



Characterization of Residual Materials in the Residential Sector 2015-2017

Final Report

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Éco
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General Background

Since 2006, RECYC-QUÉBEC and Éco Entreprises Québec (ÉEQ) have worked together to carry out provincial characterization studies regarding the residential residual materials consumers deposit for curbside recycling. In all, data collected from over 21,000 housing units across Quebec were loaded into the databases used for these studies.

Carrying out regular residential characterization studies makes it possible to get an overview of the situation and follow the evolution of the generation and composition of residual materials and of the performance of residential recovery in Quebec. These studies also make it possible to monitor Quebecers' habits regarding sorting, target the most problematic materials and prioritize consumer information, awareness and education accordingly. The collected data is also used for other studies carried out jointly by both organizations, such as the study on cost allocation

by activity tied to curbside recycling (also referred to as selective collection) of recyclable materials. The quantities and types of recyclable materials generated are also used to determine ÉEQ's fee structure under the Compensation plan for municipal curbside recycling services provided to ensure the recovery and reclamation of residual materials. RECYC-QUÉBEC draws content from the plan to prepare the residual materials management report titled "Bilan de la gestion des matières résiduelles au Québec". The 2015-2017 characterization study, which has the same objectives, goes a little further

A brief background and methodology are provided ahead of the results. In addition to the data presented, and in order to enable readers who wish to go further to do so, an appendix specifying the various data collected through these studies is available at the end of the document.



1. Residential Characterization

Background

The 2015-2017 curbside residential characterization study has the same objectives as previous characterizations, namely, to draw an updated portrait of the generation, recovery, disposal and recovery rates of residual materials generated by consumers. The results also enable us to highlight consumer sorting habits at home.

Shopping bags regularly make the headlines and are the subject of many discussions. Although recyclable (except in the case of degradable bags), they regularly end up discarded with waste. However, a certain proportion of these bags is not directly thrown away and instead serves as a substitute for traditional garbage bags. In order to learn more about reuse rates for shopping bags, ÉEQ and RECYC-QUÉBEC have commissioned a complementary study.

Also, some curbside materials (in the recycling bin or garbage can) absorb more soil and moisture, which can have an impact on their weight. A cleaning and drying protocol for residual materials was therefore developed to determine the impact of humidity on the weight of materials most likely to be affected.

In addition, compared to previous characterization studies, greater emphasis was placed on the collection of organic matter. As this collection has been expanded in recent years and is available in an increasing number of municipalities, the reliability of the data is now greater and allows for broader information distribution.

As for the 2012-2013 residential curbside characterization study, the results are presented from two angles: by material and by collection route. The sections below present the methodology for sample collection and data analysis, followed by the results of the 2015-2017 residential characterization study and its additions.

METHODOLOGY

Information gathering

For this study, 80 communities made up of boroughs, cities or regional county municipalities (RCMs) were randomly selected. In order to ensure regional representation, they were divided according to six strata covering two-thirds of the administrative regions in Quebec.

Each of the 80 communities was represented by 10 clusters, also randomly selected, all consisting of a minimum of five consecutive dwellings of the same type. The typology of the environment was determined in order to ensure the representation of each of the types of dwellings existing in Quebec. Thus, a total of 800 clusters were sampled and their distribution is shown in Table I. The total number of dwellings (households) studied is 5,867.

Table I: Distribution of samples based on the four dwelling types

Urban single-family	Rural single-family	Plex	Multi-unit housing	TOTAL
227	178	195	200	800

Three collection streams were included in the study: waste collection, recyclable materials collection (2nd stream) and organic waste collection, if available (3rd stream). The sampling method was adapted to the frequency of collections in order to cover all three streams. Note that only materials from residential curbside collections were included in this study. On average, 95% of the samples slated for the study were gathered, and the remaining 5% could not be for various reasons (bins or bags not at the curb or collection trucks already passed, etc.). Materials generated by industrial, commercial and institutional sectors (ICIs), refundable container returns, organic matter processed via home or community composting, as well as materials subject to special collections or voluntary deposits (bulky items collection, domestic hazardous waste drop-off points, ecocentres, etc.) are not targeted. The residential characterization study also does not include materials generated away from home.

Sampling was done over a period of 34 months, from March 2015 to December 2017. The samples were gathered at the curb on collection days, transported, then sorted and weighed at the premises of the firm responsible for collecting and compiling the data. Additional information was noted at the time samples were gathered (e.g. municipality, land use profile [urban, rural], type, number of dwellings and distance between them). A total of 90 tonnes of material were collected and 80 tonnes were sorted (excess sample quantities gathered account for the 10-tonne difference) into 102 different categories, as shown in Appendix I.

An additional sorting protocol was developed concurrently to determine the rate of reuse of non-degradable and degradable shopping bags. It was applied from June 1, 2016, for all shopping bags found in the waste collection. The bags were divided into two sub-categories: t-shirt bags and other types of bags. Then, the bags were sorted, depending on whether they contained residual materials or not. Two measurements were taken by sub-category: the number and weight of bags reused or not. Results are presented in section 1.3.1 of this report.

As for the methodology we used, in order to better understand the influence of humidity and dirt on the weight of the materials, a cleaning and drying protocol was applied to the materials with the following desired characteristics: low weight, high level of moisture absorption or high potential for soiling. Thus, 56 materials were selected and split into 18 categories. For each of the 18 categories, 50 samples of 2 kg were prepared, 25 from waste and 25 from recyclable materials. A random selection was made among 50 clusters from the waste and recyclable collection samples. After sorting and collecting the usual information, the selected categories were cleaned (removal of content and contaminants), then heat dried.

Data analysis

Statex, a consulting firm, was hired to support ÉEQ and RECYC-QUÉBEC in analyzing the data collected and compiled by NI Corporation. The mandate to develop the cleaning and drying protocol was entrusted to the Centre de recherche industrielle du Québec (CRIQ).

The general methodology used to analyze the collected data is the same as for the previous studies (2006-2007, 2010 and 2012-2013): estimation of the weight per household per week, calculation of the proportion and estimation of the weight generated annually for each class of materials.

The use of a moving average coupled with sampling that took place over a period of three years made it possible to follow trend evolution. However, the quantities generated can only be calculated for the total period covered, given the large number of samples required to get representative data.

Data extrapolation


In 2015-2017, as in 2012-2013, the average annual value per household was calculated and used for extrapolation to the Quebec level. This more refined approach was made possible thanks to data from the Ministry of Municipal Affairs and Housing (MAMH) and RECYC-QUÉBEC's municipal residual materials management portal. In 2015-2017, only the MAMH database was used to determine the total number of households, broken down by environment typology. Figure 1 presents the distribution for 2017. Unlike the previous characterization studies, due to the selection of the same number of clusters for each type of dwelling and thanks to the availability of data, weighting by dwelling type was applied to the provincial calculations, according to the distribution of Quebec households.

Figure 1: Distribution of dwelling types in Quebec (2017)



* The MAMH (Ministry of Municipal Affairs and Housing) defines plex buildings as residential dwellings with two to five units and multi-units as residential dwellings with six or more units.

** Calculated according to the rurality rate, insufficient data to run the calculation for other dwelling types.



The data extrapolation was made using weight data per household rather than weight data per person. Both approaches are valid, allowing for comparison with previous characterization studies (2006-2007 and 2010). For the 2015-2017 study, the weight per person was obtained by dividing the total quantities extrapolated by the total population of Quebec. The data used are population data published by the Institut de la statistique du Québec (ISQ). For data per person according to the type of environment, the number of people per household by dwelling type had to be estimated. To do this, the ratios from the 2012 survey carried out among households in the characterization study were used, while ensuring that the number of people per overall household (all dwelling types combined) matches the 2015-2017 estimate obtained from MAMH data.

All weight estimates generated were calculated using seasonally adjusted data, according to the same method as for all previous characterization studies.

Methodology differences and impacts on results

A notable difference can be observed regarding the proportion of multi-unit housing between the 2015-2017 study and that of 2012-2013. During the previous characterization, proportions were calculated based on data from the RECYC-QUÉBEC Portal, and there seems to have been an underestimation of the number of multi-unit housing in favour of rural single-family homes across Quebec. This variation should not occur again, however, as for this study and the subsequent ones, the MAMH databases will be used.

Specificities related to the analysis of organic waste

The collection of organic materials is only partially extended across Quebec, unlike that of recyclable materials and waste, which covers the vast majority, if not the entire population. The organic matter generation calculations must therefore be adapted in order to be reflect this reality.

For the 2015-2017 characterization study, in addition to the usual data analyzed in previous studies, i.e. those from the collection of green waste and the combined collection of green and food waste, there are also data taken from samples from food waste collections only.

In addition, during the 2012-2013 characterization study, the analysis of the results for organic matter was carried out jointly with the 2010 results. The results presented in this report are only based on the 2015-2017 data, the number of samples, as well as the length of the survey, to ensure representation.

Data rounding

All calculations of totals, change and percentage distribution are made using the raw data. For ease of reading, all results have then been rounded. Therefore, the totals displayed in tables and figures are not always exactly equal to the sum of the corresponding results. Unrounded results data for each of the 102 material classes are presented in Appendix I.

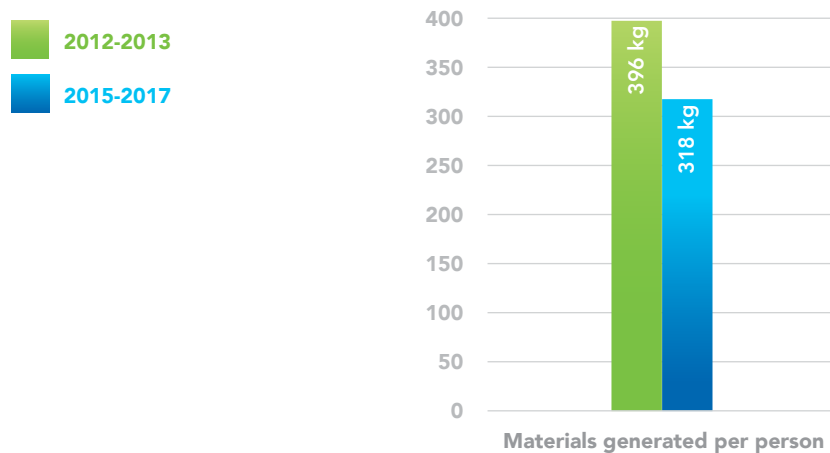
RESULTS

1.1 Overall generation of residential materials

This section presents the overall generation of residual materials deposited curbside by Quebecers each year between 2015 and 2017.

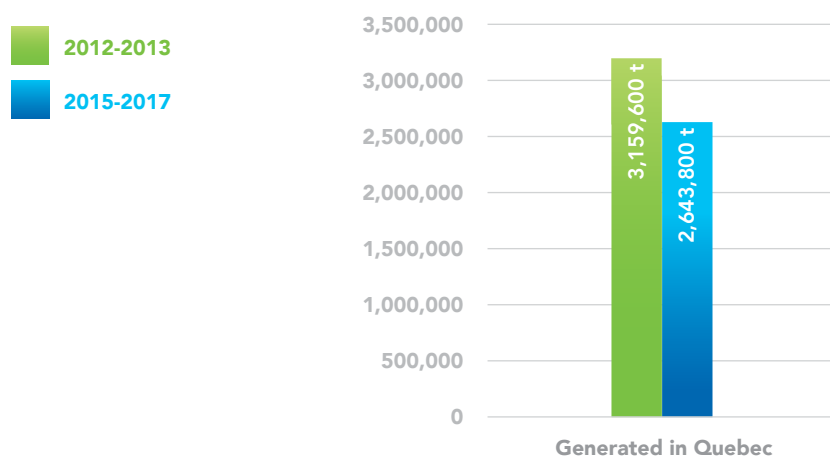
Per year, each Quebecer placed an average of 318 kg of residual materials by the curb, divided between the collection of recyclable materials, the collection of waste and the collection of organic materials. This result shows a 20% decrease in the quantities of materials generated per person since 2012-2013.

