Benchmarking Alberta Recycling Stewardship Programs for Tires, Electronics, and Paint

Final Report

Prepared for

Alberta recycling MANAGEMENT AUTHORITY

Prepared by:

Kelleher Environmental

in association with

SAMI Environmental

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Executive Summary

Alberta Recycling runs three stewardship programs for different designated materials: tires, electronics, and paint (see introduction for a brief history of the three programs). The primary purpose of these programs is to collect all the designated materials in Alberta at end-of-life, and to achieve responsible environmental outcomes through cost effective solutions.

One element of good governance and management for any organization is to compare or "benchmark" program and organizational performance against similar programs and organizations. This can be done by developing and comparing key performance indicators (KPIs). Based on the program purpose summarized above, the two most significant KPIs are:

- The amount of the designated material recovered annually at end-of-life, expressed as the **kg recovered per capita**. This measures the program's effectiveness in terms of how much of the total amount of available end-of-life materials are recovered. Using a per capita metric, rather than the often-used total tonnes recovered, provides a more meaningful comparison of program performance amongst provinces with differing populations.

- The total program costs expended annually to recover the designated material at end-of-life, expressed as the **cost per kilogram of material recovered**. This measures how cost-effectively the program recovers the end of life material. This is different to seeking the lowest cost option regardless of the environmental outcome. Using a per kilogram metric, rather than the often-used total program costs, provides a more meaningful comparison of program performance amongst provinces with differing populations.

In June 2016, Alberta Recycling commissioned Kelleher Environmental to carry out a benchmarking study to compare the performance of Alberta's stewardship programs for tires, electronics, and paint with similar stewardship/EPR programs across Canada, using the two fundamental KPIs noted above. The second component of the study is to perform a comprehensive jurisdictional scan to identify KPIs used by stewardship programs worldwide and identify additional KPIs relevant to the performance of the three Alberta programs.

The benchmarking process involved the following steps:

- Kelleher Environmental reviewed the annual reports and financial statements of each province's stewardship programs for tires, electronics, and paint from the last 6 years (2011-2016)[1] to identify and collect data on reported recovery and cost performance. Where data was not available in annual reports, program operators were contacted to collect the data. In some cases, additional information was found online.
- Available information was converted to standard KPIs of product recovery (kg/cap) and cost to recover (collect and process) the designated materials ($/kg).
- Alberta Recycling's performance was compared to that of other provincial programs.
- Alberta Recycling's performance was expressed as a percentage above or below the interprovincial average of all programs in Canada for each year 2011 to 2016.
- Alberta Recycling's performance was ranked compared to the other provincial programs.

Alberta Recycling will update the benchmarking process periodically and monitor trends and changes for indications of other opportunities for performance improvement.

[1] Where available

The KPIs for the tire, electronics, and paint recycling programs indicate that Alberta's programs were amongst the top performers across Canada:

- The amount recovered consistently exceeded the Canadian (interprovincial) average, and at a cost similar to or lower than the interprovincial average.
- The Alberta programs ranked 1st or 2nd amongst all programs over 50% of the time.

Impact of Economic Downturn (and Recovery) on Program Performance

The amounts recovered in all three Alberta programs have declined over the last several years. It is believed that these declines are due in large part to the economic downturn. Purchases decrease during a downturn. Fewer products purchased will result in a "lagged" decrease in products that reach end of life in the years following the downturn. This is turn reduces the amount available for recovery.

Recovery Performance

Table 1: Alberta Recycling Program Recovery Performance for Tires, Electronics and Paint (2011-2016) (kg/cap)

	2011	2012	2013	2014	2015	2016
Alberta Recycling Tire Program Recovery Compared to Interprovincial Average						
Alberta Recycling Tires Recovery (kg/cap)	16.3	16.2	18.7	17.2	17	14.8
Interprovincial Average Tire Program Recovery (kg/cap)	11.9	11.1	11.2	11.1	11.3	11.3
Alberta Recycling % above or below Interprovincial Average	37%	46%	67%	55%	50%	31%
Alberta Recycling Electronics Program Recovery Compared to Interprovincial Average						
Alberta Recycling Electronics Recovery (kg/cap)	4.4	4.7	4.8	4.7	4.1	3.3
Alberta Recycling Adjusted Electronics Program Recovery (kg/cap)	5	5.4	5.5	5.4	4.7	3.8
Interprovincial Average Electronics Program Recovery (kg/cap)	4.3	5.1	4.2	4.1	4	3.6
Alberta Recycling % above or below Interprovincial Average (Adjusted)	16%	6%	31%	32%	18%	6%
Alberta Recycling Paint Program Recovery Compared to Interprovincial Average						
Alberta Recycling Paint Recovery (kg/cap)	0.73	0.70	0.76	0.76	0.77	0.65
Interprovincial Average Paint Program Recovery (kg/cap)	0.65	0.64	0.63	0.63	0.72	0.71
Alberta Recycling % above or below Interprovincial Average	12%	9%	21%	21%	7%	-8%

Table 1 shows recovery values for programs that recycle tires, electronics, and paint in each Canadian province from 2011 to 2016. An interprovincial average was calculated for each year by taking the reported tonnes recovered in that year and dividing the tonnage by the population served. Alberta Recycling program performance was then expressed as a percentage of the interprovincial value.

Tire Program: For the tire program, the table shows that, in the years 2011 to 2016, annual tire recovery in Alberta exceeded the interprovincial average by 31% to 67%. These numbers were affected by the economic downturn, with declining sales in 2010 resulting in a "lagged" decline in amounts recovered since 2014. Current recovery numbers are on the rise as the economy recovers and sales grow. For the period as a whole (2011 to 2016), the overall average recovery in Alberta was 41% more than the interprovincial average.

Electronics Program: The Alberta electronics program collects a smaller range of electronics than any other program in Canada (with one exception – Alberta Recycling collects more types of floor standing printers). Despite this lower number of products included, Alberta's annual average recovery was on par with the interprovincial average, being

slightly higher for three years and slightly lower for two years (as the downturn hit electronics sales sooner and harder). In addition, to make the benchmarking process more comparable, an "apples to apples" comparison was developed (please see Appendix A for a full explanation). The amount recovered was adjusted by 14%, based on a very conservative adjustment process to estimate Alberta amounts recovered representing the product lists common to programs in other provinces. Using the adjusted amounts recovered, Alberta's annual recovery exceeded the interprovincial average by 6% to 32%. For the period as a whole (2011 to 2016), the adjusted Alberta average recovery was 12% more than the interprovincial average.

Paint Program: The Alberta paint program annually recovered 7% to 21% more than the interprovincial average in the years 2011 to 2015, but in 2016 recovery was 8% less than the average. The impact of the economic downturn on the decline in paint sales was much later than tires or electronics as major projects took time to be completed through the downturn. As a result, the "lagged" impact that reduced the amount of end-of-life paint available for recovery just started impacting amounts recovered in 2016. There are indications that the economy is turning around and increased sales will lead to a lagged increase in recovery in the next two years. For the period as a whole (2011 to 2016), the overall average recovery was 6% higher than the interprovincial average.

Cost Performance

Table 2 shows cost KPIs for programs that recycle tires, electronics and paint in each province from 2011 to 2016. The objective of all programs is to achieve responsible environmental outcomes at a reasonable cost, rather than use the lowest cost solution. An interprovincial average was calculated for each year by dividing the total program expenditures by the tonnes recovered in that year. Alberta Recycling program performance was then expressed as a percentage of the interprovincial value. Table 2 shows Alberta Recycling program costs compared to the interprovincial average for 2011 to 2016 expressed as $/kg recovered.

Table 2: Alberta Recycling Program Cost Performance for Tires, Electronics, and Paint (2011-2016) ($/kg)

	2011	2012	2013	2014	2015	2016
Alberta Recycling Tire Program Cost Compared to Interprovincial Average						
Alberta Recycling Tire Program Cost ($/kg)	$0.34	$0.37	$0.37	$0.38	$0.42	$0.40
Interprovincial Average Tire Program Cost ($/kg)	$0.36	$0.39	$0.38	$0.39	$0.40	$0.43
Alberta Recycling % above/below Interprovincial Average	-6%	-5%	-3%	-3%	5%	-7%
Alberta Recycling Electronics Program Cost Compared to Interprovincial Average						
Alberta Recycling Electronics Program Cost ($/kg)	$1.12	$1.12	$1.06	$1.03	$1.02	$1.03
Interprovincial Average Electronics Program Cost ($/kg)	$1.40	$1.15	$1.00	$1.05	$1.05	$1.04
Alberta Recycling % above/below Interprovincial Average	-20%	-3%	6%	-2%	-3%	-1%
Alberta Recycling Paint Program Cost Compared to Interprovincial Average						
Alberta Recycling Paint Program Cost ($/kg)	$1.50	$1.56	$1.57	$1.54	$1.52	$1.59
Interprovincial Average Paint Program Cost ($/kg)	$2.38	$2.47	$1.92	$1.88	$1.69	$1.92
Alberta Recycling % above/below Interprovincial Average	-37%	-37%	-18%	-18%	-10%	-17%

Tire Program: The Alberta Recycling tire program costs per kg recovered were slightly but consistently lower than the interprovincial average except for 2015 when it was 5% higher. The Alberta program had some of the highest

"value-added" funding rates in Canada (crumb, mulch) which were reduced in the 2016/17 after the expenditure spike in 2015.

Electronics Program: The Alberta Recycling electronics program cost KPI was 20% lower than the interprovincial average in 2011, and 1% to 3% lower than the interprovincial average in all other years except 2013 when costs were 6% higher.

Paint Program: The Alberta Recycling paint program cost KPI was substantially lower than the interprovincial average in all years, ranging from 10% lower in 2015 to 37% lower in 2011 and 2012.

Summary: Recovery and Cost Averages – Total Period (2011-2016)

The following graphs present the average KPI for the entire period 2011 to 2016 on a program basis, providing a broad performance summary of both program recovery and cost, between the Alberta program average and the interprovincial average. The conclusion of the benchmarking exercise is that the Alberta Recycling programs for tires, electronics, and paint all perform well when compared to other provincial programs.

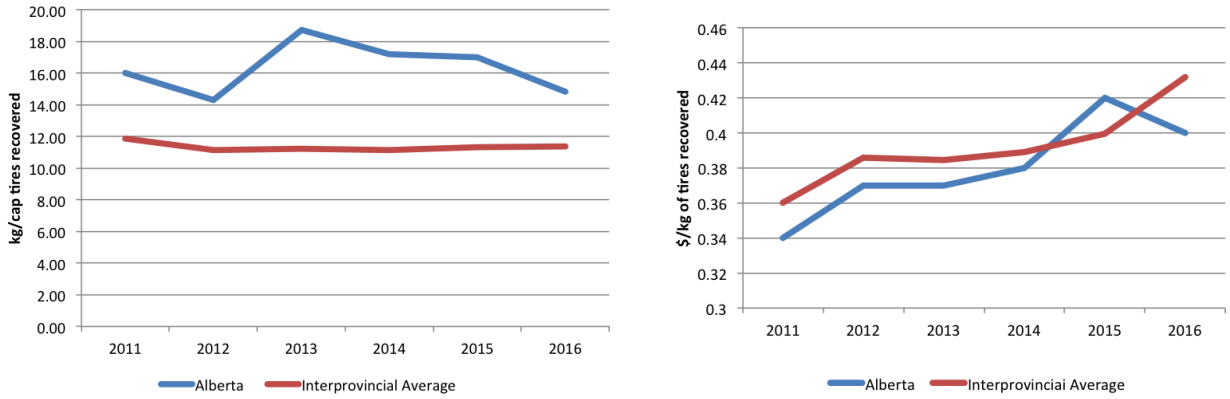

Figure 1: Tire Programs – Summary of Recovery and Cost Performance

TIRE PROGRAM SUMMARY: Overall for the period 2011 to 2016, the amount of material recovered through the Tire Recycling Program was 41% higher than the average, and at a cost that was within 1% of the average.

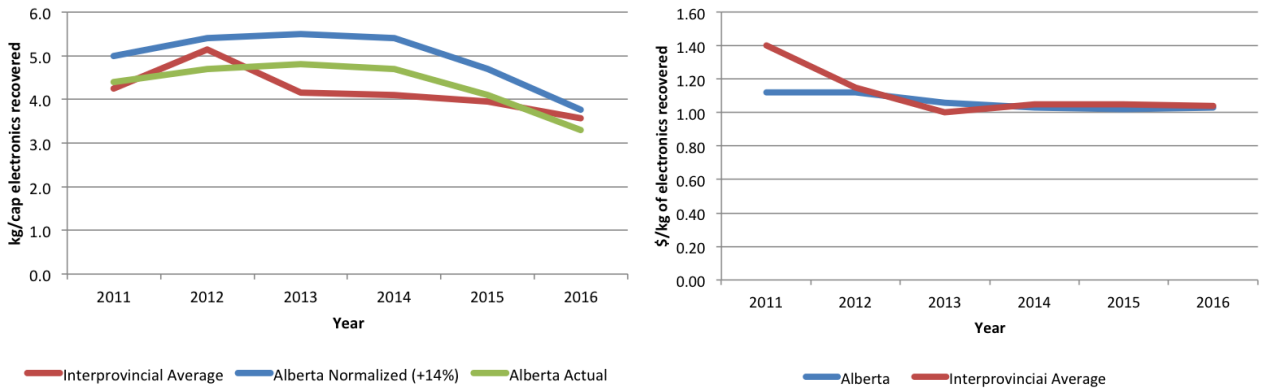

Figure 2: Electronics Programs – Summary of Recovery and Cost Performance

ELECTRONICS PROGRAM SUMMARY: Overall for the period 2011 to 2016, the amount of material recovered (adjusted) through the Electronics Recycling Program was 12% higher than the average, and at a cost that was within 2% of the average.

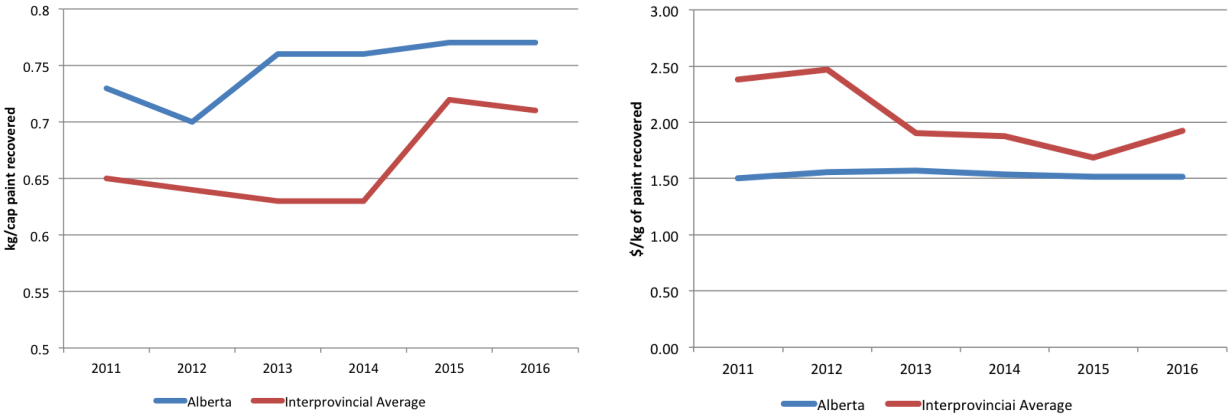

Figure 3: Paint Programs – Summary of Recovery and Cost Performance

PAINT PROGRAM SUMMARY: Overall for the period 2011 to 2016, the amount of material recovered through the Paint Recycling Program was 6% higher than the average, and at a cost that was 26% lower than the average.

Ranking Compared to Other Provincial Programs

Table 3 below shows the ranking of Alberta Recycling's program recovery rate (in kg/cap) for tires, electronics, and paint against other provincial programs for the years 2011 to 2016.

Alberta has consistently ranked second or third for recovery of tires from 2011 to 2016.

Alberta has generally ranked first or second for five of the last six years for electronics recovery, measured as kg/cap, and adjusted by 14% to account for the products recovered in the Alberta program in order to compare "apples to apples". In 2016, Alberta ranked fourth, but this is explained by the changing electronics mix and the fact that older, heavier televisions and monitors are now out of the system. The ranking drops to third and fourth for all years if actual kg/cap values are used.

Alberta has consistently ranked second or third for recovery of paint from 2011 to 2015. In 2016, Alberta ranked fifth for recovery of paint. This value is somewhat misleading as Quebec counts paint containers in the total reported and Alberta does not.

For tire program costs, expressed as $/kg recovered, Alberta ranked fourth (out of ten programs) in 2016, and has consistently ranked fourth or fifth over the previous five years.

With the volatility in interprovincial costs, Alberta's ranking for electronics program cost has varied, even if costs have been relatively stable and declining. In 2016, Alberta ranked third, down from first in 2015, and up from fourth in 2014 and 2013.

The Alberta Recycling paint program costs have consistently ranked first for the lowest cost paint program on a $/kg basis for all years, 2011 to 2016.

Table 3: Ranking of Alberta Recycling Program Recovery and Cost Performance for Tires, Electronics, and Paint (2011-2016)

	2011	2012	2013	2014	2015	2016
Ranking for Program Recovery (kg/cap)						
Alberta Recycling Ranking for Tire Program Recovery (kg/cap)	3	3	2	2	2	3
Alberta Recycling Ranking for Electronics Program Recovery (kg/cap)	3	4	4	4	5	4
Alberta Recycling Ranking for Electronics Program Recovery (kg/cap) Adjusted	1	2	2	1	2	4
Alberta Recycling Ranking for Paint Program Recovery (kg/cap)	3	2	2[2]	3	3	5
Ranking for Program Cost ($/kg)						
Alberta Recycling Ranking for Tire Program Cost ($/kg)	4[3]	5	5	5	4	4
Alberta Recycling Ranking for Electronics Program Cost ($/kg)	1	2	4[4]	4	1[5]	3
Alberta Recycling Ranking for Paint Program Cost ($/kg)	1	1	1	1	1	1

[2] Tied with BC
[3] Tied with PEI
[4] Tied with BC
[5] Tied with ON

1. Introduction

Alberta Recycling runs three programs for very different materials – tires, electronics, and paint. The tonnages recovered by the three programs for the last six years (2011 to 2016) are presented in Figure 4. The figure shows a decline in the amount recovered for all three programs since 2014. This decline is attributed in part to the impacts of the economic downturn.

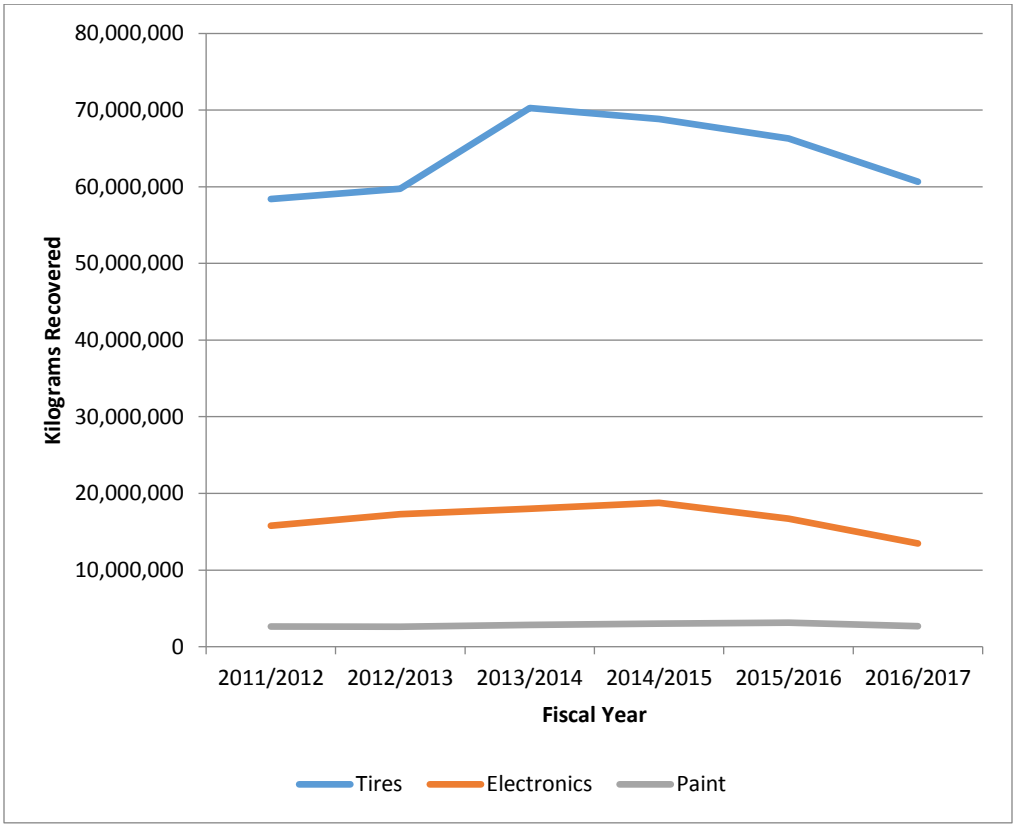

Figure 4: Annual Weight of Tires, Electronics, and Paint Recovered in Alberta Recycling Programs (2011/12-2016/17) (Kilograms)

Benchmarking business or program performance against similar businesses or programs is good management practice and one element of good governance for any organization.

