CONSUMERS RECYCLING COST	**.76 cents**	**In BC producers are charged a container recycling fee or CRF which is in most cases passed on to consumers. The CONSUMER RECYCLING COSTS represents what consumers actually pay for this system/container purchased. This is represented by the net system cost divided by containers sold. $6,175,484/ 812,877,389 = .76 cents/unit.**
CONSUMER WASTING COST (Polluter Pays)	**7.2 cents**	**Consumers that choose not to return containers are paying additional cost. This additional cost is only borne by the polluters/wasters - CONSUMER WASTING COST which is represented by the unredeemed deposit revenue divided by the unreturned containers. $15,951,902 / 221,253,685 = 7.2 cents/unit wasted.**
NON-SYSTEM RELATED COST	**.63 cents**	In 2000 consumers paid in excess of $5,087,318 more than the cost of recovery. $5,087,318 / 812,877,389 = .63 cents/unit.

Beverage Container Recovery in Alberta (not including refillable beer)		
January 1st-December 31st, 2000		
Revenues	**ABCRC**	**Notes**
Revenues generated from unredeemd deposits	$ 14,800,000	Deposit levels are: $.05<1 litres, $.20>1 litres beer: $.10
Revenues paid by manufacturers (brand-owners)	$ 5,859,300	This represents the "out-of-pocket" contribution by industry.
Sale of recyclable materials	$ 13,630,500	
TOTAL	**$ 34,289,800**	
Expenses		
Handling fees for deposit-bearing containers	$ 26,062,400	$.03/unit under 500ml, $.05/unit >500ml, $.05/unit liquor containers, $.0355 imported beer/unit
Transportation and processing and Administration	$ 7,870,900	
Other - Beverage Container Management Board (BCMB)	$ 356,500	
TOTAL	**$ 34,289,800**	
Source: ABCRC's annual report 2000		
ANALYSIS		
Net system cost to the beverage industry	**$ 5,859,300**	Net system cost is calculated by subtracting revenues from expenses and dividing by the number of containers sold.
Net system COST TO THE BEVERAGE INDUSTRY per container sold	**.61 cents**	Net system cost per container sold to the beverage industry is calculated dividing the net system cost to industry by the number of containers sold - $5,859,300/957,929,059= .**61 cents/unit sold**
Net system cost without unredeemed deposit revenue	**2.2 cents**	Even though in Alberta, ABCRC uses unredeemed deposit revenue to off-set indsutry's costs, a system cost before unredeemed deposits can be attained. This cost is represented only for program to program comparisons. Total expenses minus material revenues divided by the containers sold = $20,659,300 / 957,929,059 = **2.2 cents/unit sold**.
Net system cost with unredeemed deposit revenue	**.61 cents**	Further subtract the unredeemed deposits ($14,800,000) as an additional revenue source and divide by the number of containers sold: $5,859,300/957,929,059= .61 cents/unit sold
CONSUMER RECYCLING COST	**no cost**	This represents what consumers actually pay for this system/container purchased. In Alberta the beverage industry pays directly for any system cost shortfall. To date, there is no evidence that the shelf price of beverage containers are affect by costs associated with deposit return programs. Therefore, consumers that return containers bear **no cost** for this system.
CONSUMER WASTING COST (Polluter Pays)	**6 cents**	Consumers that choose not to return containers are paying a cost/unit. This cost is **only borne by the polluters/wasters** - the CONSUMER WASTING COST is represented by the unredeemed deposit revenue divided by the unreturned containers. - $14,800,000 / 244,761,889 = **6 cents/unit wasted.**

Beverage Container Recovery in Saskatchewan		
April 1st, 2000-March 31st, 2001		
Revenues	**SARCAN**	**Notes**
Contract Revenue	$ 8,200,000	SARCAN is funded through a contractual agreement with the provincial government.
Sale of recyclable materials	$ 4,260,557	
Other Revenue	$ 267,832	
TOTAL	**$12,728,389**	
Expenses		
SARCAN Administration	$ 1,088,868	
Collection and transporatation	$ 9,251,763	Handling fees are: Aluminum cans: $.05, plastic containrers $.06, glass containers $.07
Processing	$ 1,774,491	
Depreciation and Amortization	$ 680,654	
TOTAL	**$12,795,776**	
PROFIT/(LOSS)	**$ (67,387)**	
Source: SARC Annual Report - 2000-2001		
ANALYSIS		
Net system COST TO THE BEVERAGE INDUSTRY per container sold	**no cost**	In SK the beverage industry has NO direct costs associated with the deposit return program.
Net system cost without unredeemed deposit revenue	**3.9 cents**	Unredeemed deposit revenue is not used to off-set SK's system costs. This cost is represented for program to program comparisons. Total expenses (including loss) minus material revenues divided by the containers sold: $8,267,387 / 209,634,915 = **3.9 cents sold**
Net system cost with unredeemed deposit revenue	**2.2 cents**	Further subtract the unredeemed deposits ($3,692,032) as an additional revenue source and divide by the number of containers sold: $4,575,355 / 209,634,915 = **2.2 cents/unit sold**
CONSUMERS RECYCLING COST	**3.9 cents**	To date, there is no evidence that the shelf price of beverage containers are affected by costs associated with depsit return programs. In SK, consumers pay an "Environmental Handling Charge" or EHC when they buy a beverage. They are: aseptic: $.03, polycoat: $.03, metal cans: $.05, plastic bottles: $.06, non-refillable glasss: $.07. Only part of this revenue is required to fund the system. The rest of this revenue goes into the Province's general revenues. The **CONSUMERS RECYCLING COST** represents what consumers actually pay for this system/container purchased (through the EHC). This is equal to the net system cost: **3.9 cents/ unit purchased.**
CONSUMER WASTING COST (Polluter Pays)	**19 cents**	Consumer that choose not to return containers are paying a cost/unit. This cost is only borne by the polluters/wasters - the **CONSUMER WASTING COST** is represented by the unredeemed deposit revenue divided by the unreturned containers. - It is estimated that the province generated about $3,692,032 in unredeemed deposits in 2000-2001. ($3,692,032 / 19,296,754 = **19 cents/unit wasted.**
NON-SYSTEM RELATED CONSUMER COST	**3.8 cents**	In SK consumers pay a Environmental Handling Charge. Only part of this revenue is needed to fund the system, anything over and above what is needed is a **NON-SYSTEM RELATED CONSUMER COST**. In 2000-2001 the EHC generated $12,579,290 for the provincial government. Only $4,575,355 of this was needed to off-set system costs after unredeemed revenues ($3,692,032). Therefore the difference, $8,003,935 was a non-system related consumer cost. $ 8,003,935 / 209,634,915 containers sold = 3.8 cents/unit

Beverage Container Recovery in Nova Scotia		
April 1st, 2000 - March 31st, 2001		
Revenues	**RRFB**	**Notes**
Gross revenues from deposits	$ 26,068,255	$9,822,750 is half-back revenue, $9,822,750 in redeemed deposits and $6,422,755 is unredeemed deposit revenue.
Material revenues from the sale of recyclable materials	$ 3,790,780	
TOTAL	**$ 29,859,035**	
Expenses		
Handling fees for deposit-bearing containers	$ 5,923,382	The handling fee is 2.75 cents per container. (215,395,709 redeemed containers.
Deposits returned to consumers	$ 9,822,750	Consumers returning containers receive 5 and 10 cents back on a 10 and 20 cent deposit - "half-back system".
Transportation	$ 991,864	Local cartage is $911,893 and freight in is $79,971
Processing	$ 1,162,950	Regional processing: $754,705 and Central processing: 408,245
Administration	$ 1,248,688	Included in this figure is the administration for the scrap tire program. A separate deposit-return administration cost is not available.
Closing inventory	$ 26,392	Opening inventory $101,116 minus closing inventory $74,724 = $26,392
TOTAL	**$ 19,176,026**	
PROFIT	**$ 10,683,009**	PROFIT SPENT ON: $3,397,546 HST (government revenue), $7,285,463 towards municipal diversion and recycling market development.

Source - Resource Recovery Fund Board Annual report 2000-2001.