Figure 2: Materials generated per person (kg/person/yr.)



At home, Quebec residents have generated a total of 2,643,800 tonnes of residual matter. We note an overall drop of 16%, despite a 4% population increase between 2012 et 2017.¹

Figure 3: Generated in Quebec (in tonnes/year)



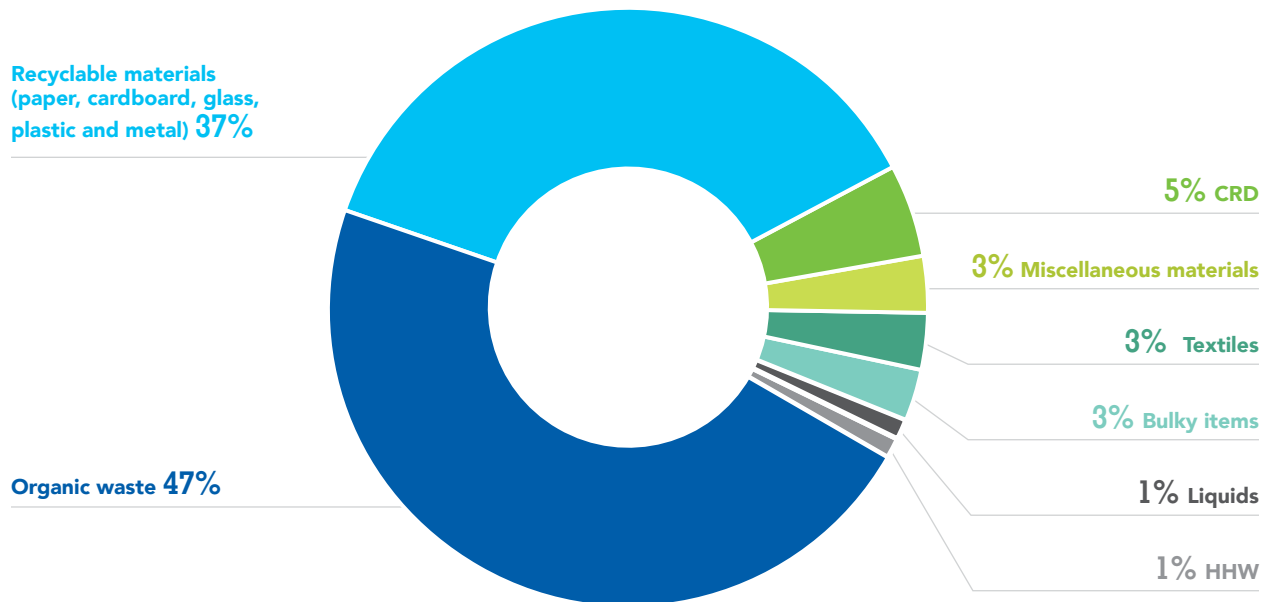
¹ ISQ (2019). *Le bilan démographique du Québec – Édition 2019*.

The next two sections present a detailed account of generation, by material, followed by results based on the three types of collections targeted in the study.

1.2 Generation based on materials

This section looks at generation by material, for all collections. The most abundantly generated materials in the residential sector are organic waste, which account for 47% of the total, the same rate as was observed in 2012-2013. In general, the composition is more or less the same as for 2012-2013. Recyclable materials are still in 2nd place, followed by construction, renovation and demolition (CRD) waste.

Figure 4: Composition of residual waste generated (in tonnes/year)



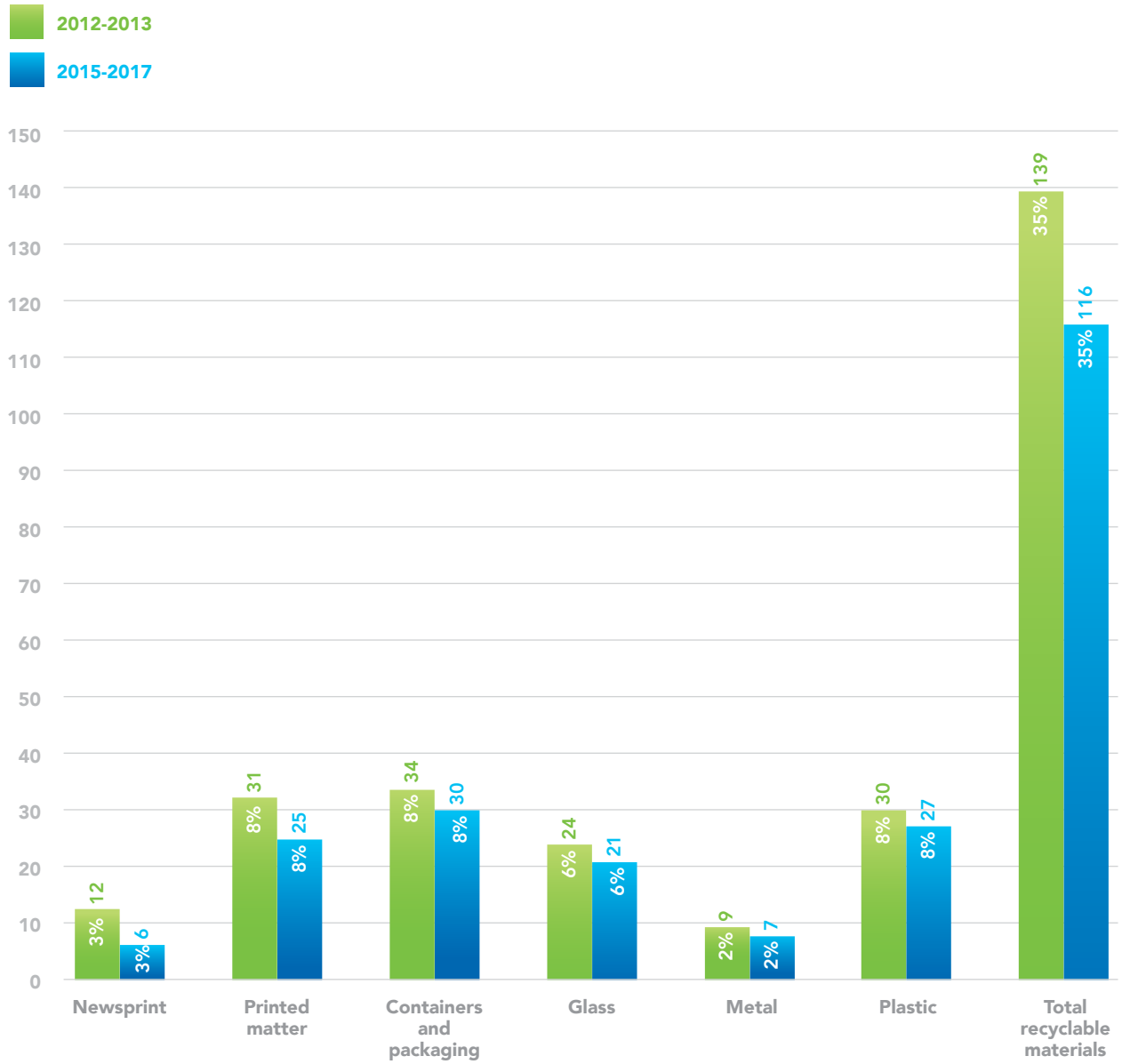
1.2.1 Recyclable materials (paper, cardboard, glass, plastic and metal)

All collections combined, each Quebecer deposited 116 kg of recyclable materials at the curb each year for the period 2015-2017 (paper and cardboard, glass, metal and plastic). Although this is a 17% drop from the 139 kg observed in 2012-2013, the relative share of these materials in the total is the same as for the previous characterization study.

Although the drop affects all classes of materials, the one that suffered the most significant reduction is newsprint (-50%), thus continuing the public's trend towards digital media, as was observed during the previous characterization studies. Several factors can also explain the general reduction in quantities of recyclable materials generated. For example, more and more companies seem to favor lighter containers, including by replacing glass with plastic. It is also possible to hypothesize a tendency to reduce over-packaging and an increasingly obvious desire on the part of consumers to reduce at source.



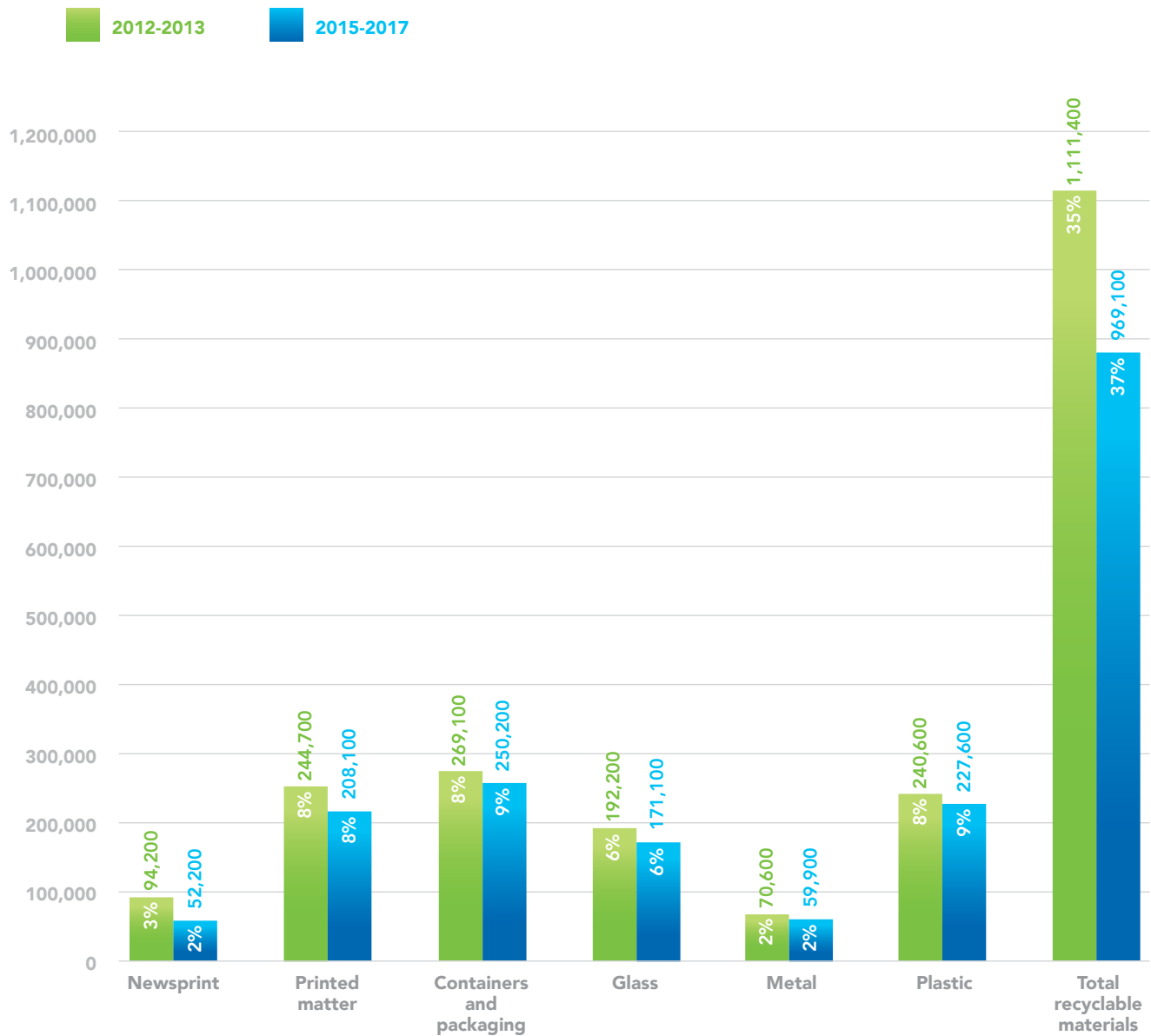
Figure 5: Recyclable materials generated per person and proportion of total quantities generated (kg/person/yr.)