In June 2016, Alberta Recycling commissioned Kelleher Environmental to carry out a benchmarking study to compare the performance of Alberta's stewardship programs for tires, electronics, and paint with EPR programs across Canada for the same materials, using standard key performance indicators (KPIs). A second component of the study is to perform a comprehensive jurisdictional scan to identify KPIs used by EPR programs worldwide and identify those KPIs suitable for use in Alberta.

The initial focus of the research was on two main quantitative KPIs, based on two primary goals in Alberta Recycling's Business Plan:

- Goal 1: recover all program materials at end-of-life (using weight recovered per capita (kg/cap) as the KPI), and
- Goal 2: make sure the program is sustainable and cost-effective (using total program cost per weight recovered ($/kg) as the KPI for comparative evaluation).

The report is organized as follows:

- Section 2 describes the methodology for the research;
- Section 3 presents information collected on tires programs across Canada, and benchmarking results for the Alberta Recycling tire program;
- Section 4 presents information collected on electronics programs across Canada, and benchmarking results for the Alberta Recycling electronics program;
- Section 5 presents information collected on paint programs across Canada, and benchmarking results for the Alberta Recycling paint program;
- Section 6 presents information on public awareness research;
- Section 7 presents information on proximity and accessibility analysis; and
- Section 8 presents a summary and conclusions from the benchmarking process.

Detailed information is presented in a series of appendices to the report.

2. Methodology

The approach to benchmarking Alberta Recycling's stewardship programs for tires, electronics and paint was to compare the performance of these programs against publicly reported data for other tire, electronics and paint programs across Canada.

The benchmarking approach involved the following steps:

- Kelleher Environmental reviewed the annual reports and financial statements of each province's stewardship programs for tires, electronics, and paint from the last 6 years (2011-2016) (where available) to identify and collect available reported recovery and cost performance data. Where data were missing from annual reports, additional data was collected by contacting program operators. In some cases, additional information was found online. A list of references reviewed is presented in Appendix B.
- Available information was converted to standard KPIs of kg/cap of product recovered and $/kg to recover the designated materials.
- Alberta Recycling program performance was compared to values for other provincial programs as well as to the interprovincial average value.
- Alberta Recycling program performance for the tire, electronics, and paint programs was ranked compared to performance of the other programs managing the same materials across Canada.

KPIs Reported in Other Provincial Programs

Appendices C, D and E provide a complete list of all the KPIs and metrics reported for tires, electronics and paint programs across Canada in the most recent reporting year, along with references for the information.

Number of Years of Data Used for Benchmarking Tires, Electronics, and Paint Programs

The research was initially carried out using data from the most recent year for which data were available (2015 in most cases). Many anomalies were found comparing program data for only one year, and it was decided that two years of program data should be used for the comparison, to minimize anomalies in the program if only one year was chosen. Further anomalies were found in the data from programs across the country, primarily as a result of the impact of changing economic conditions, particularly in Saskatchewan and Alberta. Therefore, a longer time span of five years was chosen so that the impacts of changing economic conditions and other factors could be taken into consideration in the benchmarking exercise. As the five-year report (2011 – 2015) was being finalized, 2016 data became available and it was decided to add this sixth year of annual program data for a more current result.

Population Data for Kg/Capita Calculations

The benchmarking exercise involved dividing overall program cost data and material tonnage data by provincial populations (obtained from Statistics Canada) to convert reported tonnage to kg/cap and reported costs to $/kg.

Converting reported information to kg/cap is important for two reasons:

- To compare program results in different provinces on an "apples to apples" basis, especially to facilitate comparisons between different provincial populations (which is more difficult if just total tonnes recovered or total program costs are used). In some annual reports, particularly those for electronics programs, kg/cap figures are already calculated, and these kg/cap figures were used. Where not provided in the annual reports, kg/cap figures were calculated.

- To factor out the impact of population growth on sales volumes, in order to more accurately present the net increase in the amounts of program material recovered.

Populations by province for the years 2011-2016 are presented in Appendix F. These were obtained through various Statistics Canada reports and were used for calculating kg/cap values where these were not contained in stewardship agencies' annual reports[6].

Calculating Interprovincial Average Values

Weighted average values for kg/cap and $/kg were calculated in order to carry out the interprovincial comparison.

Average kg/cap values for all Canadian programs combined are calculated by dividing total tonnes of a product (tires, electronics, paint) recovered per year by the combined population served by all operating programs for the material in question.

To calculate the interprovincial cost average value, all reported costs for a given year were added together and divided by the total tonnes recovered by the operating programs across Canada.

Benchmarking Alberta Recycling Programs for Tires, Electronics and Paint to Other Provincial Programs

Values for kg/cap and $/kg for the Alberta Recycling tires, electronics and paint programs for 2011 to 2016 are presented in the sections which follow and are compared to those reported or calculated for programs in other provinces in the same years, where data are available. Alberta Recycling values are also compared to the interprovincial average values for each program, with comments where significant anomalies are noted.

Alberta Recycling program performance is then ranked (rank 1,2,3,4 etc.) compared to other provincial programs in each year from 2011 to 2016.

[6] 2012-2015 population data obtained from Statistics Canada (http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/demo02a-eng.htm. 2011 population data obtained from Statistics Canada (https://www12.statcan.gc.ca/census-recensement/2011/dp-pd/hlt-fst/pd-pl/Table-Tableau.cfm?LANG=Eng&T=10

3. Benchmarking Alberta Recycling's Tire Program Against Other Provincial Tire Programs

This section presents KPI data collected along with interprovincial average values for tire programs across Canada for 2011 to 2016.

Alberta Recycling's tire program is benchmarked against other Canadian tire programs by ranking the KPI values against other provincial programs and comparing performance to the interprovincial average for each year from 2011 to 2016.

3.1 Tire Program Background

As shown in Figure 5, almost every province and territory in Canada has established a tire recycling program. The two exceptions are Nunavut and the Northwest Territories. Yukon has a program, but no information regarding program performance or costs was publicly available, and so it is not included in this analysis. The BC tire program started in 1991. Alberta's tire program, which started in 1992, is one of the most longstanding tire programs in Canada. Ontario had a tire tax which was implemented in the 1980s to address tire issues after the Hagersville tire fire. The tire tax was cancelled after a few years, and in 2009 Ontario implemented a tire stewardship program run by Ontario Tire Stewardship (OTS) under the *Waste Diversion Act*. Under the *Waste Free Ontario Act (2016)*, OTS will be wound up by December 2018 and stewardship of tires in Ontario will move to an individual producer responsibility framework. Future reporting requirements are not identified at this time, but the new Resource Productivity and Recovery Authority (RPRA) established under the new act is constructing a comprehensive Registry where performance against new regulatory requirements will be tracked.

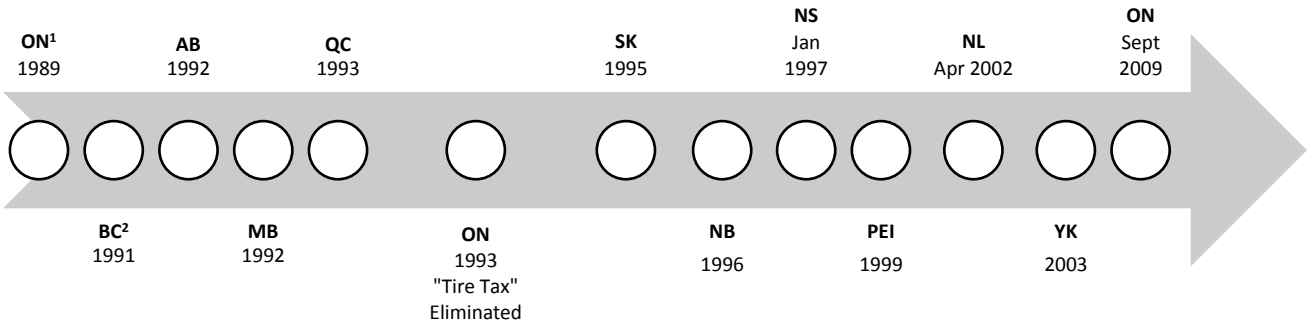

Figure 5: Tire Programs Across Canada - Start-up Timeline

Programs for collecting and recycling used tires are run by different organizations in different provinces and were established at different times. As a result, the definitions of the types of tires as well as the size of tires included in each category vary significantly between jurisdictions. British Columbia's program, for example, covers four categories of tires, each with separate fees: passenger car and light truck; medium truck tire; agricultural drive tire; and logger skidder tire. Prince Edward Island (PEI)'s program, on the other hand, only has two categories: air-filled tires with a rim size of 17" or less, or air-filled tires with a rim size greater than 17". About half of the provinces include a range of "other" types of tires.

In addition, the format of program annual reports varies, and some contain more detail than others. Alberta Recycling's annual reports tend to provide a greater level of detail. While all tire programs report on recovery, the way in which this is reported varies. Some programs report tires recovered in tonnes, while others report only in units. In order to convert from units to tonnes, a conversion factor of one passenger tire equivalent (PTE) to 10kg was used.[7] The majority of tire programs also report on the number of tires sold, number of collection sites, program costs, and revenues.

The way in which programs report on the disposition of the tires also varies, for example:

- BC reports on recovered and processed, and also provides a breakdown of the tonnes of processed tires converted into new products or sent to energy recovery or landfill.
- Ontario reports on tonnes recovered, reused, actual input to recycling, material losses and disposal, recycled rubber, recycled steel, recycled fibre and total tonnes recycled, etc.

In most cases, the KPIs that must be reported are outlined in provincial stewardship plans or regulations.

[7] Conversion factor was obtained from the 2014 New Brunswick Annual Report.

3.2 Tire Recovery Rates (kg/cap) Across Canada

Table 4 provides a summary of the weight of tires recovered in each provincial program annually each year from 2011 to 2016 on a per capita basis. The percentage difference between the interprovincial value and Alberta Recycling performance is also included in the table, as well as Alberta's rank. Figure 4 shows a comparison between Alberta Recycling program performance in kg/cap of tires recovered and the interprovincial average for each year from 2011 to 2016.

Table 4: Tires Programs Across Canada – Interprovincial Comparison of Amount Recovered (2011-2016) (kg/cap)

	2011	2012	2013	2014	2015	2016	2016 tonnes
AB	16.3	16.2	18.7	17.2	17.0	14.8	60,666
BC	8.4	8.2	8.6	8.8	9.6	9.6	45,775
SK	18.0	19.6	19.5	21.2	17.3	15.9	18,254
MB	10.2	10.2	12.5	12.3	14.8	14.1	18,622
ON	12.1	10.9	10.3	10.0	10.0	10.2	142,603
QC	10.6	9.9	9.8	9.6	10.5	n/a	87, 803 [8]
NB	14.3	14.0	13.6	14.5	14.5	15.1	11,400
NS	12.8	11.6	11.3	11.8	12.4	11.7	11,100
PEI	17.2	17.3	15.7	16.1	16.3	n/a	2,395[9]
NL	7.8	9.4	8.8	9.0	9.8	9.7	5,140
Interprovincial Average for Tires Recovered[10]	11.9	11.1	11.2	11.1	11.3	11.3	44,060
Alberta vs. Interprovincial Average for Tires Recovered	37%	46%	67%	55%	50%	31%	
Alberta Recycling Rank for Tires Recovered (kg/cap)	**3**	**3**	**2**	**2**	**2**	**3**	

8 Recyc Quebec annual report has 8,780,292 tires. This would normally translate to 87,803 tonnes at 10kg per tire. CATRA website reports 75,541 tonnes. We have run with higher number for now.

9 https://www.iwmc.pe.ca/pdfs/2016AnnualReport.pdf

10 Interprovincial average is calculated by summing the tonnes processed in participating provinces and dividing by the total population of those provinces which have operating programs.

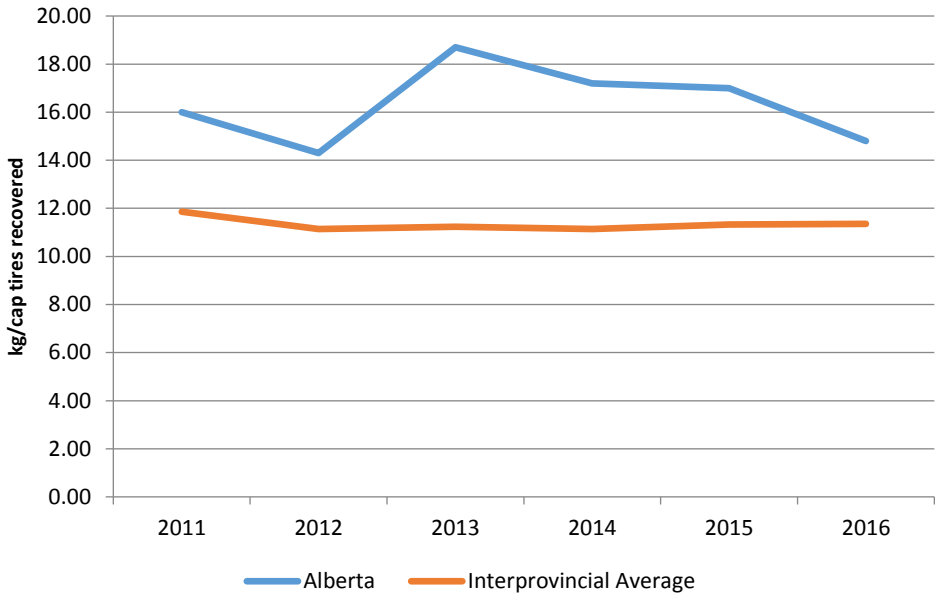

Figure 6: Comparison of Alberta Recycling Tire Program Recovery to Interprovincial Average (2011-2016) (kg/cap)

Comparing Alberta Recycling tire program performance to other provincial programs, and to the interprovincial average:

- **Alberta Tire Program Recovery Performance (kg/cap)**: Alberta recovered 14.8 kg/cap in 2016, down significantly from previous levels of about 17 kg/cap. The decline is primarily attributed to the lagged decline in lower recoveries due to lower sales during the economic downturn in 2014.
- **Comparison of Alberta Tire Program Performance to Interprovincial Average**: Alberta consistently exceeds the interprovincial average by a wide margin. In 2016 it exceeded the interprovincial average recovery rate by nearly 4 kg/cap. When compared on a percentage basis, Alberta recovery exceeds the interprovincial average by 31% or more in all years. Alberta Recycling recovers at least 31% more tires than the interprovincial average in the years 2011 to 2016,and recovered up to 67% more than the interprovincial average in 2013. The rate at which tires each end of life and are recovered is impacted by economic conditions in different provinces.
- **Provincial Ranking of Alberta Tire Program Performance:** Alberta ranked third in tire program recovery measured as kg/cap in 2016, and has consistently ranked second or third over the previous five years[11].

[11] Alberta comes in third behind Ontario and Quebec, both of which have much larger populations and more collection sites. Anomalies in Saskatchewan data compared to other provinces could not be resolved at the time of the research. Management and operation of the Saskatchewan tire program transitioned from Saskatchewan Tire Stewardship Corporation to TSS (Tire Stewardship Saskatchewan) in September, 2017 and it was not considered practical to engage in discussions on comparative data in the midst of corporate and staff transitions.

3.3 Tire Program Costs ($/kg) Across Canada

Table 5 presents information on the total cost per kilogram to recover tires in each program across Canada, from 2011-2016, where data are available. Alberta Recycling tire program costs are presented along with the interprovincial average in Figure 7.

Table 5: Tire Programs Across Canada – Interprovincial Comparison of Program Costs (2011-2016) ($/kg)

	2011	2012	2013	2014	2015	2016
AB	$0.34	$0.37	$0.37	$0.38	$0.42	$0.40
BC	$0.46	$0.50	$0.46	$0.50	$0.46	$0.46
SK	$0.37	$0.39	$0.41	$0.40	$0.51	$0.47
MB	$0.33	$0.36	$0.35	$0.35	$0.39	$0.37
ON	$0.43	$0.45	$0.47	$0.46	$0.47	$0.45
QC	$0.20	$0.23	$0.21	$0.22	$0.22	$0.29
NB	$0.42	$0.42	$0.44	$0.44	$0.45	$0.44
NS	$0.33	$0.34	$0.33	$0.33	$0.33	$0.35
PEI	$0.34	$0.35	$0.33	$0.35	$0.46	$0.46
NL	n/a	n/a	n/a	$0.48	$0.46	$0.44
Interprovincial Average for Tire Program Costs	$0.36	$0.39	$0.38	$0.39	$0.40	$0.43
Alberta Recycling vs. Interprovincial Average for Tire Program Costs	-6%	-5%	-3%	-3%	5%	-7%
Alberta Recycling Rank for Tire Program Cost ($/kg)	4 (tied PEI)	5	5	5	4	4

Comparing Alberta Recycling tire program performance to other provincial programs, and to the interprovincial average:

- **Alberta Recycling Tire Program Cost Performance ($/kg)**: Alberta's cost to recover tires was $0.40/kg in 2016, down from 2015 and up slightly from previous levels since 2011. The higher levels recently are due to higher than projected levels of value-added processing including crumb and mulch. The Board reduced this funding in 2017/18 to reduce costs.
- **Comparison of Alberta Recycling Tire Program Cost Performance to Interprovincial Average**: The interprovincial average cost to recover tires across Canada has risen from $0.36/kg in 2011 to $0.43/kg in 2016. Table 5 shows Alberta Recycling program costs compared to the interprovincial average for 2011 to 2016. The table shows that Alberta Recycling tire program costs expressed as $/kg of tires recovered are very similar to the interprovincial average for all years 2011 to 2016 and differ only slightly (ranging from 6% lower to 5% higher) from the interprovincial average in these years. With the exception of 2015, when Alberta Recycling's costs were 5% higher than the interprovincial average, in all other years Alberta Recycling's tire program costs has been slightly lower (from 3% lower to 7% lower) than the interprovincial average for five of the six years.
- **Provincial Ranking of Alberta Recycling Tire Program Cost**: Alberta ranked fourth (out of ten programs) in 2016, and has consistently ranked fourth or fifth over the previous five years for program costs in $/kg.

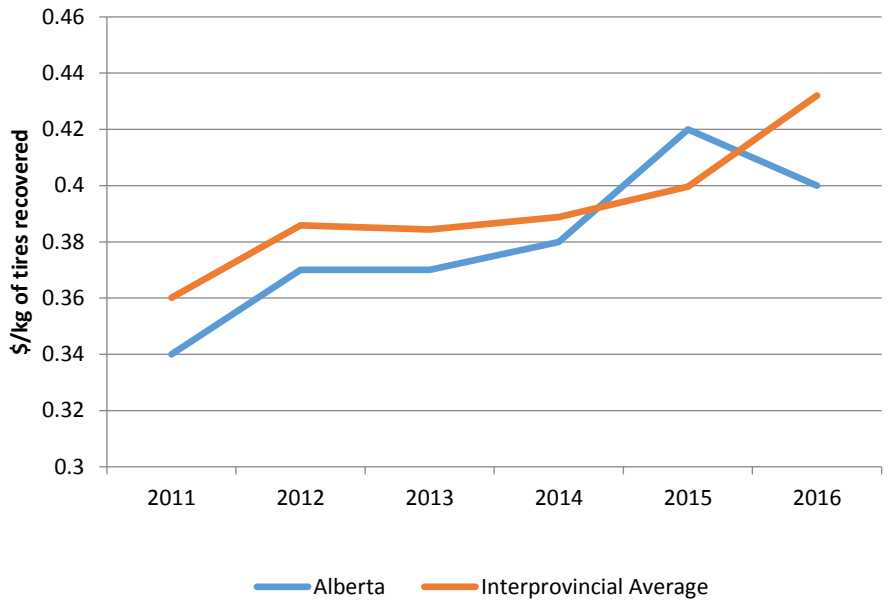

Figure 7: Alberta Recycling Tire Program Cost Performance Compared to Interprovincial Average (2011-2016) ($/kg)

3.4 Tire Fees Across Canada

Table 6 presents tire stewardship fees across Canada. For passenger car and light truck tires, the fees range from a low of $3.00/tire in Quebec to $11.25/tire (depending on rim size) in PEI.

