Part I: Program Performance

Performance Measurement

Sports teams track scores and performance statistics to make the changes they need to improve. People who invest in stocks watch how the market is performing and adjust their investments accordingly. Companies monitor their expenses, revenues, and levels of customer satisfaction in order to remain a profitable business. It is the same for recycling programs. Without performance measurement, it is difficult – if not impossible – to design effective programs and to ensure that they are meeting their objectives.

While measuring the performance of beverage container recycling programs may seem straightforward, in fact it is quite complex. Program performance is typically measured using the collection rate, which represents the number of containers collected for recycling in a given jurisdiction versus the number of containers sold in a given jurisdiction. The complexity lies in the fact that not all containers are beverage containers.

Measuring the performance of a deposit-return system (DRS) is fairly simple, since the refund provides an opportunity to track sales and collections to the last unit. Multi-material collection systems, on the other hand, make measurement more difficult since beverage containers are collected commingled with other containers, making it impossible to know exactly how many beverage containers were collected.

The tricky part when trying to determine the collection rate for containers collected in multi-material programs like those in Manitoba, Ontario, and Québec (for non-carbonated beverages) is extracting the beverage containers (by weight) from everything else that gets shipped to market, such as plastic ketchup bottles, glass pickle jars, and aluminum food tins. A PET bale, for example, includes PET from non-bottle sources, like the PET thermoform containers used to package fruits and vegetables. Adding to the complexity is the fact that in multi-material programs, the collection rate typically represents the weight of beverage containers shipped from the primary processor or sorter to the recycler (e.g. to PET reclaimers, glass beneficiators, or aluminum smelters), as opposed to the number of units collected for recycling.

In order to estimate collection rates for beverage containers collected via multi-material systems, CM Consulting applied reasonable and important assumptions to all available data (see Appendix A).

Getting the Numbers Right: Accounting for Contamination in Commingled Recycling Systems

While the growing trend towards single-stream (also known as commingled) curbside recycling systems has led to increased public participation rates and volumes of recyclables collected, it has also produced unintended negative consequences, including higher contamination rates of incoming materials. Contamination in recycling can happen when non-recyclable items are mixed in with recyclables (e.g. leftover liquids, dirt, or rocks in a beverage container) or when recyclable items are sorted improperly before they are shipped for recycling.

Contaminated materials create problems for recyclers such as higher costs, lower yield rates, more material to dispose of, and increased equipment downtime and maintenance. Contamination is also a problem when it comes to measuring program performance, because if recycling rates are reported without first removing contaminants, the rates will be inflated.

Compared to deposit-return, single-stream collection produces materials of a lower quality, with more residuals and out-throws. As evidence of this, recyclers in the U.S. have reported contamination rates (materials including caps, labels, and glue) of 32.2% for PET bottles recovered via single-stream

collection methods; this is significantly higher than 24.4% for deposit bottles.[4]

Process Loss

All bales of beverage containers shipped for recycling will experience some degree of yield loss due to the caps, labels, and glue that remain on the bottles after sorting, and it is important that both the numerator (i.e. amount of beverage container material collected) and the denominator (i.e. sales) include or exclude the weight of this material in a consistent manner.

Even in deposit-return programs, a certain level of yield loss will occur simply as a result of the recycling process. PET bottles, for example, can lose up to 15% by weight of their material in the system. Some of these losses are fines, which can be sold as a by-product, but most are disposed of in landfill. In the case of recycling Tetra Pak containers, 20% of the material (by weight) is aluminum and plastic and is considered process loss because it is disposed of after separation from the pulp.

As program operators seek new ways to increase the recovery of beverage containers, it is important that they start reporting what is actually recycled (i.e. the recycling rate), not just what is collected for recycling (i.e. the collection rate). This requires applying the processing efficiency rate (PER) to the collection rate (see Table 1.1 for rate definitions).

It should be noted that this procedure is required only for collection rates that are measured and reported in weight, as is the case in Manitoba, Ontario, and Québec (for non-carbonated beverage containers). The collection rates reported for deposit-return programs are not affected by processing efficiency because these rates are based on unit counts, not on weight. On the other hand, recycling rates reported for non-deposit, multi-material programs decrease as the level of contamination increases.