ANALYSIS		
Net system COST TO THE BEVERAGE INDUSTRY per container sold	**no cost**	
Net system cost without unredeemed deposit revenue	**2.2 cents**	Even though RRFB uses unredeemed deposit revenue to off-set their costs, a system cost before unredeemed deposits can be attained. This cost is represented for program to program comparisons. Net Expenses (handling fees, transport, processing, admin and closing inventory = $9,353,276) minus material revenues ($3,790,780) divided by the containers sold = $5,562,496 / 257,861,852 = **2.2 cents/unit**
Net system surplus with unredeemed deposit revenue	**(.33 cents)**	Further subtract the unredeemed deposits ($6,422,758) as an additional revenue source and divide by the number of containers sold: ($5,562,496-$6,422,758) / 257,861,852 = **(.33 cents) cents/unit sold**
CONSUMER RECYCLING COST	**NO COST**	To date, there is no evidence that the shelf price of beverage containers are affected by costs associated with deposit return programs. In NS, consumers do pay a "half-back" to help off-set system costs and revenue is used to fund municipal waste diverison programs and market development in the province. In 2000-2001 none of the half-back revenue was required to fund the system. The **CONSUMER RECYCLING COST** represents what all consumers actually pay for this system per container purchased. With a net cost of $5,562,496, the unredeemed deposit revenue at $6,422,758 more than covered any program shortfall. Therefore, there was **NO CONSUMER RECYCLING COST.**
CONSUMER WASTING COST (Polluter Pays)	**15 cents**	Consumers that choose not to return containers are paying a cost/unit. This cost is only borne by the polluters/wasters - the **CONSUMER WASTING COST** is represented by the unredeemed deposit revenue divided by the unreturned containers. The RRFB generated about $6,422,758 in unredeemed deposits in 2000-2001. $6,422,758 / 42,290,344 = **15 cents/unit wasted.**
NON-SYSTEM RELATED CONSUMER COST	**3.8 cents**	In NS consumers pay a half-back on all redeemed containers. Any revenue generated from consumers over and above what is needed to run the system is a **NON-SYSTEM RELATED CONSUMER COST**. In 2000-2001 it is estimated that the half-backs generated revenue of $9,822,750 for the provincial government (HST) and municipal waste diversion programs. This cost can therefore be calculated by dividing the half-back revenue by the amount of containers sold. $9,822,750 / 257,861,852 = **3.8 cents/unit purchased.**

Beverage Container Recovery in Newfoundland & Labrador		
April 1st, 1999 - March 31st, 2000		
Revenues		**Notes**
Gross revenues from deposits	$ 11,630,375	$2,541,688 is half-back revenue, $2,541,688 in redeemed deposits and $6,547,000 is unredeemed deposit revenue.
Material revenues from the sale of recyclable materials	$ 1,588,680	
Interest on income	$ 299,730	
TOTAL	**$ 13,518,785**	
Expenses		
Handling fees for deposit-bearing containers	$ 2,388,002	The handling fee is 2.75 cents per container. (The handling fee was increased to 3 cents/unit as of Sept 2001)
Deposits returned to consumers	$ 2,541,688	Consumers returning containers receive 3-cents on a 6-cent deposit, and 10-cents on a 20-cent deposit. In 2001 the levels were increased to: 5-cents returned on an 8-cent deposit and 10-cents on 20-cent deposit.
Transportation	$ 771,549	
Processing	$ 1,577,926	
Multi-Materials Stewardship Board	$ 325,000	
Administration	$ 913,854	
Closing inventory	$ 37,079	Opening inventory $102430 minus closing inventory $65,351 = $37,079
Other expenses	$ 124,049	Quality assurance: $81,161 + Shipping supplies: $35,432 + School Programs: $7,456 = $124,049
TOTAL	**$ 8,679,147**	
PROFIT	**$ 4,839,638**	PROFIT SPENT ON: $1,534,921 HST (government revenue), $3,000,000 for the Province's Waste Management Trust Fund.
Source: NewBRI Statement of Earnings and Appropriated year ended March 31, 2000.		
Net system surplus TO THE BEVERAGE INDUSTRY per container sold	**(.17 cents)**	NewBRI operates the program on behalf of beverage producers. In 1999-2000 there was a system surplus of $304,717. This is equal to .17 cents surplus/unit sold. $304,717 / 184,217,630 = .17 cents
Net system cost without unredeemed deposit revenue	**2.5 cents**	Even though in NewBRI uses unredeemed deposits and half-backs revenue to off-set their costs, a system cost before these unredeemed deposits can be attained. This cost is represented only for program to program comparisons. Total expenses (not including half-backs) minus material revenues and interest on income revenue divided by the containers sold. $4,534,921 / 184,217,630 = **2.5 cents/unit sold.**
Net system <u>surplus</u> with unredeemed deposit revenue	**(1.1 cents)**	Further subtract the unredeemed deposits ($6,547,000) as an additional revenue source and divide by the number of containers sold: ($4,534,921-$6,547,000) / 184,217,630 = (1.1) cents/unit sold
CONSUMERS RECYCLING COST	**no cost**	To date, there is no evidence that the shelf price of beverage containers are affected by costs associated with deposit return program. In NF, consumers do pay a "half-back" to help off-set system costs and revenue is used for provincial revenues (HST) and the Waste Managmenet Trust Fund. The CONSUMER RECYCLING COST represents what all consumers actually pay for this system per container purchased (through the half-back). In 2000-2001 NONE of the half-back revenue was required to fund the system. The CONSUMER RECYCLING COST represents what all consumers actually pay for this system per container purchased. With a net cost of $4,534,921, the unredeemed deposit revenue at $6,546,999 more than covered any program shortfall. Therefore, there was NO CONSUMER RECYCLING COST.
CONSUMER WASTING COST (Polluter Pays)	**6.7 cents**	Consumer that choose not to return containers are paying additional cost. This additional cost is only borne by the polluters/wasters - the CONSUMER WASTING COST which is represented by the unredeemed deposit revenue divided by the unreturned containers. $6,546,999 / 97,554,557 = **6.7 cents/unit wasted.**
NON-SYSTEM RELATED COST	**2.9 cents**	In NF, consumers pay a portion of the deposit to help off-set the cost and to contribute to the Province's "Waste Management Trust Fund" and HST. In 1999-2000 consumers paid $2,541,688 in half-back revenue, which went to the Province's Waste Management Trust Fund and to provincial general revenues (HST). Therefore the NON-SYSTEM RELATED COST was $2,541,688 / 86,663,073 = **2.9 cents/unit.**

2. Recovery Rates for Beverage Containers in Canada

Deposit-return programs had been in place for refillable beverage containers before single-serve containers entered the market place. Initiated in large part as a result of the growth in the single-serve container market share and its associated environmental impacts, deposit-return programs have expanded across Canada.

Today six of ten provinces in Canada have full deposit-return programs for all beverages except milk: British Columbia (BC), Alberta (AB), Saskatchewan (SK), New Brunswick (NB), Nova Scotia (NS), Newfoundland & Labrador (NF). Quebec (QC) maintains a deposit-return program for beer and soft drinks, and Prince Edward Island (PEI) a refillable program (deposit-return) for beer and soft drinks. Ontario and Manitoba collect all beverage containers through a province-wide curbside collection program.

In the US, ten states operate deposit-return programs (bottle bills) for soft drink and beer. Only Maine maintains an expanded program, which includes new-age, water, liquor and wine containers. California operates the largest program in the US for about 12% of the US population. Together, bottle bill states (29% of the US population) maintain a recovery rate for targeted beverage containers of 72.1%. Non-bottle bill states or states that use curbside and depot drop-off for beverage container recovery (71% of the US population) maintain a recovery rate of 28.3% of beverage container.[1]

In a very recent report, *Understanding Beverage Container Recycling – A Value Chain Assessment* prepared for the Multi-Stakeholder Recovery Project, one of the key conclusions was that, "Beverage container recycling rates are likely to steadily decline in future years in the absence of new recovery and market development initiatives."[2] The report attributes this decline to a variety of factors including:

- growth is dominated by PET containers (with an emphasis on single-serve beverages often consumed away-from-home);
- the increasing range of beverage types may complicate recycling education and/or may not be covered in a recovery program;
- the maturation of curbside and drop-off collection programs;
- there is declining support and funding for recycling; and

[1] Container Recycling Institute

[2] *Understanding Beverage Container Recycling – A Value Chain,* R.W. Beck, Franklin Associates Ltd., Tellus Institute, Sound Resource Management, and Boisson & Associates - January 2002.

- the relative value of deposit amounts have declined over the years (ie. 5-cents is not worth what is used to be).[3]

Table 2.1, Table 2.2, Table 2.3, Figure 2.1 & Figure 2.2 provides a Canadian overview of beverage container recovery rates, an overview by beverage type, and overview by container material type (Aluminum, Glass, PET). Due to inconsistencies on how container material recovery is reported, captures rates are broken down in detail as reported by program operators. The data is from year 2000 or year 2000-2001.

[3] *Understanding Beverage Container Recycling – A Value Chain,* R.W. Beck, Franklin Associates Ltd., Tellus Institute, Sound Resource Management, and Boisson & Associates - January 2002.