Regarding the total quantities generated in Quebec, despite a 13% decrease, we note a slight increase in the relative share of recyclable materials.

Figure 6: Generated recyclable materials and proportion of total generation par year in Quebec (in tonnes/year)



Section 1.3.2 provides more details on the recovery of these materials through the recyclable materials collection.

1.2.2 Organic waste

We observe a significant decrease in the quantities of organic matter generated by Quebec households, which represent 149 kg per person per year for the 2015-2017 study. Table II shows that although quantities have decreased, they still have the same weight in relation to the overall generation and remain the most abundant residual materials placed at the curb. This decrease reached 20% per person and represents a total of 244,900 tonnes across Quebec.

Table II: Organic matter generated curbside

	2012-2013	2015-2017
Quantity (kg/person/yr.)	187	149
Provincial tonnage per year	1,488,900	1,244,000
Proportion of total generated	47%	47%

For more information on the reduction observed, refer to the section on trash collection (Section 1.3.1). Section 1.3.3, on the other hand, presents in more detail the recovery data through the collection of organics.

1.2.3 Bulky items

The following table shows the results for bulky items, which include, but are not limited to, electrical appliances, appliances, and furniture. Between 2012-2013 and 2015-2017, the quantity placed at the curb per person decreased by 46%, reaching 8 kg per person. The total quantity has been cut in half and represents a total of 68,000 tonnes for the 2015-2017 study.

Table III: Bulky items generated curbside

	2012-2013	2015-2017
Quantity (kg/person/yr.)	15	8
Provincial tonnage per year	116,200	68,000
Proportion of total generated	4%	3%

As in previous characterizations, only bulky items deposited curbside at the same time as the other materials collection were included in the samples. However, due to their size, they generally cannot be placed directly among the rest of regular waste. They must therefore be handled via a special collection, or brought to an eco-centre or an authorized drop-off point by consumers. The specificity of the service varies from municipality to municipality, and access to these services may have expanded between the two characterization studies. In addition, collection frequencies in the sampled communities may have been reduced or even shifted with those of other materials deposited curbside, compared to materials sampled during the 2012-2013 characterization study.

1.2.4 Construction, renovation and demolition (CRD) waste

After seeing a significant increase between 2010 and 2012-2013 in the quantity of CRD waste deposited curbside, we now see an opposite trend between the current characterization study and the previous one. Table IV presents the generation data for these materials. Each Quebecer placed 17 kg of materials at the curb per year, a decrease of 47% compared to 2012-2013. In total, 138,600 tonnes were placed at the curb each year.

Table IV: CRD waste generated curbside

	2012-2013	2015-2017
Quantity (kg/person/yr.)	32	17
Provincial tonnage per year	255,000	138,600
Proportion of total generated	8%	5%

More specifically, the downward trend in quantities of lumber continues, as total quantities curbside fell by 39% between 2012 and 2017. Since 2010, quantities at the curb have gone down almost 60%. The significant drop can be attributed in part to the same reasons as bulky items, as the recovery streams are generally the same (special collections, eco-centres or drop-off points authorized by municipalities).

1.2.5 Hazardous household waste (HHW)

Table V shows the results for HHW. In contrast to the trends observed for most materials, amounts of HHW generated at the curb per person are stable, coupled with a slight increase in the total amount generated. The 26,400 tonnes generated province-wide represent an increase of 3% compared to the 2012-2013 study.

Table V: HHW generated curbside

	2012-2013	2015-2017
Quantity (kg/person/yr.)	3	3
Provincial tonnage per year	25,600	26,400
Proportion of total generated	1%	1%

Of the five categories of HHW, electronic products are the most frequently collected and make up 37% of this stream.

1.2.6 Textiles

In line with the trend observed for most of the materials in this study, the quantity of textiles placed at the curb has dropped. As is clear in Table VI, 74,100 tonnes of textiles per year were placed at the curb, which represents a drop of 22% compared to the 2012-2013 study. Per person, the drop reaches 25%.

Table VI: Textiles generated curbside

	2012-2013	2015-2017
Quantity (kg/person/yr.)	12	9
Provincial tonnage per year	95,100	74,100
Proportion of total generated	3%	3%

This slump may in part be due this material being transferred towards reuse.

1.2.7 Other materials

The following table shows data for miscellaneous materials. Along with HHW, these are the only materials where we saw an increase in generated quantities. The increase reached 37% and represents 92,400 tonnes generated per year for the 2015-2017 study, or 11 kg per person.

Table VII: Other materials generated curbside

	2012-2013	2015-2017
Quantity (kg/person/yr.)	8	11
Provincial tonnage per year	67,400	92,400
Proportion of total generated	2%	3%

This category includes materials that cannot be classified in other streams, such as disposable razors, bicycle inner tubes, incandescent bulbs, Christmas garlands, etc. For the time being, most of these materials have no other collection or recovery streams than disposal once they reach the end of their lifecycle.



1.2.8 Liquids

This class is new and was not in previous characterization studies. Previously, liquids were partially excluded; only the organic portion was included and integrated into organic materials for compilation and analysis. Liquids are present in some containers placed in recycling bins (e.g. liquid left at the bottom of a water or oil bottle) or may collect due to precipitation (e.g. melted ice or snow). All liquids are included in this category, except hazardous materials (solvents, oils, paints, etc.). Quantities generated province-wide for the 2015-2017 characterization study are 31,400 tonnes per year. As demonstrated by the results presented in Table VIII, liquids only account for 1% of the total generated.

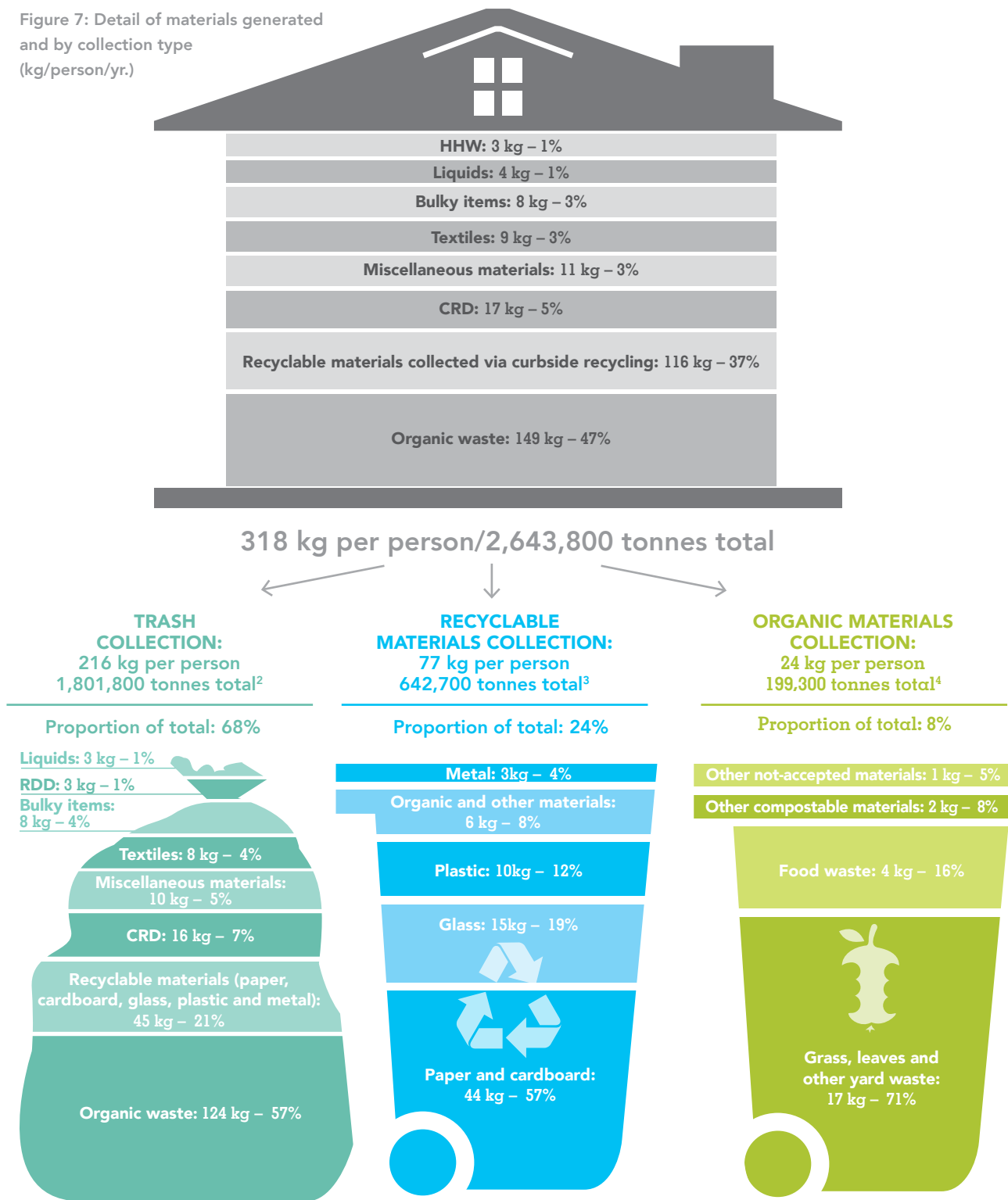
Table VIII: Liquids generated curbside

	2015-2017
Quantity (kg/person/yr.)	4
Provincial tonnage per year	31,400
Proportion of total generated	1%

1.3 Results by collection type

This section of the characterization study presents details by type of collection. The figure below shows quantities generated per person, as well as the composition of the materials for each of the three collections studied.

Figure 7: Detail of materials generated and by collection type (kg/person/yr.)



² Province-wide tonnages for waste collection for the 102 materials studied are available in Appendix I.

³ Province-wide tonnages for recyclable materials collection for the 102 materials studied are available in Appendix I.

⁴ This is an estimation for the province based on total population in Quebec, not on population served.