Alberta's fee for medium truck tires is $9/tire. The lowest fee is in Quebec ($3/tire) followed by Yukon ($5/tire). Saskatchewan charges the highest fee for medium truck tires at $14/tire.

About half of the provinces (but not Alberta) collect agricultural tires, with the fees ranging from $5.00 to $172.10, depending on rim size. Fees for large off-the-road (OTR) tires range from $4.00 in PEI to as high as $1,237.98 in Ontario, depending on rim size.

Table 6: Tire Fees Across Canada (2017)[12]

TIRE CATEGORY	TIRE SUB-CATEGORY	YT	BC	AB	SK	MB	ON	QC	NB	PE	NS	NL
Passenger / Light Truck	Passenger, Small RV, Light Truck	$5.00	$5.00	$4.00 or $9.00*	$4.00	$3.75	$3.30	$3.00	$4.50	$4.00 or $11.25*	$4.50	$3.00 or $9.00*
	Motorcycle, Golf Cart, All Terrain Vehicle	$5.00	$5.00	$4.00	$4.00	$3.75	$3.30	$3.00	$3.00	$4.00	$4.50	$9.00
	Small Utility, RV Trailer	$5.00	$5.00	$4.00	$4.00	$3.75	$3.30	$3.00	$4.50	$4.00	$4.50	$3.00
	Lawn & Garden Tractor	$5.00	$5.00	$4.00	$4.00	$3.75	$5.55	$3.00	$3.00	$4.00	-	-
Truck / Bus	Medium Truck, Bus, Highway Trailer	$5.00	$9.00	$9.00	$14.00	$9.00	$12.95	$3.00	$13.50	$11.25	$13.50	$9.00
Agricultural	Agricultural (Small)	-	$5.00	-	$4.00	$3.75	$11.10	$3.00	-	$11.25	-	-
	Agricultural Drive (Med.)	-	$15.00	-	$25.00	$9.00	$27.76	$3.00	-	$11.25	-	-
	Agricultural Drive (Large)	-	$35.00	-	$25.00	$30.00	$44.41	$3.00	-	$11.25	-	-
Industrial	Forklift, Bobcat/Skid Steer	$5.00 **	$5.00 or $15.00 * / **	$4.00 or $40.00 */**	$4.00 or $14.00 *	$3.75 or $9.00 *	$11.10 to $55.51	$3.00	-	$4.00	-	-
	Logger / Skidder	$5.00	$35.00	$100.00	$57.00	$135.00	$44.41	$3.00	-	$11.25	-	-
	Skid Steer, Loader	$5.00	$35.00	$40.00	$14.00	$9.00	$27.76	$3.00	-	$11.25	-	-
	Aviation	$5.00	-	-	-	-	-	-	-	-	-	-
Off the Road	Small OTR	$5.00	-	$40.00	$57.00	$60.00	$27.76	$3.00	-	$11.25	-	-
	Medium OTR	-	-	$100.00	$140.00	$135.00	$172.10	-	-	$11.25	-	-
	Large OTR	-	-	$200.00	$140.00	$135.00	$516.29	-	-	$11.25	-	-
	Giant OTR	-	-	-	-	$135.00	$1,237.98	-	-	$11.25	-	-

*The TRF varies by sub-category type

**Only selected sub-category types are included in this Province's program.

[12] Provided by CATRA 25th September, 2017 and is the current information on the CATRA website

4. Benchmarking Alberta Recycling's Electronics Program Against Other Provincial Electronics Programs

This section presents KPI data collected along with interprovincial average values for electronics stewardship programs across Canada for each year from 2011 to 2016. Values for Alberta are adjusted to account for the fact that the Alberta program collects a smaller list of electronic products than other provincial programs.

Alberta's electronics program is benchmarked against other Canadian programs by ranking the KPI values against other provincial programs and comparing performance to the interprovincial average for each year from 2011 to 2016.

4.1 Electronics Program Background

As shown in Figure 8, Alberta was the first province in Canada, and in fact North America, to implement an electronic stewardship program in 2004, followed by California in January 2005. Since that time, all provinces have implemented similar programs aimed at increasing the collection and recycling of Waste Electrical and Electronic Equipment (WEEE). New Brunswick's program only began in March 2017, and so information on costs and performance is unavailable at this time. In the US, 25 states now have some type of electronics program, targeting different lists of materials.

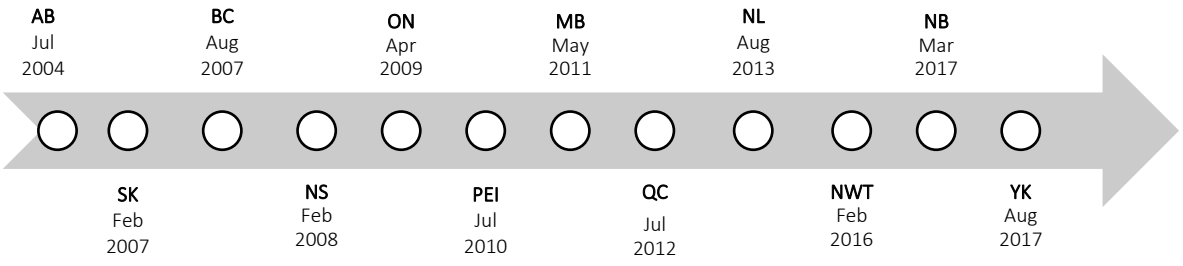

Figure 8: Electronics Programs Across Canada - Start-up Timeline

The list of designated electronics varies by province, and is presented in Appendix G. Most of the electronics stewardship programs in Canada are run by one organization, the Electronic Products Recycling Association (EPRA)[13]. The exceptions are Alberta, Yukon and the Northwest Territories. As part of its mandate to harmonize programs, EPRA uses a suite of core KPIs to report on provincial program performance each year. This makes it easy to compare programs on a province-by-province basis, since the format of each annual report is the same, except for Ontario where the format is slightly different because of regulatory requirements.

When comparing performance across provinces, the fact that the programs started at different times should be taken into account. Normally, as recycling programs mature, they collect more materials as the number of collection sites increases and as more people become aware of the program. However, there are a number of complicating

[13] www.epra.ca

factors with electronics programs, such as light-weighting of products, the rapidly changing electronics mix, and phasing out of heavier products such as CRT televisions and monitors which impacts on collection tonnages.

4.2 Electronics Recovery Rates (kg/cap) Across Canada

Table 7 provides a summary of the weight of electronics recovered per capita in each provincial program from 2011-2016. Alberta Recycling recovered a total of 13,465 tonnes in 2016. It is clear from the table that the tonnage of electronics recovered in most provincial programs has been on a decline. Part of this decline can be explained by the recent trends toward producing multi-function electrical and electronic equipment as well as toward light-weighting products and miniaturization.

Table 7: Electronics Programs Across Canada – Interprovincial Comparison of Amount Recovered (2011-2016) (kg/cap)

	2011	2012	2013	2014	2015	2016	2016 tonnes
AB Actual Electronics Recovered	4.4	4.7	4.8	4.7	4.1	3.3	13,465
AB Adjusted (+14%)	5.0	5.4	5.5	5.4	4.7	3.8	15,350
BC	4.7	4.8	5.0	4.9	4.6	4.2	19,581
SK	3.2	2.9	3.0	2.8	2.4	2.3	2,529
MB[14]	No program	See note	2.4	2.6	2.7	2.7	3,430
ON	4.0	5.6	5.7	5.3	4.8	4.5	60,139
QC[15]	No program	See note	1.3	2.0	2.5	2.6	21,525
NS[16]	4.7	5.0	5.0	5.0	4.7	4.5	4,174
PEI	3.9	4.1	4.4	4.5	4.2	4.7	670
NL[17]	No program	No program	See note	1.6	2.0	1.9	969
Interprovincial Average for Electronics Recovered	4.3	5.1	4.2	4.1	4.0	3.6	
Alberta Recycling vs. Interprovincial Average (adjusted value) for Electronics Recovered	16%	6%	31%	32%	18%	6%	
Alberta Recycling Rank for Electronics Recovered (kg/cap) (Actual):	3	4	4	4	5	4	
Alberta Recycling Rank for Electronics Recovered (kg/cap) (Adjusted) +14%:	**1**	**2**	**2**	**1**	**2**	**4**	

For the electronics program benchmarking exercise, the base Alberta kg/cap recovery values for electronics were adjusted to account for the fact that the Alberta program collects a smaller number of electronic products than other provinces, and that if Alberta accepted the same list of electronics products, their electronics kg/cap recovered value

[14] Manitoba – Program launched in August 2012. Data only available from August to December 2012.

[15] Quebec – EPRA Quebec began operations on July 2012. Annual report for that year provides no data on program performance.

[16] Nova Scotia – Data for 2011 is for fiscal year ended June 30, 2011. All other data is reported for calendar years. Also, because the annual report only provides a *combined kg/cap rate* for PEI & NS for this year, we used Statistics Canada population data to calculate the per capita rate for NS alone.

[17] Newfoundland and Labrador – Program launched on August 1, 2013. No data on program performance is provided in the annual report.

would be higher. An adjustment factor of 14%[18] was used, based on the analysis presented in Appendix A. When the adjustment factor of +14% is applied (shown in red), to account for the smaller number of obligated products in Alberta and be able to compare programs across Canada on an "apples to apples" basis, the adjusted 2016 tonnage increases to 15,350 tonnes.

Comparing or benchmarking Alberta Recycling electronics program performance to other provincial programs, and to the interprovincial average:

- **Alberta Electronics Program Recovery Performance (kg/cap)**: Alberta Recycling recovered 3.3 kg/cap of designated electronics in 2016, down significantly from 4.1 kg/cap in 2015, and prior years above 4.5 kg/cap. The decline is primarily attributed to the lagged decline in lower recoveries due to lower sales during the economic downturn in 2014, as well as to the fact that a lot of the heavier electronics (e.g. CRT based televisions and monitors) have now been recycled. The adjusted recovery value (to account for the small number of products in the Alberta program relative to the other provincial programs) is 3.8 kg/cap.
- **Comparison of Alberta Electronics Program Recovery Performance to Interprovincial Average**: The Alberta adjusted recovery rate of 3.8 kg/cap is higher than the interprovincial average of 3.6 kg/cap in 2016, and consistently higher for the years 2011 to 2015. The unadjusted recovery rate of 3.3 kg/cap is lower in 2016, but higher than all other years except 2012. Based in the adjusted kg/cap values, Alberta has recovered anywhere from 6% to 32% more than the interprovincial average kg/cap value.
- **Provincial Ranking of Alberta Electronics Program Recovery Performance**: Based on the adjusted value to account for the smaller list of designated electronics in the Province, Alberta ranks first or second in all years except 2016 where it declines to fourth. Unadjusted, Alberta ranked fourth compared to other provinces in most years except in 2015 when it ranked fifth.

Alberta Recycling's performance for the electronics program is shown along with the interprovincial average in Figure 9.

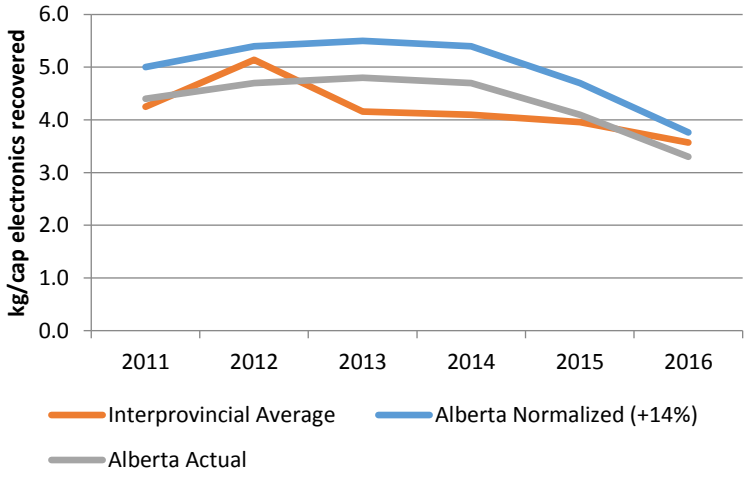

Figure 9: Alberta Recycling Electronics Program Recovery Performance (2011-2016) (kg/cap)

The figure shows the dramatic drop in the amount of electronics recovered since 2013. This trend has been seen in US programs and also programs in the European Union (EU) and is related to a number of factors, including light-

[18] The 14% adjustment value is considered a conservatively low assumption to account for what would likely be collected in an electronics program with a longer list of designated products. Input from industry and municipal representatives (Electronics Industry Council, February 1, 2017) indicated that the actual estimate for additional electronics was more on the order of 30% of returned tonnage categories that are designated in other provinces. However, the adjustment value of 14% was applied as a conservatively low value to ensure that Alberta Recycling not be seen to over-estimate the adjustment of the electronics values for the benchmarking exercise.

weighting of electronic products and the gradual reduction in collection of heavier televisions and monitors as noted above. Information on the trend is presented in Appendix G.

4.3 Electronics Program Costs ($/kg) Across Canada

Table 8 presents information on the total costs to operate electronics stewardship programs across Canada each year from 2011 to 2016 on a $/kg basis and by rank.

Table 8: Electronics Programs Across Canada – Interprovincial Comparison of Program Costs (2011-2016) ($/kg)

	2011	2012	2013	2014	2015	2016
AB	$1.12	$1.12	$1.06	$1.03	$1.02	$1.03
BC	$1.28	$1.21	$1.06	$1.00	$1.03	$1.02
SK[a]	$1.76	$1.82	$1.35	$1.45	$1.38	$1.35
MB[b]	No program	See note	$0.80	$1.15	$1.10	$1.10
ON	$1.51	$1.10	$0.99	$0.99	$1.02	$1.01
QC[c]	No program	See note	$0.71	$1.19	$1.10	$1.05
NS[d]	$1.38	$1.32	$1.21	$1.14	$1.05	$1.05
PEI[d]	$1.72	$1.50	$1.11	$0.98	$1.09	$1.02
NL[e]	No program	No program	See note	$2.35	$2.03	$2.09
Interprovincial Average for Electronics Program Costs	$1.40	$1.15	$1.00	$1.05	$1.05	$1.04
Alberta Recycling vs. Interprovincial Average for Electronics Program Costs	-20%	-3%	6%	-2%	-3%	-1%
Alberta Recycling Rank for Electronics Program Costs ($/kg)	**1**	**2**	**4** (tie BC)	**4**	**1** (tie ON)	**3**

[a]SK – For 2012, data is for the year ended March 31, 2013. Reporting switched to calendar years in 2013 (when EPRA took over the program).
[b]MB – Program launched August 2012. Annual report provides no data on program performance other than to say that in the first 5 months the program recovered over 830 tonnes of WEEE. Therefore, the costs are only divided by 5 months worth of WEEE collection as opposed to 12 months, leading to high costs of $3.09/kg in 2012. This value is not shown in the table because it is misleading.
[c]QC – EPRA Quebec began operations in July 2012. 2012 annual report provides information on total program costs ($8,279,829) but does not provide data on program performance so it is not possible to determine a $/kg figure for 2012.
[d]NS & PEI – 2011 and 2012 annual reports for PEI and Nova Scotia only show combined program costs (does not break down by province). In order to calculate province-specific costs we used pro-rating based on population.
[e]NL– Program launched on August 1, 2013. No data on program performance or costs provided in annual report.

Comparing Alberta Recycling electronics program cost performance to other provincial programs, and to the interprovincial average:

- **Alberta Electronics Program Cost ($/kg)**: Alberta's cost to recover electronics has been consistent at $1.03/kg for the last three years, after decreasing from $1.12/kg in 2011.
- **Comparison of Alberta Electronics Program Cost to Interprovincial Average**: With the exception of 2013, Alberta Recycling's cost has been slightly lower than the interprovincial average for each year from 2011 to 2016. Interprovincial costs have been quite volatile especially prior to 2014. Alberta Recycling electronics program costs were 20% less than the interprovincial average in 2011, but have been very similar to the interprovincial average for all years since then, except 2013. Costs were 6% higher than the interprovincial average in 2013, but have been slightly below the interprovincial average, at 1% to 3% below the interprovincial average in 2012, 2014, 2015 and 2016. Program costs per kg are generally higher in provinces with smaller populations (SK, PEI), and can be explained by lack of economies of scale in these markets.

- **Provincial Ranking of Alberta Electronics Program Cost**: With the volatility in interprovincial costs, Alberta's ranking for cost has varied, even if costs have been relatively stable and declining. In 2016, Alberta ranked third, down from first in 2015, and up from fourth in 2014 and 2013.

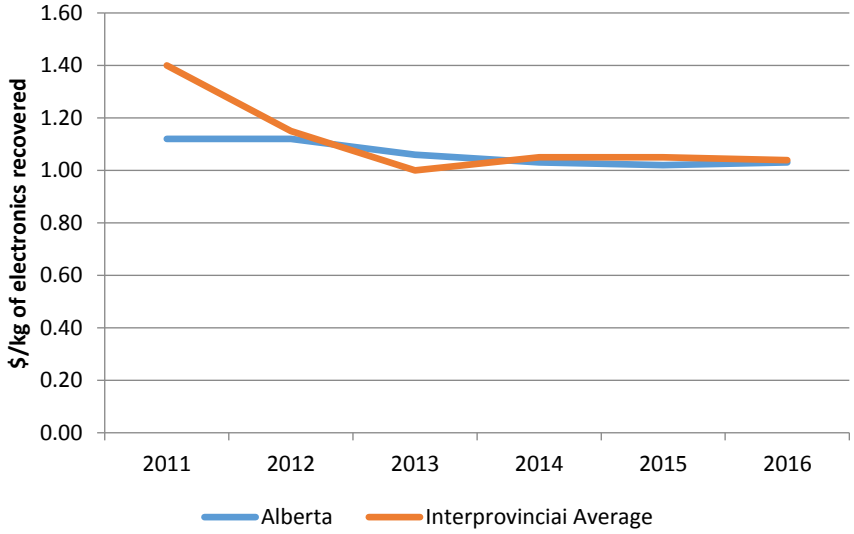

Figure 10: Alberta Recycling Electronics Program Cost (2011-2016) ($/kg)

4.4 Electronics Fees Across Canada

Table 9 presents a summary of the environmental handling fees (EHFs) charged on electronic products in each program across Canada[19]. Since EHFs are meant to reflect the actual cost of recycling a particular product, they are not uniform across product categories and will vary depending on a number of factors such as the total product weight per category. EHFs can also vary depending on the actual and forecasted amount of product in the market (i.e. product sales and forecasts).

Fees are highest in the Northwest Territories, followed by Nova Scotia and PEI. For most product categories, Quebec's fees are the lowest. Alberta's fees fall somewhere in the middle.

19 http://epra.ca/wp-content/uploads/2017/10/2017-National-list-EN-Oct-EHF-table-v3-1.pdf.

