# Part 1: 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.

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. Measuring the performance of a deposit-return system (DRS) is simple, since the refund provides an opportunity to track sales and collection to the last unit. Measuring the performance of multi-material collection systems, such as those in Manitoba, Ontario, and Québec (for non-carbonated beverages) on the other hand, is more complex. The complexity here lies in that beverage containers are collected commingled with other types of containers, for example PET from non-bottle sources, like ketchup bottles, and PET thermoform containers used to package fruits and baked goods.

Adding to this complexity is the fact that the weight of contaminants (leftover fluid, non-recyclables, glue and caps) is also included in the weight of collected containers. This renders the collection rate unable to reflect actual recycling of beverage containers. Before we can know what is truly recycled in these programs, the weight of non-beverage container material must be subtracted from the total collected tonnage. For this reason, CM Consulting chose to use recycling rates for this report.

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

### 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. 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 33% for PET bottles recovered via single-stream collection methods; this is significantly higher than 27% for deposit bottles.[1]

**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 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 collection programs decrease as the level of contamination increases.

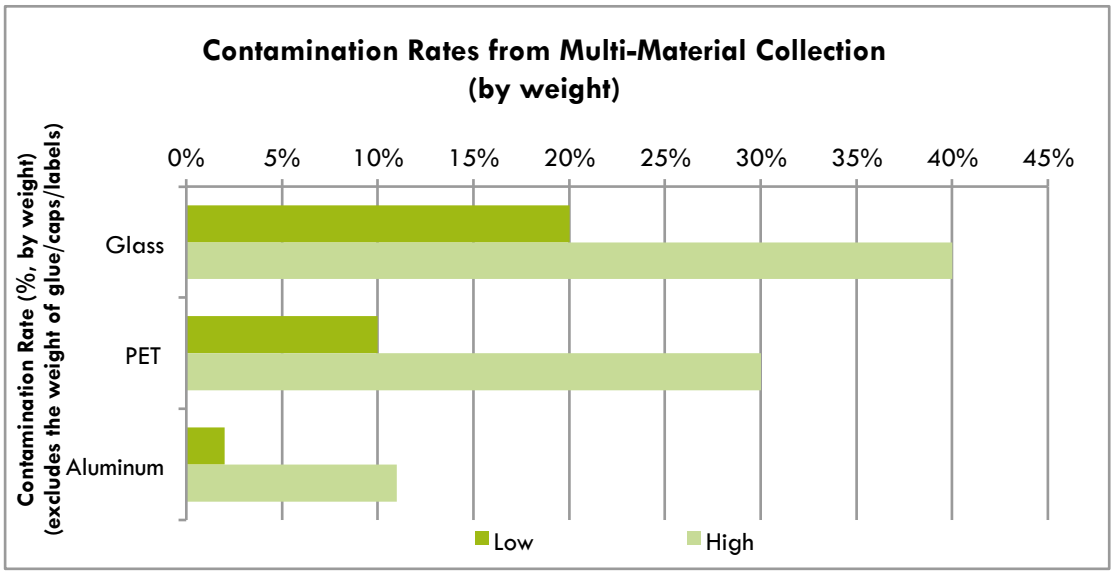
**TABLE 1 RATE DEFINITIONS**

| | |
|---|---|
| **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. There are instances where programs use "recovery rete" in place of collection rate in definitions.<br><br>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.<br><br>Note: In deposit return systems, the collection rate and the recycling rate are the same. |

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

**FIGURE 3 TYPICAL CONTAMINATION RATES (%, BY WEIGHT) OF MATERIAL COLLECTED IN MULTI-MATERIAL COLLECTION SYSTEMS (EXCLUDES THE WEIGHT OF GLUE, GAPS, AND LABELS)**




# MATERIAL-SPECIFIC RECYCLING RATES

Collection or recycling rates for beverage containers are reported annually on a province-by-province basis. The method for measuring collection in deposit-return jurisdictions is straightforward: the collection/recycling rate is determined by dividing the number of units returned by the number of units sold in that year. Determining a recycling 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').

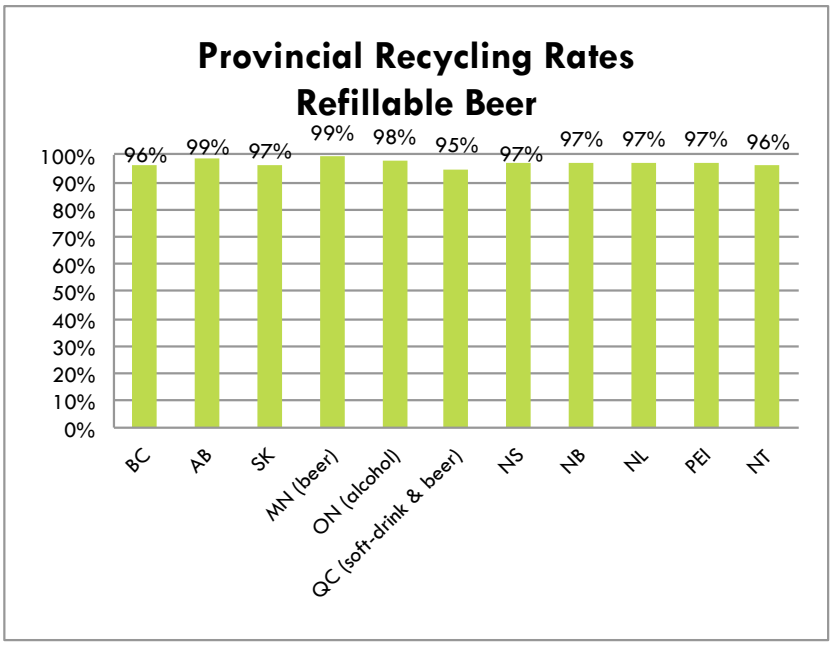
## Refillable Beer Bottles

Provincial operating agencies and the Brewers Association of Canada are responsible for monitoring the collection/recycling rates for refillable beer bottles. The 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 recycling rate for these containers has been consistently high. Figure 4 summarizes the recycling rates for refillable beer bottles collected through brewer-run provincial programs in fiscal year 2014. 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/recycling rates for these containers are not reported and so are not available to the public.)