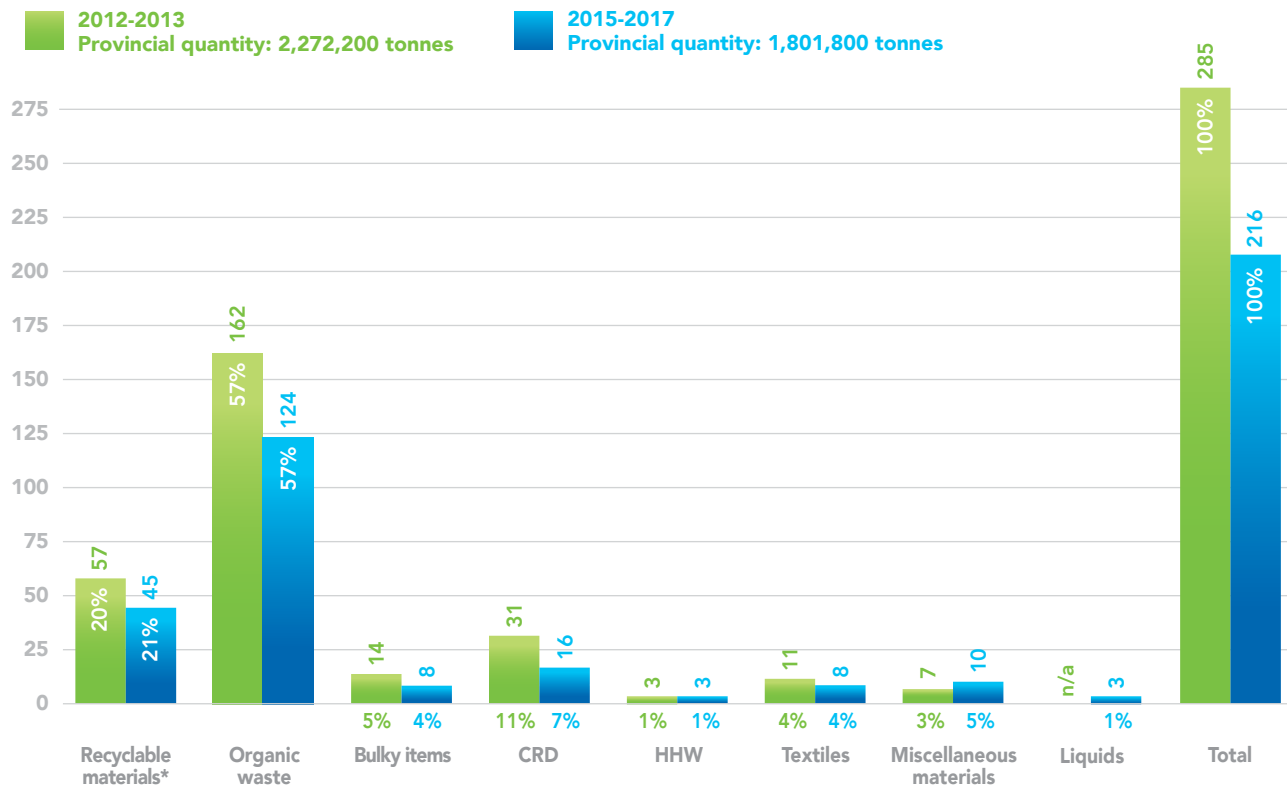
By comparing the three collections and the proportion they occupy in relation to the total, it is interesting to underline the drop in weight of waste compared to the total generated (68% instead of 72% in 2012-2013), for the benefit of recyclable materials and collection of organic materials, which combined, make up 32% of the total of the three collections, compared to 28% for 2012-2013. It is therefore an increase in the rate of diversion of materials to recycling and recovery.

1.3.1 Trash collection

The overall decrease in the quantities of residual materials generated results mainly from the drop in quantities of waste collected per person, details of which are presented in Figure 8. For the 2015-2017 study, every Quebecker put out 216 kg of waste at the curb annually. Compared to the results of the 2012-2013 characterization study, this is a drop of 24%. Province-wide, there is also a drop. Just over 1.8 million tonnes of materials were put into waste collection bins by residences, or 21% less than for 2012-2013.

The composition has remained relatively stable. Organic matter is still the most abundant matter. As in 2012-2013, they represent 57% of the content of waste collections. The most notable difference in composition concerns CRD waste, the proportion of which found in waste has gone from 11% to 7%.

Figure 8: Weight and composition of materials found in garbage collection (kg/person/yr.)



* (paper, cardboard, glass, plastic and metal)

With the exception of HHW and miscellaneous materials, we note that the decrease affects all materials. The biggest drops are with CRDs and bulky items, which represent 48% and 43% respectively. Overall, the quantities of recyclable materials sent for disposal have dropped by 21%.

As for organic matter, the tonnage went down by 23%. All classes of organic matter are affected by this drop (see Appendix I for tonnages by class), but the drop observed for the quantities of leaves in waste is much more marked than the general trend, as we see a difference of 64% between the two studies. Several hypotheses can be put forward to explain this decrease. Part of it can certainly be explained by a greater offer of municipal services for the collection of organic matter. More details are available in section 1.3.3. Concurrently, more and more municipalities are promoting leafcycling or prohibiting the disposal of leaves in the waste collection. In addition, during the fall, the sample collection effort focused on municipalities offering a green waste collection service; it is therefore possible that this choice has a downward impact on estimated quantities that end up in waste. Weather may also have contributed to higher quantities of leaves left on the ground (late falling coupled with snowfall or early frost) rather than being placed at the curb by residents.

Reuse of shopping bags

Among recyclable materials (paper, cardboard, glass, plastic, metal) found in waste are shopping bags. A lesser amount of degradable bags is also present. The two types of bags combined account for nearly 10% of plastics contained in waste and they are partly reused as waste bags, replacing bags designed for this specific purpose. The results of the additional sorting carried out make it possible to determine reuse rates more precisely and assert that a large majority of the shopping bags found in waste were reused as bags to contain this waste, as shown by the rates presented in Table IX. Reuse rates indicated are based on the number of bags.

Table IX: Reuse rate of shopping bags included in waste collection

Types of bags		Reuse rate
Non-degradable bags	T-shirt bags	76.1%
	Other types of bags	60.5%
	Average of non-degradable bags	74.6%
Degradable bags	T-shirt bags	72.0%
	Other types of bags	64.2%
	Average of degradable bags	71.4%

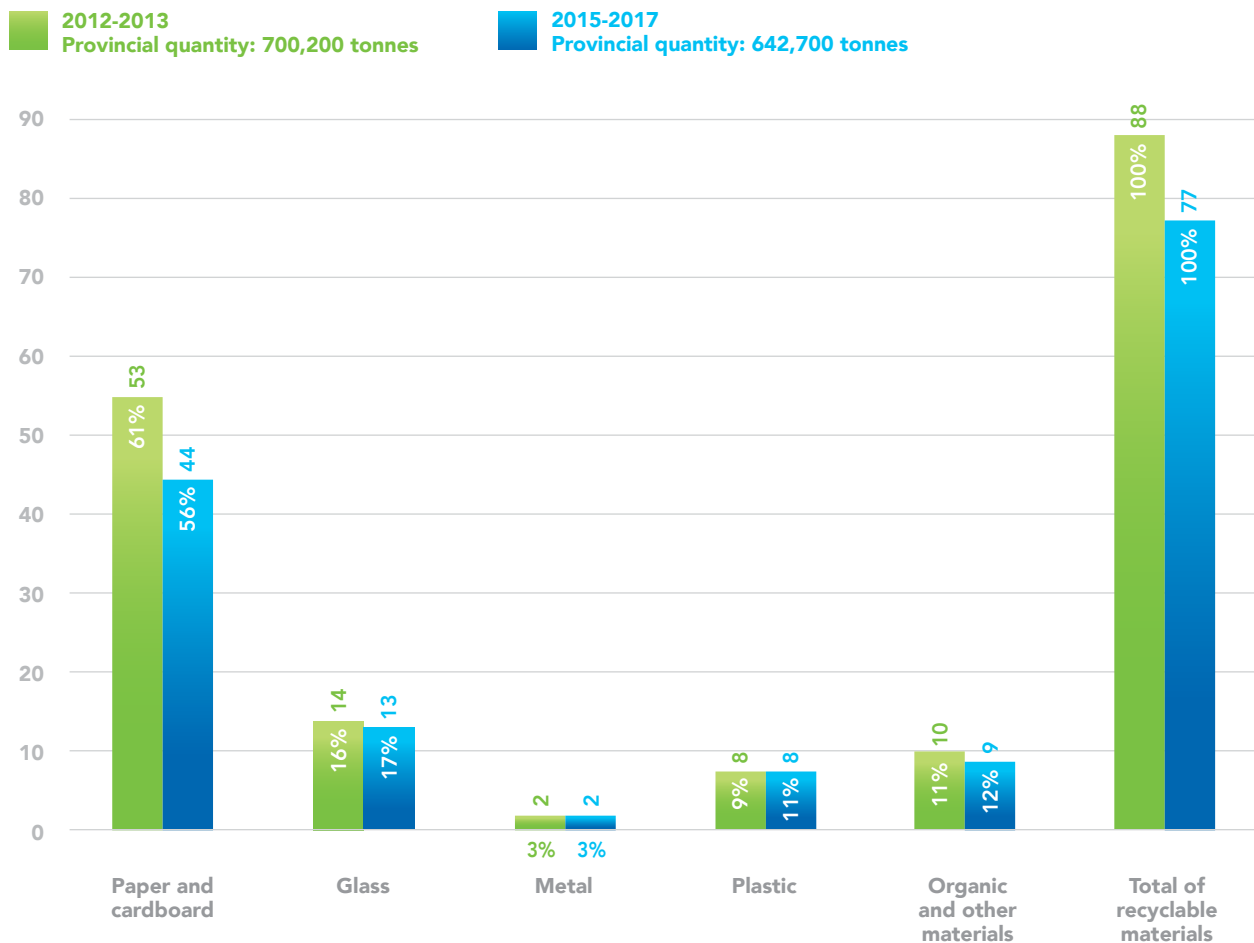
1.3.2 Recyclable materials collection (paper, cardboard, glass, plastic and metal)

Each resident put out 77 kg of recyclable materials for curbside recycling, which represents a drop of 13% compared to 2012-2013 and follows the general downward trend observed previously. Note, however, that compared to 2012-2013, the collection of recyclable materials represents a slightly larger share of residual materials put out for curbside recycling (24% instead of 22%).

1.3.2.1 Quantities and composition of recyclable materials recovered

Since 2010, the per-capita quantities of paper and cardboard found in recyclable materials curbside collections have dropped by 25%. This significant reduction also has an impact on the composition of the collection. Figure 9 shows a decrease in the proportion of fibers found in the collection of recyclable materials, which represented 56% of the contents in 2015-2017, which is 5% less compared to the 2012-2013 characterization study. For other materials, the trend is stable.

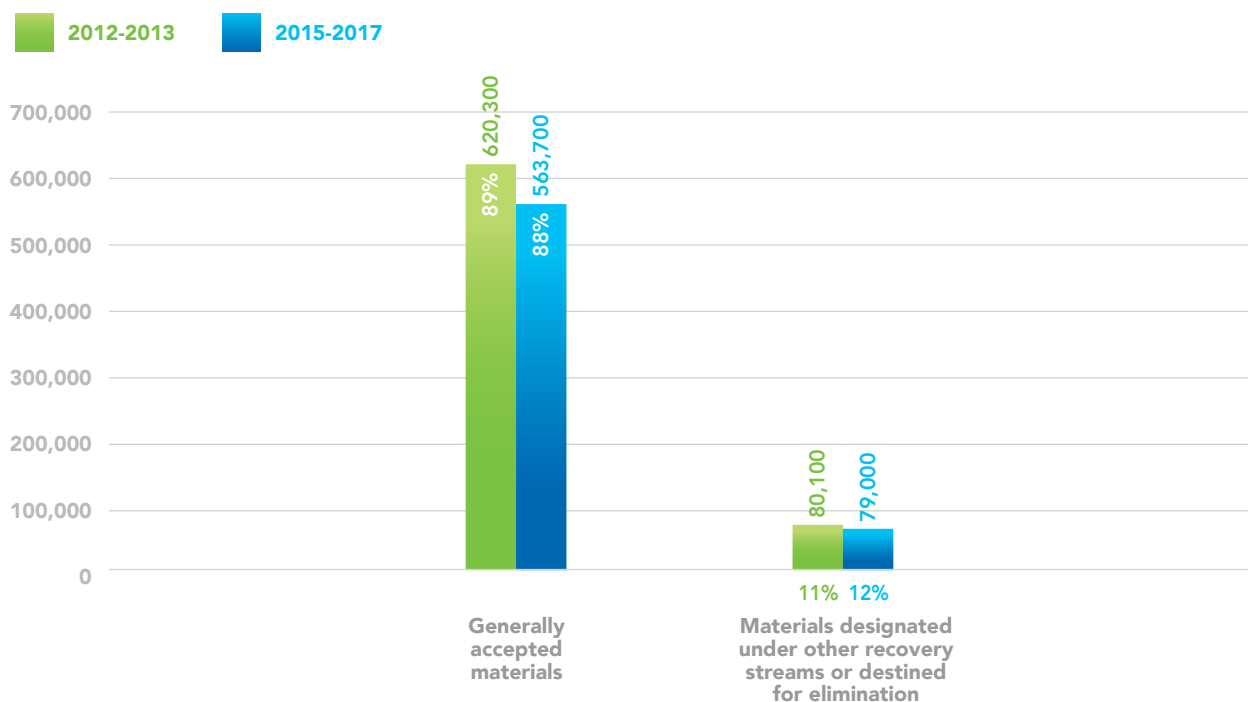
Figure 9: Weight and composition of materials found in the recyclable materials collection (kg/person/yr.)