Table 2.1 Overview of beverage container recovery/capture in Canada

Canada	Containers with deposits	Capture Rate
Alberta	all beverage containers except milk (milk is under a voluntary recovery program through depots)	Refillable beer: 94% , Domestic beer cans: 88.9% aluminum cans: 80.2%, Plastics: 71.9%, glass: 78.2%, polycoat: 51.4%, metal: 50.9% OVERALL: 74.4%
British Columbia	all beverage containers except milk	Refillable beer: 94.3% , Domestic beer cans: 95% NON-ALCOHOL: 73% - aluminum cans: 84.3%, Plastic: 73.1%, glass: 60.6%, bi-metal 38.5%, gable top: 45.6%, aseptic: 43.4%, drink pouch: 16.4%, bag-in-a-box: 60% ALCOHOL: 85%
Saskatchewan	all beverage containers except milk (milk is under a voluntary recovery program through depots)	Refillable beer: 91.9%, Domestic beer cans: 95.2% aluminum cans: 94.8%, PET: 86.5%, other plastic: 86.5%, glass: 83.3%, metal: 94.8%, aseptic: 46.1% OVERALL: 85.6%
Manitoba	beer containers only (all other beverage containers are collected through the blue box)	Refillable beer: 95.5% , Doemstic beer cans: 74.4% glass: 34%, steel: 26%, PET: 37% HDPE: 23%, aluminum cans: 31%, top/ aseptic 26% OVERALL RESIDENTIAL: 31% (via blue box)
New Brunswick	all beverage containers except milk	Refillable beer: 95.9%, Domestic beer cans: 75% NON-ALCOHOL: 75% Aluminum 77%, PET 76%, Glass 69%, Other 73% ALCOHOL: 74%
Newfoundland	all beverage containers except milk	Refillable beer: 95% , Domestic beer cans: 54.6% OVERALL: 47%
Nova Scotia	all beverage containers except milk (milk is under a voluntary recovery program through municipal curbside programs)	Refillable beer: 96.1%, Domestic beer cans: 69.5% OVERALL: 84% (Includes alcohol and non-alcohol)
Ontario	beer and refillable soft drinks (all other beverage containers are collected through the blue box)	Refillable beer: 96.4% , Domestic beer cans: 76.8% OVERALL RESIDENTIAL: 41% (via blue box)
P.E.I.	refillable soft drinks & beer alcoholic beverages (non-refillable beer and soft-drink are banned in PEI)	Refillable beer: 96.4% wine/liquor: 59% soft drinks - OVERALL : 98%
Quebec	all beer and soft drinks	Refillable beer: 98%, Domestic beer cans: 76% aluminum soft drink cans: 77%, PET soft drinks: 75%, glass soft drink and way beer bottles: 76% OVERALL: 75.8%
Yukon	all beverage containers except milk	Refillable Bottles: 103.5%, Non-refillable Bottle (beer, cider and coolers) 113.5% , <1 litre: 78.5%, > 1-litre: 89.6%, Liquor Containers >200ml: 99.3% OVERALLl: 84.9% (includes refillable bottles)

Table 2.2 Overview of beverage container recovery by beverage type (beer / non-beer)

Container Type	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec	Nova Scotia	New Brunswick	Newfoundland
Refillable beer bottles	94%	94%	92%	96%	96%	98%	96%	96%	95%
Domestic beer cans	95%	89%	95%	74%	77%	76%	70%	75%	55%
Non-Alcohol	73%							77%	
Alcohol	85%							74%	
Soft-Drinks						76%			
Containers (non-beer)	75%	74%	86%	31%	41%	76%	84%	75%	52%

*MB and ON capture rates represent ONLY material from the residential sector.

Figure 2.1 Overview of beverage container recovery by beverage type (beer / non-beer)

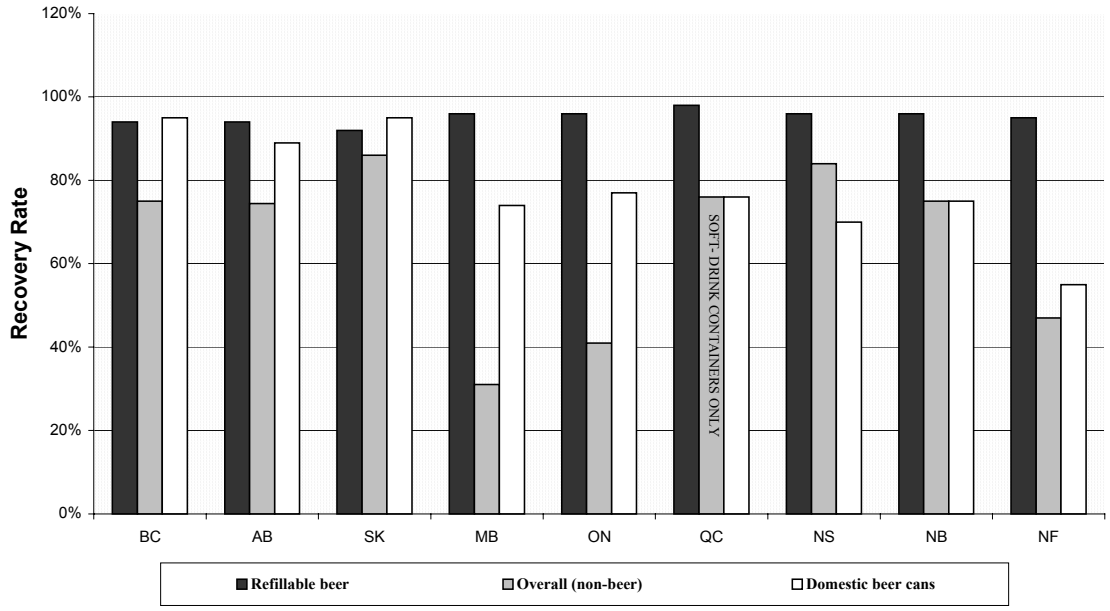
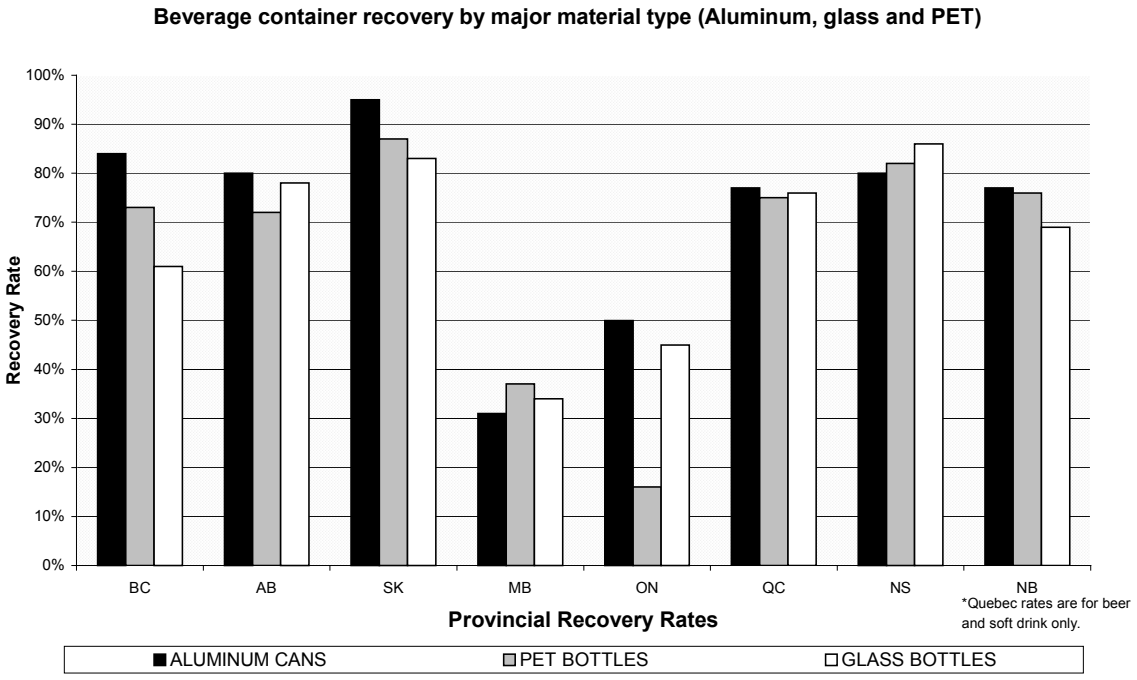


Table 2.3 Overview of beverage container recovery by major material type (Aluminum, glass and PET)

Container Type	BC	AB	SK	MB	ON	QC	NS	NB
ALUMINUM CANS	84%	80%	95%	31%	50%	77%	80%	77%
PET BOTTLES	73%	72%	87%	37%	16%	75%	82%	76%
GLASS BOTTLES	61%	78%	83%	34%	45%	76%	86%	69%

Figure 2.2 Beverage Container Recovery by Major Material Type (Aluminum, Glass, PET)



3. Cost estimates of curbside collection for beverage containers

Since curbside collection systems began operating in the early 1980s, there have been several attempts to gain a better understanding of the system costs. However, the majority of cost estimates have been done based on the "basket of goods" collected, which includes beverage containers, other household packaging and fibre materials. As well, costing is usually done on a weight basis, which fails to account for the volume of material – a measurement that has a significant impact on costs.