Table 9: Environmental Handling Fees for Electronic Products Across Canada (2017)

Product Category	BC	AB	SK	MB	ON	QC	NS/PEI	NL	NWT	NB
Desktop Computers	$2.25	$4.40	$1.40	$1.40	$1.40	$1.10	$4.50	$3.50	$10.50	$5.50
Large Battery-Powered Ride-On Toys	$2.25	-	-	-	-	-	-	-	-	-
Portable Computers	$1.00	$1.20	$1.00	$1.00	$1.00	$0.90	$2.50	$2.50	$3.00	$4.50
Small Battery-Powered Ride-On Toys	$1.00	-	-	-	-	-	-	-	-	-
Display Devices ≤ 29" All-in-one (AIO) computers	$9.00	$4.00	$7.00	$7.00	$7.00	$5.50	$12.25	$12.25	$12.25	$16.00
Display Devices 30-45" All-in-one (AIO) computers	$19.00	>30": $10.00	$12.00	$12.00	$12.00	$9.00	$24.50	$24.50	$24.50	$31.00
Display Devices ≥ 46" All-in-one (AIO) computers	$35.00	>30": $10.00	$28.00	$28.00	$28.00	$24.00	$40.00	$39.50	$40.00	$46.00
Desktop Printers	$3.50	$4.80	$1.25	$1.25	$2.50	$1.25	$4.80	$4.80	$8.00	$5.50
Floor Standing Printers	$15.00	$4.80	-	$15.00	$25.00	-	-	-	$40.00	-
Computer Peripherals	$0.50	-	$0.20	$0.20	$0.75	$0.20	$0.75	$0.75	-	$0.75
Personal/Portable Audio/Video Playback and/or Recording Systems	$0.40	-	$0.25	$0.25	$0.75	$0.25	$0.75	$0.75	-	$1.50
Electronic Toys	$0.40	-	-	-	-	-	-	-	-	-
Home Audio/Video Playback and/or Recording Systems	$2.50	-	$1.10	$1.10	$2.50	$0.80	$2.75	$2.50	-	$2.75
Home Theatre in a Box	$2.50	-	$1.10	$1.10	$2.50	$0.80	$2.75	$2.50	-	$2.75
Vehicle Audio and Video Systems	$2.50	-	$1.10	$1.10	$2.50	$0.80	$2.75	$2.50	-	$2.75
Non-Cellular Telephones and Answering Machines	$0.45	-	$0.45	$0.45	$1.50	$0.45	$0.85	$0.85	-	$0.85
Cellular Devices and Pagers	-	-	-	-	$0.07	$0.07	-	-	-	$0.07
Countertop Microwave Ovens	-	-	-	<1.0 cu. ft.: $3.00 >1.0 cu. ft.: $3.00	-	-	-	-	-	-
IT and Telecom Equipment and Medical and Monitoring Equipment <2kg 2-10kg 10-50kg 50-200kg	 $0.40 $1.00 $2.25 $15.00									
Musical Instruments With a battery With a plug	 $0.40 $2.50									
Micro Toys Electronic	$0.05									

4.5 KPIs and Metrics to Reflect Changing Electronics Product and Material Mix

Another factor that is starting to impact all electronics programs is the trend of light-weighting. As shown in the figure below, taken from the Ontario Electronics Stewardship (OES) 2014 annual report, many of the electronic products collected in provincial stewardship programs experienced a reduction in unit weight of between 30% and

60% between 2009 and 2014. Computer monitors have experienced the greatest weight decreases of almost 60% in weight in the five year period 2009 to 2014, followed by televisions, where the weight reduction has varied from 42% to 55% depending on the screen size and model and cordless telephones which are now over 50% lighter.

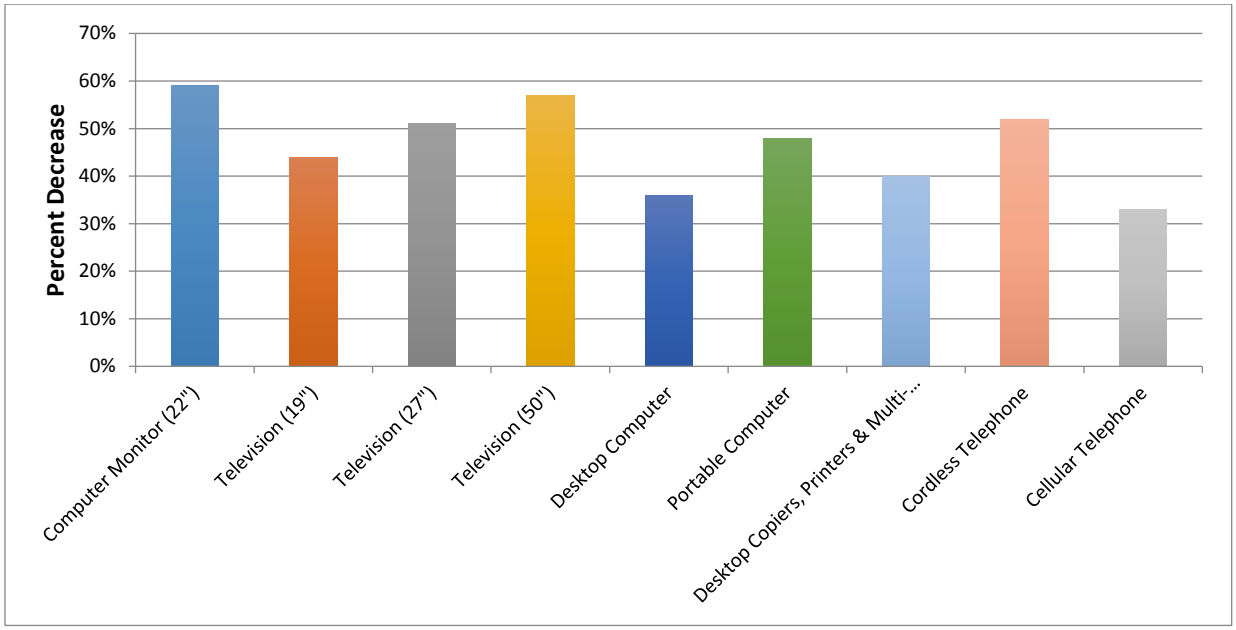

Figure 11: Industry-Wide Weight Reduction by Electronic Product Category (2009-2014)[20]

The 2017 Electronics Product Stewardship Canada (EPSC) Annual Report[21] also provides a number of examples of light-weighting of products. For instance, by 2017 some popular televisions weighed only one quarter of what an equivalent unit weighed in 2006. As an example, a 50" Samsung DLP TV weighed 30.3 kg in 2006 and in 2017 a 65" LG OLEF HDR Smart TV only weighed a reported 7.6kg per unit[22].

Similar statistics apply to other electronics recovered in stewardship and EPR programs.

This light-weighting trend has been underway for a number of years, and is now being felt in less tonnage coming back to electronics stewardship and EPR programs. This will be an increasing factor in electronics program design and management because the annual tonnages of electronics recovered will continue to decline. Also, many older, heavier products such as CRT televisions and monitors have been recovered and are seen less frequently in electronics returned.

With more light-weighting and electronic product integration, as well as the introduction of an increasing number of smaller and lighter electronic products into the market, the constantly changing electronics landscape suggests that weight-based metrics are not sufficient to accurately measure program success, and that new metrics—such as units or cost per unit—are needed. Considerable research is underway at this time to identify other metrics for programs where the product mix is changing, particularly electronics. Information on light-weighting of electronics is presented in Appendix H.

20 Ontario Electronic Stewardship, Annual Report, 2014

[21] Electronics Products Stewardship Canada. 2017 Design for Environment Report. <http://epsc.ca/wp-content/uploads/EPSC-2017-Design-for-Environment-Report_FINAL-EN.pdf>

[22] The EPRA 2017 Annual Report notes that in 2009 a Samsung 46" LED TV weighted approximately 18kg, and In 2012 a Panasonic Smart Viera 47" television weighed a reported 13 kg.

5. Benchmarking Alberta Recycling's Paint Program Against Other Provincial Paint Programs

This section presents KPI data collected along with interprovincial average values for paint stewardship programs across Canada for each year from 2011 to 2016.

Alberta's paint program is benchmarked against other Canadian paint programs by ranking the KPI values against other provincial programs and comparing performance to the interprovincial average for each year from 2011 to 2016.

5.1 Paint Program Background

As shown in Figure 12, British Columbia was the first province in Canada to implement a stewardship program for paint in 1994. Since then, nearly all provinces have followed suit, with PEI being the latest to launch a program in 2012.

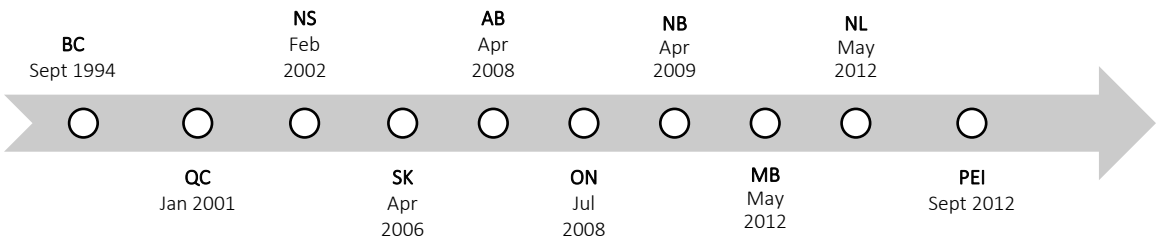

Figure 12: Paint Programs Across Canada - Start-up Timeline

With the exception of Alberta and Quebec, Product Care Association (PCA), a federally incorporated, not-for-profit, product stewardship organization, runs all provincial paint programs. The Quebec program is run by Éco-Peinture (Société québécoise de gestion écologique de la peinture).

Some programs (i.e., New Brunswick, Newfoundland, Nova Scotia, and PEI) are for paint only, while others collect paint along with other materials like pesticides, fluorescent lights, gasoline, and flammables (i.e., British Columbia and Manitoba). The format of the annual reports for these programs varies, but in all cases there is less detail related to the paint program specifically than is provided by Alberta Recycling. In almost all cases, the paint metrics that must be reported on are outlined in stewardship plans or regulations.

Paint is a consumable product, and in this regard it is different from electronics or tires, where a product needs managing at end of life. In an ideal world, all paint would be consumed, and none would need to be recovered. Even though kg/cap recovered is the performance metric used for reporting by most paint programs, the ultimate goal is to reduce this value over time and also to ensure that any residual paint is properly managed to protect the environment.

5.2 Paint Recovery Rates (kg/cap) Across Canada

Table 10 presents data on the amount of paint[23] recovered in each provincial program from 2011-2016 on a per capita basis. It also ranks Alberta Recycling's performance relative to other provinces.

The table shows the wide variation in recovery of paint across the provinces with Quebec recovering high rates of 0.77 to 0.83kg/cap over the last six years, and Manitoba reporting the lowest recovery rate at around 0.3kg/cap. It is important to note that Quebec's collection data includes the weight of containers, so it cannot be compared directly with other programs. When Quebec data is removed from the analysis, BC has the highest rates for all years. In some cases, the provincial program had not launched in the reporting year, or data were reported for only part of the year.

Table 10: Paint Programs Across Canada – Interprovincial Comparison of Amount Recovered (2011-2016) (kg/cap)[24]

	2011	2012	2013	2014	2015	2016	2016 (litres)
AB	0.73	0.70	0.76	0.76	0.77	0.65	2,670,000[25]
BC	0.78	0.77	0.76	0.77	0.83	0.86	3,396,025
SK	0.41	0.41	0.38	0.42	0.45	0.45	432,764
MB[a]	No program	0.15 (for 7 months)	0.26	0.30	0.31	0.38	413,233
ON[26]	0.53	0.61	0.56	0.54	0.72	0.69	8,035,833
QC[b]	0.81	0.77	0.77	0.78	0.82	0.83	5,747,403
NB	0.41	0.46	0.38	0.39	0.43	0.47	297,811
NS	0.68	n/a	0.57	0.49	0.61	0.60	472,017
PEI[c]	No program	0.14 (partial year only)	0.52	0.51	0.64	0.78	96,118
NL[d]	No program	0.19 (partial year only)	0.37	0.30	0.37	0.39	173,109
Interprovincial Average for Paint Recovered	0.65	0.64	0.63	0.63	0.72	0.71	
Alberta Recycling vs. Interprovincial Average for Paint Recovered	12%	9%	21%	21%	7%	-8%	
Alberta Recycling Rank for Paint Recovered (kg/cap)	**3**	**2**	**2** (tied BC)	**3**	**3**	**5**	

*Notes:
a: MB – Program launched on May 1, 2012. Data is for reporting period May 1 to December 31 only.
b: QC - Collection data includes paint residues *and* containers. It also excludes aerosols.
c: PEI – Program launched on September 1, 2012. Data is for reporting period September 1 to December 31 only.
d: NL – Data for 2012 covers reporting period from program launch date (April 18, 2012) to December 31, 2012 only.

Figure 13 shows Alberta Recycling's paint program performance compared to the interprovincial average for 2011 to 2016.

[23] The Quebec program reported values include paint containers recovered
[24] A conversion factor of 1L = 1.2kg[24] was used to convert reported litres of paint to tonnes (Conversion value provided by Alberta Recycling).
25 Taken directly from Alberta Recycling's annual report. It is the first year that kg collected in addition to litres are reported.
[26] Ontario reported in tonnes (which was multiplied by 1,000 to get kg).

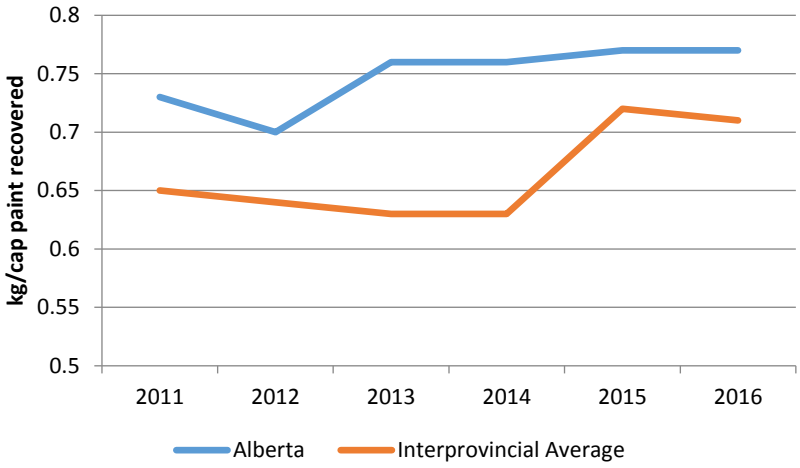

Figure 13: Alberta Recycling Paint Program Recovery Compared to Interprovincial Average (2011-2016) (kg/cap)

Comparing Alberta Recycling's paint program performance to other provincial programs, and to the interprovincial average:

- **Alberta Paint Program Recovery Performance (kg/cap)**: Alberta recovered 0.65 kg/cap of paint in 2016, a significant decrease from previous years when recovery levels were around 0.77 kg/cap. The decline is primarily attributed to the lagged decrease in paint available for recovery, due to lower sales during the economic downturn in 2014. This is based on a total recovery of 2.2 million litres of paint, or an estimated 2.7 million kg (conversion rate of 1.2kg/litre). Alberta is the only province where kg/cap figures were presented in the annual report. For all other provinces the per capita figures are calculated using Statistics Canada population data for the respective years (see Appendix F).
- **Comparison of Alberta Paint Program Recovery Performance to Interprovincial Average:** The table and figure show that Alberta Recycling's paint program has consistently recovered more paint per capita than the interprovincial average for the past 6 years. The year 2016 was an exception, when Alberta's recovery rate (0.65 kg/cap) was lower than the interprovincial average of 0.71 kg/cap. From 2011 to 2014, Alberta Recycling's paint program recovered 12% to 21% more than the interprovincial average, and in the last two years it recovered 7% more and then 6% less than the interprovincial average. Some of this difference is explained by the fact that Quebec includes paint containers in the reported weight recovered, whereas Alberta Recycling and other provinces report product weight separately from container weight.
- **Provincial Ranking of Alberta Paint Program Recovery Performance**: From 2011 to 2015, Alberta ranked second or third relative to other provincial paint programs. In 2016, its rank declined to fifth.

5.3 Paint Program Costs ($/kg) Across Canada

Table 11 presents information on the costs to recover paint and paint containers by stewardship programs across Canada. Figure 14 shows Alberta Recycling data compared to the interprovincial average from 2011 to 2016.

Comparing Alberta Recycling paint program cost performance to other provincial programs, and to the interprovincial average:

- **Alberta Recycling Paint Program Cost Performance ($/kg):** Alberta's cost to recover discarded paint and paint containers was $1.59/kg in 2016, up somewhat from 2015 and prior years. The increase is attributed to lower levels of paint recovery against fixed costs.

- **Comparison of Alberta Recycling Paint Program Cost Performance to Interprovincial Average**: Alberta's cost per kg has been consistently and substantially lower than the interprovincial average for all years reviewed. Alberta Recycling's costs were 37% lower than the interprovincial average in 2011 and 2012; 18% to 17% lower in 2013, 2014 and 2016; and 10% lower in 2015.
- **Provincial Ranking of Alberta Recycling Paint Program Cost**: From 2011-2016, Alberta Recycling has consistently ranked first for the lowest cost paint program on a $/kg basis.

Table 11: Paint Programs Across Canada – Interprovincial Comparison of Program Costs (2011-2016) ($/kg) [27]

	2011	2012	2013	2014	2015	2016
AB	$1.50	$1.56	$1.57	$1.54	$1.52	$1.59
BC[a]	n/a	n/a	n/a	n/a	n/a	n/a
SK	$2.05	$1.86	$2.24	$2.40	$2.17	$1.99
MB[b]	n/a	n/a	n/a	n/a	n/a	n/a
ON[c]	$2.86	$2.79	$1.98	$1.84	$1.59	n/a
QC[d]	n/a	n/a	n/a	n/a	n/a	n/a
NB	$0.41 partial year only	n/a	$2.73	$2.84	$2.98	$2.81
NS[e]	$1.98	n/a	n/a	$2.50	$2.13	$2.16
PEI	No program	0.14 (partial year only)	n/a	$3.30	$3.06	$2.73
NL	No program	0.19 (partial year only)	$2.80	$4.24	$3.69	$3.37
Interprovincial Average for Paint Program Cost	$2.38[28]	$2.47	$1.92	$1.88	$1.69	$1.92
Alberta Recycling vs. Interprovincial Average for Paint Program Cost	-37%	-37%	-18%	-18%	-10%	-17%
AB Rank for Paint Program Cost ($/kg)	**1[29]**	**1**	**1**	**1**	**1**	**1**

Notes:
[a]BC: Annual reports do not break out costs by material type and only gives total program expenses, which include costs to collect products other than paint, for example, pesticides and fluorescent lights.
[b]MB: Annual reports do not break out costs by material type and only gives total program expenses, which include costs to collect products other than paint, for example, pesticides and fluorescent lights.
[c]ON: 2016 annual report does not break out costs by material type and only gives total program expenses, which include costs to collect products other than paint, for example, pesticides and solvents.
[d]QC: There is no annual report for Quebec's program and no information on program costs on Eco-Peinture's website.
[e]NS: Costs for 2011 are for fiscal year ended March 31, 2012. All other program years where cost data is available are for calendar years.

[27] A conversion factor of 1L = 1.2kg[27] was used to convert reported litres of paint to tonnes (Conversion value provided by Alberta Recycling).
[28] New Brunswick cost data for 2011 are not included in the calculation as the program only ran for part of the year
[29] RRFB's 2011 annual report states that "Data for the calendar year 2011 are provided by Product Care Association as required under the Designated Materials Regulation of the Clean Environment Act". Product Care Association does not have an annual report for New Brunswick for 2011 available online. Cost & revenue data are taken from 2011 RRFB Annual Report (Schedule 1 - Paint Program). It only includes a partial year, therefore the reported costs are much lower for 2011 ($127,884) than for 2013 ($774,775).

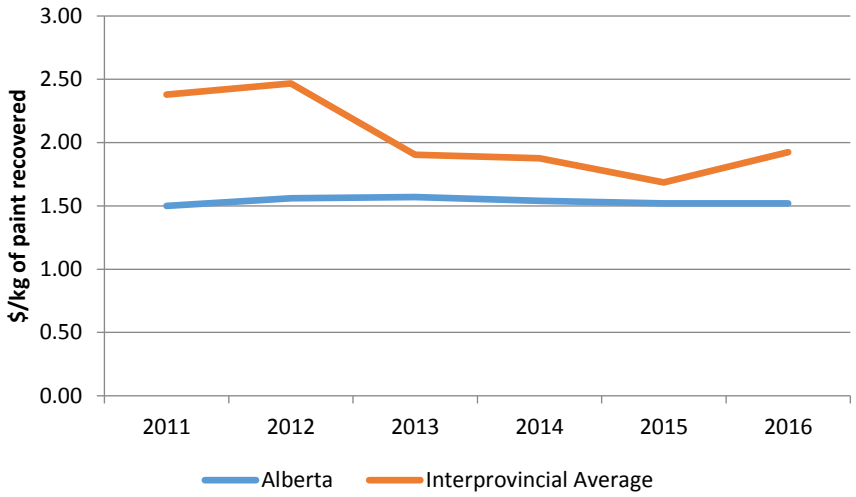

Figure 14: Alberta Recycling Paint Program Cost Compared to Interprovincial Average (2011-2016) ($/kg)

5.4 Paint Fees Across Canada

Table 12 presents the environmental handling fees (EHFs) charged on different paint products across Canada. As shown in the table, paint fees vary considerably from province to province and are highest in PEI.