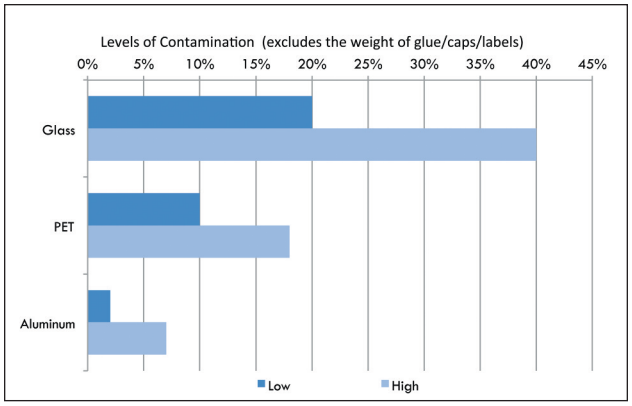
Knowing the PER (i.e. the contamination level) is critical for accurate performance measurement because it provides information on what was actually recycled – not on the material that was sent to disposal after secondary processing. To determine reasonable estimates of PERs, CM Consulting considered rates published by industry and conducted interviews with recyclers that process beverage container material in Canada.

Figure 1.1 presents typical contaminant rates (low and high) that are common in today's loads shipped from primary processors (i.e. material recycling facilities).

Table 1.1 Definitions of Different Rates

Collection Rate (CR)	The amount of beverage container material collected (by weight or unit) that is shipped to the recycler by the primary processor (e.g. MRF) expressed as a percentage of the amount of beverage container material placed on the market in a given jurisdiction, excluding exports. *Note:* If material is measured by weight, the weight of caps, labels, and glue should be considered in both the numerator and denominator.
Processing Efficiency Rate (PER)	The amount of beverage container material received by the recycler that is used in the recycling process (excluding energy-from-waste) expressed as a percentage of the amount of material shipped to the recycler. The higher the PER, the lower the level of contamination, and vice versa.
Recycling Rate (RR)	The amount of beverage container material used in the recycling process (excluding energy-from-waste) expressed as a percentage of the amount of beverage container material placed on the market in a given jurisdiction, excluding exports. The RR takes into account materials rejected due to contamination.

Figure 1.1
Contamination Rates from Multi-Material Collection



Material-specific Collection and Recycling Rates

Collection rates for beverage containers are reported annually on a province-by-province basis. The method for measuring collection in deposit-return jurisdictions (e.g. British Columbia, Alberta, Nova Scotia) is straightforward: the collection rate is determined by dividing the number of units returned by the number of units sold in that year. Determining a collection rate for provinces that operate multi-material recycling programs (in which beverage containers are collected mixed with other materials, such as paper and non-beverage containers) is more complex (see discussion above under 'Process Loss').

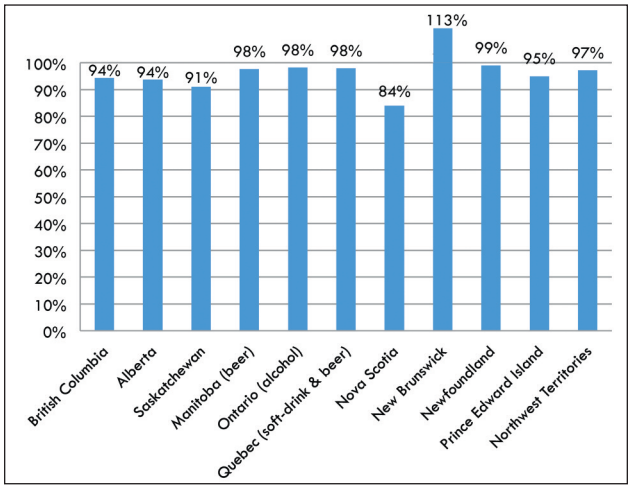
Refillable Beer Bottles

Provincial operating agencies and the Canada's National Brewers are responsible for monitoring the collection rates for refillable beer bottles. The collection rate for these bottles has a considerable influence on the trippage rate, which, in turn, determines the environmental benefit to be gained from refillables. "Trippage" is the term used to describe the average number of trips a container makes before it is recycled by the bottler, damaged by the consumer (and thus not returned for deposit), or otherwise landfilled. In Canada, the average trippage rate for industry standard beer bottles (ISB) is 15 times.