There are however several studies available that have taken a closer look at the costs of collecting beverage containers via curbside collection. Section 3 of this report will present the findings of the various cost studies. The most recent and comprehensive cost and performance study available today is the Businesses and Environmentalists Allied for Recycling (BEAR) *Value Chain Assessment Final Report* - January 2002.

The following curbside cost analyses will be examined:

1) *Analysis and Report on Beverage Container Recovery Methods* by Coopers & Lybrand for the BC Ministry of Environment, 1995.
2) *An Analysis of a Recycling System – As an alternative to Expanding the Scope of the Bottle Bill in Massachusetts* by Tellus Institute for the Massachusetts Department of Environmental Protection, 1998
3) Works and Utilities Committee Report – *The Issues Associated with a Deposit-return System for Alcoholic and non-Alcoholic Beverage Containers* by John Warren, Director of Operations and Sanitation, City of Toronto.
4) Businesses and Environmentalists Allied for Recycling (BEAR) - *Understanding Beverage Container Recycling – A Value Chain Assessment prepared for the Multi-Stakeholder Recovery Project* by R.W. Beck, Franklin Associates Ltd., Tellus Institute, Sound Resource Management, and Boisson & Associates - January 2002.

3.1 *Analysis and Report on Beverage Container Recovery Methods* by Coopers & Lybrand for the BC Ministry of Environment, 1995.

This reports evaluates the relative cost and performance of collecting beverage containers through various collection systems, including expanded deposit-return via depot, retail, depot & retail, and curbside collection in British Columbia. Its findings suggest: "The cost for recovering containers for recycling

through municipal curbside systems range from 1.4 to 2.1 cents per container."[4] The range is based on whether containers will be collected on their own, or commingled with newspaper and magazines. The higher figure (2.1 cents/unit) represents the costs of container collection on their on through curbside collection. This cost is further broken out by container type: carbonated soft drinks: 1.2 cents/unit, other carbonated drinks: 5.8 cents/unit, non-carbonated drinks: 5 cents/unit, wine and spirits 8.2 cents/unit, fruit and vegetable juice: 3.9 cents/unit and milk and milk products 7.1 cents/unit.[5]

The report suggests that while a deposit-return program can attain an 86% capture rate, curbside collection can only achieve a 35% capture rate. As such, landfill and litter abatement costs would increase from an estimated $2.6 million to $14 million.[6] The report also states that the cost of curbside collection, landfill and litter abatement are borne by the general taxpayer, versus deposit-return systems where the system costs are borne by consumers and/or the beverage industry, and the lowered landfill and litter abatement costs borne by taxpayers.

3.2 *An Analysis of a Recycling System – As an alternative to Expanding the Scope of the Bottle Bill in Massachusetts* by Tellus Institute for the Massachusetts Department of Environmental Protection, 1998

The Tellus Institute was commissioned by the Massachusetts government to identify costs of achieving an 85% recovery rate for beverage containers using alternative recycling systems like curbside collection. Tellus found that an 85% recovery rate would only be achievable with the addition of extensive infrastructure for capturing the high percentage of beverage containers consumed away from the home. The requirement for additional recycling bins and collection services from public spaces, parks, beaches, shopping centres, service centres and office buildings plus the requirement for increased education and promotion would, according to their calculations, drive system costs to approximately US $6,000 /ton (about CDN $7000/tonne). Tellus also notes, that since such alternative programs are uncommon, their ability to achieve an 85% recovery rate remains uncertain.[7]

3.3 Works and Utilities Committee Report – *The Issues Associated with a Deposit-return System for Alcoholic and non-Alcoholic Beverage Containers* by John Warren, Director of operations and Sanitation, City of Toronto.

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[4] *Analysis and Report on Beverage Container Recovery Methods* by Coopers & Lybrand for the BC Ministry of Environment, 1995. Page. iii
[5] Ibid.,
[6] Ibid.,

The purpose of this report was to provide Toronto City Council with sufficient information to decide whether the implementation of deposit-return for wine and spirit and other beverage containers is appropriate. The report found that: "Deposit-return for only wine and spirit containers is estimated to reduce the cost of the city's waste management system by approximately $1,000,000 per year following full implementation. Comprehensive deposit-return on all alcoholic and non-alcoholic beverage containers is estimated to reduce the cost of the City's waste management system by approximately $4,750,000 per year following full implementation."[8]

3.4 Businesses and Environmentalists Allied for Recycling (BEAR) - *Understanding Beverage Container Recycling – A Value Chain Assessment prepared for the Multi-Stakeholder Recovery Project* by R.W. Beck, Franklin Associates Ltd., Tellus Institute, Sound Resource Management, and Boisson & Associates - January 2002.

Businesses and Environmentalist Allied for Recycling (BEAR) is an American coalition dedicated to significantly increasing the national recycling rate for beverage containers. BEAR's members include recycling collection, processing and end-markets, and environmental organizations. The Multi-Stakeholder Recovery Project (MSRP), initiated through the BEAR coalition, is a three-stage initiative to move toward BEAR's 80% recycling target.

Stage one of the project was to provide an objective, unbiased source of information on beverage container recovery programs. The research consulting team included: R.W. Beck, Franklin Associates, Tellus Institute and Sound Resource Management Group. The report is based on existing data and information, and was extensively reviewed by the project's Task Force and Advisory Committee comprising stakeholders from throughout the value chain, including the world's largest beverage brandowner, Coca-Cola.

The report found that the average gross cost for curbside recycling was 2.48 US cents per container recovered, and a net cost (including revenue from material sales) of 1.72 US cents per unit recovered. [9]

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[7] *An Analysis of a Recycling System – As an alternative to Expanding the Scope of the Bottle Bill in Massachusetts* by Tellus Institute for the Massachusetts Department of Environmental Protection, 1998

[8] Works and Utilities Committee Report – *The Issues Associated with a Deposit-return System for Alcoholic and non-Alcoholic Beverage Containers* by John Warren, Director of operations and Sanitation, City of Toronto.

4. Environmental Impacts of Deposit-return vs. Curbside Programs

4.1 Methodology

In an attempt to gain a better understanding of the environmental benefits or impacts of various container collection programs, unit sales and recovered tonnes from British Columbia's non-alcohol recovery program, managed by Encorp Pacific was used as baseline data for this analysis.

British Columbia container sale data was applied to alternative beverage container recovery programs currently operating in Canada. More specifically, performance rates for existing data on BC's beverage container recovery rate for the year 2000 attributable to the present deposit-refund system[10] was compared to estimated recovery rates of two curbside system scenarios for beverage container material: glass, aluminum, and PET and HDPE. Recovery rates for curbside collection were extrapolated according to the following scenarios:

1. An "optimum recovery blue box" program was projected using Ontario 1999 recovery data. Ontario presently has the most sophisticated and successful curbside recovery program in North America. The program has been in place for nearly 15 years in some jurisdictions, it is regulated (Reg 101/94), and 97% of the population have access to the system.
2. A "moderate recovery" curbside program was projected using Manitoba 2000-2001 values, which reflect the average recovery rates for curbside programs in North America.

Recovery values for deposit-return *vs.* curbside "optimum" and curbside "moderate" were compared to assess the environmental benefits associated with each system in terms of total materials recycled and consequent landfill space displaced. Avoided litter was also quantified. In addition, the displacement of virgin resources attributable to the recycling rates of each program was compared in terms of: (1) barrels of oil conserved; (2) greenhouse gas emissions avoided; and (3) reduced atmospheric, waterborne and industrial emissions. It was found that the British Columbia beverage container recovery system had far superior environmental performance in all categories investigated, despite utilizing a "best-case" recovery rate scenario for a curbside system.

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[9] *Understanding Beverage Container Recycling – A Value Chain,* R.W. Beck, Franklin Associates Ltd., Tellus Institute, Sound Resource Management, and Boisson & Associates - January 2002. Table ES-1.

4.2 Materials Recycled

Recovery rates for (1) present deposit-return, (2) optimum curbside, and (3) moderate (average) curbside were calculated as per the following sections (Section 4.2.1 and 4.2.2), and illustrated as per estimated weight of material diverted (Section 4.2.3).