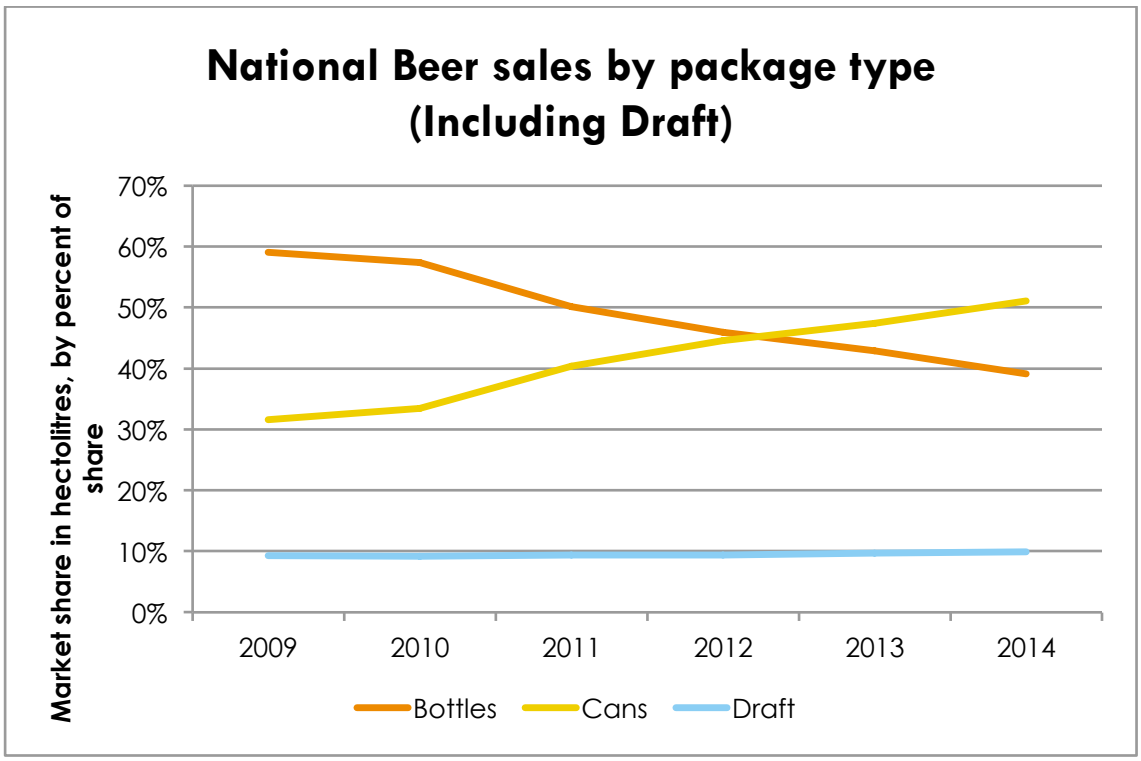
**FIGURE 4 RECYCLING RATES FOR REFILLABLE BEER BOTTLES (2014)**




### The Decline in Refillable Beer Bottles

Historically, the majority of beer sold in Canada has been sold in The Beer Store's ISB. However, in recent years there has been a dramatic decline in the use of such refillable containers. Statistics from the Brewers Association of Canada (BAC) show that from 2009 to 2014, nation-wide market share for the ISB dropped from 60% to 40% of overall hectoliters sold.

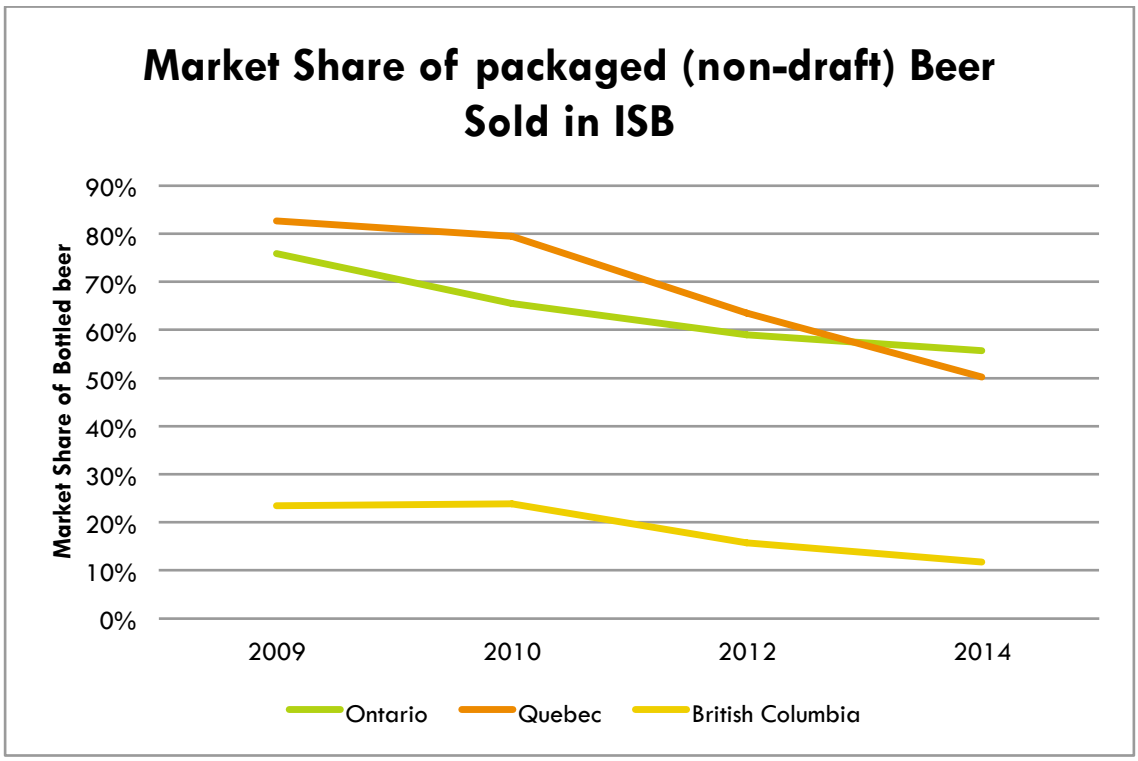
**FIGURE 5 NATIONAL BEER SALES BY PACKAGE TYPE (INCLUDING DRAFT) (2009-2014)**




Over 75% of refillable beer bottles sold in Canada are sold in Québec and Ontario, and it is in these two provinces where the greatest decline has occurred. In Québec, in 2009, 83% of packaged (cans and bottles) beer sold was in refillable bottles; by 2014, that share had dropped to 50%. During the same time period in Ontario, the percentage of beer sold in ISBs dropped from 76% to 56%. Many of these containers are being replaced by aluminum cans, which saw their market share in Ontario increase from 32% to 40% from 2012 to 2014. The province of B.C. has experienced a similar decline in refillable beer containers.

Figure 6 shows how the market share of the ISB has declined in Québec, Ontario and B.C. (2009-2014).