Canada's collection rate for these containers has been consistently high. Figure 1.2 summarizes the collection rates for refillable beer bottles collected through brewer-run provincial programs in fiscal year 2012. These rates will likely decline over the next few years as more and more brewers switch to non-refillable, one-way containers for beer, such as aluminum and plastic.

(Note: While the majority of refillable bottles are beer bottles, other forms of refillable bottles exist; these include refillable water bottles and bottles for other alcoholic and non-alcoholic beverages like milk and soft drinks. However, collection rates for these containers are not reported and so are not available to the public.)

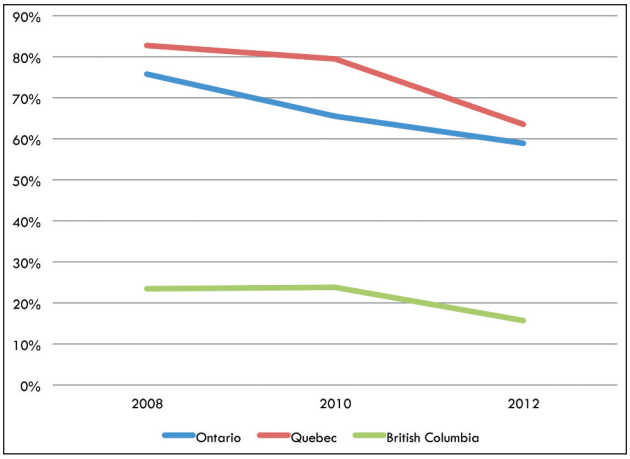
Figure 1.2
Provincial Collection Rates - Refillable Beer



The Decline in Refillable Beer Bottles

Historically, the majority of beer sold in Canada has been sold in Canada's National Brewers' Industry Standard Bottle (ISB). However, in recent years there has been a dramatic decline in the use of such refillable containers. The greatest decline has occurred in Québec (see Figure 1.3), where the market share of refillable beer bottles has dropped from 83% in 2009 to 64% in 2012. Ontario and B.C. have experienced similar declines. From 2008 to 2012, Ontario's market share for the ISB dropped from 76% to 59%. During the same time period in B.C., the percentage of beer sold in ISBs dropped from 23% to 16%. Other countries such as the United Kingdom, U.S., New Zealand and Australia have witnessed a similar decline in refillables.

Figure 1.3
Market Share of Beer in Refillable Glass Bottles



The reasons for the decline of the refillable beer bottle are varied. They include, among others, changes in the relative costs of container materials (aluminum and plastic), a shift to lighter packaging, and a change in consumer preference and behavior. Cans are becoming the container of choice for beer drinkers in Ontario and Québec, where the ISB is most common. There is an increase in home consumption of beer, where traditionally the majority of beer was consumed in pubs, clubs, restaurants and hotels, etc., where empty bottles were retained by the establishments and returned to the distributors.

Non-Refillable Containers

Non-refillable containers typically include aluminum or steel cans, and PET bottles. These are collected at higher rates in jurisdictions that have deposit-return. For example, B.C. and Alberta show non-refillable collection rates of 83% and 82%, respectively, in 2012. In contrast, Ontario's non-refillable collection rate was 59%. These rates are also significantly higher than in Manitoba, where the collection rate is only 51%.

The following charts provide summaries of collection rates for each of the non-refillable beverage container categories across Canada. Entries of "N/A" indicate that data for that category is either not available or not applicable for that province.