The fees charged by Alberta Recycling are among the lowest for most smaller container categories. The Alberta fee of $0.10 for aerosols and small cans (100 to 250ml) is the lowest of all fees charged across Canada for this container size. Some of the paint fees in Saskatchewan were similar to Alberta's in 2016, but in October 2017 Saskatchewan's fees were raised, making Alberta paint fees the lowest.

Table 12: Paint Fees Across Canada (2017)

Province	AB	BC	SK	MB	ON	QC	NB	NS	NL	PEI
Aerosols	$0.10	$0.35	$0.25	$0.25	$0.25	$0.25	$0.20	$0.25	$0.20	$0.45
100ml-250ml	$0.10	$0.35	$0.20	$0.20	$0.20	$0.25	$0.20	$0.25	$0.20	$0.45
251ml-1 L	$0.25	$0.65	$0.35	$0.25	$0.35	$0.25	$0.35	$0.45	$0.35	$0.75
1.01L-5 L	$0.75	$1.00	$0.75	$0.60	$0.85	$0.55	$0.70	$0.95	$0.70	$1.75
5.01L-23 L	$2.00	$2.25	$1.95	$1.50	$2.15	$1.50	$1.50	$1.90	$1.50	$3.15
Fee Effective	Aug-09	Oct-17	Oct-17	May-12	Sep-16	Jan-01	Apr-09	Oct-14	Feb-14	Apr-15
Startup Date	Apr-08	1994	Apr-06	May-12	Jul-10	1998	Apr-08	Apr-02	May-12	Sep-12
Source: Product Care and Provincial Program websites.										

The $0.25 fee Alberta charges for containers in the 251ml -1L category is the same as the fee charged by Manitoba and Quebec, and is less than fees charged in other programs. Manitoba, Quebec, New Brunswick and Newfoundland charge less than Alberta for paint sold in the 1-5 litre category, while Saskatchewan charges the same amount. Alberta charges $0.75 for containers in the 1-5 litre category, while Manitoba charges $0.60 and Quebec charges $0.55. It is worth noting that PEI charges $1.75 for containers in the 1-5 litre category.

6. Public Awareness and Support for Programs

Awareness of and support for Alberta Recycling programs is measured through public opinion polling. Eight hundred (800) residents are polled annually: one third in each of Calgary, Edmonton and rural areas. Since the polling has been carried out since 2007 (for electronics and tires) and 2008 (for paint), changes in awareness can be tracked over time. It is important to note that results for 2017 are somewhat different as the rating scale was changed.

Table 13 presents detailed awareness and support information for the tires, electronics, and paint programs and fees for 2012 to 2017. The information is presented in graphic format in Figures 15, 16 and 17.

The table shows that support for all three programs is very high, ranging from 86% to 90% for the tire program, 86% to 91% for the electronics program, and from 84% to 90% for the paint program. Awareness of all three programs is somewhat lower.

Table 13 also shows results of public opinion polling on awareness of and support for the fees related to the tires, electronics, and paint programs. Support for fees is somewhat lower than support for the programs and was highest in 2013 when the economy was very strong.

Table 13: Public Awareness and Support of Alberta Recycling's Tires, Electronics, and Paint Programs and Fees/Surcharges (2012-2017)

	Tires Program		Tire Fees and Surcharges		Electronics Program		Electronics Fees and Surcharges		Paint Program		Paint Fees and Surcharges	
Year	Awareness	Support	Awareness	Support	Awareness	Support	Awareness	Support	Awareness	Support	Awareness	Support
2012-13	68%	89%	75%	73%	80%	91%	68%	75%	51%	90%	42%	66%
2013-14	69%	86%	71%	61%	72%	91%	62%	55%	68%	86%	41%	59%
2014-15	62%	90%	66%	60%	70%	91%	60%	55%	68%	89%	46%	59%
2015-16	72%	86%	70%	64%	70%	89%	55%	53%	71%	86%	46%	61%
2016-17	61%	87%	64%	61%	66%	86%	53%	51%	64%	84%	42%	53%

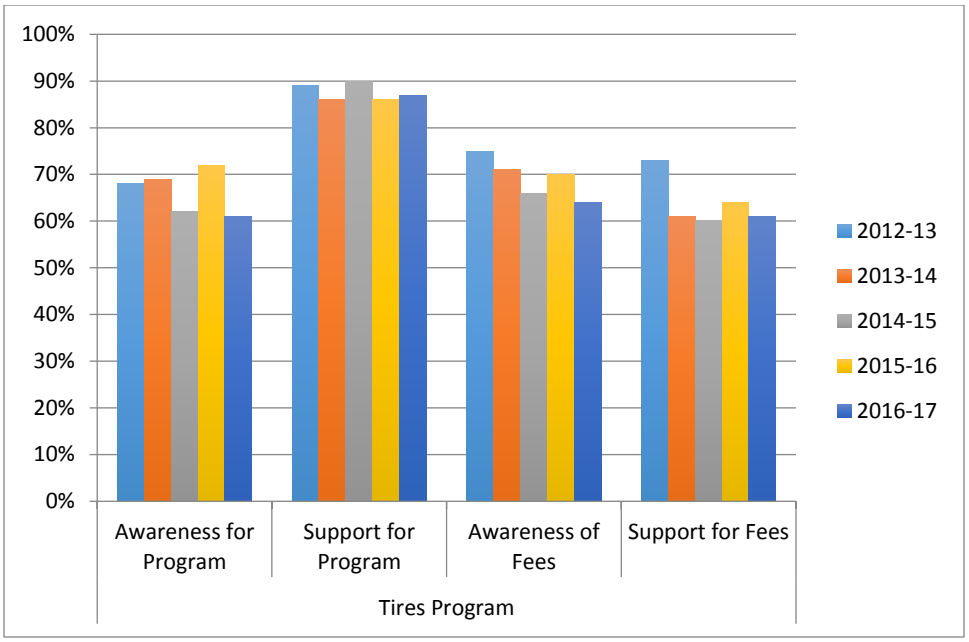

Figure 15: Public Awareness and Support for Alberta Recycling Tires Program and Fees (2012-2017)

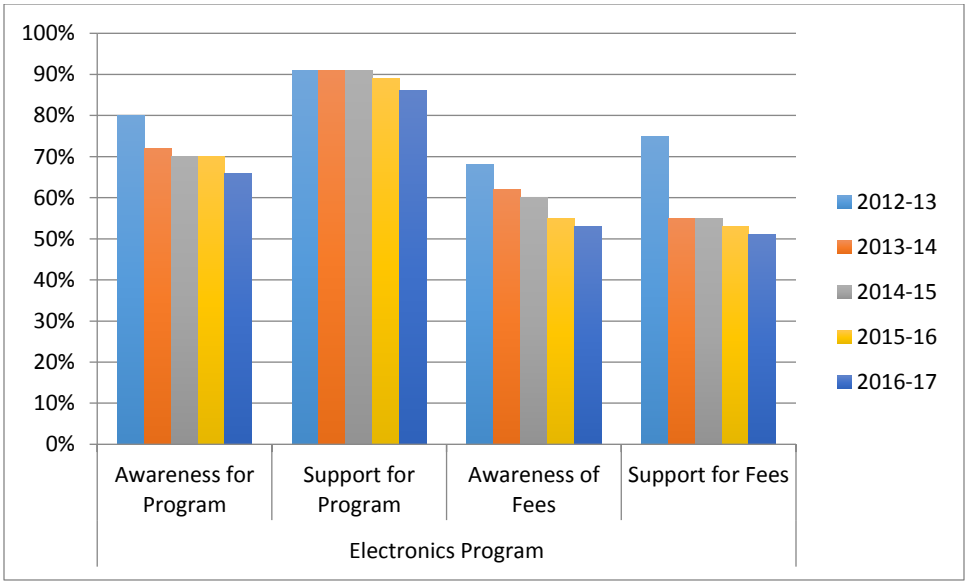

Figure 16: Public Awareness and Support for Alberta Recycling Electronics Program and Fees (2012-2017)

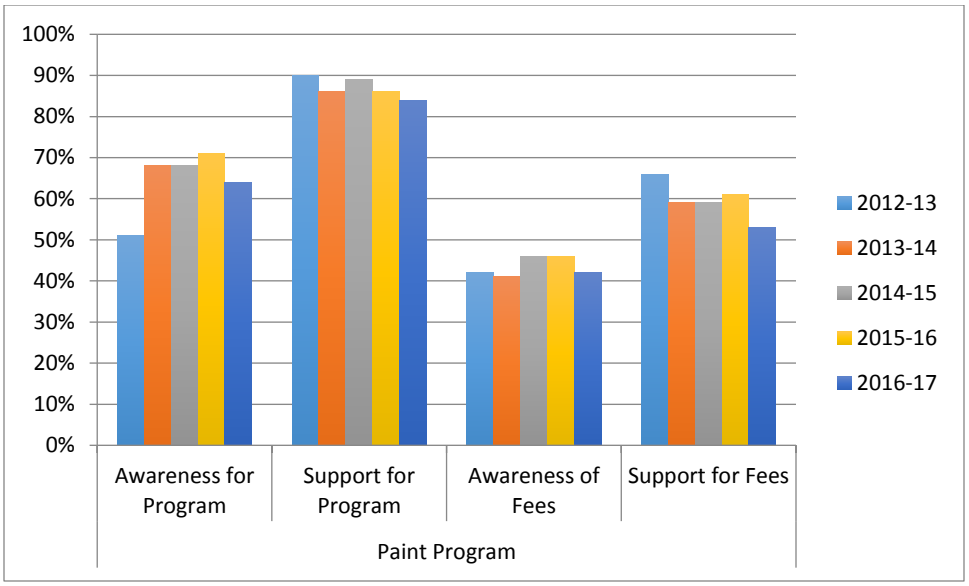

Figure 17: Public Awareness and Support for Alberta Recycling Paint Program and Fees (2012-2017)

EPRA also measures awareness of its electronics recycling programs in all provinces. Reported EPRA data for all provinces is presented in Table 14 below, along with Alberta Recycling data on electronics program awareness for the years from 2011 to 2016.

Table 14: Awareness of Electronics Programs by Province (2011-2016)

	2011	2012	2013	2014	2015	2016
BC	73%	75%	72%	80%	76%	75%
SK	88%	79%	86%	89%	82%	84%
MB	No program	N/A	55%	55%	68%	69%
ON	65%	67%	64%	68%	62%	65%
QC	No program	N/A	52%	81%	80%	79%
NS	80%	79%	81%	91%	83%	87%
PEI	79%	69%	81%	80%	86%	84%
NL	No program	No program	70%	72%	72%	74%
AB	88%	89%	91%	91%	91%	86%

It is not possible to draw any direct conclusions from the information as the methodologies used by EPRA and Alberta Recycling may be different. If different poll sizes or approaches, or even different companies or questions are involved, then the information is not directly comparable. No interprovincial average was calculated for the awareness data.

7. Proximity or Accessibility Analysis

Most EPR and stewardship programs across Canada report on the availability of recycling opportunities for their residents, usually expressed as the number of drop off depots and recycling events held each year. Some provinces (e.g. BC) require reporting by regional district. EPRA is the only EPR program that measures accessibility through an analysis carried out by EDM Planning Services Ltd. Alberta Recycling has used the services of EDM to carry out a proximity analysis for all of their programs for the last two years. Proximity is not reported as an Alberta program KPI.

Opportunities are provided to Alberta residents to recycle tires, electronics, and paint through a combination of:

- 450 collection sites
- 131 Tire Marshalling Area projects and
- 492 municipal community projects.

Figure 18 shows the location of these sites.

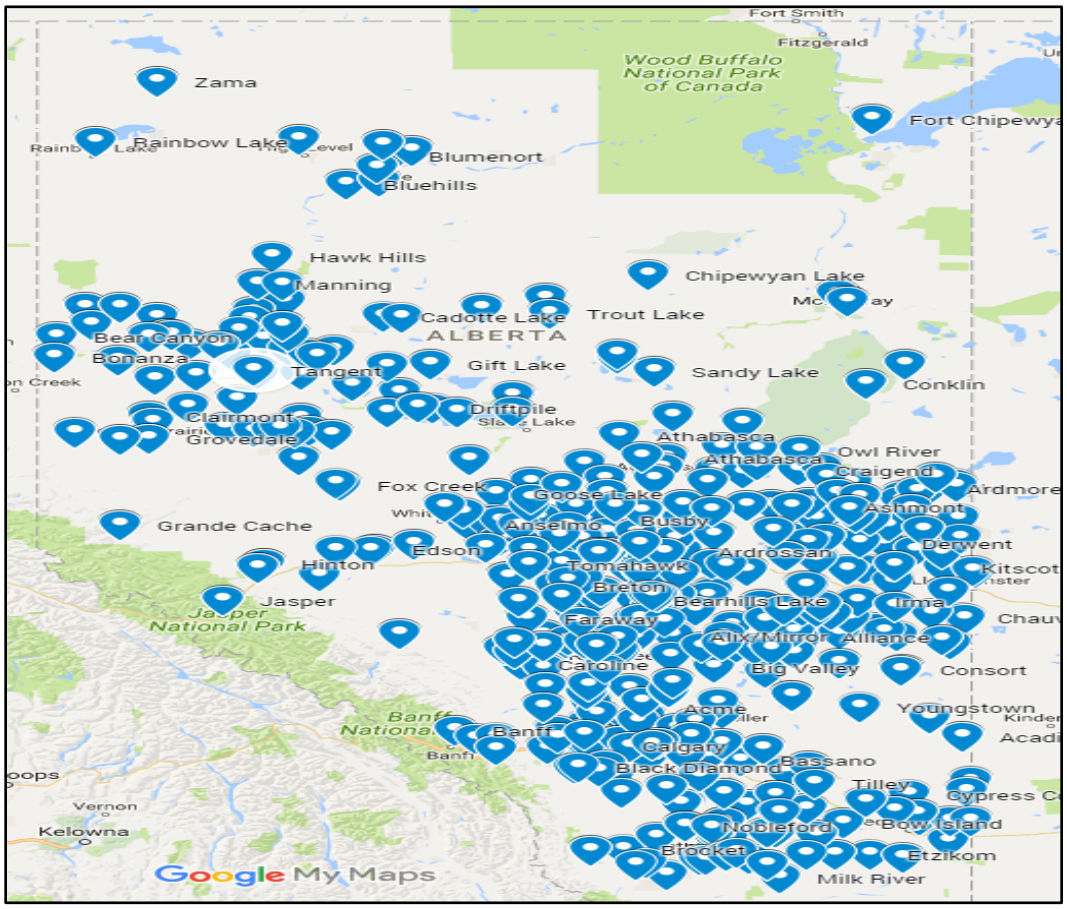

Figure 18: Alberta Recycling Drop Off Locations (2017)

Accessibility to the tires, electronics and paint programs is measured by a computer modelling program (also used by EPRA) which calculates travel distance to collection sites. Urban accessibility for Alberta is defined as having a recycling location within a 30 minute drive, and rural accessibility is defined as having access to a site which is within a 45 minute drive or 60km. The accessibility statistics for all three programs are presented in Table 15 which shows that over 99% of the provincial population have good access to electronics and paint programs. An analysis completed by EDM Planning Services Ltd (the company carries out the EPRA accessibility analysis also) in February 2018 using 2016 census data has determined that based on an accessibility standard of 15 minute urban and 20 minute rural drive times, 99.4% of Alberta residents have access to the paint and electronics programs and 99.3% have access to the tire program.

Table 15: Accessibility for Alberta Population to Tires, Electronics, and Paint Recycling Facilities – Measured by "Proximity" (Time + Distance) [30]

Program	Urban	Rural	Urban	Rural	Urban	Rural
	15 min	**20 min**	**20 min**	**30 min**	**30 min**	**45 min**
Electronics	94.0%	97.3%	97.0%	99.0%	99.3%	99.3%
Paint	93.6%	95.3%	96.9%	98.5%	99.3%	99.3%
Tires	81.0%	98.3%	94.8%	99.2%	99.1%	99.1%
Provincial Summary	96.4%	98.3%	99.0%	99.2%	99.3%	99.3%

[30] Alberta Recycling Analysis October, 2017

EPRA Accessibility Analysis

EPRA reports annually on access to their electronics recycling programs in the provinces where they deliver the electronics program. Data for the last few years are presented in Table 16. The definition of access varies by province depending on geography and population base. It is sometimes measured as drive time and in other cases as the distance from a drop off location (in km), and is different for urban and rural areas of each province. Alberta Recycling contracted with the developer of the EPRA accessibility model to construct an Alberta model and estimate accessibility for all three of Alberta Recycling's programs in 2016. Prior to that date, accessibility was not reported as a program KPI.

Table 16: Accessibility of Electronics Programs Across Canada by Province (2011-2016)

	2011	2012	2013	2014	2015	2016
AB	Not measured	Not measured	Not measured	Not measured	Not measured	99.4%
BC	97%	97%	98%	98%	98%	98%
SK	N/A	94%	94%	92%	92%	93%
MB	No program	N/A	90%	90%	90%	91%
ON	86%	85%	99.5%	99.6%	99.6%	99.7%
QC	No program	92%	98%	98%	99%	99%
NS	98%	97%	96%	98%	99%	99%
PEI	98%	99%	99%	99%	99%	100%
NL	No program	No program	N/A	95%	96%	96%

Notes:
BC: Access is measured as percentage of the BC population within 45 minutes (rural) or 30 minutes (urban) of an EPRA BC Drop Off location.
SK: Access is measured as percentage of the Saskatchewan population within 50kms (rural) or 30 minutes (urban) of an EPRA Sask Drop-off Centre.
MB: Access is measured as percentage of the Manitoba population within 50kms (rural) or 15 minutes (urban) of an EPRA Manitoba Drop Off location.
ON: Ontario Electronics Stewardship measures access as percentage of the Ontario population living within 10km, 25km, and 50km of a collection site. They measure accessibility for OES collection sites, generator collection sites, and also provide a figure for total accessibility. The figures shown in the table show % of the Ontario population living within 25km of total collection sites.
QC: With the exception of 2012, access is measured as percentage of Quebec population within 45 minutes (rural) or 30 minutes (urban) of an EPRA Quebec Drop Off point. For 2012, access is defined as "collection coverage" but the annual report does not specify what that means.
NS: With the exception of 2013, where access is measured as percentage of population within 30km of an EPRA collection depot, access in NS is defined as percentage of the population within 30 kms (rural) or 30 minutes (urban) of an EPRA NS Drop Off centre.
PEI: With the exception of 2013, where access is measured as percentage of population within 30km of an EPRA collection depot, access in PEI is defined as percentage of the population within 30 kms (rural) or 30 minutes (urban) of an EPRA PEI Drop Off centre.
NL: Access is measured as percentage of Newfoundland/Labrador population within 45 minutes (rural) or 30 minutes (urban) of an EPRA NL Drop Off centre.

8. Summary and Conclusions

The purpose of the benchmarking report was to compare the performance of Alberta Recycling's stewardship programs for tires, electronics, and paint to that of other programs across Canada and to the interprovincial average. To achieve this, two main KPIs were analyzed:

- recovery (expressed as kg/cap) and
- program costs (expressed as cost per kg recovered).

While the report includes some information on awareness and accessibility, these two metrics were not used for the benchmarking process. This section presents a summary of the benchmarking process.

8.1 Recovery Performance

Table 17 summarizes recovery performance for Alberta Recycling's tires, electronics, and paint programs for 2011 to 2016, and also shows an interprovincial average for all programs across Canada in those years. An interprovincial average was calculated by dividing the reported tonnes recycled by the populations served by the programs in all provinces including Alberta in that year. Alberta Recycling program performance was then expressed as a percentage of the interprovincial value. The table shows that Alberta Recycling recovered 31% to 67% more tires than the interprovincial average in the years 2011 to 2016. The rate at which tires reach end of life and are recycled is impacted by economic conditions in different provinces.