4.2.1 Deposit-Return Recovery Rate in British Columbia

In the United States, bottle bills were passed from the 1970s until the *1987 California Beverage Container Recycling and Litter Reduction Act*, which includes the redemption of beverage containers to be recycled. The container return rate found in bottle bill (deposit-return) states ranges between 72 to 98%[11]. These values are consistent with the data published by Encorp Pacific (Canada), the company responsible for the recycling of non-alcohol beverage containers as per British Columbia's deposit-refund system. Encorp's 2000 Annual Report indicated a 60.6% recovery rate for glass, a 73.1% recovery rate for plastic, and an 84.3% recovery rate for aluminum. Encorp's average recovery rate for the year 2000 is 73%. Materials recovered by component in 2000 are presented in Table 4.1

Table 4.1 British Columbia Recovery Data for 2000 Deposit-Return System

Component	**Recovery Rate (%)**	**Weight (metric tonnes)**
Glass	60.6%	9354
Aluminum	84.3%	5312
Plastic[12]	73.1%	
PET		5827
HDPE		508

[10] Encorp Recycling Statistics: http://www.encorpinc.com
[11] National Centre for Environmental Decision Making Research: http://www.ncedr.org
[12] The breakdown for HDPE and PET was derived from data presented in the EnvirosRIS (2000) "Inventory of Rigid Plastic Containers Generated, Recovered, and Discarded in British Columbia"

4.2.2 Estimating Curbside Recovery Rates

For this study, estimates of recovery attributable to a curbside program were derived using a combination of (1) unit sales compiled by container types for British Columbia in 2000[13]; (2) best and average case recovery rate scenarios for curbside; and (3) accounting for the loss of material for recovery attributable to point of generation away from curbside collection systems.

(a) Estimating Curbside: Unit Sales by Container Type

Unit sales by container type (non-alcohol) for the year 2000 were compiled for the Province of British Columbia. Values for components of interest are presented in Table 2.

Table 4.2 Year 2000 Unit Sales by Container Type, British Columbia

Component Type	Unit Sales
Glass	60,807,259
Aluminum	416,795,531
PET[14]	184,425,538
HDPE	16,037,003

(b) Estimating Curbside: Optimum Recovery Scenario

The Ontario Blue Box program, which is presently the most sophisticated curbside program in North America, has an estimated container recovery rate of 41%. The program has a 97% residential access rate and a regulation that requires all municipalities of over 5000 to operate curbside programs for residents. Specific 1999 capture rates for components of interest are: 68% for glass, 58% for aluminum, 43% for PET, and 29% for HDPE[15]. Consequently, data on component-specific recovery rates for Ontario was

[13] Encorp Pacific
[14] The breakdown for HDPE and PET was modified from data presented in the EnvirosRIS (2000) "Inventory of Rigid Plastic Containers Generated, Recovered, and Discarded in British Columbia"
[15] Ontario Waste Diversion Organization (2000) "Achieving Sustainable Municipal Waste Diversion Programs in Ontario"

applied to British Columbia non-alcohol beverage sales figure to assess the results of an "Optimum Blue Box Program" in the province.

(c) Estimating Curbside: Moderate (Average) Recovery Scenario

Data on Manitoba's curbside recovery program was used to derive recovery values attributable to a moderately successful average curbside program, as opposed to the "best-in-class" represented by Ontario data. The Manitoba Product Stewardship Corporation has estimated the 2000 recovery rate for container material (including non-beverage containers) for their provincial curbside system to be 31% of residentially generated container material. It should be noted that according to national statistics for the United States, non-deposit states have recovery rates of 28% for beverage containers, further illustrating that the average recovery rates for curbside systems tend to be lower then the 41% recovered through the Ontario system, and the 31% recovery rate as reported by Manitoba. Specific capture rates in Manitoba for components of interest are: 34% for glass, 31% for aluminum, 37% for PET, and 23% for HDPE.[16]

(d) Estimating Curbside: Accounting for Point of Generation

Despite significant increases in population, the Container Recycling Institute has indicated that those states served by curbside recycling programs have seen a dramatic **decrease** in the recovery rates. For example, between 1994 and 1997 it was found that while the populations served by curbside increased 21%, the total PET bottle recycling rate declined by 20%[17]. Partial explanation for the decreased recycling rates associated with curbside systems has to do with the point of generation of beverage containers. An increasing portion of beverage sales packaged in single-serve containers are consumed away from home, and consequently, away from curbside recycling bins. The percent of beverage containers generated at home *vs* outside the home for glass, aluminum, PET, and HDPE is illustrated in Table 3.[18] Recovery rates for blue box or curbside materials must account for point of generation occurring outside the home. Consequently, recovery rates for optimum and average curbside scenarios were adjusted for the reduced pool of material for capture (Table 3).

[16] Manitoba Product Stewardship Corporation, Annual Report 2000 – 2001.
[17] Container Recycling Institute: http://cri.earthsystems.org/
[18] Modified from Container Consulting Inc., R.W. Beck Inc., and Franklin Associates Ltd. "Estimates of Point of Generation"

Table 4.3 Estimates of Point of Generation and Adjusted Recovery Rates

Component Type	Percent of Beverage Container Generated in Residence	Percent of Beverage Containers not generated in Residence	Estimated Optimum Component Recovery Rate as per Ontario data	Adjusted Recovery Rate accounting for Point of Generation – Ontario Data	Estimated Moderate Component Recovery Rate as per Manitoba data	Adjusted Recovery Rate accounting for Point of Generation – Manitoba data
Glass	66%	34%	68%	**45%**	34%	**22%**
Aluminum	87%	13%	58%	**51%**	31%	**27%**
PET	37%	63%	43%	**16%**	37%	**14%**
HDPE	95%	5%	29%	**28%**	23%	**22%**

4.2.3 Materials Recycled in British Columbia: Documented Deposit-return vs. Projected Optimum Curbside, and Projected Moderate Curbside Recovery

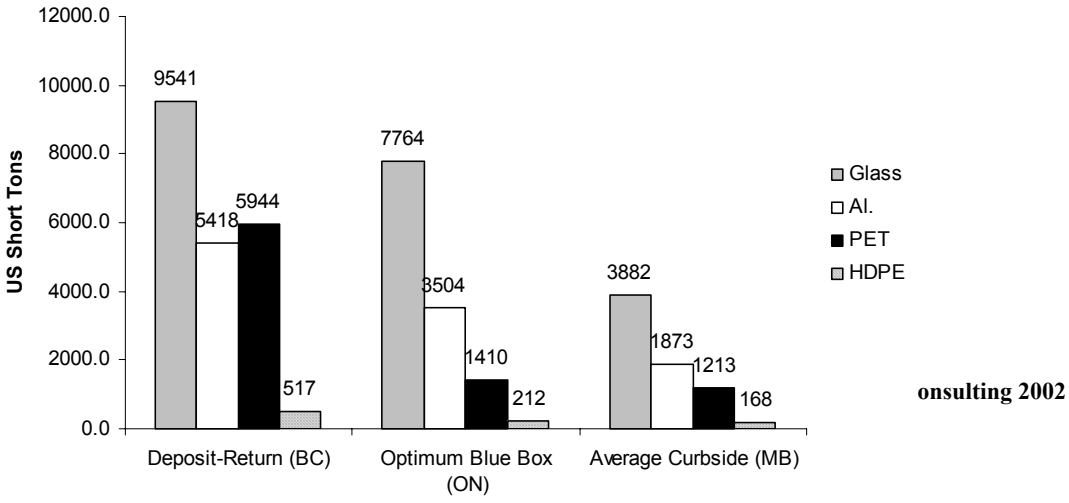
Values tabulated were used to determine the total materials recycled for:

(1) The present deposit-return system in British Columbia;

(2) A projected optimum curbside recovery system in British Columbia;

(3) A projected moderate (average) curbside recovery system in British Columbia.