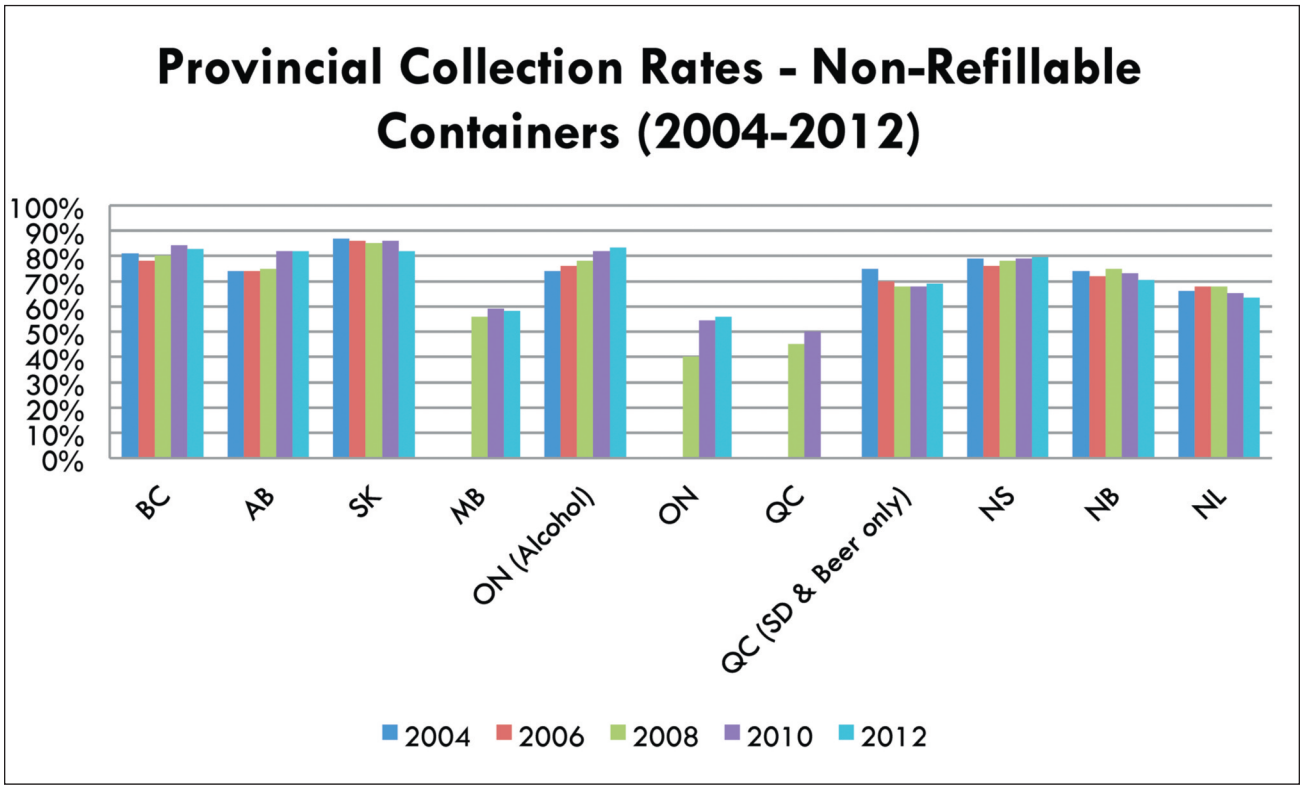
Table 1.2 shows collection rates for the different types of non-refillable containers collected through the provincial programs in 2012. This Table clearly shows the difference in performance between deposit jurisdictions (with relatively high rates of return) and non-deposit jurisdictions (with relatively low rates of return).

Figure 1.4 shows provincial collection rates for non-refillables from 2004 to 2012. The greatest increase can be seen in Alberta, where the collection rate rose from 75% in 2008 to 82% in 2012. This is likely attributable to the deposit hike in 2009.