From a regulatory standpoint⁴, the current recovery system does not cover all recyclable materials. Returnable containers, materials made of paper, cardboard, plastic, glass or metal that are recyclable, but not compatible with the current system, as well as organic matter and other contaminants, should not end up in the recycling bin. They all have in common that they must be directed to other recovery streams (deposit returns, eco-centres, etc.). Materials that must be placed in the recycling bin are containers, packaging, printed matter and newspapers made of paper, cardboard, glass, plastic and metal. These are the generally-accepted materials for recyclable materials collections. Materials targeted by other recovery streams, as well as those for which there are currently no or few outlets, should not be included in the recyclables collection (e.g. miscellaneous metals and plastics, degradable plastics, wood crates, cork, broken dishes and porcelain).

The distinction between materials generally accepted in the recyclables collection and other materials is also used to evaluate the performance of this collection. The figure below shows quantities and proportions of materials found in the collection of recyclable materials, according to their acceptability in the system. It is noted that the generally accepted quantities of material recovered have dropped by 9% since the last characterization study, although it is noted that the performance has still remained roughly the same.

Figure 10: Quantities of materials recovered via the recyclable materials collection in Quebec (tonnes/yr.)



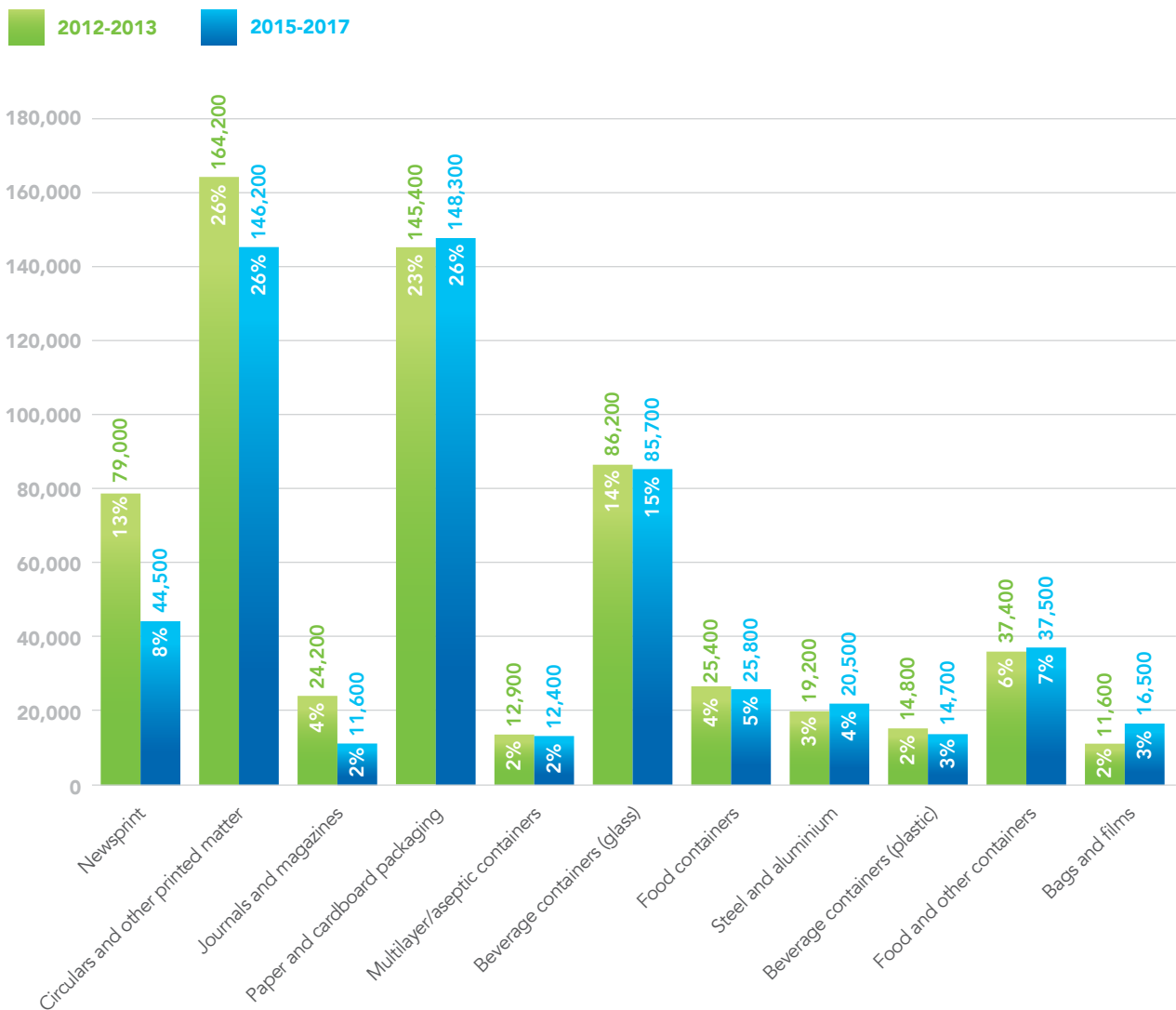
⁴ RECYC-QUÉBEC. [Régime de compensation pour la collecte sélective des matières recyclables.](#)


1.3.2.2 Materials generally accepted in the recyclable materials collection

This section only covers categories of materials that are generally accepted in the collection of recyclable materials. According to the 2015-2017 study, 563,700 tonnes of these materials were recovered annually. This lower quantity compared to 2012-2013 (-9%) follows the same trend as that observed for quantities of materials found in waste collection. Figure 11 presents the provincial tonnages by major class of materials.

The most abundant are those made of paper and cardboard. They represent 64% of accepted materials found in the recycling bin. Quantities of glass (second most important material) and metals are practically the same as in the 2012-2013 study. The only material for which significant growth is observed is plastic, where quantities placed in recycling bins have increased by 8%, in particular due to bags and films. Figure 11 also presents provincial tonnages recovered annually and the breakdown by subclass.

Figure 11: Recovered quantities of materials generally accepted in the recyclable materials collection in Quebec (tonnes/yr.)





The most highly recovered material classes categories are fibers, mainly paper and cardboard packaging, as well as circulars and other printed matter. Newspapers continue to decline and represent a smaller and smaller portion of the bin contents. There is also a decrease of more than half of the tonnage of journals and magazines recovered compared to the previous characterization study. With circulars and other printed matter, the quantities of which have dropped by 11% despite a similar proportion compared to the previous characterization study, it is possible to hypothesize an evolution regarding consumption, where newspapers and printed matter are increasingly being abandoned in favour of online media and advertising.

At the same time, recovered plastic bags and film are up 42%, and paper and cardboard packaging saw a slight increase as well. This growth can be justified at least in part by the increasing popularity of e-commerce, considering that these materials are the preferred packaging for that type of purchase. Indeed, in 2017, 58% of Quebecers made at least one online purchase⁵, compared to one in two people in 2012⁶. Other than these upward variations, the trend for other materials remains rather stable.

Recovery rates of generally accepted materials

Performance measurement and the evolution of the recovery rate is possible thanks to the residential characterization study and only targets materials generally accepted in the collection of recyclable materials. For 2015-2017, the average recovery rate is 63.5%, a slight improvement over 2012-2013 (62.5%). It should be noted, however, that this performance is below the maximum rate reached in 2010 (64.8%). Once again, this slight change reflects certain stagnation in consumer behavior.

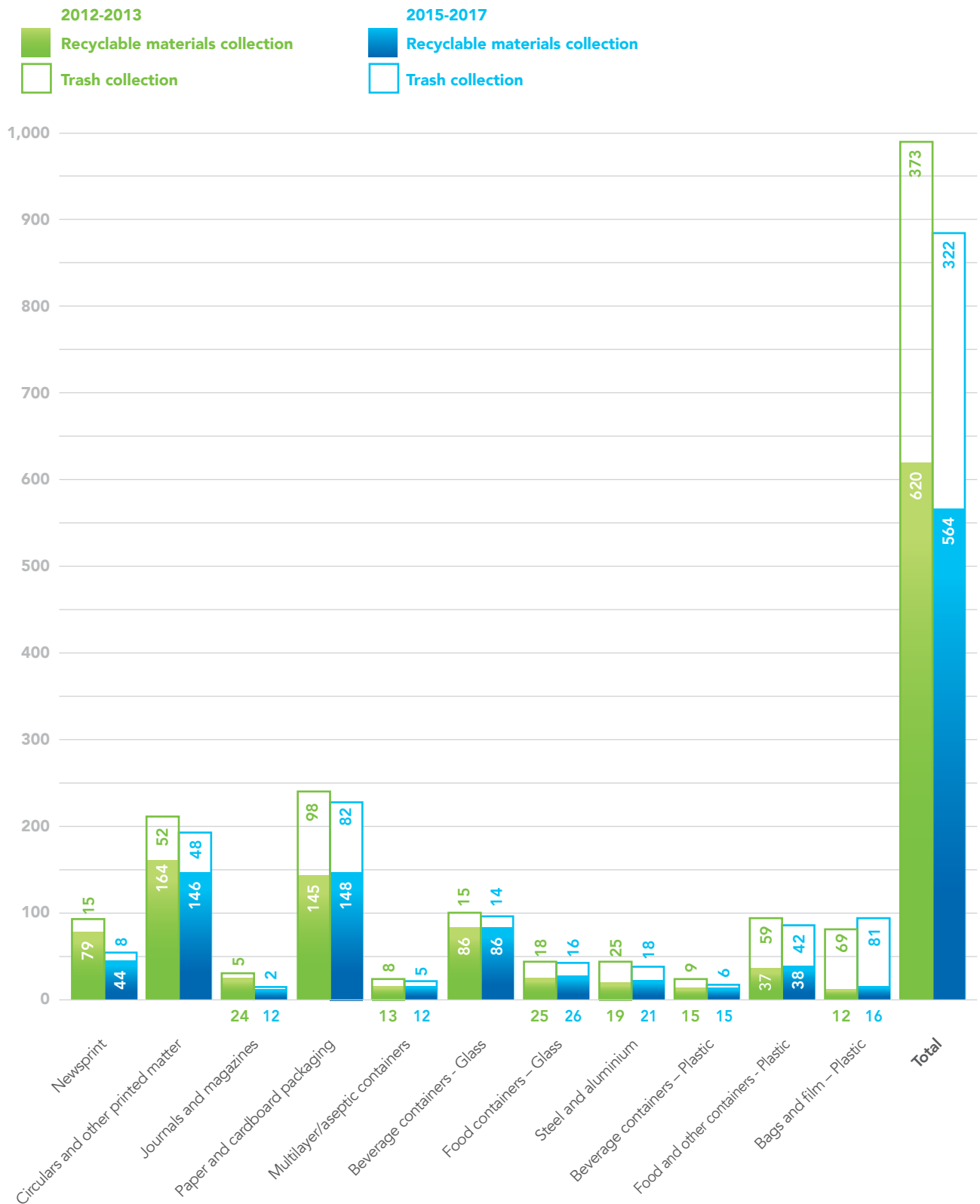
By comparing quantities of generally accepted recyclables recovered and eliminated (Figure 12), we see the following: Although recovered quantities of generally accepted materials have dropped between the two characterizations (-9%), the decrease is more marked with regard to quantities of recyclable materials placed in the waste, which fell from 373,000 to 323,000 tonnes, a 14% drop.

