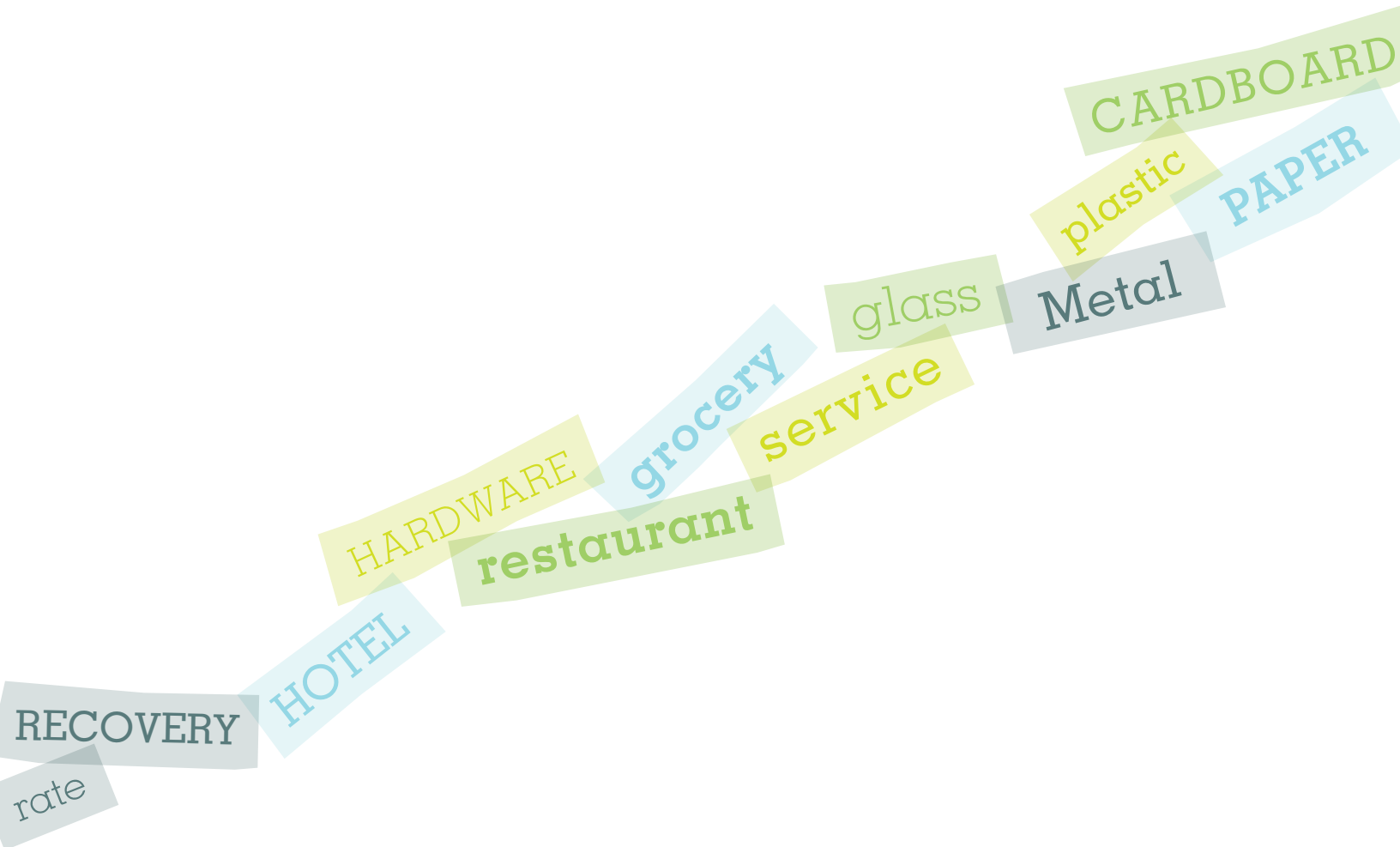




SUPPLEMENTARY
ANALYSIS REPORT ON DATA
PRODUCED BY THE 2008-2009
CHARACTERIZATION
OF RESIDUAL MATERIALS
FROM QUÉBEC'S
COMMERCIAL SUB-SECTOR

MARCH 2011



NOTE to the Reader

A wide-ranging characterization study of residual materials from the business sector in the Greater Montreal area was undertaken in 2008-2009. Partnering in this large-scale study were BFI Canada and its subsidiary Entreprise sanitaire F.A., the Conférence régionale des élus de Montréal, the City of Montréal, RECYC-QUÉBEC and Éco Entreprises Québec (ÉEQ).