Table 1.2 Provincial Collection Rates - Non-Refillable Containers

	British Columbia	Alberta	Saskatchewan	Manitoba (beer)	Manitoba (other)	Ontario (alcohol)	Ontario (non-alcohol)	Quebec (soft-drink & beer)	Quebec (other beverages)	Nova Scotia	New Brunswick	Newfoundland	Prince Edward Island	Northwest Territories
Aluminum Cans	88%	88%	87%	79%	61%	82%	60%	67%	-	84%	71%	66%	85%	100%
Non-Refillable Glass	94%	90%	87%	N/A	55%	89%	N/A	83%	73%	81%	83%	64%	66%	90%
PET Bottles	75%	76%	79%	-	51%	52%	50%	74%	47%	80%	72%	74%	84%	95%
Other Plastics	75%	76%	79%	-	N/A	-	59%	-	-	48%	66%	24%	-	95%
Bi-Metal	61%	82%	87%	-	56%	-	64%	-	-	93%	-	44%	-	55%
Gable/Tetra Pak/BIB	56%	68%	49%	-	18%	30%	30%	-	43%	59%	47%	45%	68%	67%
Total Non-Refillables	**83%**	**82%**	**82%**	**79%**	**51%**	**83%**	**56%**	**69%**	**50%**	**80%**	**70%**	**63%**	**80%**	**95%**
Refillable Beer	94%	94%	91%	98%	-	98%	-	98%	-	84%	113%	99%	95%	97%
Total containers	**83%**	**83%**	**83%**	**84%**	**51%**	**90%**	**56%**	**81%**	**50%**	**80%**	**76%**	**73%**	82%	95%

Figure 1.4 Provincial Collection Rates – Non-Refillable Containers



Aluminum Cans

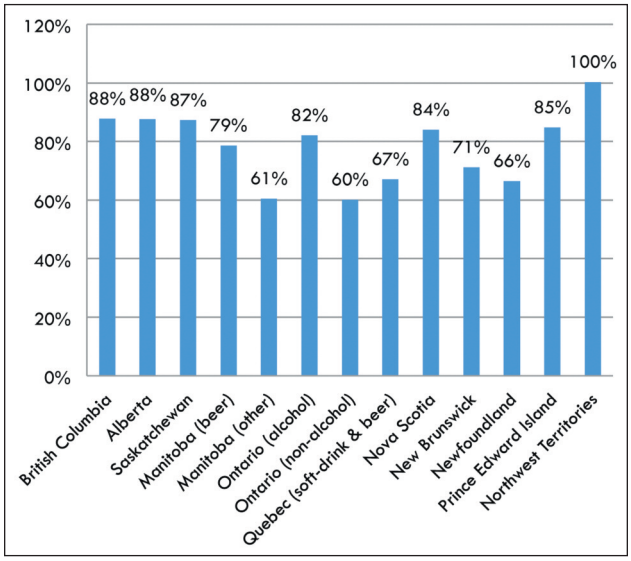
Figure 1.5 presents 2012 aluminum can collection and recycling rates by province. As with all non-refillables, provinces with deposit-return programs in place show considerably better collection rates than those without.

For example, B.C. and Alberta, both of which have deposits on aluminum cans, have collection rates of 88% – the highest collection rates for aluminum cans in Canada.

Despite being down from 95% in 2004, Saskatchewan's collection rate is also high at 87%.

Québec's collection rate for aluminum cans is 67%. Compared to other deposit jurisdictions, which generally have collection rates of between 80% and 90%, this is relatively low. The most likely cause for Québec's poorer performance is the level of the deposit it places on beer cans (5-cents), which is half the value of the deposit in most other provinces, and the fact that not all cans are covered. In Québec, only carbonated beverages (beer and soft drinks) carry a deposit. Aside from lowering performance, this creates confusion for consumers.

Figure 1.5
Provincial Collection Rates - Aluminum Cans



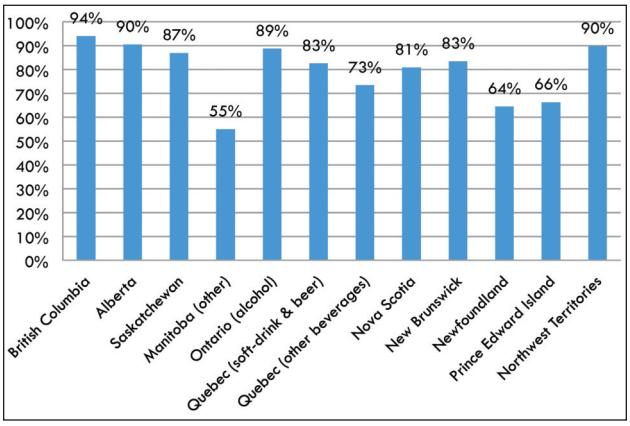
When comparing these rates, it is important to consider the different deposit values placed on beer cans versus non-alcoholic beverage cans in each province. In B.C., for example, while beer cans carry a 10-cent deposit, the deposit on non-alcoholic beverages is only 5-cents. This difference may help explain why the collection rate for beer cans is 93%, eleven percentage points higher that the 82% rate for non-alcohol cans in that province.