Table 17: Alberta Recycling Program Recovery Performance for Tires, Electronics, and Paint (2011-2016) (kg/cap)

	2011	2012	2013	2014	2015	2016
Alberta Recycling Tire Program Recovery Performance Compared to Interprovincial Average						
Alberta Recycling Tires Recovery (kg/cap)	16.3	16.2	18.7	17.2	17	14.8
Interprovincial Average Tire Program Recovery (kg/cap)	11.9	11.1	11.2	11.1	11.3	11.3
Alberta Recycling % above or below Interprovincial Average	37%	46%	67%	55%	50%	31%
Alberta Recycling Electronics Program Recovery Performance Compared to Interprovincial Average						
Alberta Recycling Electronics Recovery (kg/cap)	4.4	4.7	4.8	4.7	4.1	3.3
Alberta Recycling Adjusted Electronics Recovery (kg/cap)	5	5.4	5.5	5.4	4.7	3.8
Interprovincial Average Electronics Program Recovery (kg/cap)	4.3	5.1	4.2	4.1	4	3.6
Alberta Recycling % above or below Interprovincial Average (Adjusted)	16%	6%	31%	32%	18%	6%
Alberta Recycling Paint Program Recovery Performance Compared to Interprovincial Average						
Alberta Recycling Paint Recovery (kg/cap)	0.73	0.7	0.76	0.76	0.77	0.65
Interprovincial Average Paint Program Recovery (kg/cap)	0.65	0.64	0.63	0.63	0.72	0.71
Alberta Recycling % above or below Interprovincial Average	12%	9%	21%	21%	7%	-8%

The Alberta Recycling electronics program accepts a smaller list of designated electronics than any other program in Canada (with one exception – Alberta Recycling accepts more types of floor standing printers). The reported weights were adjusted by 14% to account for this fact. Based on the adjusted kg/cap values, Alberta recovered 6% to 32% more electronics than the interprovincial average. As with other electronics programs, the annual tonnage recovered in Alberta has been on the decline for the last few years. This is attributed to the fact that many designated electronics products have been light-weighted. Also, many older, heavier products such as CRT televisions and monitors have been recycled and are seen less frequently in electronics returned. There is a need to identify new performance measures for electronics programs that take the changing product mix and light-weighting trend into account.

The Alberta Recycling paint program recovered slightly more than the interprovincial average from 2011 to 2015, ranging from 7% to 21% more depending on the year. The only year in which Alberta Recycling recovered less than the interprovincial average was 2016, when it recovered 8% less. Some of this difference for all years is explained by the fact that Quebec reports weights recovered which include paint containers, whereas Alberta Recycling and other provinces report product weight separately from container weight.

8.2 Cost Performance

Table 18 shows Alberta Recycling program costs compared to the interprovincial average for 2011 to 2016. The table shows that Alberta Recycling tire program costs expressed as $/kg of tires recovered are very similar to the interprovincial average for all years 2011 to 2016 and differ only slightly (ranging from 6% lower to 5% higher) from the interprovincial average.

Alberta Recycling electronics program costs were 20% less than the interprovincial average in 2011, but have been very similar to the interprovincial average for all years since then except 2013. Costs were 6% higher than the interprovincial average in 2013, but have been 1% to 3% below the interprovincial average in the other four years.

Alberta Recycling paint program costs are substantially lower than the interprovincial average in all years from 2011 to 2016, ranging from 37% lower in 2011 and 2012 to 10% lower in 2015.

Table 18: Alberta Recycling Program Cost Performance for Tires, Electronics, and Paint (2011-2016) ($/kg)

	2011	2012	2013	2014	2015	2016
Alberta Recycling Tire Program Cost Performance Compared to Interprovincial Average						
Alberta Recycling Tire Program Cost ($/kg)	$0.34	$0.37	$0.37	$0.38	$0.42	$0.40
Interprovincial Average Tire Program Cost ($/kg)	$0.36	$0.39	$0.38	$0.39	$0.40	$0.43
Alberta Recycling % above/below Interprovincial Average	-6%	-5%	-3%	-3%	5%	-7%
Alberta Recycling Electronics Program Cost Performance Compared to Interprovincial Average						
Alberta Recycling Electronics Program Cost ($/kg)	$1.12	$1.12	$1.06	$1.03	$1.02	$1.03
Interprovincial Average Electronics Program Cost ($/kg)	$1.40	$1.15	$1.00	$1.05	$1.05	$1.04
Alberta Recycling % above/below Interprovincial Average	-20%	-3%	6%	-2%	-3%	-1%
Alberta Recycling Paint Program Cost Performance Compared to Interprovincial Average						
Alberta Recycling Paint Program Cost ($/kg)	$1.50	$1.56	$1.57	$1.54	$1.52	$1.59
Interprovincial Average Paint Program Cost ($/kg)	$2.38	$2.47	$1.92	$1.88	$1.69	$1.92
Alberta Recycling % above/below Interprovincial Average	-37%	-37%	-18%	-18%	-10%	-17%

8.3 Ranking Compared to Other Provincial Programs

Table 19 shows how Alberta Recycling's programs for tires, electronics, and paint perform relative to other provincial programs for the years 2011 to 2016.

In terms of recovery performance (expressed as kg/cap), Alberta has consistently ranked second or third for recovery of tires and paint from 2011 to 2015. In 2016, Alberta ranked fifth for recovery of paint. However, this value is somewhat misleading as Quebec counts paint containers in the total weight reported and Alberta does not. With regards to electronics recovery, Alberta has generally ranked first or second for five of the last six years (adjusted by 14% to account for the products recovered in the Alberta program to compare "apples to apples"). In 2016, Alberta ranked fourth, but this is explained by the changing electronics mix and the fact that older, heavier televisions are now out of the system. The ranking drops to third and fourth for all years if actual (i.e., not adjusted) kg/cap values are used.

With respect to costs (expressed as $/kg recovered), Alberta ranked fourth (out of ten programs) in 2016 for tire program costs, and has consistently ranked fourth or fifth over the previous five years. In 2016, Alberta ranked third in terms of electronics program costs, down from first in 2015, and up from fourth in 2014 and 2013. Alberta Recycling' paint program has consistently ranked first for the lowest cost paint program for all years, 2011 to 2016.

It should be noted that with the volatility in interprovincial costs, Alberta's ranking for cost has varied, even if costs have been relatively stable and declining.

Table 19: Ranking of Alberta Recycling Program Recovery and Cost Performance for Tires, Electronics, and Paint (2011-2016)

	2011	2012	2013	2014	2015	2016
Ranking for Program Recovery (kg/cap)						
Alberta Recycling Ranking for Tire Recovery (kg/cap)	3	3	2	2	2	3
Alberta Recycling Ranking for Electronics Recovery (kg/cap)	3	4	4	4	5	4
Alberta Recycling Ranking for Electronics Recovery (kg/cap) Adjusted	1	2	2	1	2	4
Alberta Recycling Ranking for Paint Recovery (kg/cap)	3	2	2[31]	3	3	5
Ranking for Program Cost ($/kg)						
Alberta Recycling Ranking for Tire Program Cost ($/kg)	4[32]	5	5	5	4	4
Alberta Recycling Ranking for Electronics Program Cost ($/kg)	1	2	4[33]	4	1[34]	3
Alberta Recycling Ranking for Paint Program Cost ($/kg)	1	1	1	1	1	1

8.4 Conclusions and Next Steps

The conclusion of the benchmarking exercise is that the Alberta Recycling programs for tires, electronics, and paint all perform well when compared to other provincial programs.

On a go forward basis, additional metrics and KPIs need to be developed to adequately reflect the performance of the electronics program, which is processing more units and less weight than originally envisaged due to changing market conditions discussed earlier in this report (product integration, light-weighting, etc.)

Primary KPIs are those that are reported out publicly and secondary KPIs are used for internal management purposes.

There is a need to develop additional primary and secondary KPIs for all three programs to address issues such as governance, enforcement, compliance, revenue completeness, expenditures environmental outcomes, etc.

[31] Tie with BC
[32] Tie PEI
[33] Tie BC
[34] Tie ON

Appendix A - Method to Adjust Alberta Recycling Electronics Kg/Cap to Account for Different Product Lists in Other Provincial Programs

For the benchmarking exercise, the base Alberta kg/cap recovery values for electronics were adjusted to account for the fact that if Alberta recovered the same list of electronics products as other provinces, their electronics kg/cap value would be higher. The adjustment was carried out using available data on the relative weights of existing electronic products designated in other programs.

The relative weights of various electronics products likely to be sold into the Alberta market were estimated as background to a proposed Phase 2 electronics program launch in 2012. Products under consideration for Phase 2 expansion at the time included a broad range of household appliances, audio visual and telecom products as well as power tools. Table 20 below shows the relative tonnages of designated electronic products sold into the Alberta market (45,500 tonnes in 2012) and the potential tonnage of four additional designated electronic product categories calculated during the Phase 2 research (24,780 tonnes in 2012).

Comparing Alberta to other programs (see tables in Appendix G), most programs collect the list of designated electronics recovered in Alberta (with the exception of floor standing printers), and most add audio visual products and answering machines. Should these products be added to the Alberta program, it would increase the tonnage of designated products sold into the market by an estimated 14%.

The 14% adjustment value is considered a conservatively low assumption to account for what would likely be recovered in an electronics program with a longer list of designated products. Input from industry and municipal representatives (Electronics Industry Council, February 1, 2017) indicated that the actual estimate for additional electronics was more on the order of 30% of returned tonnage categories that are designated in other provinces.

However, the adjustment value of 14% was applied as a conservatively low value to ensure that Alberta Recycling not be seen to over-estimate the adjustment of the electronics values for the benchmarking exercise.

Table 20: Adjustment Calculation to Account for Smaller Designated Electronics List in Alberta

Electronics Category	Estimated Units Sold into Alberta Market 2012	Estimated Tonnes Sold into Alberta Market 2012	Adjustment Factor
Small Appliances	4,930,421	16,480	
Audio visual	2,227,483	5,584	
Telecom	9,147,343	1,182	
Power Tools	324,660	1,535	
Total	16,629,907	24,781	
Alberta Base with existing list of designated electronics		45,500	
Increase if audio visual products were added		5,584	12.3%
Increase if microwaves were added		2,250	4.9%
Increase if non-cellular telecom equipment were added		837	1.8%
Increase if cellular phones added		345	0.8%
Adjustment for Manitoba Comparison (with microwaves added)			19.1%
Adjustment for Saskatchewan Comparison (audio-visual and non-cellular telephones added)			14.1%

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Appendix C – Detailed List of KPIs and Metrics Reported in Tire Stewardship and EPR Programs in Canada

Province	KPI/Metric Reported for Tire Stewardship and EPR Programs
2016 Tire Stewardship BC Annual Report[167]	-Collection: • number of tires collected and delivered to a processor, by tire category: passenger & light truck, medium truck, large agricultural, logger/skidder, total • number of tires collected by tire type by regional district • recovery rate (%) by tire category and total (# of units collected / # of units sold) • total collection rate (%) (total # units collected / total # units available for collection) • number of tires collected at collection events -Access: • number of collection events and their locations and dates • number of collection sites • total number of Return to Retailer locations • number of R2R locations per Regional District -P&E: • number of grants awarded to communities throughout BC • number of stewards that participated in the BC Recycles annual Ambassador Tour • number of communities visited throughout the Ambassador Tour • number of community events attended as part of the Ambassador Tour and approx. number of consumers reached as a result • number of retailers visited as part of the Ambassador Tour • % increase in site visits to BC Recycles website after the Ambassador Tour (including % of new visitors) • number of BC Recycles app downloads during the period of the tour • retailer satisfaction level with scrap tire collection services (average score out of 10) -Financial: • revenue: advance disposal fees, investment income (from cash equivalents, from fixed income securities and equities, management fees) • expenses: program incentives, program management, communications and education, community grant program, professional fees, board expenses & travel • assets: cash, accounts receivable, investments, intangible asset • liabilities: accounts payable and accrued liabilities • net assets: unrestricted, restricted, program reserve • change in net assets beginning of year to end of year • cash flows: amortization of intangible asset, realized loss (gain) on sale of investments, unrealized loss (gain) on investments, proceeds from sale of investments, purchase of investments, purchase of intangible asset, net cash -Other: • sales by tire category (units sold): passenger & light truck, medium truck, large agricultural, logger/skidder, total • number of processing sites • product end use/fate, as % by weight: 3R (tire derived product); 4R (tire derived fuel), broken down as follows: % fibre, % whole tires or shred; 5R residuals; 5R off spec • advance disposal fee (ADR) by tire category (in dollars) • number of legitimate collection complaints received from registered retailer and scrap tire generator sites • number of consumer complaints • $/PTE program cost • number of operational months in reserve
2016 Saskatchewan Scrap Tire Corporation	-Governance: • number of members that make up the volunteer Board of Directors and the groups that are represented • number of SSTC staff (full-time employees)

[167] http://www.tsbc.ca/pdf/TSBC-AnnualReport2016.pdf

Province	KPI/Metric Reported for Tire Stewardship and EPR Programs
Annual Report[168]	-Collection: • number of tires collected during the year, by tire type (PLT, MTRK, AG, OTR I, and OTR II) • total weight (lbs) of tires collected during the year • recovery rate (%) (units collected / units sold), total and by tire type • historical recovery rates (2005-2016) • number of tires recovered since program inception • weight of fort lift/industrial tires collected from X number of retailers since introduction of Fork Life/Industrial Tire program • number of bicycle tires that have been collected since program inception • number of tires collected through Household Hazardous Waste Days -Access: • number of participating R2R retailers and number of communities they operate in • number of registered bike retailers, which accept scrap bicycle tires -Financial: • expense breakdown: % spent on processing; % on transportation/collection; % on community cleanup/grants; % on administration • revenue: tire recycling fee, investment income • cost of sales: recycling fee commission, processing and collection costs, professional fees (program compliance), special projects • gross profit • program administration expenses: advertising, sponsorships, and memberships; amortization; bad debts; computer support; conferences; directors' remuneration; office equipment lease; insurances and licenses; meeting expense; office operations; postage; printing and publications; professional fees; Recycle Sask; rent; salaries, wages, and benefits; stationary and supplies; telephone, tax, and internet; training and education; travel • $ transferred to stabilization reserve • assets: cash and cash equivalents; marketable securities; accounts receivable; prepaid expenses and deposits; capital assets; investments • liabilities: accounts payable and accruals; goods and services tax payable • reserves (stabilization reserve) • cash flows: cash received from customers; cash paid to suppliers; cash paid for salaries and benefits; cash receipts from interest; purchase of capital assets; proceeds on disposal of investments; cash resources (end of year) -P&E: • number of *Community Demonstration Grants* awarded over the years (total and by year) as well as the total cost of these grants ($) -Other: • number of tires sold, by tire type (PLT, MTRK, AG, OTR I, OTR II, and NVS) and as percent of annual sales • number of registered retailers • approx. number of scrap tires used in rubberized asphalt between 2005 and 2009 • results of the Black Gold Rush program (special program to collect scrap tire stockpiles from rural municipalities): number of scrap tire stockpiles cleaned up since program inception; population in each community that participated; weight of tires collected; collection cost; processing cost; money raised by Service Groups; marketing/advertising cost; misc. costs; tires collected per capita • advance disposal fees by tire type • product or material end-use/fate (units of tires): crumb, shred/mulch, molded/stamped, other (material transfer), waste steel/fibre • processing inventory (lbs): opening inventory at processing facilities (lbs), received tire volume from program (lbs), tire volume recycled (lbs), and closing inventory at processing facilities (lbs and PTE equivalents) • volume of inventory to various processors (as % of total) • material production from scrap tires (% crumb, % molded, % TDA, % mulch, % steel/fibre, % blasting mats, % other, % TDF
2016 Tire Stewardship Manitoba	-Governance: • number of board members • composition of advisory committee

[168] https://www.scraptire.sk.ca/wp-content/uploads/2016/10/SSTC_AnnualReport_2016_Web.pdf

Province	KPI/Metric Reported for Tire Stewardship and EPR Programs
Annual Report[169]	-Collection: • tonnes of material collected • kilograms collected per capita • percent of material recovered -Access: • percent of residents with collection site access • number of registered year-round collection sites • number of communities and First Nations registered with Tire Stewardship Manitoba -Awareness: • percent of the population aware of the program and what happens to their scrap tires and tubes -P&E: • number of scholarships awarded • community grants: dollars spent on community and market development projects (and number of those projects) • tire recycling innovation grants: dollars distributed in funding and number of projects that received it • number of community events attended by TSM's *Be Tire Smart Community Relations Team*, and how many people (approx.) were attracted to those events -Financial: • revenues: steward fees, interest • expenses: processing incentives, collection incentives, municipal storage incentives, manufacturing incentives, community demonstration grants, public education program, tire recycling innovation grants, capital grants, special projects, advertising and communications, administration and corporate, Green Manitoba agreement • expenses per tonne of material collected: recycling costs per tonne; general and administrative costs per tonne; stewardship costs per tonne; and total program costs per tonne • total annual expenses • assets: cash, interest receivable, prepaid expenses, marketable securities, investments, capital assets • liabilities and net assets: accounts payable and accrued liabilities, goods and services tax payable • stabilization reserve • addition/(draw down) from previous year • cash flows: net operating surplus (deficit), amortization of capital assets, interest receivable, accounts payable, prepaid expenses, GST payable (receivable), purchase of capital assets, proceeds from marketable securities, proceeds from long-term investments -Other: • generation: tonnes of material sold • markets (percent of total products processed and manufactured in Manitoba): % crumb/manufactured; % cut/fabricated; % aggregate • number of jobs created and $ of economic activity created as a result of the program
2016 Ontario Tire Stewardship Annual Report[170]	-Collection: • reduction rate (%) by tire type • collection rate (%) by tire type • reuse rate (%) by tire type • recycling rate (%) by tire type • recycling efficiency rate (%) by tire type • diversion rate (%) and target by tire category (PLT, MTRK, and OTR) • tonnes of tires collected, by tire category (PLT, MTRK, and OTR) • tonnes of tires delivered from haulers to registered processors, by destination (i.e. in –province deliveries, out of province deliveries, processor cull (-ve), and total deliveries) • number of tires collected through the OARA Tire Take Back, and amount of donations generated as a result of the event -Access: • number of collection sites, by type (i.e. garages, municipal waste management sites, tire retailers, mass merchants, other private collection sites, and total)

[169] http://www.tirestewardshipmb.ca/wp-content/uploads/29367-tsm_annual_report_2016-web-1.pdf
[170] http://rethinktires.ca/wp-content/uploads/OTS-2016-Annual-Report-UTP-March-31-2017-Updated-May-26-17.pdf

Province	KPI/Metric Reported for Tire Stewardship and EPR Programs
	• collection site targets, by site type (i.e. garages, municipal waste management sites, tire retailers, mass merchants, other private collection sites, and total) • number of actual collection sites as % of target • number of collection events and amount of tires (in tonnes and units) collected as a result -Awareness: • percent of respondents aware of the program • percent of respondents that agree that the program is successful in recycling used tires to create innovative green products • percent of respondents ready to consider using products made from recycled tires in their homes and/or garden and landscaping projects, and percent of respondents who've already made the switch and purchased a product made from recycled tires -P&E: • number of earned media impressions • number of grants awarded and total amount of funding • number of impressions resulting from various outreach activities • number of views of promotional videos on YouTube and number of Instagram impressions • number of Facebook posts, number of Tweets, and number of user comments, likes, shares, and impressions • number of Twitter followers and Facebook followers • number of page views on rethinktires.ca, % of those that were new visitors to the site, average session duration • number of consumer shows at which OTS exhibited • number of stops on RethinkTires Roadtrip • number of consumers (approx.) that OTS was able to engage and educate in one-on-one, direct communications • number of tire safety demonstrations • average open rate of quarterly stakeholder newsletters and quarterly consumer newsletters • number of consumer newsletter subscribers • number of email campaigns/communications sent out to program participants/stakeholders • retail rebate program: amount ($) of rebates redeemed, number of recycled products sold through the Rebate program and tonnes of recycled rubber that accounted for, number of items with rebates on them -Financial: • revenue: steward fees, tire steward fee penalties • expenses: operational costs broken down by research and development, manufacturing incentive, transportation incentive, processor incentive, collection allowance, promotion and communication costs; administration costs broken down by program management, professional fees, office and general, bad debt, and write-off of HST input tax-credit • assets: cash, trade accounts receivable, prepaid expenses, capital assets • liabilities and net assets: accounts payable and accrued liabilities, other liabilities, deferred leasehold inducement, unrestricted net assets, internally restricted net assets (operational reserve fund, market development fund, stabilization reserve fund) • net assets balance beginning of year, interfund transfers, net assets balance end of year • cash flows: amortization, amortization of deferred lease inducement, loss on disposal of capital assets, trade accounts receivable, prepaid expenses, accounts payable and accrued liabilities, other liabilities, purchase of capital assets, cash beginning and end of year -Other: • generation: tonnes of tires supplied on the market, by tire category (PLT, MTRK, and OTR) and % change from previous year • tonnes available for collection • processor inventory carryover from previous year • material available for recycling • material losses and disposal • reuse vs. retreading, by tire category (PLT, MTRK, OTR)[171] • Tire-Derived Product production: tonnes of on-road tires and off-road tires (separately) produced into TDP1 (95% minus 20 mesh, free of steel), TDP2 (80% minus 8 mesh, free of steel), TDP3 (minus ¼" sleve, free of steel), TDP4 (fabricated products such as blasting mats, etc. must utilize at minimum 75% of the tire by weight), TDP5 (primary shred used as tire derived aggregate or as a feeder stock for crumb rubber production)