⁵ CEFRIO (2018). [NETendances 2017 – Le commerce électronique au Québec](#), p. 5.

⁶ CEFRIO (2013). [NETendances 2012 – Le commerce électronique et les services bancaires en ligne au Québec](#), p. 6.



Figure 12: Recovered and eliminated quantity of materials generally accepted in the recyclable materials collection (kt tonnes/yr.)

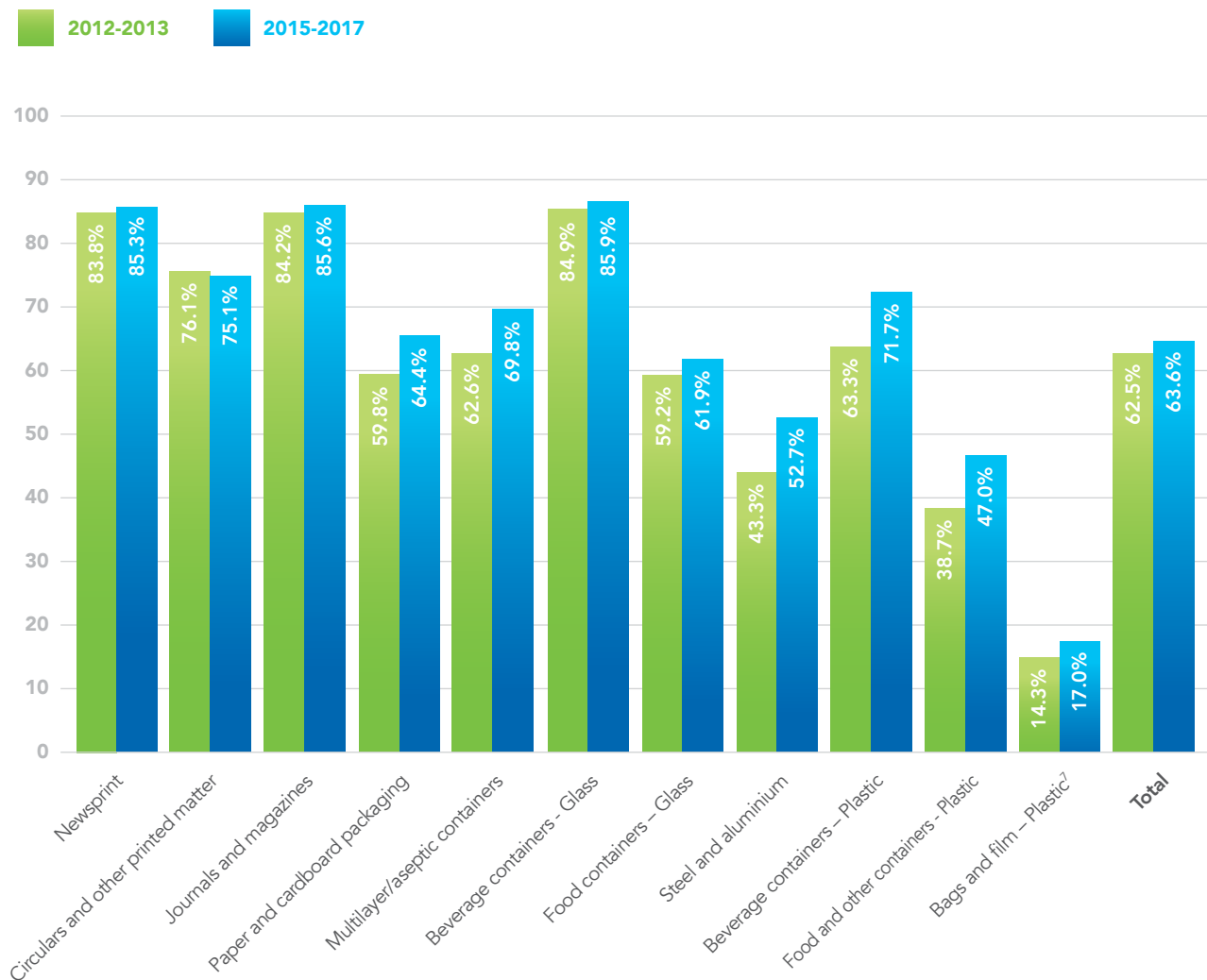




Furthermore, if we take a closer look at recovery rates for the different classes of materials shown in Figure 13, we can see improvements for the majority of materials, with the exception of circulars and other printed matter. The most notable improvements are in steel (9.4%) and aluminum containers, beverage containers (8.4%), as well as food and other plastic containers (8.3%). Thus, it seems that in general, consumers behaviour is better when it comes to putting materials in the recycling bin.

Just as in 2012-2013, newspapers, journals, magazines and glass beverage containers have the highest recovery rates. With the exception of glass, the quantities of materials continue to drop. Consequently, efforts must continue and place greater emphasis on materials for which the rates remain low despite their widespread use in Quebec residences. Detailed recovery rates for all materials generally accepted in the recyclable materials collection are presented in Appendix I.

Figure 13: Recovery rates for materials generally accepted the in recyclable materials collection (%)



⁷ A previous section on the reuse rate of shopping bags helps to qualify this result.

The recovery performance of materials generally accepted in the recyclable materials collection has therefore improved very slightly, despite a drop in the quantities of materials generated. It will be interesting to see whether this trend continues in the coming years, as this drop follows a significant increase measured between 2010 and 2012-2013.

What we observe elsewhere in North America nevertheless confirms certain trends and qualifies the weak performance evolution in Quebec. A characterization study conducted in Vermont and published in 2018⁸, comparing some of its results to those of border States, also shows a decrease in the quantities of paper collected. There is also a decline in performance in several provinces. In 2017, Ontario recorded the lowest recovery rate from its Blue Box program since 2005, with the exception of the paper rate.⁹

1.3.2.3 Materials designated under other recovery streams

The following table lists materials not accepted in the recyclable materials collection and covered by other recovery streams or intended for disposal. However, some of these are covered under the compensation plan, namely, wood containers and packaging, shopping bags and other degradable plastics.

Table X: Quantity of materials placed in the recyclable materials collection, but covered by other recovery streams (tonnes/yr.)

Class	Material	2012-2013	2015-2017
Paperboard	Containers and packaging made of wood	2,200	800
Total - Paper and carton		2,200	800
Glass	Refundable glass alcoholic beverage bottles	8,200	6,600
	Refundable glass non-alcoholic beverage bottles	1,600	2,100
	Metal caps/lids - Refundable glass	n/a*	< 100
	Non-identifiable broken glass	n/a*	1,700
	Flat glass, stoneware, ceramic and other glass	7,700	3,100
Total - Glass		17,500	13,600
Metal	Refundable cans	2,000	1,900
	Other metals	5,600	3,900
Total - Metal		7,700	5,800
Plastic	Refundable plastic bottles	1,800	1,200
	Plastic caps/lids – Refundable/deposit	n/a*	< 100
	Polylactic acids (PLA) and other degradable plastics	700	< 100
	Degradable shopping bags	n/a*	100
	Rigid packaging and durable items made of non-designated, code-free and #7 plastic (non-PLA) and other plastics	9,600	9,000
Total - Plastic		12,100	10,500

⁸ DSM Environmental Services Inc. (2018). [2018 Vermont Waste Characterization](#). Prepared for Vermont Department of Environmental Conservation, solid Waste Program.

⁹ The Paper and Paperboard Packaging Environmental Council (2017). [Ontario Blue Box recovery rate slips, but paper steady](#).

Class	Material	2012-2013	2015-2017
Organic waste	Grass	400	< 100
	Leaves		200
	Other yard waste		1,700
	Food waste	6,200	5,800
	Other compostable waste generally not accepted in a 3 rd stream collection	5,100	2,200
	Other organic waste treatable by composting or bio-methanization		1,600
	Disposable diapers		700
Total – Organic waste		11,700	12,300
HHW	Other HHW	1,500	1,100
	Containers - Empty or with residual motor oil or antifreeze		200
	Containers - Empty or with residual paint		300
	Used filters		< 100
	Mercury lamps/bulbs		< 100
	Batteries		200
	Electronic products		1,500
Total - HHW		1,500	3,400
CRD	Other furniture, bulky items and other household items	1,900	2,500
	Other CRD waste	4,400	5,000
	Lumber	1,900	800
	Large and small household electrical appliances, refrigerating appliances and electric tools	5,500	1,700
Total - CRD		13,700	10,000
Textiles	Textiles and footwear	5,300	6,400
Total – Textiles		5,300	6,400
Liquids	Other food liquids	n/a**	4,700
	Other non-food liquids	n/a**	1,200
Total - Liquids		n/a	5,900
Other	Other residual waste	2,700	7,100
	Miscellaneous objects	5,600	2,800
	Fine particles	n/a*	200
	Protective pads used on fruit or meat tray bottoms	n/a*	100
Total – Miscellaneous materials		8,300	10,200
Overall total		80,100	79,000

Quantities of materials found in the recyclables collection that should not be there have decreased very slightly. Materials covered by other recovery streams with the greatest decreases are wood containers and packaging (-64%), CRD (-27%) and metals (-25%). All in all, that overall decrease is quite small, as for certain categories, conversely, quantities have increased. This is the case for HHW (127%), miscellaneous materials (23%) and textiles (21%).