The greatest difference between beer can and non-alcoholic beverage can collection rates is seen in Manitoba and Ontario. In both of these provinces, beer cans are subject to a 10-cent deposit, while all non-alcoholic beverage cans are recovered through municipal curbside recycling systems.

Non-Refillable Glass

Figure 1.6 presents provincial collection rates for non-refillable glass bottles in 2012. As with other types of beverage containers, provinces with deposit-return show the highest collection rates for non-refillable glass. The province with the highest collection rate for this material is British Columbia at 94%.

Figure 1.6 Provincial Collection Rates – Non-Refillable Glass

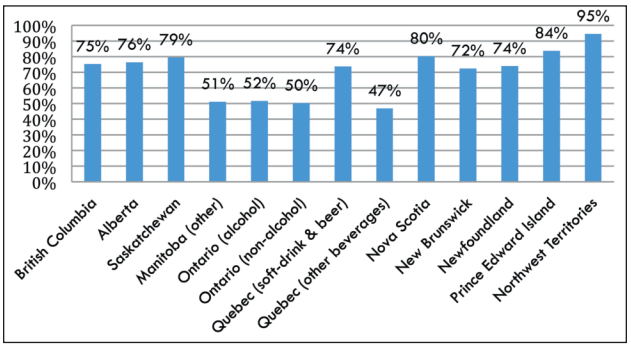


PET Bottles

Figure 1.7 shows provincial collection rates for PET bottles in 2012. In most provinces, PET bottles show a lower collection rate than aluminum cans and glass bottles.

Like the other materials, PET containers are collected at a higher rate in the deposit provinces. Nova Scotia, PEI and NT show the highest collection rates. At the other end of the spectrum is Québec, with a collection rate of 47%. The effect of using the Processing Efficiency Rate to calculate the Reycling Rate shows that contamination in the curbside streams reduces the overall amount of PET recovered for recycling even further.

Figure 1.7 Provincial Collection Rates – PET Bottles



Gable Top and Tetra Pak Cartons, Bi-Metal Cans, and Other Plastics

Overall, the collection rates for gable top and Tetra Pak cartons, bi-metal cans, and other plastics are on the rise. Figures 1.8, 1.9, and 1.10 show 2012 collection rates for these materials in provinces that report them.

The highest collection rate for gable top and Tetra Pak cartons was shown in Alberta and Prince Edward Island. Both provinces recovered these containers at a rate of 68%.

With respect to bi-metal cans, Nova Scotia had the highest collection rate at 93%. For the 'other plastics' category, which includes bottles made from resins other than PET, or in some provinces PET or HDPE, collection rates were between 24% and 95%. (Note: Because the bi-metal cans and 'other plastics' categories of containers are so small (in terms of units sold each year) relative to other container types, there tends to be a greater degree of fluctuation in collection rates year over year.)

Figure 1.8 Provincial Collection Rates – Gable Top and Tetra Pak Containers

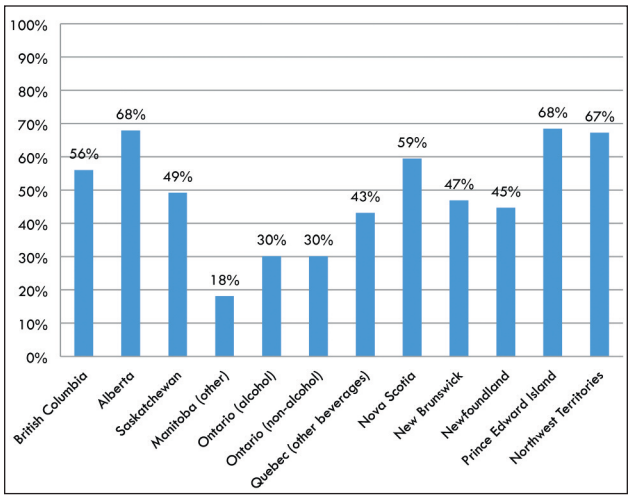
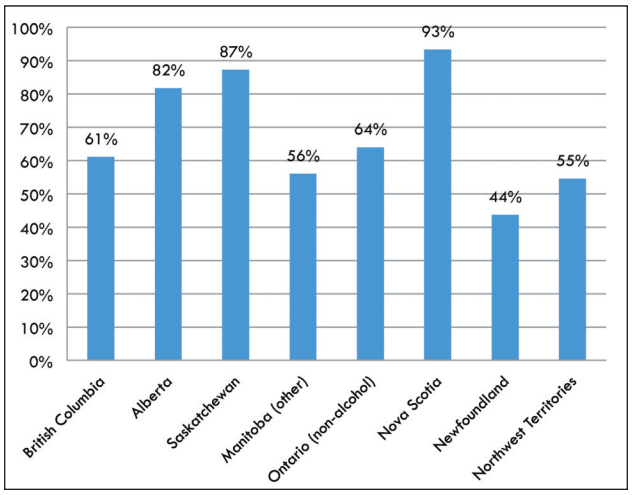