[171] Not clear if this is reported in units or tonnes

Province	KPI/Metric Reported for Tire Stewardship and EPR Programs
	• end use by residual type (fluff, steel/metal, other): amount recycled/reused, amount disposed, and % of total residuals sent to either end-use[172] • tonnes of TDP used in Ontario recycled products, by product type: moulded, extruded, calandered, total • target and actual number of audits completed by service provider type (i.e. collector, hauler, processor, RPM, and steward)
2015-2016 Recyc-Quebec Annual Report[173]	-Collection: • number of scrap tires recovered and recycled (approx.) • percentage of scrap tires collected that are recycled • percentage of scrap tires collected that are used in energy recovery as an alternative fuel source -P&E (not specific to Tires program): • number of LinkedIn followers, Twitter followers, Facebook likes
2015 Recycle New Brunswick Annual Report[174]	-Governance: • members of the Board and terms of office • number of times the Board met during the year, and dates and locations of those meetings • level of attendance of directors at Board meetings (overall percentage, as well as number of meetings attended by Board member) • number of members in Executive Committee -Collection: • total tires (passenger tire equivalent) collected: units • total tire recovery rate (%) -Access: • number of retail tire collection sites -Financial: • total revenues (no breakdown) • expenses: scrap tire processing, salaries and employee benefits, general and administrative, communication and translation, and amortization of capital assets • all other financial metrics are not specific to the tire program (i.e. they combine financial information for paint and electronics and oil programs) -Other: • tires sold (passenger tire equivalent): units • number of registered tire retailers • number of dealer audits performed • number of dealer audits in full compliance
2016 DivertNS Nova Scotia Annual Report[175]	-Collection: • total number of tires (passenger tire equivalents) collected • total recovery rate (%) -Access: • number of Enviro-Depot locations -P&E (not specific to tire program): • amount ($) of funding provided to municipalities for diversion credits and for local recycling and other programs • amount ($) of funding provided to educate residents and build ongoing support for environmental action • amount ($) of funding approved for new research projects that support entrepreneurs and encourage innovation in waste reduction -Financial: • total revenues • all other financial metrics are not specific to the tire program (i.e. they combine financial information for paint and beverage container programs) -Other:

[172] Not clear if this is reported in units or tonnes
[173] https://www.recyc-quebec.gouv.qc.ca/sites/default/files/documents/rapport-annuel-2015-2016-anglais.pdf
[174] https://www.recyclenb.com/vendor/laravel-filemanager/files/annual-reports-e/recycle-nb-2015-anglais-v7-lr.pdf
[175] http://divertns.ca/assets/files/DivertNS_AnnualReport2016.PDF

Province	KPI/Metric Reported for Tire Stewardship and EPR Programs
	• number of participating tire retailers • avoided landfill space (cubic meters) as a result of recycling beverage containers and tires (and its equivalency in terms of Olympic-sized pools) • GHGs avoided (tonnes/year) as a result of recycling beverage containers and tires (and its equivalency to removing X number of cars from NS roads each year) • number of jobs (full-time equivalent) created as a result of the beverage container and tire recycling programs, and income earned from those jobs • annual cost savings from avoided municipal curbside collection costs and avoided landfill costs, resulting from recycling beverage containers and tires • amount ($) of funding provided for municipal enforcement activities (not specific to tire program), number of FTE jobs sustained by this funding, number of audits, inspections, and proactive compliance visits sustained by this funding, and number of offence tickets issued
PEI 2016 Annual Report[176]	-Collection: • tonnes of tires collected • tonnes of tires shipped to Quebec for recycling and/or as a fuel source -Financial: • total revenues • tire collection costs • tire disposal costs • all other financial metrics are not specific to the tire program (i.e. they combine financial information for other stewardship programs)
Newfoundland MMSB 2015-2016 Annual Report[177]	-Governance: • composition of Board of Directors (number of employees, female and male) -Collection: • number of tires collected and diverted from waste disposal sites (approx.) during year and since program inception -Access: • number of collection sites -P&E (not specific to tire program): • number of presentations, workshops, and consultations delivered by MMSB • amount ($) of funding provided to regional waste management authorities and other recipients • number of users to have visited RethinkWasteNL.ca; % of site traffic acquired from paid display; % of site traffic acquired through referrals -Financial: • revenues: tire fees • total expenses, public education expenses, • all other financial metrics are not specific to the tire program (i.e. they combine financial information for other stewardship programs) -Other: • advance disposal fees by tire size

[176] https://www.iwmc.pe.ca/pdfs/2016AnnualReport.pdf and https://www.iwmc.pe.ca/pdfs/2016AnnualReportFinancialStatements.pdf
[177] http://mmsb.nl.ca/wp-content/uploads/2014/03/MMSB-AnnualReport-2015-16-Tabled.pdf

Appendix D – Detailed List of KPIs and Metrics Reported in Electronics Stewardship and EPR Programs in Canada

Province	KPI/Metric Reported for WEEE Stewardship and EPR Programs
EPRA Annual Report 2016 (National report, but shows details of each provincial program)[178]	-Governance: • number of members that make up the Board of Directors (and their names); number of recyclers that received RQO approvals as of year end -Access: • number of drop-off locations or collection sites • QC: number of collection events representing X number of collection days • BC, QC, NF: % of population within 45 minutes (rural) or 30 minutes (urban) of an EPRA drop-off centre) • SK: % of population within 50 kms (rural) or 30 minutes (urban) of an EPRA drop-off-centrre • MB: % of population within 50 kms (rural) or 15 minutes (urban) of a EPRA drop-off centre • NS and PEI: % of population within 30 kms (rural) or 30 minutes (urban) of an EPRA drop-off centre • NF: % increase in number of drop-off locations over prior year -Awareness: • % of population aware of how to recycle end-of-life electronics in an environmentally friendly way • number of manufacturers, retailers, and other industry stewards registered with the program -Diversion: • number of devices safely diverted from Canada's landfills and illegal export • metric tonnes of electronics that are kept out of landfills each year • metric tonnes of electronics recycled since the program first began -Collection: • metric tonnes of electronics collected for recycling • QC: metric tonnes of electronics collected for reuse; total tonnes collected (recycling + reuse) • kg/capita collected • QC: kg/capita collected (recycling + reuse) -Financial: • Revenue: environmental handling fees, interest • Expenses: processing; collection; transportation, warehousing, and storage; and quality assurance sampling and recycler audits; consumer awareness and communications; administration; government fees (MB, QC, NS, PEI) • Total program cost per tonne • Assets: cash and cash equivalents, accounts receivable, short-term investments, prepaid expenses, long-term investments, capital assets • Liabilities and net assets: accounts payable and accrued liabilities, Effectiveness & Efficiency Fund, contingency reserve, invested in capital assets, unrestricted • Changes in net assets: balance (beginning of year), excess of revenue over expenses, interfund transfers, invested in capital assets, balance (end of year) • Cash flow (for more detail see p.24 of report)
BC 2016 EPRA Annual Report[179]	-Collection:

[178] http://epra.ca/wp-content/uploads/2017/06/EPRA_Annual_Report_EN_2016_Final.pdf.pdf

[179] http://recyclemyelectronics.ca/bc/wp-content/uploads/2017/06/EPRA-Report-to-Director-2016-Final.pdf

Province	KPI/Metric Reported for WEEE Stewardship and EPR Programs
	• total WEEE collected in metric tonnes; total WEEE collected per capita; per capita collected by Regional District -Access: • total number of collection sites; total number of collection events; % of population covered by collection sites • -Awareness: • % of population aware of the program -Financial: • Total program costs per tonne; Operational costs per tonne; Administrative costs per tonne -P&E: • types of media used to communicate/promote; date promotion was done; what it consisted of (e.g. interview, press release, etc.) • number of impressions (circulation/viewership) -Other: • number of regulated electronic products supplied into the province • number of verified processors and their names and locations • mass balance results or material end fate (note: this information is based on primary processor quarterly mass balance reporting which includes the destination of material shipped from their facilities): o average % of materials requiring further processing; o average % of materials going to energy-from-waste facilities; o average % of materials going to landfill o % of materials that were shipped to processors who were not approved by RQO to receive the specific materials shipped o volume (as % of material stream) of specific materials/components shipped to approved destinations by primary processors and the qualitative information on processing methods and end fate of these materials/components (leaded glass, plastic, ferrous metals, mixed metals, wood, circuit boards, wires/cables, copper, aluminum, copper yokes, batteries, ink/toner cartridges, glass, mercury lamps, ethylene glycol, landfill, dusts, AV media)
Ontario 2016 OES Annual Report[180]	-Collection: • metric tonnes of electronics collected • kg/capita collected • total tonnes colleted since program start (2009) • kg/capita collected since program start (2009) • number of devices (approx.) diverted from landfill since program start (2009) -Access: • number of collection events • number of OES collection sites • % of population that lives within 10km, 25km, and 50km of an OES collection site • % of population that lives within 10km, 25km, and 50km of a generator collection site • total accessibility (this metric combines point 3 and 4 above) -Awareness: • % of population aware of the program (total and by age category [18-34, 35-54, and 55+]) • number of participating manufacturers, retailers, and other industry members (includes stewards and sub-remitters) -Financial: • total program costs

[180] http://www.recyclemyelectronics.ca/on/oes-annual-report/

Province	KPI/Metric Reported for WEEE Stewardship and EPR Programs
	• total program costs per tonne • revenue: steward fees, investment • direct operating costs: material management • other expenses: shared promotion & education, Waste Diversion Ontario administration and program delivery, program delivery and administration • assets: cash, investments, accounts receivable, prepaid expenses, capital assets • liabilities and net assets: accounts payable and accrued liabilities, invested in capital assets, contingency reserve -P&E: • number of classroom visits • number of generator interviews conducted in order to better understand ways the program can further support their collection efforts • Recycle Your Electronics website: total visits (sessions) during the year; number of unique visits (users) in a month; number of pageviews; bounce rate; average time spent on site; visits YoY % +/-, unique visits YOY % +/- • OntarioElectronicsStewardship.ca: total visits (sessions) during the year; number of unique visits (users) in a month; number of pageviews; bounce rate; average time spent on site; visits YoY % +/-, unique visits YOY % +/- • number of actions and brand impressions resulting from integrated advertising campaign • % increase in web traffic after five Marquee collection events, and total number of tonnes collected at these events -Other: • percent weight reduction of TVs (from CRT console to LCD and LED type screens)

Appendix E – Detailed List of KPIs and Metrics Reported in Paint Stewardship and EPR Programs in Canada

Province[181]	KPIs and Metrics Reported for Paint Stewardship and EPR Programs Across Canada
2016 BC Product Care Association Annual Report (Paint and HHW)[182]	-Collection: • number of tubskids (or tubskid equivalents) of paint collected by Regional District • number of tubskids (or tubskid equivalents) of paint aerosols collected by Regional District • approximate residual recovery volume (Litres) for paint (non-aerosol) • approximate residual recovery volume (Litres) for paint aerosol • approximate container capacity volume (Litres) for paint (non-aerosol) • approximate container capacity volume (Litres) for paint aerosol • paint recovery rate (amount of product collected (residual recovery volume) / amount of product sold) • paint aerosol recovery rate (amount of product collected (residual recovery volume) / amount of product sold) • collection volume target • paint reuse target • recycling of latex paint target • metal and plastic container recycling target -Access: • number of collection sites added • collection site changes (site name and location of new collection sites, as well as depots that were closed) • total number of collection sites as of year end, by type (i.e. paint-only, paint plus) • total number of collection sites by regional district • number of collection events, their date and location • collection site target -Awareness: • percent of BC adults aware of a program to recycle paint and HHW -P&E (not specific to paint program): • number of unique visitors to the program website; number of visitors to the collection site finder • number of events attended -Financial: • financial metrics are not specific to the paint program (i.e. they combine financial information for paint and other HHW) -Other: • paint (non-aerosol) sales (litres) • paint (aerosol) sales (litres) • environmental handling fees by paint category and container size • end-of-life product management: percent of paint collected that was reused through the Paint Exchange program; percent of latex paint that was recycled back into paint and coating products or used as a raw material in the manufacturing of concrete products; percent of alkyd paint and latex paint that was sent to energy recovery; percent of latex paint that was sent to landfill; percent of metal paint containers recycled; percent of plastic paint containers recycled; percent of #5 plastic containers sent to energy recovery; percent of paint aerosol residuals sent to energy recovery; percent of paint aerosol containers recycled • estimated GHG impact of the recycling of paint products, flammable liquids, and pesticides (combined): tonnes of equivalent carbon dioxide
2016 Saskatchewan Waste Paint Management Program	-Collection: • number of tubskids of paint collected • number of tubskids of paint aerosols collected • residual volumes of water-based paint collected (Litres) • residual volumes of solvent-based paint collected (Litres) • total paint collected (Litres) • total paint recovery rate (%) (product collected / product sold)

[181] No annual report is available for Quebec
[182] http://www.productcare.org/wp-content/uploads/2017/06/2016-BC-Paint-HHW-Annual-Report.pdf

Province[181]	KPIs and Metrics Reported for Paint Stewardship and EPR Programs Across Canada
Annual Report[183]	-Access: • number of SARCAN collection depots • number of participating retail locations that act as additional collection sites • number of collection events -P&E: • number of "infomercial" style ads aired on TV • number of promotional messages aired via radio • number of visitors to program website • number of events participated in by the ambassardor team -Financial: • total PaintRecycle revenue • expenses: program operations; program administration; education, public awareness, and communications • surplus/deficit • cumulative surplus (reserve) -Other: • total paint sales (Litres) • amount (Litres) of paint taken for reuse by members of the public through the Paint Reuse Program, broken down into water-based paint and solvent-based paint • amount (Litres) of latex water-based paint recycled back into paint • amount (Litres) of solvent-based (alkyd) paint and paint from paint aerosols that was blended with other fuels and sent for energy recovery • amount (Litres and number of drums) of solvent-based (alkyd) paint that was incinerated • amount (Litres) of water-based paint that was solidified and sent to landfill • tonnes of metal containers recycled • tonnes of plastic containers recycled • tonnes of total containers recycled
Manitoba HHW Annual Report 2016[184]	-Collection: • residual recovery volume (Litres) of paint (non-aerosol) • residual recovery volume (Units) of paint aerosol • paint recovery rate (%) • paint aerosol recovery rate (%) -Access: • number of collection sites by type (paint only, lights only, both paint and lights, and full HHW) and by retail or private/municipal • number of collection events, their date and location • number and location of direct pick-ups -P&E (not specific to paint program): • number of visits to program website; number of visitors to the collection site finder • number of attendees at presentation given by PCA representative at MARR Annual General Meeting • number of people who attended a PCA sponsored bus tour • number of municipal representatives that PCA had in-person or teleconference meetings with -Financial: • financial metrics are not specific to the paint program (i.e. they combine financial information for paint and other HHW) -Other: • paint sales (Litres) • paint aerosol sales (Units)

[183] http://www.productcare.org/wp-content/uploads/2017/06/Saskatchewan-Paint-Annual-Report-2016.pdf

184 http://www.productcare.org/wp-content/uploads/2017/05/Manitoba-HHW-2016-Annual-Report.pdf

Province[181]	KPIs and Metrics Reported for Paint Stewardship and EPR Programs Across Canada
2016 Ontario Annual Report[185]	-Collection: • collection rate target (%) • actual collection rate • collection target tonnes • actual tonnes collected • recycling rate target (%) • actual recycled tonnes • actual recycling rate (%) -Access: • number of collection sites by type (municipal depot, municipal events, return to retail) • annual collection site targets, by type (municipal depot, municipal events, return to retail) -P&E (not all of these are specific to the paint program): • number of paid search impressions • number of Facebook page likes; total reach; and number of impressions • website traffic: number of sessions (visits); % of returning visitors; % of new visitors; average visit duration (time); average page views; audience source (% organic (search) traffic, % referral traffic, % direct traffic, % paid search) -Financial: • financial metrics are not specific to the paint program (i.e. they combine financial information for paint and other HHW) -Other: • tonnes of paint available for collection • number of approved service providers • number of paint members participating included in the Paint ISP
New Brunswick Paint Stewardship Program 2016 Annual Report[186]	-Collection: • number of tubskids of paint collected • residual paint volume (Litres) • number of aerosol drums collected • residual aerosol paint volume (Litres) • total residual paint volume (Litres) • recovery rate (%) (paint collected / paint sold) • number of tubskids of paint collected by region • number of aerosol drums collected by region • number of paint containers processed • number of non-program containers processed, and % of total • total containers processed • tonnes of metal paint containers collected and recycled • tonnes of plastic pails (HDPE 2) paint containers collected and recycled • tonnes of plastic (polypropylene) paint containers collected and recycled -Access: • number of collection sites • collection site changes since previous year (number of sites added and/or closed) • number of collection events, their locations and dates • number of collection sites participating in the Paint Reuse program -Awareness: • percent of consumers aware of the program • awareness target -P&E: • number of page views on program webpage; number of page views on collection site finder page • number of households that received flyers promoting PaintRecycle

185http://www.productcare.org/wp-content/uploads/2017/06/2016-PCA-Annual-Report-x01.pdf

[186] http://www.productcare.org/wp-content/uploads/2017/04/NB-2016-Annual-report.pdf

Province[181]	KPIs and Metrics Reported for Paint Stewardship and EPR Programs Across Canada
	• number of collection site visits made by a PCA representative for the purpose of providing in-person support, delivering informational brochures, and provide any necessary training. -Financial: • total revenues • expenses: processing, transportation, administration, collection, communications, regulatory • surplus/deficit • accumulated surplus -Other: • total paint sales (litres) • amount of paint shipped to processor: number of tubskids of paint, residual paint volume (L); number of aerosol drums; residual aerosol paint volume (L); total residual paint volume (L) • amount of paint processed: number of tubskids of paint, residual paint volume (L); number of aerosol drums; residual aerosol paint volume (L); total residual paint volume (L) • percentage of paint collected that was reused, recycled, dispose of in a landfill, recovered for energy, contained, or otherwise treated or dispose of • amount of paint (Litres) that was given away through the Paint Reuse program • amount of latex paint (Litres) recycled, and as % of total paint recycled • amount of alkyd paint (Litres) recycled, and as % of total paint recycled • amount (Litres) of alkyd paint and paint from aerosols that were blended with other fuels and sent for energy recovery • amount (Litres) of non-recyclable latex sludge/solid which were solidified and disposed in landfill • amount (Litres) of paint incinerated • number of brand owners registered under the program
Nova Scotia Paint Stewardship Program 2016 Annual Report[187]	-Collection: • amount of paint collected: number of tubskids of paint collected; residual paint volume (L); number of aerosol tubskids collected; residual aerosol paint volume (L); paint reuse volume (L); total residual paint volume (L) • amount (L) of latex paint recycled, and as % of total • amount (L) of alkyd paint recycled, and as % of total • recovery rate (%) (residual recovery volume / sales) • weight (metric tonnes) of metal containers collected and recycled • weight (metric tonnes) of plastic pails (HDPE 2) collected and recycled • weight (metric tonnes) of plastic paint cans (polypropylene) collected and recycled -Access: • number of collection sites -P&E: • number of page views on program website • number of Tim Hortons' restaurants which ran PCA digital advertising in-store -Financial: • total revenues • expenses: processing, collection, administration, communications, transportation • surplus/deficit -Other: • total paint sales (Litres) • amount of paint shipped to processor: number of tubskids, residual paint volume (L), number of aerosol tubskids, residual aerosol paint volume (L), total residual paint volume (L) • amount of paint processed: number of tubskids, residual paint volume (L), number of aerosol tubskids, residual aerosol paint volume (L), total residual paint volume (L) • amount of paint reused through Paint Reuse Program (L, and as % of total paint managed) • amount of paint reused through Paint Recycling (L, and as % of total paint managed) • amount of paint sent for energy recovery (L, and as % of total paint managed) • amount of paint sent to landfill ((L, and as % of total paint managed)
PEI Paint Recycling Program	-Collection: • amount of paint collected: number of tubskids, residual paint volume (L), number of aerosol drums, residual aerosol paint volume (L), paint reuse volume (L), total residual paint volume (L)