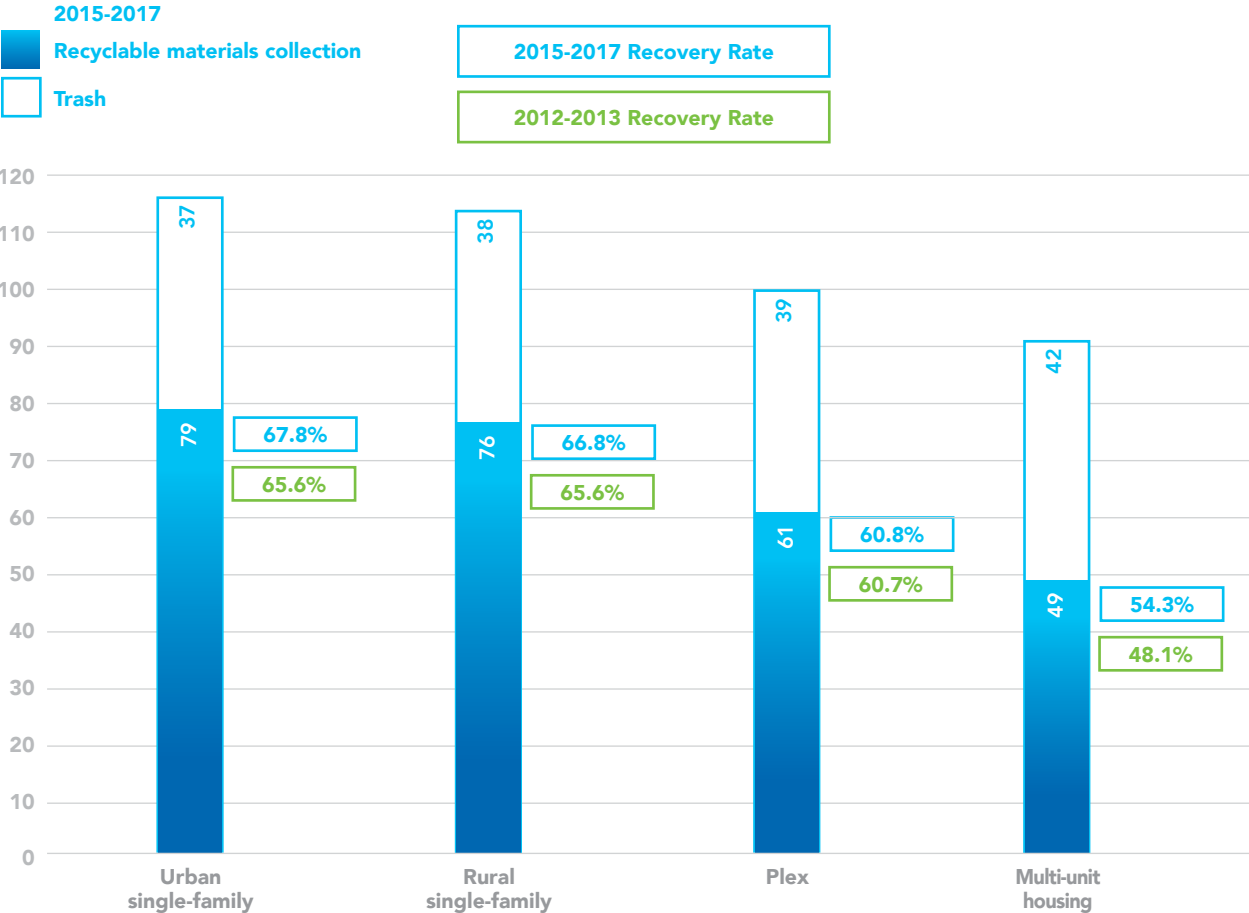
* Included in another category.

** Excluded in 2012-2013.

1.3.2.4 Quantities and performance of recyclable materials collections according to dwelling type

The study highlights differences (quantities generated per person, performance) between the various types of dwellings. Several factors may explain the differences between dwelling types observed in Figure 14. Consumer habits, the number of people per household, access to services, household income and education level, among other things, vary according to dwelling types and have an impact on habits and behaviour regarding waste management, as has already been demonstrated in a previous study¹⁰.

Figure 14: Recovered and eliminated quantities and rate of recovery of materials generally accepted in the recyclable materials collection based on dwelling type (kg/person/yr.)



Recovery performance is better for urban and rural single-family dwellings. However, between 2012-2013 and 2015-2017, we noted an improvement in performance of multi-unit housing. We also note that the generation of recyclable materials is higher in single-family residences and decreases conversely as per the number of residential units per dwelling.

¹⁰ RECYC-QUÉBEC and ÉEQ (2007). *Caractérisation des matières résiduelles du secteur résidentiel au Québec 2006-2007*.

1.3.3 Organic waste collection

Organic waste samples gathered from curbside covered three types of collections:

- Green waste collection
- Combined green and food waste collection
- Food waste collection

It does not include materials recovered through voluntary drop-offs (eco-centres, community composting) or those recycled directly at the consumer's home (grasscycling, leafcycling, home composting). Organic waste collection, unlike that of recyclable materials and trash, is not available to all Quebec residents, although more and more municipalities are providing the service. It is also difficult to measure the evolution of the rate of service, as the types and proportions of units covered vary from one municipality to another and are not precisely known.

Table XI shows average quantities recovered per person per year in Quebec, taking into account only households that have access to one of the three types of door-to-door organic waste collection.

Table XI: Quantity recovered per person in serviced area, according to service type (kg/person/yr.)

	2012 – 2013 ¹¹	2015-2017
Yard waste collection	36	47
Combined yard and food waste collection	128	67
Food waste collection	n/a	19

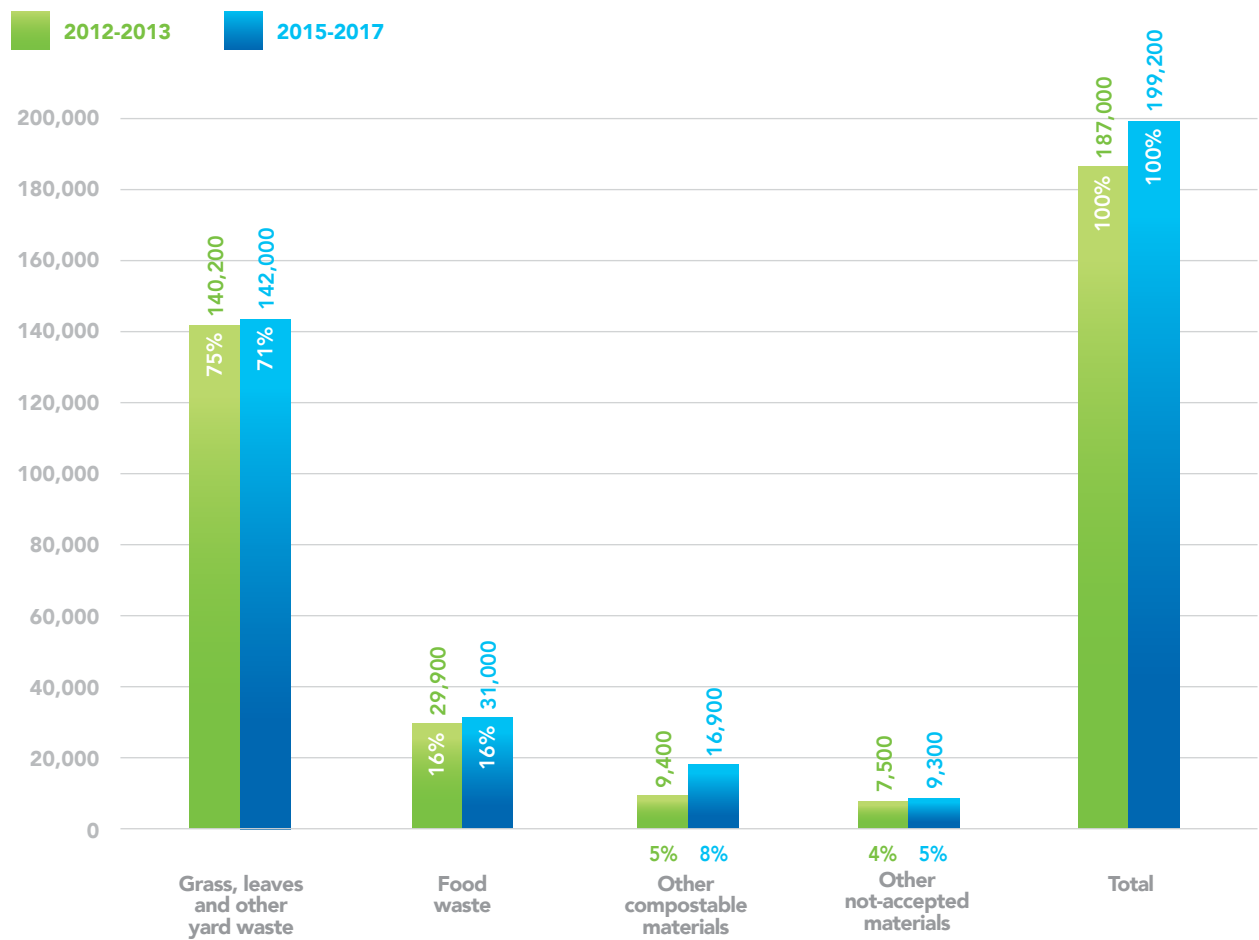
There is also a significant difference between 2012-2013 and 2015-2017 with regard to quantities recovered per person for the combined collection of green and food waste. Several factors explain this significant decrease. Between this characterization study and the previous one, service has expanded to include new residences. We know that quantities recovered are generally lower when it comes to a new service and that these tend to increase in time, especially with information and awareness activities. Moreover, in previous studies, housing units selected were mainly single-family residences, as organic waste collection was mainly aimed at that category of dwelling. As service to different types of housing increases, the random selection includes more and more plexes and multi-unit housing that generate and place at curbside smaller quantities of organic waste, which has a significant downward impact on the average (see the "Results by type of dwelling" section). Moreover, this decrease is consistent with the overall trend observed for quantities generated curbside.

¹¹ During the 2012-2013 characterization study - due to the non-standardized collection methods, differences between the sample sizes, as well as seasonal variations and frequency of collections - the data were analyzed together with those of 2010 in order to ensure greater reliability.



With regard to quantities and composition presented in Figure 15, on the one hand, quantities recovered went up 7% compared to the previous characterization study. This can be explained namely by an increased rate of service. This increase will continue with the additional service offer brought on by the implementation of new composting and bio-methanization sites slated to be operating by 2022 in several municipalities. We also found that quantities recovered are mostly green residues. These are still in a slightly less marked proportion compared to 2012-2013, when they represented 75% of materials recovered. This slight change in composition may be attributable to an increase in amounts of other types of organic waste being recovered due to an increased in the collection of food waste, either alone or combined with green waste.

Figure 15: Quantity recovered and average composition of materials found in the organic waste collection, all collection types combined (tonnes/yr.)



As mentioned in the section on trash collection, we observe a significant decrease in tonnages of organic waste eliminated. Part of the drop in tonnage of organic waste found in the trash can be explained by a transfer of these to organic waste collection (3rd stream).

Results according to dwelling type

We found that quantities recovered in single-family residences, particularly in urban areas, are much higher than in other types of dwellings (Table XII). Several factors can explain the spread between the various types of dwellings. The results are presented by unit of occupancy, and the number of people per household is generally greater in single-family homes than in plexes or multi-unit housing. On average, the per-household number of people for single-family homes is close to three (2.7) and just below two (1.9) for multi-unit housing. Additionally, single-family residences are generally surrounded by green spaces, including lawns and landscaping, which creates an increase in quantities of green waste generated. In contrast, the green space area is generally not as big for plexes and multi-unit housing. In addition, the implementation of organic waste collection in multi-unit housing represents a particular challenge, which can have an impact on the quantities recovered in this type of dwelling. In rural areas, it is also possible that residents are more accustomed to leaving leaves and other green waste on site, which reduces quantities collected curbside.

Table XII: Quantity recovered per unit according to dwelling type (kg/yr.)

	Green waste	Combined food and yard waste	Food waste
Urban single-family	233	283	72
Rural single-family	37	226	n/a
Plex	47	96	26
Multi-unit housing	14	12	33
All housing types	109	157	43

Residential sector performance

Of the 1,244,000 tonnes of organic waste generated in 2015-2017, 199,300 were recovered curbside for composting or bio-methanization, which is a 16% rate of recovery. Overall, we see an improvement of performance, which was 13% in 2012-2013. However, part of the increase in quantities collected is due to materials generally not accepted in a 3rd stream collection. Indeed, 15% of the additional 12,300 tonnes recovered were from that class of material, some of which are only accepted in a limited number of facilities (e.g. animal litter and diapers). As with recyclable materials, information, awareness and education efforts must continue in order to improve the quality of recovered organic waste, the objective being to optimize and facilitate their reclamation.

It is important to specify that these results cannot be compared with those of the residual materials management report or *Bilan de la gestion des matières résiduelles au Québec*. Indeed, the recycling rate presented in the *Bilan* (report) is not calculated based on residential materials collected curbside, but from tonnages received at composting and bio-methanization facilities that process organic waste from different sources (residential, municipal, ICI).

It is also interesting to look at performance by taking into account only single-family households, which are more widely served, for the combined collection of food waste and green waste, which is the most common. Excluding rejected and generally non-accepted materials, the recovery rate is 63%. Even if the service is available, a significant amount of organic waste still gets thrown away. However, with the recent implementation of several collections, and as information and awareness efforts continue, we can expect to see an increase in performance over the next few years.