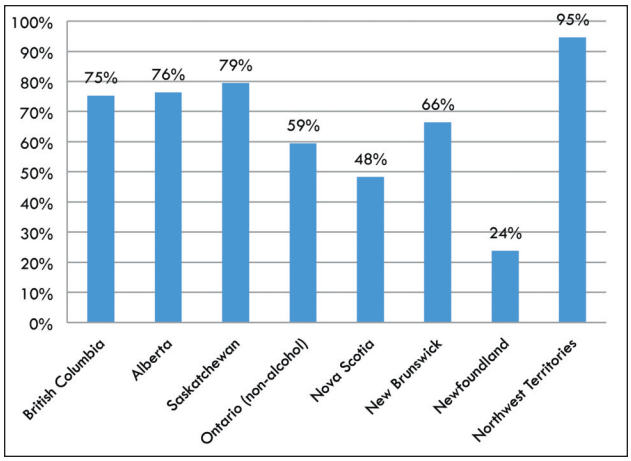
Figure 1.9 Provincial Collection Rates – Bi-Metal Cans



Milk Containers

Depending on the province, collection rates for milk container packaging are measured in different ways. In some provinces collection rates are based on data from waste audits, while in others they are based on actual unit sales and collection data. In some cases, collection rates for milk containers are estimated by extrapolating from the collection rates of a more wide-ranging material category, such as "aseptic" packaging, which includes Tetra Pak and gable top containers. In provinces where multi-material collection takes place, one collection rate is reported for the entire category of materials and no distinction is made between, for example, milk containers and orange juice containers.

Figure 1.10 Provincial Collection Rates – Other Plastics



Most plastic milk containers are made from high-density polyethylene, also known as HDPE. Overall, milk jugs have a much higher collection rate than cartons. This difference may be attributable to several factors, including a strong secondary market for HDPE jug material.

In the first 6 months of 2012, B.C. collected 340,121 kg of plastic milk jugs and polycoat milk containers, an increase of over 50,000 kg from 2010 levels, and more than double what was recovered in the first half of 2008.

In Alberta, because collection rates are reported by material as opposed to by beverage type, it is impossible to determine a specific collection rate for milk containers.

While the Northwest Territories reports milk containers alone, it does not separate HDPE and polycoat milk containers. Large milk containers with a 25-cent refundable deposit are collected at a rate of 90%, while smaller milk containers with a 10-cent refundable deposit are collected at a rate of 49%.

In Manitoba, Ontario, and Québec, the majority of (if not all) milk containers are collected through residential curbside recycling programs (e.g. the Blue Box Program). Because they are collected with other materials, like paper, other plastics, and food containers, it is impossible to calculate a collection

rate specific to beverage containers. The same can be said for milk container collection rates in the provinces of P.E.I. and New Brunswick.

While Nova Scotia also collects milk containers via curbside recycling, specific collection rates are available from the Atlantic Dairy Council (ADC). According to the ADC, in 2005, the collection rate for milk packaging was 47.3%, an increase of nearly 25 percentage points compared to when the program began in 2000. Now, in 2012-2013, the ADC states that the collection rate for gable top cartons and HDPE milk jugs is 70.5%.