The initial study was made up of two parts. First, a characterization of the residual materials from some 1,000 businesses served by municipal and private municipal collection was carried out to determine the composition of residual materials, quantities generated and rates of recovery. Second, a survey of 3,000 businesses throughout Québec was conducted to get an overall picture of their participation in available residual material collection programs. The summary document entitled *Caractérisation des matières résiduelles du sous-secteur commercial au Québec 2008-2009 (2008-2009 Characterization of Residual Materials from Québec's Commercial Sub-Sector, hereafter referred to as 2008-2009 Business Characterization Study)* is the official report published by the partners in the study.

ÉEQ decided to conduct further analysis of the data that were collected as part of that study. These results will be used to determine the allocation of costs per material and to develop ÉEQ's schedule of contributions. It is important to note that responsibility for the results described in this report rests solely with ÉEQ. They consist in a second interpretation of the data from the initial study following calculations and statistical extrapolations carried out by ÉEQ.

It is essential for the reader to understand that the statistical validity of the results presented in this report is not the same as that of results obtained entirely from direct sampling. In addition, the extrapolations in this report are based on a survey of businesses. Even though the margin of error of the survey is very low due to the number (3,000) of businesses surveyed, it is impossible to verify the quality of the responses provided by respondents. Given these limitations, ÉEQ will make judicious use of the results obtained and will only apply them to reveal general trends in residual materials management in the business sector.

1,000
BUSINESSES covered by the
CHARACTERIZATION

TABLE *of* Contents

| | |
|--|-----------|
| 1. INTRODUCTION | 3 |
| 2. METHODOLOGY | 4 |
| 3. RESULTS | 8 |
| 3.1 Composition of Residual Materials Generated by Québec Businesses | 9 |
| 3.2 Recovery Rate by Material | 11 |
| 3.3 Recovery Rate by Sector | 13 |
| 3.4 Composition of Municipal Curbside Collection Serving Businesses | 15 |
| 4. INTERPRETATION AND CONCLUSION | 17 |
| SOURCES OF DATA | 19 |
| APPENDIX 1: Composition of Residual Materials Specific to Certain Types of Businesses | 20 |
| APPENDIX 2: Sensitivity Analysis | 26 |

1. INTRODUCTION

Characterizing residual materials is not an easy task. It requires substantial investment and rigorously applied logistics. The success of any characterization depends, essentially, on access to residual materials, which may be difficult in the case of businesses. Complications include inaccessible or locked containers, difficulty in coordinating procedures with regular collection services, business people who feel uneasy about having their waste collected by a sampling team, the variety of private and public collection services or, simply, complex logistics for random and realistic sampling routes.

When field work for the 2008-2009 *Business Characterization Study* was carried out, a sampling of the six main types of collection was made from 14 types of businesses. In addition, waste and recyclable materials collections were targeted for three types of superstores. Of all combinations

that linked a type of business with a type of collection, it was possible to collect samples of residual materials in over 80% of cases. The original report therefore presented valid and useful information on what materials were generated and their composition according to type of collection. However, the results did not reflect the overall composition of residual materials, or the recovery rates achieved.

This supplementary report sets out the results of an extensive statistical analysis conducted by ÉEQ to fill the gap created by a lack of data in the approximately 20% of cases where no samples of residual materials were collected. This work was necessary to estimate the overall composition of residual material generated by Québec's business sector and to present statistics on recovery rates achieved according to type of business and general class of materials.