FIGURE 6 MARKET SHARE OF PACKAGED (NON-DRAFT) BEER SOLD IN ISB IN ONTARIO, QUEBEC, AND BRITISH COLUMBIA (2009-2014)




Several factors can explain this decline, one of which is a shift in the retail landscape towards large retailers or "big box" stores. Without policies in place to promote them, retailers have stopped carrying refillables in an effort to reduce the labour, space and general management requirements associated with having to take them back. Another contributing factor to the decline in refillable beverage packaging and corresponding increase in one-way containers is that refillable systems require a greater level of cost internalization by beverage producers. Whereas producers of beverages in one-way packaging generally only incur a share of the end-of-life management costs, producers of refillable beverage containers incur the full costs of collection and refill. This un-level playing field creates an economic incentive to use one-way containers over reusable ones.

Other reasons for the decline include changes in the relative costs of container materials (aluminum and plastic), a shift to lighter packaging, and a change in consumer preference and behavior (increasing 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, also called "one-way containers," "single-use containers" or "disposable containers", include cans (aluminum and steel), bottles (glass and plastic), and gabletop/Tetra Pak cartons. These containers are recycled at higher rates in jurisdictions that

have deposit-return. For example, Saskatchewan and the Northwest Territories show non-refillable recycling rates of 86% and 88%, respectively, in 2014. In contrast, Ontario's non-refillable recycling rate (non-alcohol containers) was only 50%.

Table 2 shows recycling rates for the different types of non-refillable containers collected through the provincial programs in 2014. Entries of "-" indicate that data for that category is either not available or not applicable for that province.

**TABLE 2 PROVINCIAL RECYCLING RATES – NON-REFILLABLE CONTAINERS (2014)**

| Container Type | BC | AB | SK | MN (beer) | MN (other) | ON (alcohol) | ON (non-alcohol) | QC (soft-drink & beer) | NS | NB | NL | PEI | NT | YT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum Cans | 90% | 88% | 92% | 79% | 50% | 82% | 48% | 70% | 92% | 80% | 64% | 85% | 97% | - |
| Non-Refillable Glass | 92% | 92% | 94% | - | 55% | 87% | - | 72% | 83% | 72% | 62% | 71% | 82% | - |
| PET Bottles | 75% | 78% | 82% | - | 54% | 53% | 49% | 78% | 81% | 71% | 65% | 81% | 81% | - |
| Other Plastics | 75% | 78% | - | - | - | - | 53% | - | 53% | 57% | 37% | - | 81% | - |
| Bi-Metal | 66% | 89% | - | - | 50% | - | 64% | - | 93% | - | 53% | - | 59% | - |
| Gable/Tetra Pak/BIB | 56% | 65% | 49% | - | 19% | 26% | 29% | - | 57% | 124% | 45% | 50% | 61% | - |
| **Total Non-Refillables** | **84%** | **82%** | **86%** | **79%** | **55%** | **82%** | **50%** | **72%** | **84%** | **73%** | **62%** | **80%** | **88%** | **82%** |
| Refillable Beer | 96% | 99% | 97% | 99% | - | 98% | - | 95% | 97% | 97% | 97% | 97% | 96% | - |
| **Total Containers** | **84%** | **83%** | **87%** | **83%** | **49%** | **89%** | **51%** | **78%** | **85%** | **76%** | **71%** | 82% | 89% | - |

Figure 7 presents recycling rates, by province, for non-refillables as a category in 2014. This figure clearly shows the difference in performance between deposit jurisdictions, with relatively high rates of recycling, and non-deposit jurisdictions (Manitoba, Ontario, and Québec), with relatively low rates of recycling.