[187] http://www.productcare.org/wp-content/uploads/2017/05/2016-NS-Paint-Annual-report-with-FS.pdf

Province[181]	KPIs and Metrics Reported for Paint Stewardship and EPR Programs Across Canada
Annual Report 2016[188]	• recovery rate (paint collected / paint sold) • weight (tonnes) of metal containers recycled • weight (tonnes) of plastic pails (HDPE 2) recycled • weight (tonnes) of plastic paint cans (polypropylene) recycled • amount (L) of latex paint recycled, and as % of total • amount (L) of alkyd paint recycled, and as % of total -Access: • number of collection sites -P&E: • number of page views on program website -Financial: • total revenues • expenses: collection, transportation, processing, communications, regulatory, administration • surplus/deficit • accumulated surplus/deficit -Other: • total paint sales (L) • amount of paint shipped to processor: number of tubskids, residual paint volume (L), number of aerosol tubskids, residual aerosol paint volume (L), total residual paint volume (L) • amount of paint processed: number of tubskids, residual paint volume (L), number of aerosol tubskids, residual aerosol paint volume (L), total residual paint volume (L) • amount (L) of alkyd paint and paint from paint aerosols sent for energy recovery (and as % of total) • amount (L) of paint sent for incineration (and as % of total) • amount (L) of non-recyclable latex sludge/solid sent to landfill (and as % of total) • environmental handling fees by paint container size
Newfoundland Paint Stewardship Program 2016 Annual Report[189]	-Collection: • reuse rate target (%) • reuse rate (%) • amount (L) of paint given away to consumers through Paint Reuse program • recovery rate target (%) • recovery rate (%) • amount of paint collected: number of tubskids, residual paint volume (L), number of aerosol drums, residual aerosol paint volume (L), paint reuse volume (L), total residual paint volume (L) • percentage of waste paint collected by collection site type (green depot, retailer, collection events, local government waste facilities) • number of tubskids collected at collection events, by location • weight (tonnes) of metal containers collected and recycled • weight (tonnes) of plastic pails (HDPE 2) collected and recycled • weight (tonnes) of plastic paint cans (polypropylene) collected and recycled -Access: • collection site target • number of collection sites • number of collection sites participating in the Paint Reuse program, and as & of total collection sites -Awareness: • percent of residents aware of a recycling program for paint in the province -P&E: • number of page views on program website and number of page views on collection site finder page • number of 30-second commercials that ran during radio campaign -Financial: • total revenues • expenses: collection, transportation, processing, communications, regulatory, administration

[188] http://www.productcare.org/wp-content/uploads/2017/06/2016-PEI-Paint-Annual-Report.pdf
[189] http://www.productcare.org/wp-content/uploads/2017/04/2016-NL-Annual-report.pdf

Province[181]	KPIs and Metrics Reported for Paint Stewardship and EPR Programs Across Canada
	• surplus/deficit • accumulated surplus/deficit -Other: • total paint sales (L) • amount of paint processed: number of boxes of paint, residual paint volume (L), number of aerosol drums, residual aerosol paint volume (L), total residual paint volume (L) • amount (L) of latex paint processed, and as % of total • amount (L) of oil based paint processed, and as % of total • amount (L) of oil-based paint and paint from paint aerosols sent for energy recovery • amount (L) of non-recyclable latex sludge/solid sent to landfill • amount (L) of paint sent to incineration • percent of paint by disposal method (reuse [Paint Reuse Program], reuse [Paint Recycling], landfill, energy recovery)

Appendix F – Population Data Used for Kilogram/Capita Calculations

The benchmarking exercise involved dividing overall program cost data and material recovered tonnage data by provincial populations (obtained from Statistics Canada) to convert reported tonnage to kg/cap and reported costs to $/kg.

Populations by province for the years 2011-2016, obtained through various Statistics Canada Reports and used for calculating kg/cap values where these are not contained in Annual Reports of reporting agencies are presented in Table 21[190]. The table shows the steady increase in Alberta's population from 3.6 million in 2011 to 4.2 million in 2016, increasing the province's population by 600,000, or 16.7% in this period, the largest increase of any province in those years. Significantly, Alberta's population has increased from 10.9% of the national population in 2011 to 11.7% of the national population in 2016.

Table 21: Populations by Province (2011-2016) Used for Comparative Kg/Capita Calculations

	2016		2015		2014		2013		2012		2011	
	Pop (1,000's)	% of Total	Pop (1,000's)	% of Total	Pop (1,000's)	% of Total	Pop (1,000's)	% of Total	Pop (1,000's)	% of Total	Pop (1,000's)	% of Total
Nat'l	36,286		35,849		35,545		35,156		34,751		33,477	
NL	530	1.5%	529	1.5%	528	1.5%	527	1.5%	527	1.5%	515	1.5%
PEI*	149	0.4%	147	0.4%	146	0.4%	145	0.4%	145	0.4%	140	0.4%
NS*	950	2.6%	943	2.6%	943	2.7%	944	2.7%	945	2.7%	922	2.8%
NB	757	2.1%	754	2.1%	755	2.1%	756	2.1%	757	2.2%	751	2.2%
QC	8,326	22.9%	8,260	23.0%	8,215	23.1%	8,156	23.2%	8,086	23.3%	7,903	23.6%
ON	13,983	38.5%	13,797	38.5%	13,685	38.5%	13,556	38.6%	13,414	38.6%	12,852	38.4%
MB	1,318	3.6%	1,296	3.6%	1,281	3.6%	1,266	3.6%	1,250	3.6%	1,208	3.6%
SK	1,151	3.2%	1,132	3.2%	1,121	3.2%	1,105	3.1%	1,086	3.1%	1,033	3.1%
AB	4,253	11.7%	4,180	11.7%	4,108	11.6%	3,997	11.4%	3,881	11.2%	3,645	10.9%
BC	4,752	13.1%	4,693	13.1%	4,645	13.1%	4,589	13.1%	4,546	13.1%	4,400	13.1%
YK	38	0.1%	37	0.1%	37	0.1%	36	0.1%	36	0.1%	34	0.1%
NWT	45	0.1%	44	0.1%	44	0.1%	44	0.1%	44	0.1%	41	0.1%
NT	37	0.1%	37	0.1%	36	0.1%	35	0.1%	35	0.1%	32	0.1%

*For electronics programs, NS and PEI performance data is combined, therefore the population of the two provinces was combined to calculate a kg/cap value.

[190] 2012-2015 population data obtained from Statistics Canada (http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/demo02a-eng.htm. 2011 population data obtained from Statistics Canada (https://www12.statcan.gc.ca/census-recensement/2011/dp-pd/hlt-fst/pd-pl/Table-Tableau.cfm?LANG=Eng&T=10

Appendix G – Products Accepted for Recycling in Provincial Electronics Programs

There are significant differences across Canada in terms of what types of electronics are accepted for recycling in each of the provincial programs. British Columbia's electronics recycling program is the most comprehensive, and is the only program in Canada that collects e-toys, medical monitoring and control equipment, electronic musical instruments, power tools, IT and telecom devices, among others. Ontario and BC are the only provinces that collect cell phones as part of the program, and Manitoba is the only one to collect microwaves. Of all provinces, Alberta's current program is the smallest in the scope of products accepted for recycling, although a potential Phase 2 electronics program would expand the list of designated products to include small household appliances, power tools, audio visual equipment and telecom equipment. Some planning for the Phase 2 expansion has been underway since 2012.

The general categories of electronic products accepted for recycling in different programs are presented in Table 22.

Table 22: Designated Electronic Products Accepted for Recycling by Electronics Stewardship and EPR Programs in Canada (2017)

Province	BC	AB	SK	MB	ON	QC	NS	PEI	NL	NWT	NB*
Desktop Computers	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Portable Computers	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Display Products (Monitors, TV's)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Printing, Scanning & Multi-Function	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Audio Products	✓		✓	✓	✓	✓	✓	✓	✓		✓
Medical Monitoring & Control	✓										
E-Toys	✓										
Electronic Musical Instruments	✓										
IT &Telecom Devices	✓										
Video Products	✓		✓	✓	✓	✓	✓	✓	✓		✓
Video Gaming Systems	✓					✓					
Cellular Telephones					✓	✓					
Answering Machines	✓		✓	✓	✓	✓	✓	✓	✓		✓
Floor Standing Printers, Copiers, Multi-Function	✓	✓		✓	✓					✓	
Microwaves				✓							

*effective June 1, 2017

Table 23 provides a detailed list of the electronics accepted for recycling in Alberta (referred to as the BASIC LIST), and the additional electronics which are designated in all other provinces compared to Alberta.

Table 23: Electronics Products Accepted in Programs Across Canada

Province	List of Electronics Products Designated for Recycling
AB	**BASIC LIST**: Televisions, monitors, and all-in-one computers (processing unit combined with a monitor); computers and servers; laptop, notebook, and tablet computers; printers, copiers, scanners, and fax machines (including floor standing copiers up to 1,000kg)
BC	**BASIC LIST +** Large battery-powered ride-on toys, small battery-powered ride-on toys, computer peripherals, personal/portable audio/video playback and/or recording systems, electronic toys, home audio/video playback and/or recording systems, home-theatre-in-a-box, vehicle audio and video systems, non-cellular telephones and answering machines, IT and telecom equipment, musical instruments, medical and monitoring equipment, micro toys electronic
SK	**BASIC LIST +** Computer peripherals, personal/portable audio/video playback and/or recording systems, home audio/video playback and/or recording systems, home-theatre-in-a-box, vehicle audio and video systems, non-cellular telephones and answering machines (does not accept floor standing printers)
MB	Same as Saskatchewan but with the following additions: Counter-top microwave ovens, floor-standing printers
ON	Same as Saskatchewan but with the following additions: Cellular devices and pagers, floor-standing printers
QC	Same as Saskatchewan but with the following additions: Cellular devices and pagers
NS	Same as Saskatchewan
PEI	Same as Saskatchewan
NL	Same as Saskatchewan
NWT	**BASIC LIST**
YT	Same as Saskatchewan but with the following additions: Cellular telephones. Does not accept home-theatre-in-a-box systems.

Appendix H - Light-Weighting of Electronics

As shown in the figure below, taken from the Ontario Electronics Stewardship (OES) 2014 annual report, most of the electronics profiled have experienced light-weighting of between 30% and 60% between 2009 and 2014. Computer monitors have experienced the greatest weight decreases, followed by televisions and cordless telephones.

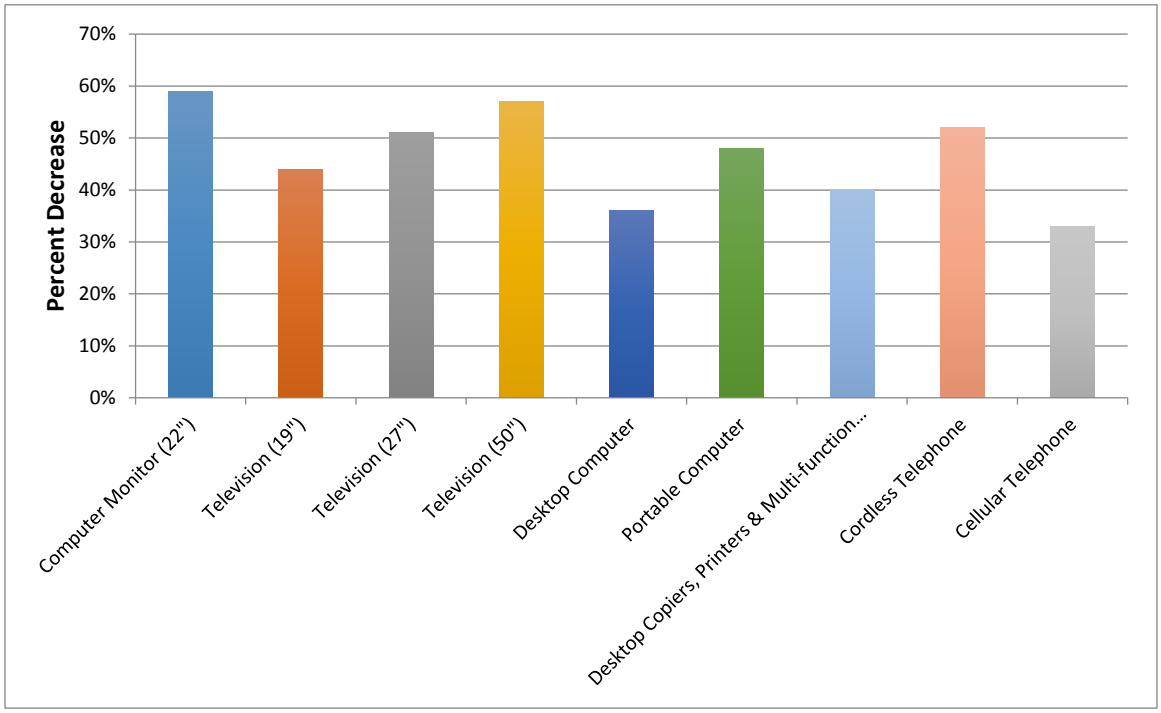


Figure 19: Industry-Wide Weight Reduction by Electronic Product Category (2009-2014)[191]

The 2017 Electronics Product Stewardship Canada (EPSC) Annual Report provides a number of examples of light-weighting of products. For instance, the unit weight of a television has changed dramatically in the last ten years. For instance:

- In 2006, a Samsung 50"DLP TV weighed approximately 30.3 kg;
- In 2009 a Samsung 46" LED TV weighted approximately 18kg
- In 2012 a Panasonic Smart Viera 47" television weighed 13 kg and
- By 2017 am LG 65" OLED HDR Smart TV weighted only 7.6kg.

Similar statistics apply to other electronics recovered in stewardship and EPR programs.

This light-weighting trend has been underway for a number of years, and is now being felt in less tonnage coming back to electronics stewardship and EPR programs. A number of articles and reports have been written on this topic,

191 Ontario Electronic Stewardship, Annual Report, 2014

as annual reports of many US state programs show a reduction in returned tonnage from one year to the next and state officials ask for explanations. Figures from two of these reports are presented below.

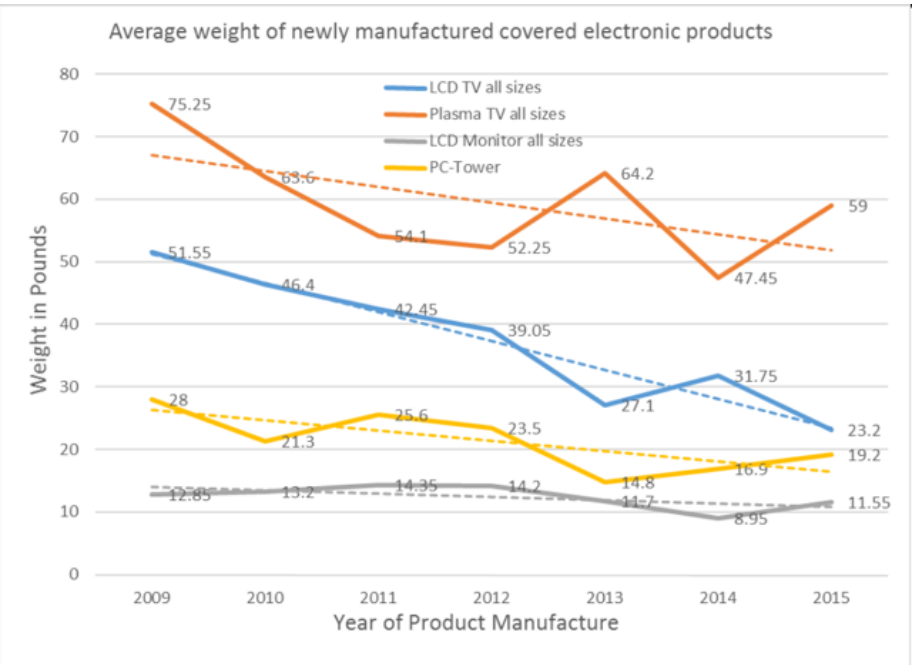


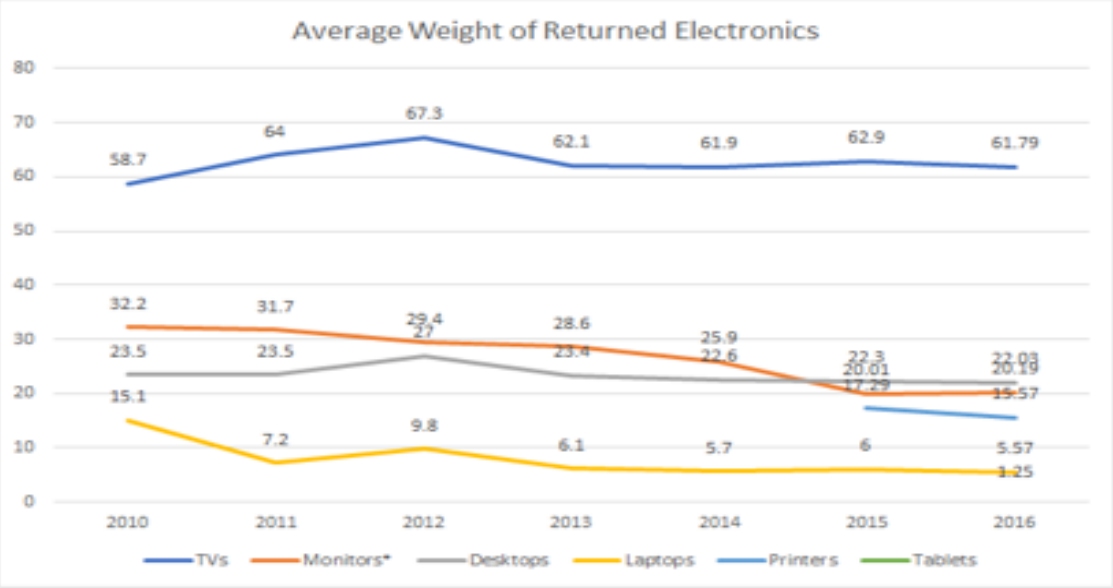
Figure 20: Average Weight of Newly Manufactured Electronic Products in the U.S. (2009-2015)[192]

192 Source: http://www.ecy.wa.gov/programs/swfa/eproductrecycle/docs/2016WMMFAAnnualReport.df

Average Weight of Returned Devices under State Programs

ERCC compiles the average weights from several state electronics recycling law programs where the number of units, unit weight, and product device type is recorded. Currently, these data are only tracked under the Maine, Oregon (sampling) and Washington (sampling until 2014) programs. Below is the change over time in average weights for 2010-2014. (All numbers are in pounds.)

	2010 Avg Wt	2011 Av Wt	2012 Avg Wt	2013 Avg Wt	2014 Avg Wt	2015 Avg Wt	2016 Avg Wt
TVs	58.7	64	67.3	62.1	61.9	62.9	61.79
Monitors*	32.2	31.7	29.4	28.6	25.9	20.01	20.19
Desktops	23.5	23.5	27	23.4	22.6	22.3	22.03
Laptops	15.1	7.2	9.8	6.1	5.7	6	5.57
Printers						17.29	15.57
Tablets							1.25



*Maine average monitor weight for 2015 includes laptops and all-in-ones and is not included on these charts: 21.88 pounds (2016 data not yet available).

Figure 21: Average Weight of Devices Returned in US Programs (2010-2016)[193]

Another factor which is contributing to a lower tonnage of electronics being recovered is that a lot of the older, heavier units, such as CRT televisions and monitors, have now been recycled. These used to be a large part of the weight recycled in the earlier years of the program.

193 Source: http://www.ecycleclearinghouse.org/content.aspx?pageid=114