In over **80%** of cases,
SAMPLES of
RESIDUAL MATERIALS
 were **COLLECTED**

2.

METHODOLOGY

The data used to carry out this supplementary analysis essentially come from the results of the *2008-2009 Business Characterization Study*. The study report presents the detailed methodology used to identify targeted businesses as well as obtain and sort samples. In a nutshell, the study considered 297 collection trips in the Montréal area, covering approximately 1,000 different businesses. In all, 22,000 kg of materials were collected from 6,200 containers. Sub-samples were then sorted in 68 different categories of materials. At the same time, a telephone survey of 3,000 businesses from all over the province was conducted mainly to determine whether they participated in any of six different types of collection.

The methodology used to fill the gaps in missing data in order to obtain an overall picture of residual materials generated by businesses may be divided in four stages:

FILL IN THE MISSING DATA

This first crucial stage involved filling in the 20% of data that was missing (see Table 1). Various statistical analyses helped identify, in each case, the method most appropriate for the purpose.

α) Quantity Generated - Municipal Waste Collection:

The hypothesis was established that the profile of businesses with similar generated waste collected by private collection services would be the same as the profile of counterpart businesses whose waste was collected by municipal collection programs. Student's t-tests were used to match the types of businesses and attribute, on a proportional basis, the same quantity for municipal waste collection.

b) Quantity Generated – Municipal Curbside Collection and Private Collection of Cardboard:

For these collections, it was impossible to fill in the missing information with similar data. Linear regressions were therefore applied.

c) Quantity Generated – Superstores:

Of the ten different cases identified for superstores, only four were sampled. Considering the small sample that was available, an average quantity generated and recovered per employee was applied to superstores of the same type.

d) Composition - Municipal Waste Collection:

The relative composition observed in private waste collection was applied to each type of business that used municipal waste collection.

e) Composition – Municipal Curbside Collection:

As no statistical method could be satisfactorily used in this case, the composition values from the California study entitled *Waste Disposal and Diversion Findings for Selected Industry Groups* (California Environmental Protection Agency, 2006) were applied to quantities recovered by municipal curbside collection.

f) Composition – Private Collection of Paper, Carton and Plastic / Glass / Metal:

The average composition according to type of collection was applied in the few cases where data were missing.

g) Composition – Superstores:

Again, considering the small sample that was available, the average composition was applied to superstores of the same type.

h) Convenience Stores – Private Collection of Paper and Plastic / Glass / Metal:

No satisfactory statistical method could be found to estimate figures for convenience stores to fill in missing data for these two types of collection. We therefore decided to apply to convenience stores the quantities and composition produced by drug stores, adjusted proportionally to the number of employees (rather than the method described in points b and f).

i) Service Stations:

For service stations, only private waste and carton collection was sampled. Considering the lack of samples and relatively low proportion of service stations relative to the entire business sector in Québec, this segment of business was excluded from calculations.

Over **22,000 kg** of **MATERIALS** were **COLLECTED**

TABLE 1

Available and Missing Data for the Six Types of Collections, by Type of Business

| BUSINESSES \ COLLECTIONS | MUNICIPAL COLLECTION | | PRIVATE COLLECTION | | | |
|---|----------------------|-----------|--------------------|-------|-----------|-----|
| | WASTE | RECYCLING | WASTE | PAPER | CARDBOARD | PGM |
| Service | DA | DA | DA | DA | DA | DA |
| Hotels, motels | DU | DU | DA | DA | DU | DA |
| Bars | DA | DA | DA | DA | DA | DA |
| Full-service restaurants | DA | DA | DA | DA | DA | DA |
| Fast food | DA | DU | DA | DA | DA | DA |
| Grocery stores | DA | DA | DA | DA | DA | DA |
| Drug stores | DU | DA | DA | DA | DA | DA |
| Convenience stores | DA | DA | DA | DU | DA | DU |
| Service stations | DU | DU | DA | DU | DA | DU |
| Wholesalers | DU | DU | DA | DA | DA | DA |
| Automobile sector | DA | DA | DA | DA | DA | DA |
| Hardware and garden stores | DU | DA | DA | DA | DA | DA |
| Furniture, electronics, appliances, clothing, sports equipment, leisure and musical instruments | DU | DA | DA | DA | DA | DA |
| Other businesses | DA | DA | DA | DA | DA | DA |

DA: Data available

DU: Data unavailable

PGM: Plastic/glass/metal

It was possible to calculate specific composition for the six types of businesses for which available information covers all types of collection, i.e. services, bars, full-service restaurants, grocery stores, businesses in the automobile sector and other businesses. These results are shown in Appendix 1.