**FIGURE 7 PROVINCIAL RECYCLING RATES FOR NON-REFILLABLE CONTAINERS, DEPOSIT VS. CURBSIDE PROGRAMS (2014)**

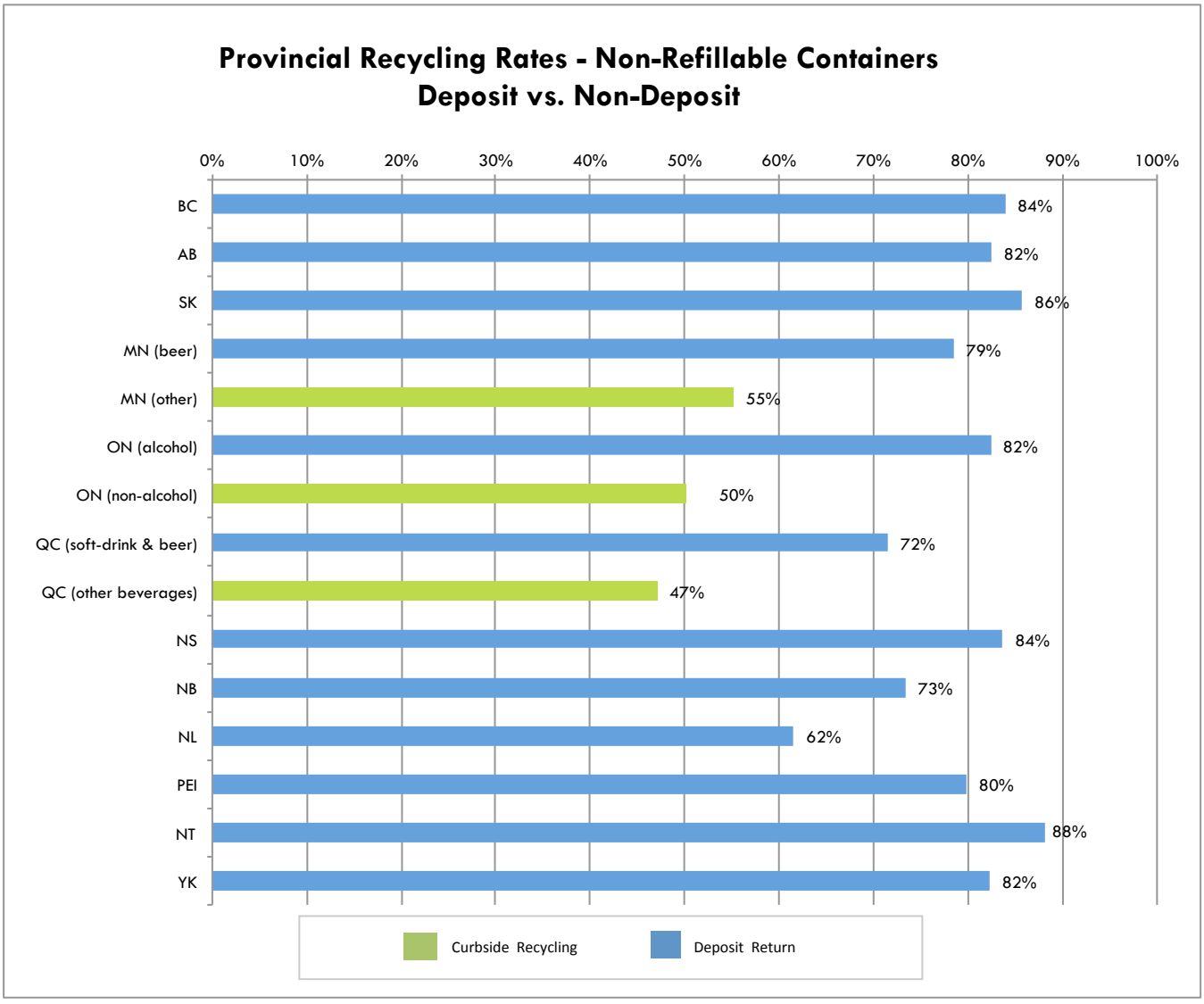
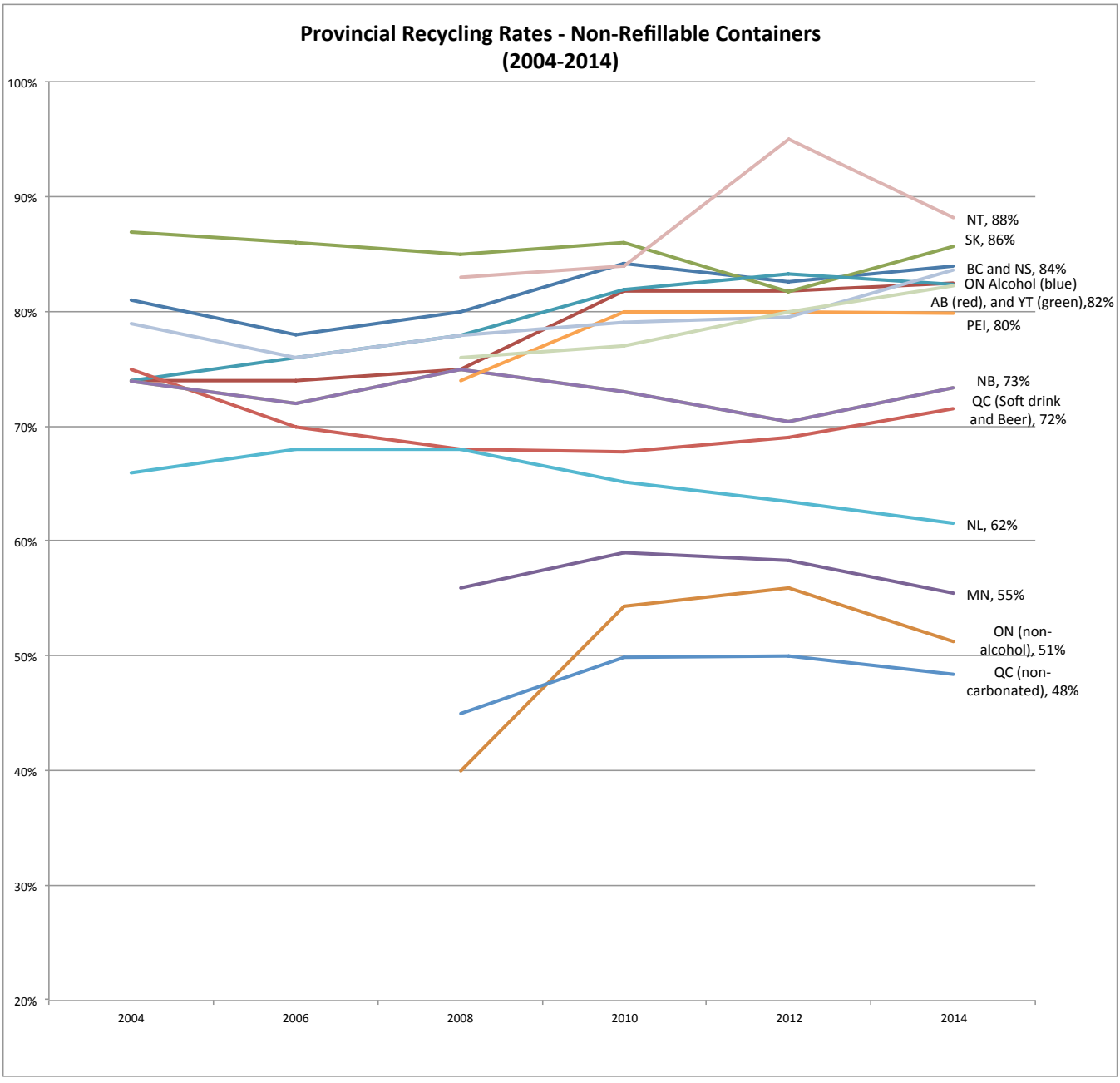



Figure 8 provides historical data on non-refillable recycling rates for the last decade. From 2004 to 2014, we can see that many programs have seen increases in recycling rates. One of the greatest increases can be seen in Alberta, where the recycling rate rose from 75% in 2008 to 82% in 2014. This is likely attributable to the deposit hike in 2009.

**FIGURE 8 PROVINCIAL RECYCLING RATES, NON-REFILLABLE CONTAINERS (2004-2014)**



### Aluminum Cans

Figure 9 presents 2014 aluminum can recycling rates by province. It is clear from the chart that provinces with DRS in place perform considerably better than those without. For example, the Northwest Territories and Nova Scotia—both of which have deposits on aluminum cans—show can recycling rates of 97% and 92%, respectively.

It is worth pointing out that Québec's recycling rate for aluminum cans (beer and soft drinks) is 70%. Compared to other deposit jurisdictions, which generally have collection rates of between 80% and 95%, 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 carry a deposit. This creates confusion for consumers, which lowers overall performance.