CONCLUSION

This fourth residential characterization study carried out jointly by RECYC-QUÉBEC and ÉEQ provides a portrait of the habits and behaviours of Quebecers regarding the management of residual materials generated in their homes. Ad hoc characterization studies are equally essential in monitoring the evolution of quantities recovered and the system's performance in order to highlight improvements, but also, to target those areas where efforts must be maintained or prioritized.

For 2015-2017, Quebecers generated 318 kg of residual waste per year, a relatively lower amount compared to 2012-2013. This 20% slump is not, however, coupled with a significant increase in performance. It seems, therefore, that Quebecers manage materials as they did in previous years, although they more frequently make the right choice when it comes to disposing of a material in one or the other of the available streams. It is possible to hypothesize that the materials situation is evolving towards reduction at the source, whether this is due to a change in consumer habits and behaviour, a reduction of material weight and over-packaging, or a combination of all these factors. However, observation must continue before this can be considered as a trend that will be maintained.

As for organic waste, recovered quantities remain relatively low in spite of expanding service. However, it is possible to hope for a steady increase of recovery quantities and rates observed.

Information, awareness and education efforts must also continue in order to improve participation and the quality of materials deposited in recyclable material and organic waste collections. Generally speaking, we see a certain stagnation in recovery rates, whereas residents have an essential role to play in ensuring sound management of residual materials.

Appendix I – Quantities of residual materials (trash and recyclable material collections) for all of Quebec (tonnes/yr.) (“Residential” area)

QUEBEC					
Class of materials	Recyclable materials collection	Trash collection	Total	Proportion placed in recyclable materials collection	Recovery rates for materials generally accepted the in recyclable materials collection
Printed matter	202,225	58,079	260,303	77.7%	77.7%
Newsprint	44,490	7,676	52,166	85.3%	85.3%
Newsprint publications and circulars	78,642	13,722	92,363	85.1%	85.1%
Journals and magazines	11,551	1,937	13,488	85.6%	85.6%
Catalogues and bound documents	18,178	3,872	22,050	82.4%	82.4%
Directories	1,809	409	2,217	81.6%	81.6%
Paper for general use and office paper	3,776	2,871	6,647	56.8%	56.8%
Other printed matter	31,667	19,121	50,788	62.4%	62.4%
Books	6,180	1,299	7,479	82.6%	82.6%
Other non-designated printed matter	5,933	7,170	13,103	45.3%	45.3%
Paperboard	161,469	88,719	250,188	64.5%	64.8%
Corrugated cardboard	77,332	22,470	99,802	77.5%	77.5%
Kraft paper shopping bags	2,419	3,445	5,864	41.3%	41.3%
Kraft paper packaging	2,203	7,301	9,504	23.2%	23.2%
Molded pulp	4,328	3,124	7,452	58.1%	58.1%
Boxboard packaging	55,261	33,015	88,276	62.6%	62.6%
Other paper packaging	957	1,167	2,124	45.1%	45.1%
Gable-top containers	8,950	2,542	11,492	77.9%	77.9%
Laminated containers	1,158	3,280	4,438	26.1%	26.1%
Laminated paper	1,801	5,442	7,242	24.9%	24.9%
Composite containers	2,799	2,741	5,539	50.5%	50.5%
Tetra Pak and other aseptic containers	3,463	2,839	6,302	54.9%	54.9%
Containers and packaging made of wood	799	1,355	2,155	37.1%	n/a
Glass	125,139	45,930	171,069	73.2%	78.8%
Refundable alcoholic beverage bottles - glass	6,592	2,761	9,353	70.5%	n/a
Refundable non-alcoholic beverage bottles - glass	2,110	445	2,555	82.6%	n/a
Metal caps/lids - Refundable glass	39	48	87	45.0%	n/a



QUEBEC					
Class of materials	Recyclable materials collection	Trash collection	Total	Proportion placed in recyclable materials collection	Recovery rates for materials generally accepted the in recyclable materials collection
Non-refundable alcoholic beverage bottles - glass	78,591	11,796	90,387	86.9%	86.9%
Non-refundable non-alcoholic beverage bottles - glass	6,916	1,968	8,884	77.9%	77.9%
Metal caps/lids - Non-refundable glass	242	295	537	45.0%	45.0%
Glass containers	25,811	15,884	41,694	61.9%	61.9%
Non-identifiable broken glass	1,705	3,130	4,835	35.3%	n/a
Flat glass, stoneware, ceramic and other glass	3,133	9,604	12,737	24.6%	n/a
Metal	26,351	33,504	59,855	44.0%	52.7%
Refundable cans	1,883	2,095	3,979	47.3%	n/a
Non-refundable aluminium beverage cans	666	356	1,023	65.2%	65.2%
Other rigid aluminium packaging	518	916	1,433	36.1%	36.1%
Aluminium foil and containers	650	5,833	6,483	10.0%	10.0%
Steel aerosol containers and tubes (other than HHW)	295	1,389	1,684	17.5%	17.5%
Other non-refundable metal containers and packaging	17,567	8,946	26,513	66.3%	66.3%
Metal caps/lids - Metals	843	1,029	1,873	45.0%	45.0%
Other metals	3,927	12,940	16,867	23.3%	n/a
Plastic	79,222	148,381	227,602	34.8%	34.8%
Refundable plastic bottles	1,189	979	2,168	54.9%	n/a
Plastic caps/lids – Refundable/deposit	53	39	92	57.4%	n/a
Non-refillable water bottles	7,140	2,659	9,799	72.9%	72.9%
Plastic caps/lids – Water bottles	185	138	323	57.4%	57.4%
#1 non-returnable beverage bottles – Transparent clear, blue or light green	4,640	1,444	6,084	76.3%	76.3%
#1 non-returnable beverage bottles – Opaque or transparent other than clear, blue or light green	286	117	403	71.1%	71.1%
#1 bottles other than beverage and containers with tops - transparent clear, blue or light green	4,080	3,314	7,393	55.2%	55.2%
#1 bottles other than beverage and containers with tops - opaque or transparent other than clear, blue or light green	547	484	1,031	53.1%	53.1%
Plastic caps/lids – #1 clear bottles	97	72	169	57.4%	57.4%
Plastic caps/lids – #1 opaque bottles	9	7	15	57.4%	57.4%
Plastic caps/lids - #1 clear container	132	98	231	57.4%	57.4%



QUEBEC					
Class of materials	Recyclable materials collection	Trash collection	Total	Proportion placed in recyclable materials collection	Recovery rates for materials generally accepted the in recyclable materials collection
Plastic caps/lids - #1 opaque container	35	26	61	57.4%	57.4%
Other #1 packaging – Transparent clear, blue or light green	2,349	2,037	4,385	53.6%	53.6%
Other #1 packaging – Opaque or transparent other than clear, blue or light green	923	1,103	2,025	45.6%	45.6%
Clamshell #1	4,749	3,261	8,011	59.3%	59.3%
#2 beverage bottles	2,276	1,307	3,582	63.5%	63.5%
#2 bottles other than beverage and containers with tops	9,499	4,130	13,629	69.7%	69.7%
Plastic caps/lids – #2 bottles	88	66	154	57.4%	57.4%
Plastic caps/lids - #2 container	265	197	461	57.4%	57.4%
Other #2 packaging (except pails and buckets)	673	323	996	67.6%	67.6%
#3 bottles, containers and packaging	401	289	689	58.1%	58.1%
Plastic caps/lids - #3 plastic	18	13	31	57.4%	57.4%
#4 rigid plastic	305	294	599	50.9%	50.9%
#5 rigid plastic (except pails and buckets)	5,444	7,527	12,971	42.0%	42.0%
#2 and #5 pails, buckets and lids	748	1,433	2,182	34.3%	34.3%
Targeted rigid plastic packaging, non-coded and #7 plastic (non-PLA)	1,270	3,580	4,850	26.2%	26.2%
Plastic caps/lids – Other plastics	2,646	1,966	4,612	57.4%	57.4%
Other expanded plastics	48	276	323	14.8%	14.8%
#6 expanded food containers and packaging	654	5,010	5,663	11.5%	11.5%
#6 expanded protective containers and packaging	879	1,269	2,149	40.9%	40.9%
#6 non-expanded containers and packaging	1,862	5,623	7,485	24.9%	24.9%
Stand-up pouches	758	1,470	2,228	34.0%	34.0%
Other bags and plastic films and laminates	4,570	26,182	30,752	14.9%	14.9%
#2 and #4 films and bags	6,906	12,943	19,850	34.8%	34.8%
Other plastic film	1,763	26,797	28,561	6.2%	6.2%
Non-degradable shopping bags	2,471	13,180	15,651	15.8%	15.8%
Degradable shopping bags	150	830	980	15.3%	n/a
Polylactic acid (PLA) and other degradable plastics	94	122	216	43.4%	n/a
Rigid packaging and durable items made of non-designated, code-free and #7 plastic (non-PLA) and other plastics	9,018	17,778	26,796	33.7%	n/a



QUEBEC					
Class of materials	Recyclable materials collection	Trash collection	Total	Proportion placed in recyclable materials collection	Recovery rates for materials generally accepted the in recyclable materials collection
Organic waste	12,322	1,032,418	1,044,741	1.2%	n/a
Grass	77	37,976	38,053	0.2%	n/a
Leaves	204	23,213	23,418	0.9%	n/a
Other yard waste	1,707	143,889	145,596	1.2%	n/a
Food waste	5,844	478,267	484,111	1.2%	n/a
Other organic waste treatable by composting or bio-methanization	1,602	74,203	75,806	2.1%	n/a
Disposable diapers	679	69,689	70,368	1.0%	n/a
Other compostable materials generally not accepted in a 3 rd stream collection	2,208	205,181	207,390	1.1%	n/a
Bulky items	4,245	63,751	67,996	6.2%	n/a
Large and small household electrical appliances, refrigerating appliances and electric tools	1,727	7,808	9,534	18.1%	n/a
Other furniture, bulky items and other household items	2,518	55,943	58,462	4.3%	n/a
CRD	5,768	132,792	138,560	4.2%	n/a
Lumber	756	28,460	29,216	2.6%	n/a
Other CRD waste	5,012	104,333	109,344	4.6%	n/a
HHW	3,442	22,969	26,411	13.0%	n/a
Electronic products	1,464	8,250	9,714	15.1%	n/a
Batteries	220	1,327	1,547	14.2%	n/a
Mercury lamps/bulbs	66	556	623	10.6%	n/a
Containers - Empty or with residual paint	272	3,867	4,139	6.6%	n/a
Containers - Empty or with residual motor oil or antifreeze	232	1,479	1,711	13.5%	n/a
Used filters	46	570	615	7.4%	n/a
Other HHW	1,143	6,920	8,063	14.2%	n/a
Textiles	6,450	67,641	74,090	8.7%	n/a
Textiles and footwear	6,450	67,641	74,090	8.7%	n/a
Liquids	5,869	25,472	31,341	18.7%	n/a
Other food liquids	4,713	20,886	25,599	18.4%	n/a
Other non-food liquids	1,156	4,586	5,743	20.1%	n/a
Miscellaneous materials	10,194	82,160	92,355	11.0%	n/a
Other residual waste	7,055	61,950	69,006	10.2%	n/a
Miscellaneous objects	2,843	15,275	18,118	15.7%	n/a
Fine particles	175	1,865	2,040	8.6%	n/a
Protective pads used on fruit or meat tray bottoms	120	3,070	3,191	3.8%	n/a
Overall total	642,695	1,801,816	2,444,511	26.3%	63.6%

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