Figure 4.1: Estimated Materials Recycled Annually in British Columbia, Deposit-Return *vs.*



Optimum and Moderate Curbside

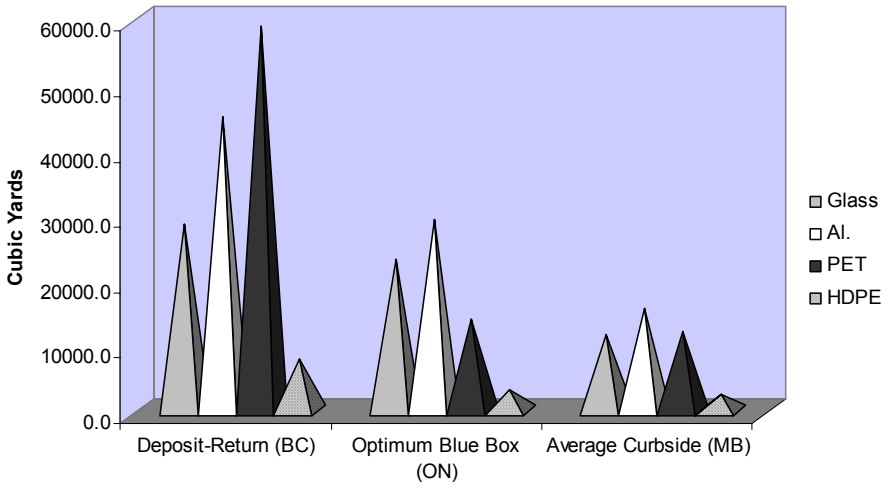
An optimum curbside program would be estimated to recover 40% less material than the present deposit-return system (~ 8500 short tons). A moderately successful curbside program would recover 67% less material (~ 14,000 short tons) as compared to the present system in BC.

4.3 Landfill Space

Reductions in waste disposed as per efforts related to reduce, reuse, and recycle translate directly into landfill space savings. Since 1989, more than half of the 207 landfills in British Columbia have closed. Present and pending population and pollution pressures will lead to even more stringent environmental safeguard requirements and required alternatives to current landfill disposal.[19] Figure 2 illustrates the total volume of landfill space saved as per different beverage container recovery systems for British Columbia.[20]. Data is reported in cubic yards.

[19] Felder, M. (1999) "A Waste Audit and Directions for Reduction at the University of British Columbia"
[20] Values are modified from Tellus (1998) "Recycling for the Future – Consider the Benefits", which calculates avoided landfill space from materials recycled based on loose material densities, compaction factors, and a 13% cover.

Figure 4.2 Estimated Annual Landfill Space Saved in British Columbia, Deposit-Return *vs.* Optimum and Moderate Curbside



The present deposit-refund system (as per Section 4.2.1) is estimated to result in diversion of ~ 140, 500 cubic yards of waste annually from landfill. An optimum curbside system would divert 50% **less** materials from landfill (occupying an additional ~ 70,000 cubic yards annually in landfill space) as compared to the present system and a moderately successful program 70% less (occupying an additional ~100,000 cubic yards annually in landfill space).

4.4 Avoided Litter

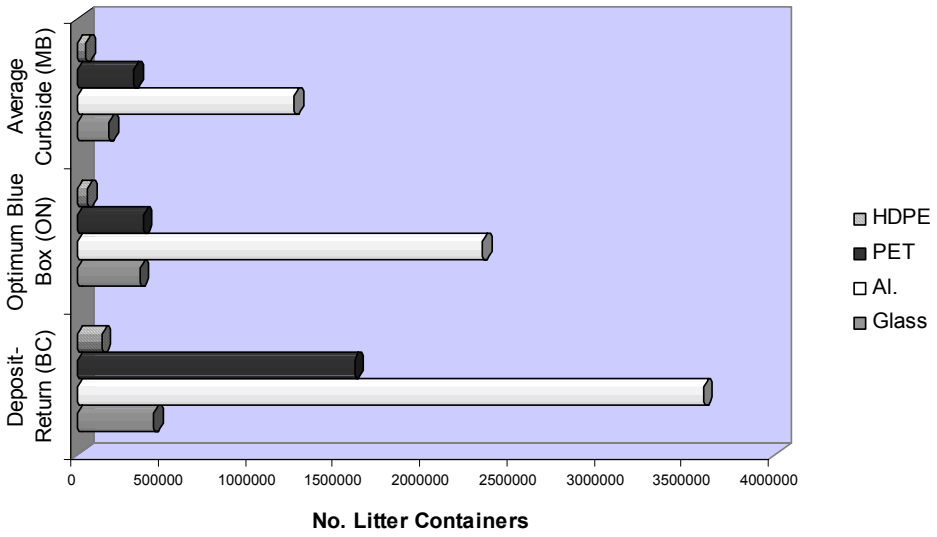
Data from the Center for Marine Conservation's (CMC) *1995 International Coastal Cleanup* indicates that beverage container debris, on average, represents a greater portion of beach litter in non-bottle bill states (19%) than in bottle bill states (7%). If data outliers are removed, beverage container litter reductions have consistently been between 70 to 84% in bottle bill states, and total litter has been reduced 34-47%. The high percentage reduction for beverage container litter has been said to clearly indicate that bottle bills (and similarly, deposit-refund systems) reduce the number of bottles and cans that are littered.

In addition to improving environmental aesthetics, litter reduction reduces: (1) litter clean-up costs; (2) injuries to children and others who might otherwise come in contact with old or broken containers, and (3) costs to farmers in terms of time, damage, injury, and contamination. In the year after Massachusetts enacted the bottle bill for example, outdoor glass-related injuries to children treated at Children's Hospital

in Boston dropped by 60 percent, while other childhood accidents remained steady or increased slightly[21]. A 1984 Study by the Virginia Farm Bureau Federation determined that statewide on farms, beverage container damage cost Virginia's farmers between $1.2 million and $3.5 million annually. The Pennsylvania Farmer's Association estimated the total cost to Pennsylvania's farmers to be $37 million in lost time, productivity, damage to crops and injury to farm stock.[22]

Using factors for the relation between avoided litter and beverage container recycling (estimates from Tellus Institute, R.W. Beck, and Sound Resource Management Group[23]), Figure 3 presents the number of litter containers avoided as a result of different recovery programs projected for British Columbia.

Figure 4.3 Avoided Annual Litter in British Columbia, Deposit-Return *vs.* Optimum and Moderate Curbside



[21] Baker *et al*., (1986) "The Impact of 'Bottle Bill' Legislation on the Incidence of Lacerations in Childhood" AJPH, Vol. 76, No. 10.
[22] Bottle Bill Resource Guide: http://www.bottlebill.org/
[23] Estimates from "Select Environmental Benefits Due to Beverage Container Recycling in 1999"

Compared to the present deposit-return program, the reduced recycling rates attributable to an optimum curbside program (and the corresponding lack of 'scavenging') would result in an estimated 46% increase in beverage container litter annually (~ 2,600,000 containers). A moderately successful curbside program would result in an estimated 69% increase in beverage containers littered annually, or ~ 4,000,000 containers compared to the present program.

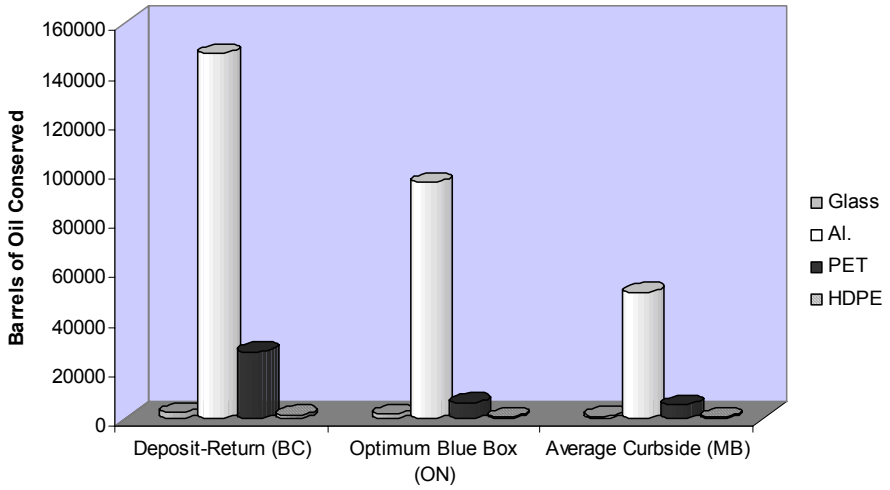
4.5 Energy Savings, or Barrels of Oil Conserved

Because of its high volume to weight ratio, the exponential growth of plastics in the waste stream is putting pressure on local solid waste management (landfills, as exemplified in Section 4.3) and recycling program budgets. The production of plastic products from virgin resins is also extremely energy intensive. The Container Recycling Institute has found that it takes approximately *47* million Btus to produce 1,000 pounds of PET non-container products from virgin materials and approximately *2* million Btus to produce the same quantity from recycled PET. Deriving aluminum resources from virgin materials is also very energy intensive.

The energy content of one barrel of oil is approximately equivalent to 5.8 million Btus of energy. The recovery rates reported in Section 6.2 were used to quantify and compare the estimated oil savings due recycling rates of deposit-return *vs*. curbside in British Columbia. Energy savings are based on the difference in energy consumption (material processing, transportation) between utilizing recycled as opposed to virgin feedstock.[24] Figure 4.4 presents data on the estimated barrels of oil conserved as a consequence of each program.