**FIGURE 9 PROVINCIAL RECYCLING RATES, ALUMINUM CANS (2014)**

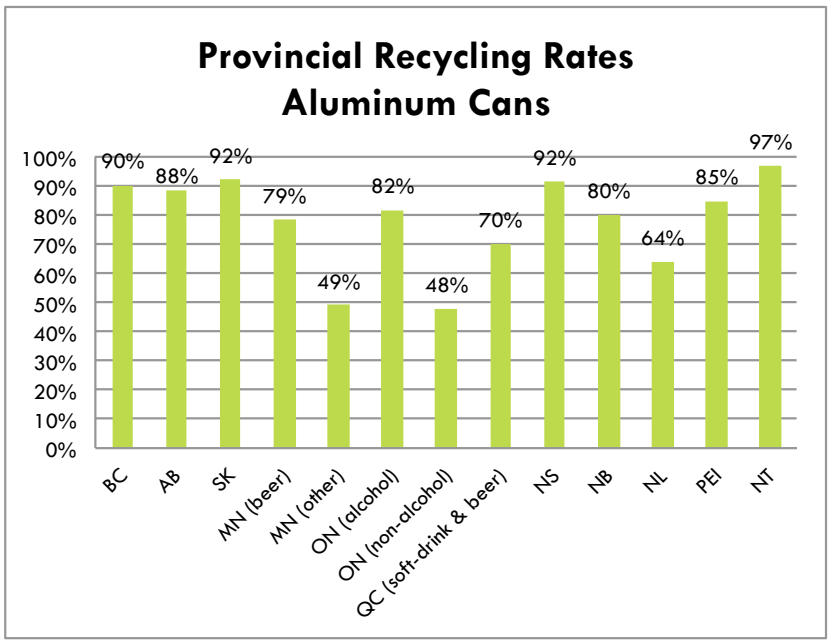


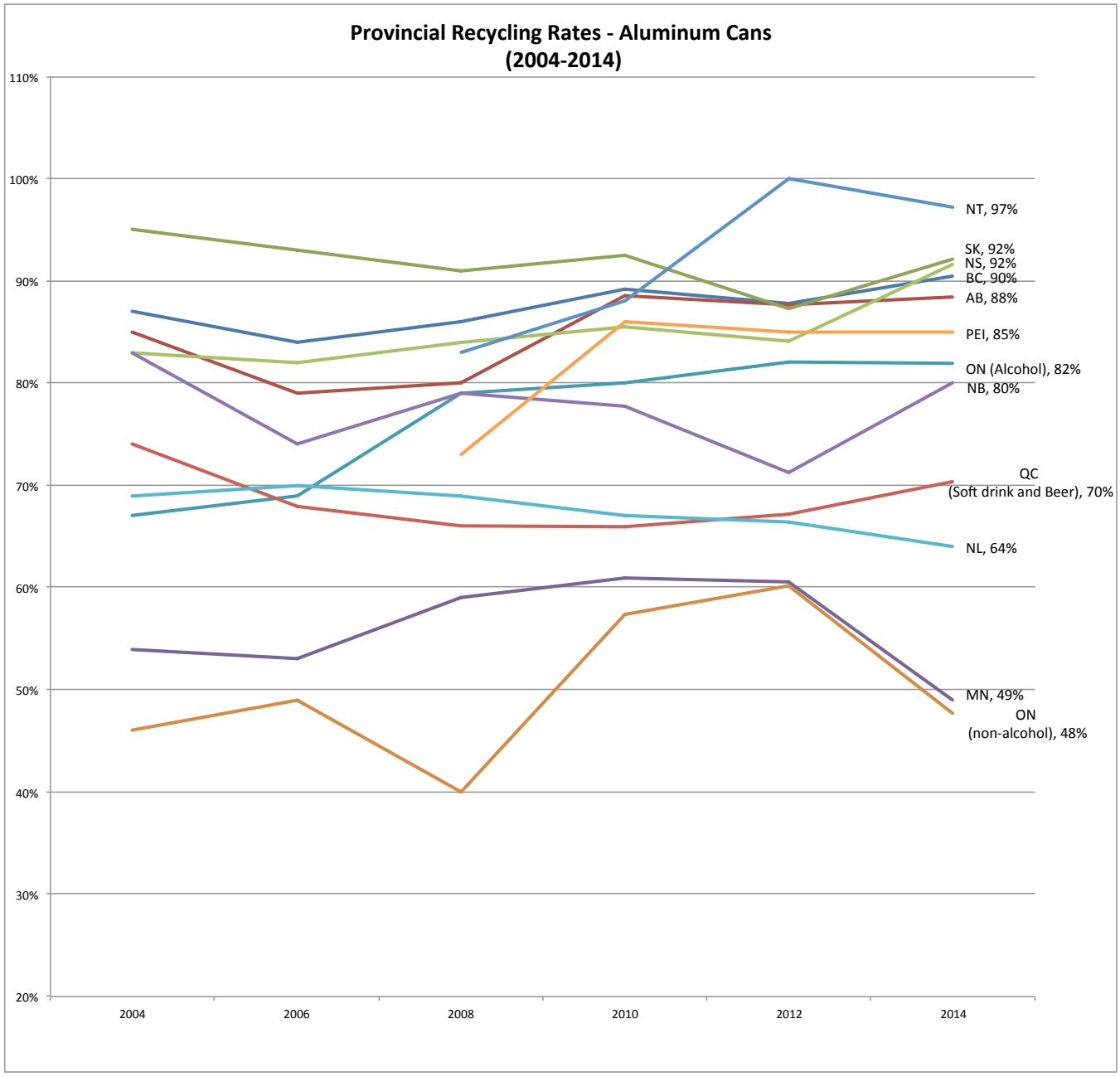

Table 3 shows 2014 recycling rates for aluminum beer cans and non-alcoholic beverage cans. When comparing these rates, it is important to consider the different deposit values placed on beer cans versus non-alcoholic beverage cans in each province. In B.C., for example, beer cans carry a 10-cent deposit, while non-alcoholic beverage containers have a deposit of only 5-cents. This difference may help explain why the recycling rate for beer cans is 95%, eleven percentage points higher than the 84% rate for non-alcohol cans in that province. The chart also clearly shows the difference in recycling rates for beer and soft drink cans in Ontario and Manitoba, where beer cans are on deposit and soft drink cans are collected through curbside programs.

**TABLE 3 PROVINCIAL COLLECTION RATES, ALUMINUM BEER CANS VS. SOFT DRINK CANS (2014)**

| | British Columbia | Alberta | Saskatchewan | Manitoba | Ontario | Quebec | Nova Scotia | New Brunswick | Newfoundland | Prince Edward Island |
|---|---|---|---|---|---|---|---|---|---|---|
| Beer Cans | 95% | 88% | 92% | 79% | 82% | 70% | 92% | 80% | 64% | 85% |
| Soft Drink Cans | 84% | 88% | 92% | 49% | 48% | 70% | 92% | 80% | 64% | 85% |

Figure 10 shows how collection rates for aluminum beverage cans have changed over time in each province. From 2004 to 2014, some jurisdictions, like BC, Alberta, Nova Scotia, PEI, and Ontario (alcohol), have seen their collection rates increase, while others, like Newfoundland and Saskatchewan, have seen theirs decrease.