RECONSTRUCTING QUANTITIES GENERATED BY TYPE OF BUSINESS

Secondly, total quantities generated according to type of business were reconstructed using the results of the survey, which helped determine the proportion of businesses that participated in each of the six types of collection. Thus, for each type of business, total generation and composition, by type of collection, were reconstructed.

RECONSTRUCTING TOTAL QUANTITIES FOR ALL OF QUÉBEC BUSINESS

Finally, data from *Statistics Canada's Business Register (2006)* were used to determine the number of employees for each type of business (2006 was used to maintain consistency with the first analysis report). Then, the picture for all of Québec was reconstructed for the entire business sector. The number of employees was used to determine the relative size of each type of business in Québec so that weighted results could be produced.

ALTERNATE SCENARIOS

Scenarios were evaluated to test the impact of hypotheses and calculations on final results. The first scenario consisted in taking all extrapolated values and reducing them by 50%; the second scenario consisted in doing the contrary. The impact of the scenarios on recovery rates per material and recovery rates by sector is shown in Appendix 2.

3.

RESULTS

This section presents the following results: composition of residual materials generated by businesses in Québec, recovery rates by material, recovery rates by type of business and composition of municipal curbside recycling collection serving businesses.

{
CORRUGATED CARDBOARD
accounts for CLOSE TO A QUARTER
of all RESIDUAL MATERIALS generated
}

3.1 COMPOSITION OF RESIDUAL MATERIALS GENERATED by Québec Businesses

Not surprisingly, corrugated cardboard accounts for the largest proportion of recyclable materials; as shown in figure 1, corrugated cardboard makes up 24% of residual materials generated by Québec businesses, all types combined. Cardboard accounts for 41% of all containers, packaging and printed matter, including newspapers and magazines, generated by Québec businesses. Organic materials account for the greatest proportion (31%) of residual materials generated by businesses.

Contrary to general opinion, beverage bottles (all types combined) only account for a small proportion of materials generated by businesses. Data from the Société des alcools du Québec (SAQ), for example, seems to support this observation relating to glass. According to the SAQ's 2010 Annual Report, only 15% of its sales volume, in litres, goes to permit holders.

FIGURE 1

Composition of Residual Materials Generated by Businesses



3.2

RECOVERY RATE

by Material

Figure 2 presents the recovery rate by material for all businesses, all types of collection combined. This rate is calculated only for materials designated for curbside recycling.

Recovery rates for paper (newspapers, journals and magazines, printed matter) are all over the 60% mark as compared to similar materials in residential curbside collection. Corrugated cardboard, which is the recyclable material most generated by businesses, also reached a very high recovery rate at 77%. At