[24] Values are modified from EPA (1999) "GHG Emissions from Management of Selected Materials in MSW"

Figure 4.4 Estimated Annual Barrels of Oil Conserved for British Columbia, Deposit-Return *vs.* Optimum and Moderate Curbside



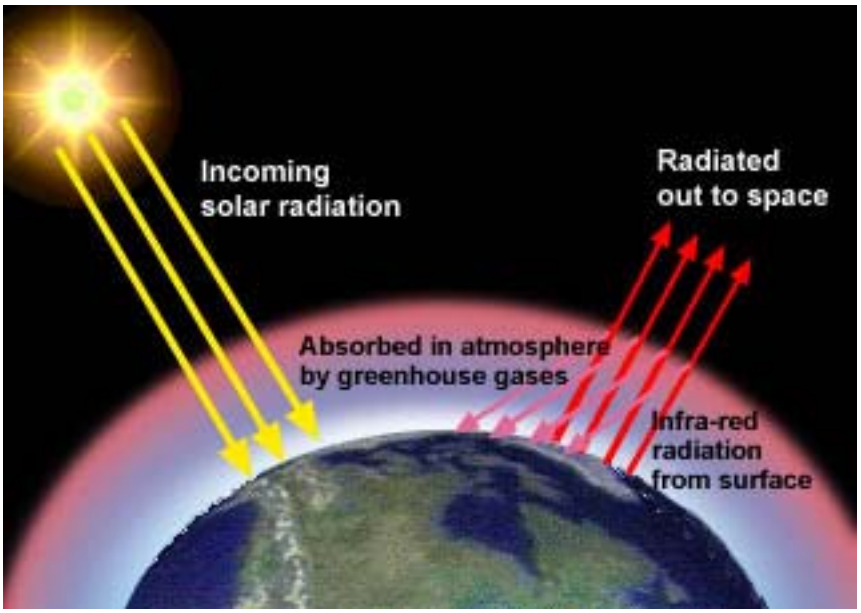
The present deposit-return program is estimated to save 180,000 barrels of oil annually by replacing virgin material as a feedstock. The decreased recovery rates attributable to substituting the present deposit-return system with an optimum curbside collection system would result in the usage of an additional 74,000 barrels of oil annually. A moderately successful curbside program would result in the usage of an additional 120,000 barrels of oil annually compared to the present system.

4.6 Greenhouse Gas Emissions Avoided

Greenhouse gases (GHGs) act to absorb infrared radiation and control the flow of natural energy through the climate system. An increase in greenhouse gases requires an adjustment in climate in order to maintain the balance between energy arriving from the sun and energy escaping back into space (Figure 4.5). Among other effects, a projected increase in greenhouse gases has been estimated to result in a mean sea level rise and associated flooding, a change in climatic zones and fragmentation of ecosystems, and the extinction of species[25].

[25] United Nations Environment Programme: http://www.unep.ch

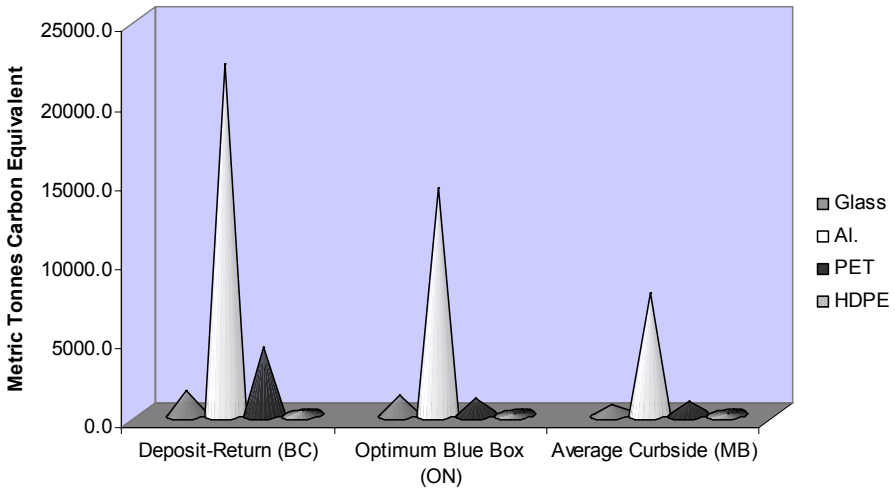
Figure 4.5 Relation between Solar Radiation, Greenhouse Gas, and Climate



Alternative waste management programs such as recycling strategies have been estimated by the EPA to result in lifecycle GHG reductions. Figure 5.6 illustrates the metric tonnes of carbon equivalent that are diverted as a result of recycling recovery programs[26]. One metric tonne of carbon equivalent is equivalent to the volume of the Skydome in Toronto[27].

[26] Factors for calculation are excerpted from EPA (1999) "GHG Emissions from Management of Selected Materials in MSW"
[27] P. Comm: Q. Chiotti, Ph.D. Environment Canada.

Figure 4.6 Estimated Annual Reduction in Greenhouse Gas Emissions, Deposit-Return *vs.* Optimum and Moderate Curbside



In British Columbia, the reduced recycling rate attributable to an optimum curbside recovery system is estimated to result in ~12,000 more metric tonnes of carbon equivalent released to the atmosphere annually as compared to the present bottle-deposit recovery system. A moderately successful curbside system would result in the annual release of approximately 20, 000 metric tonnes of carbon equivalent compared to the present system.

4.7 Reduced Atmospheric, Waterborne, and Industrial Emissions

In addition to reducing GHG emissions, recycling beverage containers generally reduces emissions of criteria air pollutants, airborne toxics, and waterborne pollutants and toxics.[28] The increase in atmospheric emissions, particularly for materials such as nitrous oxides, sulfur oxides, carbon monoxide, and non-methane hydrocarbons resulting from the implementation of a curbside recovery program as contrasted to the baseline current deposit-return program are presented in Figures 4.7 and 4.8.

[28] Data for related calculations modified from Tellus Institute , Sound Resource Management Group data supplied to the Washington State Department of Ecology by Research Triangle Institute (RTI).

Figure 4.7 Estimated Increase in Annual Atmospheric Emissions from Replacing Present Deposit-Return System with Curbside System, Optimum Recovery

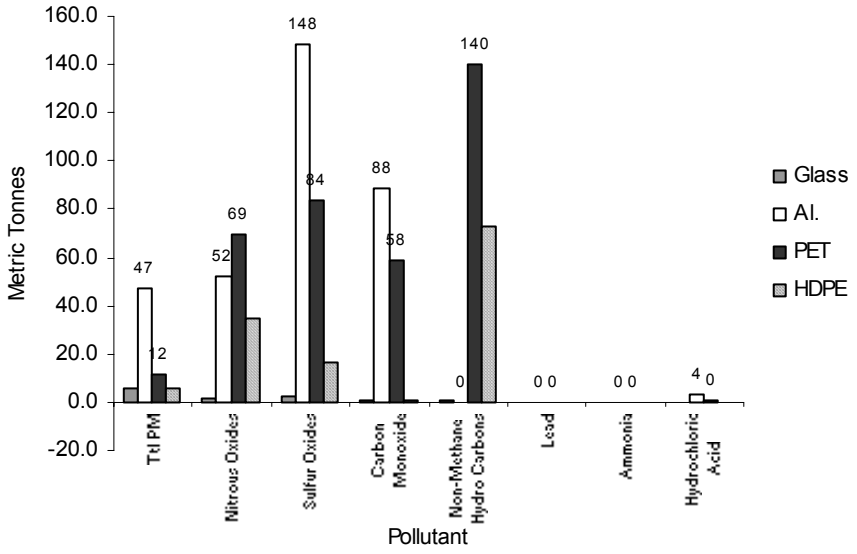
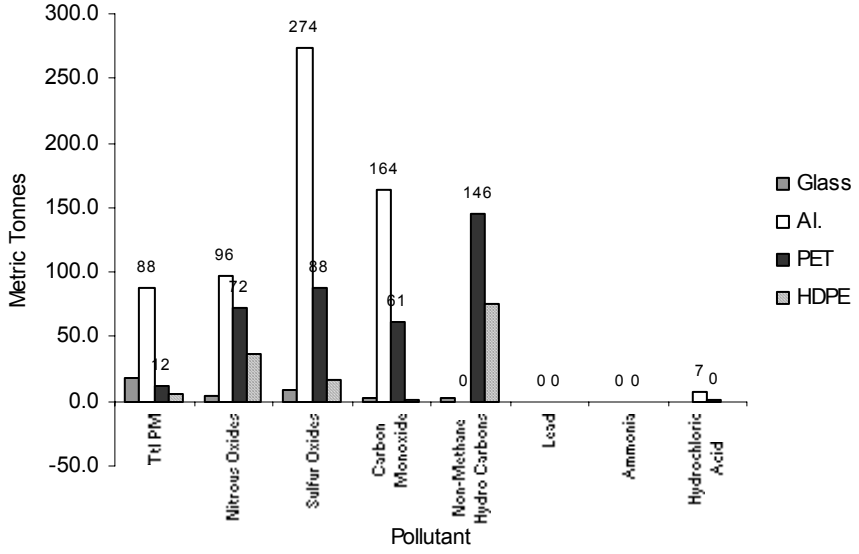


Figure 4.8 Estimated Increase in Annual Atmospheric Emissions from Replacing Present Deposit-Return System with Curbside System, Average Recovery



Atmospheric emissions associated with a curbside recovery program are estimated to result in approximately 840 more tonnes of pollutants in an optimum recovery scenario and 1200 more tonnes of industrial pollutants in an average recovery scenario.