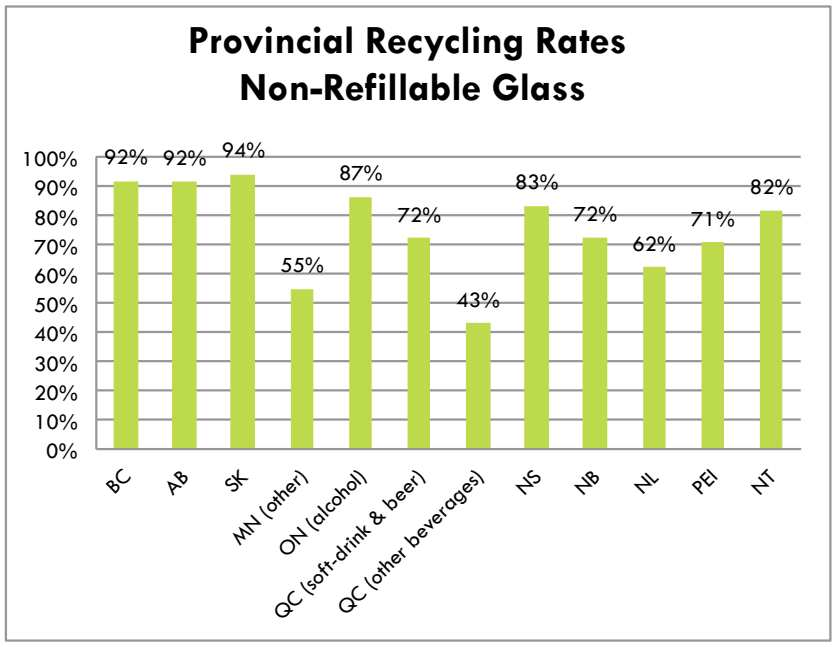
**FIGURE 10 PROVINCIAL RECYCLING RATES, ALUMINUM CANS (2004-2014)**



### Non-Refillable Glass

Figure 11 presents provincial recycling rates for non-refillable glass bottles in 2014. As with other types of beverage containers, provinces with deposit-return perform considerably better. The province with the highest recycling rate for this material is Saskatchewan at 94%, followed by BC and Alberta at 92% each.

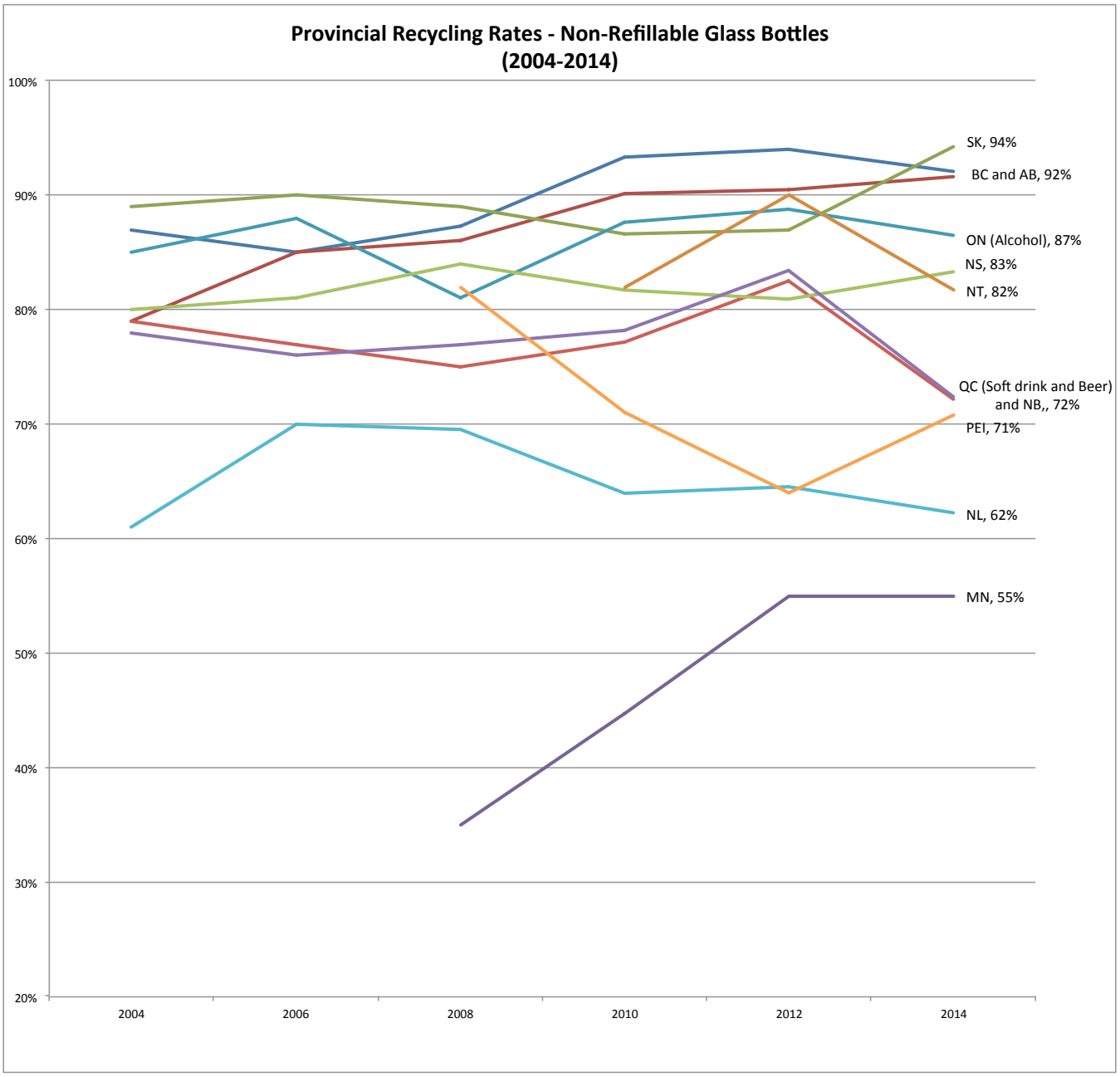
**FIGURE 11 PROVINCIAL RECYCLING RATES, NON-REFILLABLE GLASS (2014)**




As shown in Figure 12, some provinces have seen recycling rates for non-refillable glass bottles change significantly over the last 10 years. Consider Alberta, for example, which had a recycling rate of less than 80% in 2004, but today collects over 90% (an increase of over 10 percentage points). The province of Manitoba has also seen a significant increase in the amount of non-refillable glass containers collected and recycled, from less than 40% in 2004 to 55% in 2012. Other provinces, like PEI, have seen their rates drop dramatically only to pick back up in the last two years.

Various factors can help explain changes in return rates over time. For example, the drop in Ontario from 2006 to 2008 can be attributed to the launch of the Ontario Deposit Return Program. While the 2006 recycling rate included only non-refillable glass from beer bottles (which were under deposit), the 2008 rate included glass from wine, spirit, and cooler bottles, which were collected at a lower rate in the early years of the program (2007 and 2008). As shown in the figure, the recycling rate for non-refillable glass has since recovered.

**FIGURE 12 PROVINCIAL RECYCLING RATES NON-REFILLABLE GLASS (2004-2014)**



### PET Bottles

Figure 13 shows provincial recycling rates for PET bottles in 2014. Like other beverage packaging, PET containers are collected at higher rates in deposit provinces. In 2014, Saskatchewan was the leader with a recycling rate of 82%. At the other end of the spectrum is Québec (other beverages), with a rate of 51%.