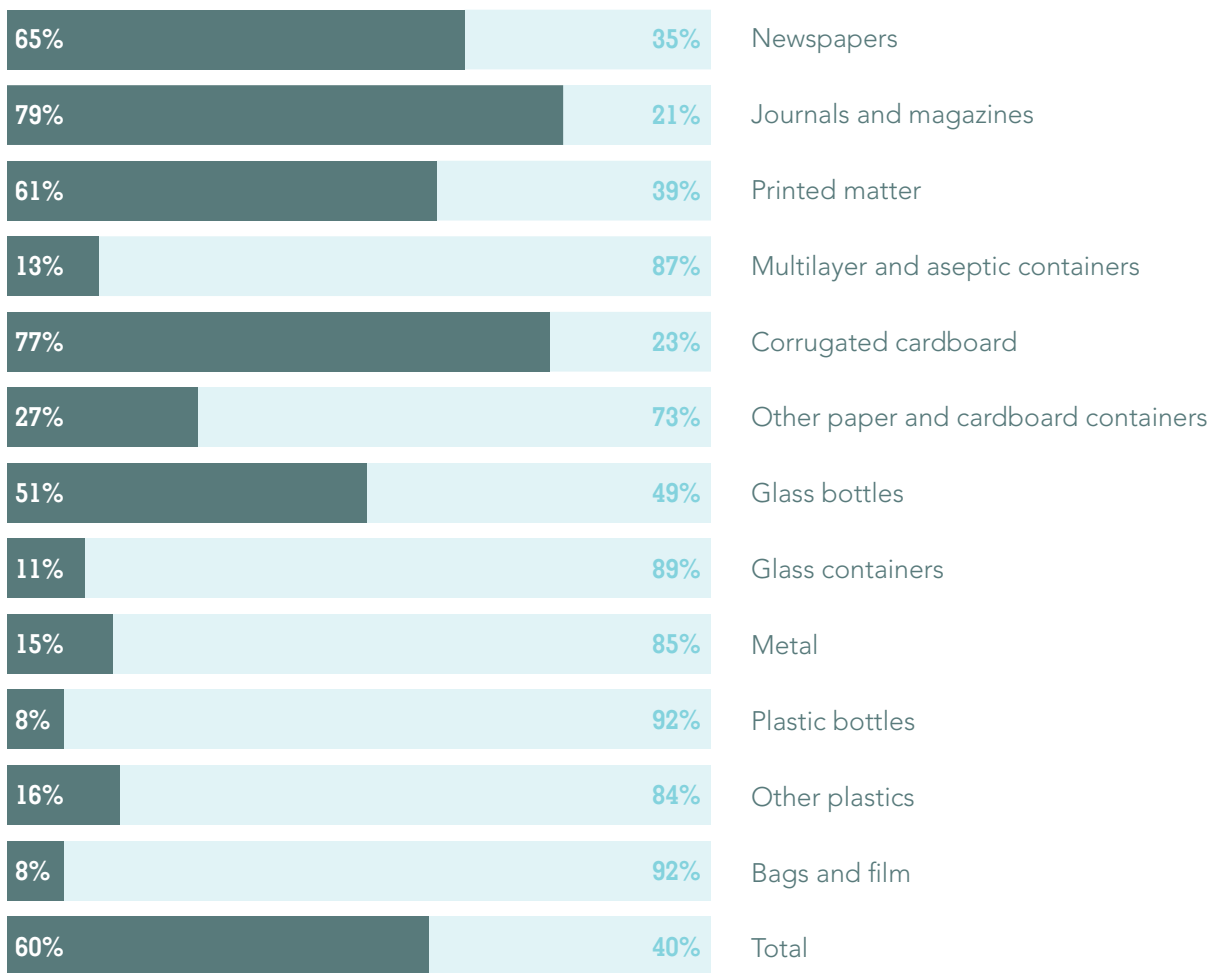
the other end of the spectrum, plastic, glass and metal containers and packaging, whose recovery program directed at businesses was implemented later, produced lower recovery rates. Glass bottles are the exception, with a recovery rate of over 50%. More specifically, SAQ glass bottles, especially wine, have a 57% recovery rate.

The total weighted rate of recovery for all recyclable materials generated by businesses tops 60%.

60%

It is the total **WEIGHTED RATE**
of recovered for all **RECYCLABLE MATERIALS**
generated by **BUSINESSES**