The increases in waterborne emissions, particularly in terms of dissolved and suspended solids, attributable to the aforementioned scenarios are presented in Figures 9 and 10.

Figure 4.9 Estimated Increase in Annual Waterborne Emissions from Replacing Present Deposit-Return System with Curbside System, Optimum Recovery

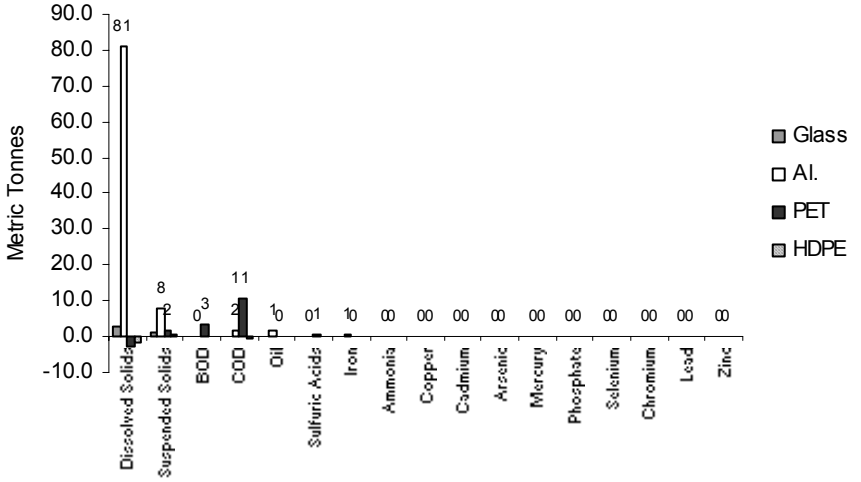
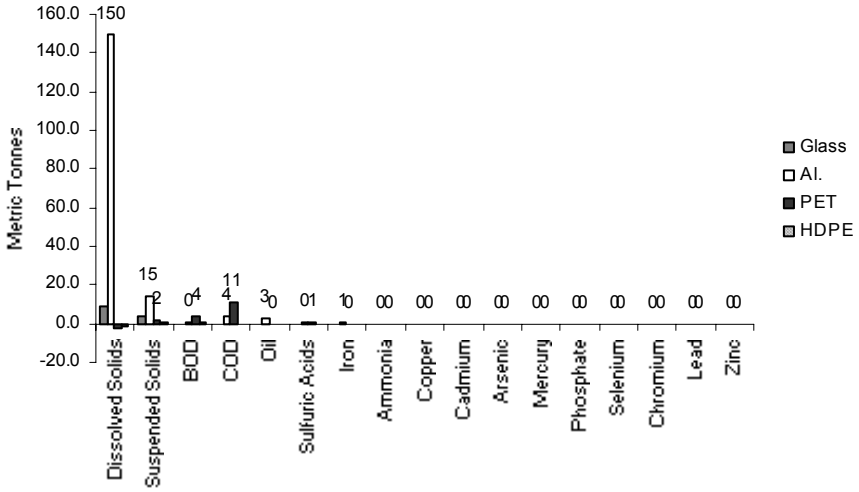


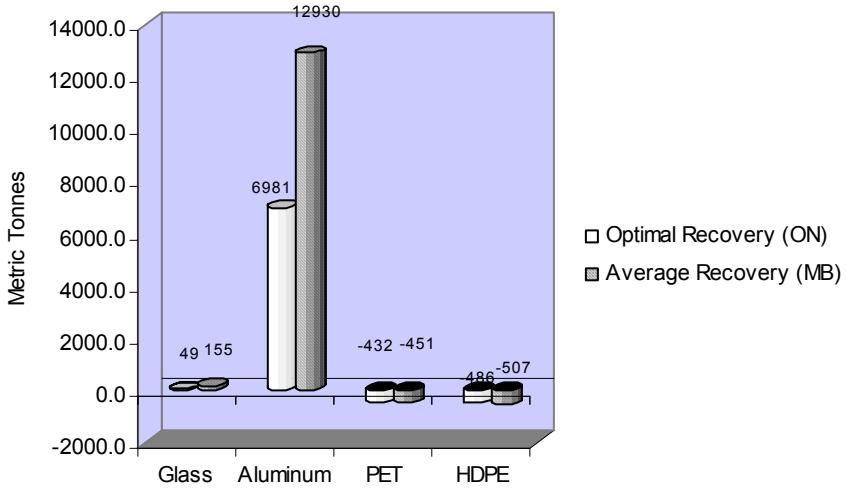
Figure 4.10 Estimated Increase in Annual Waterborne Emissions from Replacing Present Deposit-Return System with Curbside System, Average Recovery



Waterborne emissions associated with a curbside recovery program are estimated to result in approximately 110 more tonnes of pollutants in an optimum recovery scenario and 200 more tonnes of pollutants in an average recovery scenario; as compared to the annual baseline associated with the present deposit-refund system.

Lastly, industrial emissions associated with substitution of the present deposit-refund system with a curbside program are estimated to result in the creation of 6000 more tonnes of industrial pollutants in an optimum recovery system and 12,000 more tonnes of industrial pollutants in an average recovery scenario (Figure 11).

Figure 4.11 Estimated Increase in Annual Industrial Emissions from Replacing Present Deposit-Return System with Curbside System, Optimum and Average Recovery Trajectories



4.8 Summary of Environmental Impacts of Recovery Program Assessed

Table 4.4 presents a quantitative overview of the environmental characteristics associated with the three recovery program scenarios as applied to British Columbia assessed in this chapter.

Table 4.4 Overview of Projected Environmental Characteristics Associated with Beverage Recovery Programs as applied to British Columbia

Characteristic, Measured on Annual Basis	Deposit-Recovery (Present System)	Optimum Curbside (Ontario System)	Average Curbside (Manitoba System)
Beverage Materials Recycled in Short Tons	21420	12890	7136
Landfill Space Saved in Cubic Yards	140, 665	69, 747	41, 879
Avoided Litter in Number of Containers	5, 749, 986	3, 109, 295	1, 786, 975
Barrels of Oil Conserved	178, 284	104. 341	57, 929
Greenhouse Gas Emissions Avoided in MTCE	28, 194	16, 682	9, 228
Additional Reduced Atmospheric Emissions in Metric Tonnes	1, 667	823	488
Reduced Waterborne Emissions in Metric Tonnes	301	191	110
Reduced Industrial Emissions in Metric Tonnes	18, 818	12, 706	6691

5. Information Gaps

5.1 Recent Public and Consumer Attitudes on beverage Recovery Systems

While there is fairly comprehensive data available as to the effectiveness and costs of the various beverage recovery programs, there are limited recent studies undertaken to measure how beverage consumers and taxpayers view the various recovery approaches. In 1998, a study was undertaken by Angus Reid for McConnell Weaver – *The Deposit Program in BC: Attitudes and Behavior.* The study states: "There is a high level of support for the deposit program across the province of BC. Almost all (96%) of British Columbians think the deposit program is a good idea. The main reason for their support of the program is that the program gives people an incentive to recycle. The inconvenience of returning containers for the deposit appears to be only a minor concern" [29]

In order to gain a better understanding of how people (consumers and taxpayers) view deposit-return systems vs curbside program today, a comprehensive independent study/poll would be helpful.

5.2 Away from Home Consumption

There has been significant growth in the area of PET packaging used for beverage containers that are consumed away from home (bottled water being the greatest). Today there is limited data available on the actual share of containers consumed away from the home and in the home. This may have a significant impact on a curbside collection programs' ability to a) increase recovery or b) maintain recovery of beverage containers. Gaining a more comprehensive understanding of this split in consumption may assist in determining the most appropriate recovery mechanism.

Tables:

Figures:

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[29] *The Deposit Program in BC: Attitudes and Behavior* – Angus Reid for McConnell Weaver, July 1998