**FIGURE 13 PET BOTTLE RECYCLING RATES BY PROVINCE (2014)**

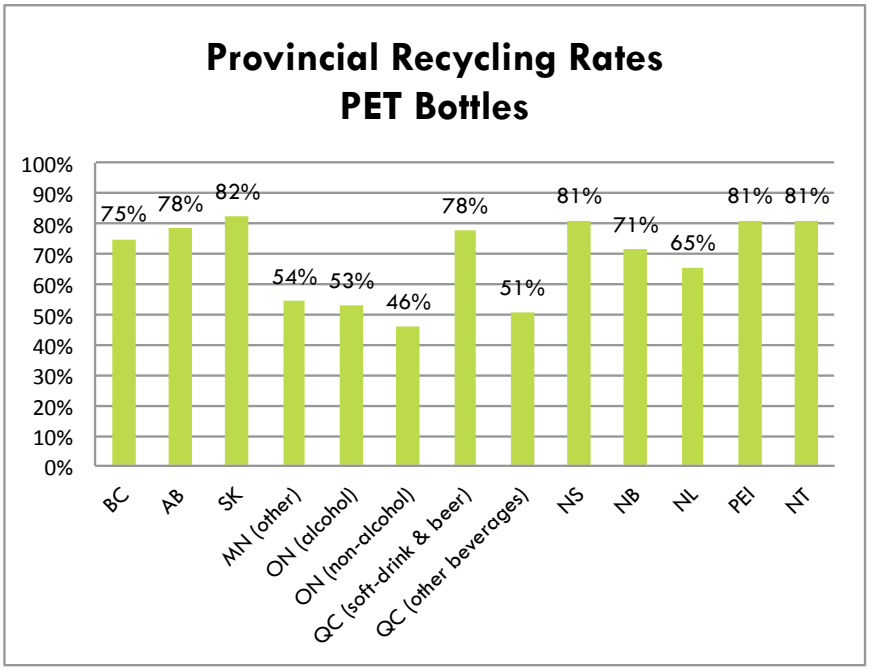
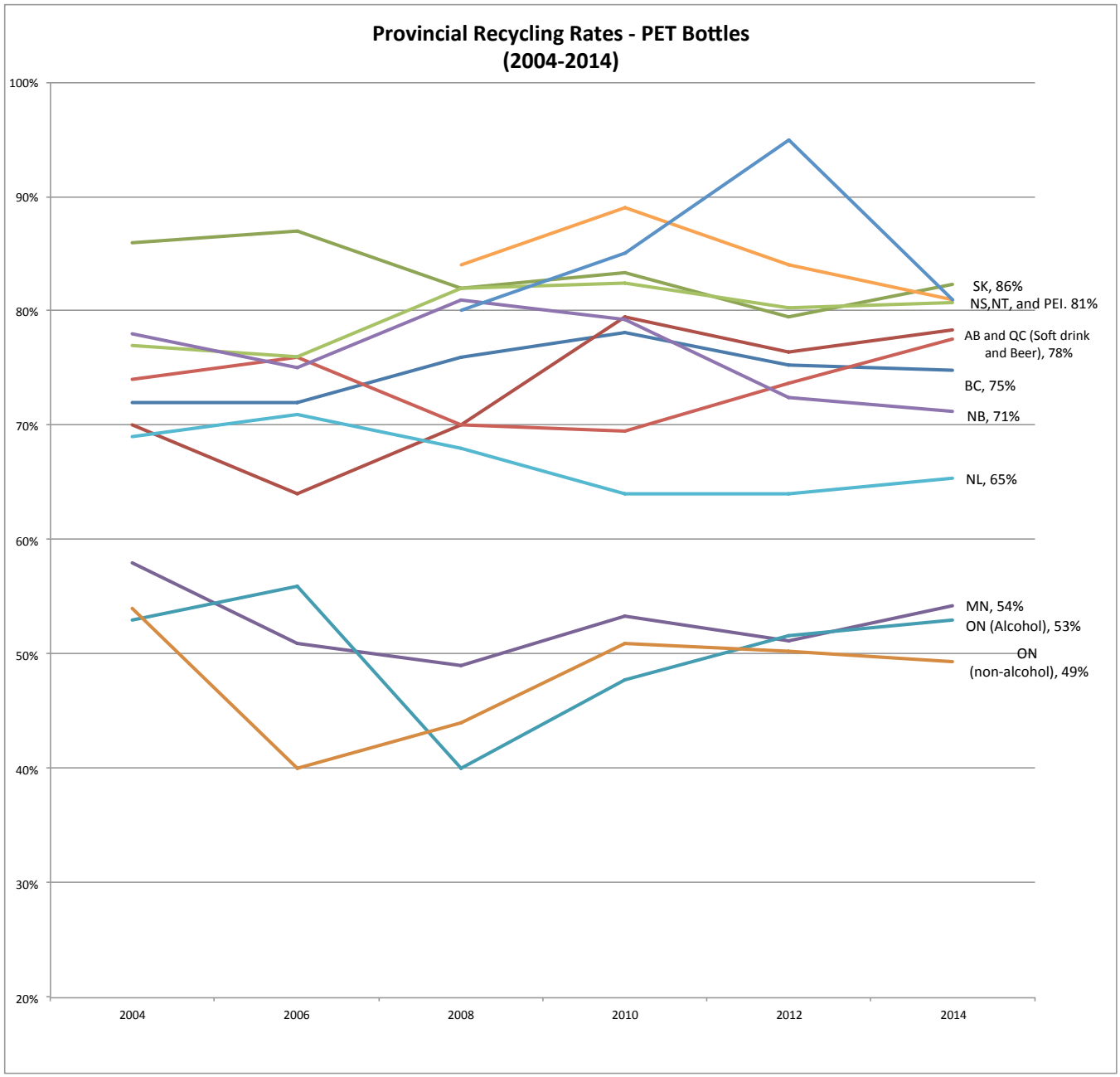



Figure 14 provides a historical perspective on the changes in PET recycling rates since 2004. As shown by the chart, most provinces have experienced a decrease in recycling rates since 2010. The exceptions are Ontario (alcohol containers) and Québec (soft drink and beer).

**FIGURE 14 PROVINCIAL RECYCLING RATES, PET BOTTLES (2004-2014)**



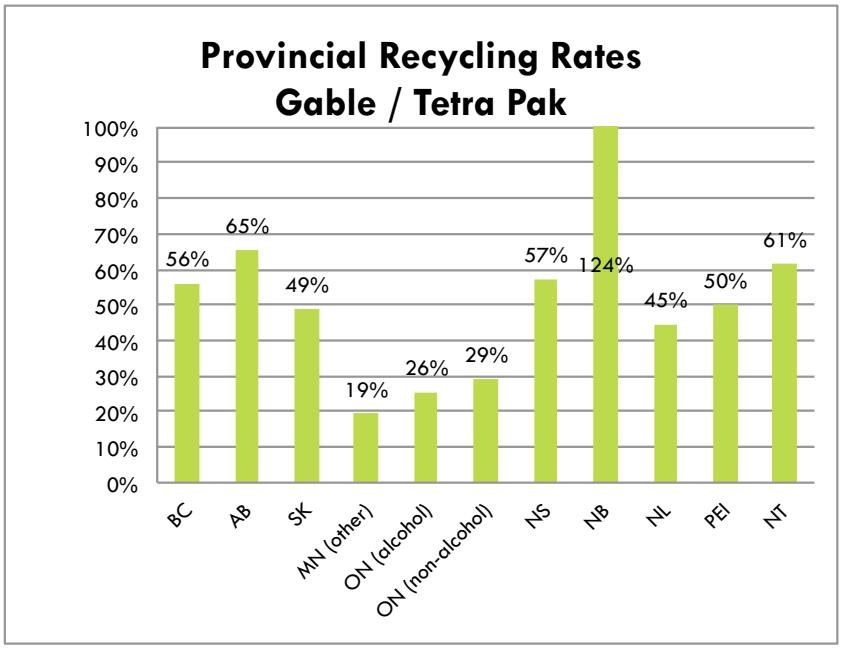
### Gable Top and Tetra Pak Cartons, Bi-Metal Cans, and Other Plastics

Overall, the recycling rates for gable top and Tetra Pak cartons, bi-metal cans, and other plastics are on the rise. Figures 15, 16, and 17 show 2014 recycling rates for these materials in provinces that report them.

The highest recycling rate for gable top and Tetra Pak cartons was reported in New Brunswick (124%). This is clearly not possible, and reflects the fact that some cartons are being reported as sold under other categories by distributors, leading to a situation where the denominator for gable/Tetra Pak containers sold is lower than it should be, while the denominator for other categories may be falsely reported as too high (see Figure 26, page 82).

With the exceptions of Alberta and the Northwest Territories, all other provinces have recycling rates below 60%.

**FIGURE 15 PROVINCIAL RECYCLING RATES, GABLE/TETRA PAK CONTAINERS (2014)**




With respect to bi-metal cans, Nova Scotia had the highest recycling rate at 93% (see Figure 16). For the 'other plastics' category, which includes bottles made from resins other than PET, or in some provinces PET or HDPE, recycling rates were between 37% and 81% (see Figure 17). (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 recycling rates year over year.)

FIGURE 16 PROVINCIAL RECYCLING RATES, BI-METAL/STEEL CANS (2014)

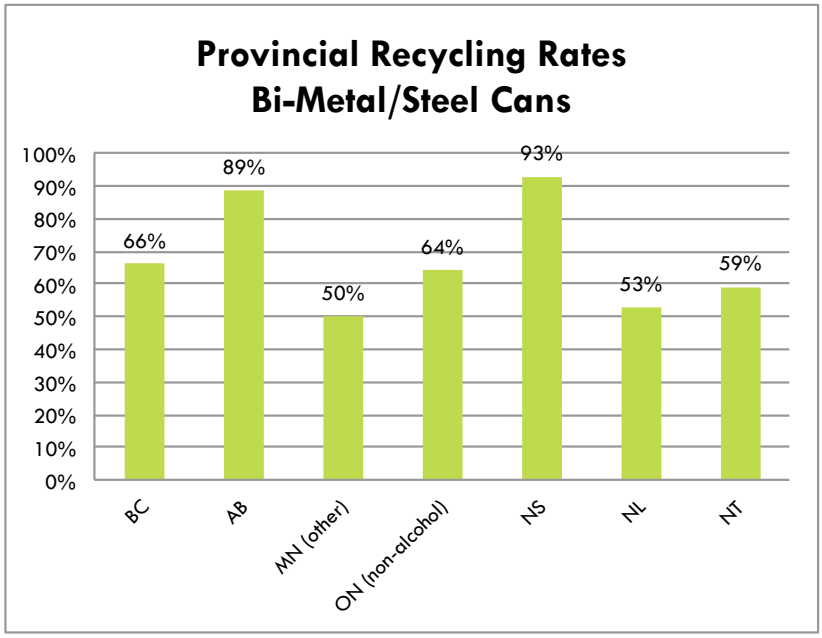
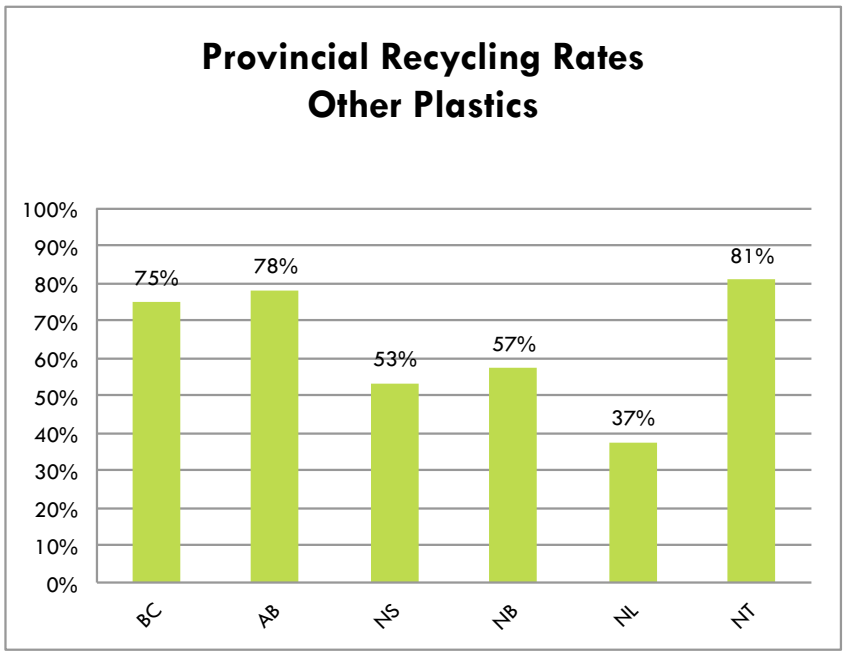



FIGURE 17 PROVINCIAL RECYCLING RATES, OTHER PLASTICS (2014)



### Milk Containers

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

Depending on the province, recycling rates for milk container packaging are measured in different ways. In some provinces the calculation is based on data from waste audits, while in others it is based on actual unit sales and collection data. In some cases, recycling 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.

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

The Northwest Territories used to report milk containers alone, but no longer does. As such, no rate is available.

In BC, 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 recycling rate specific to beverage containers. The same can be said for milk container recycling rates in the provinces of PEI and New Brunswick.

While Nova Scotia also collects milk containers via curbside recycling, specific collection rates have in the past been 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 over 2000, when the program began. In 2012-2013, the ADC stated that the collection rate for gable top cartons and HDPE milk jugs was 70.5%. Data for 2014 was not available.