FIGURE 2
Recovery Rate by Material



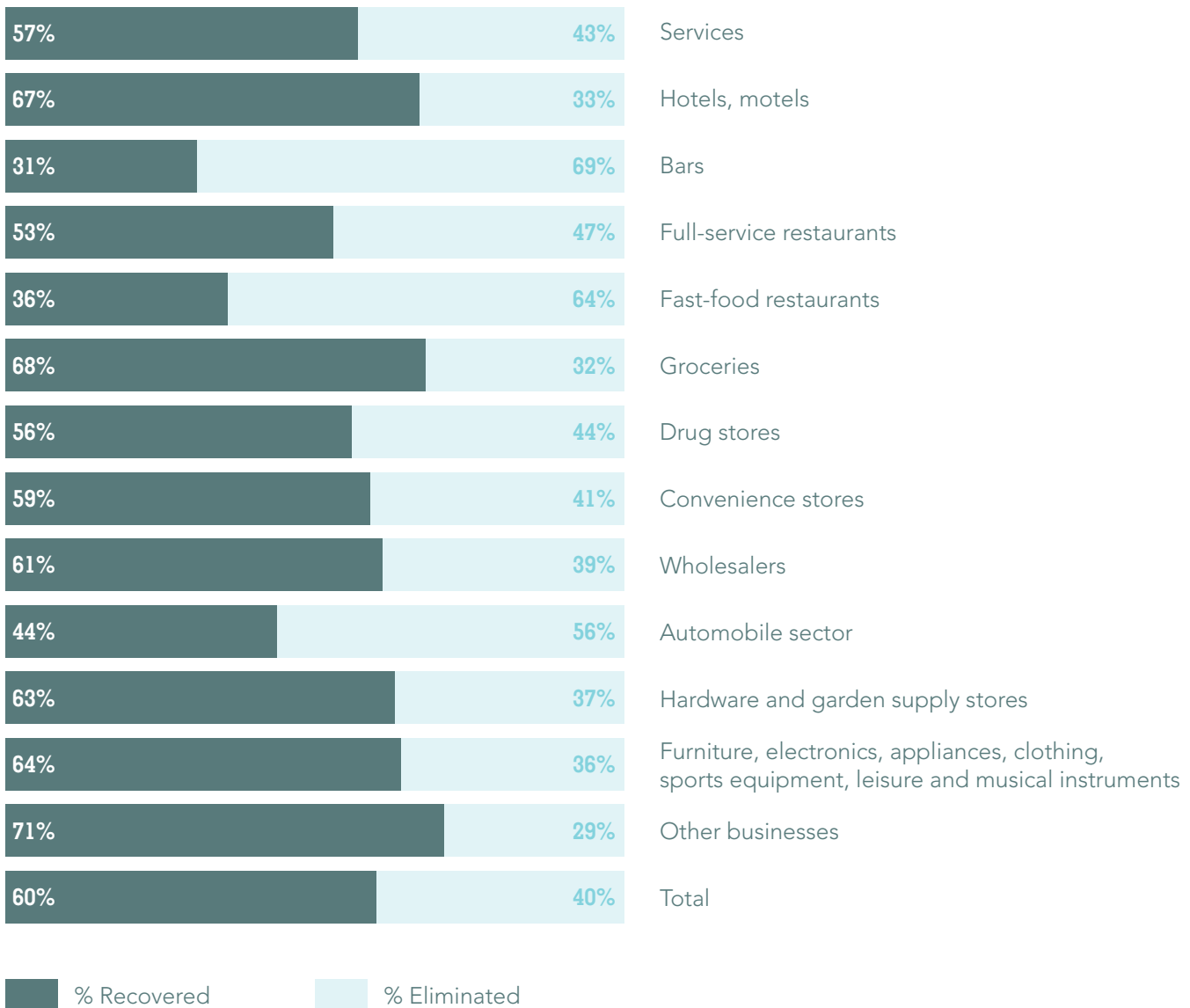
% Recovered % Eliminated

3.3

RECOVERY RATE by Sector

As previously mentioned, the weighted recovery rate for recyclable materials generated businesses reached 60% in 2008. This result is comparable to the municipal curbside recovery rate, established at 53% in the most recent residential characterization (2006-2009). Figure 3 shows that the majority of business types have recovery rates of over 50%.

FIGURE 3
Recovery Rate by Sector



The previously cited California study (2006) enables us to establish a comparison of recovery rates observed for similar categories. Our results allow us to compare a sub-sample of six types of businesses. As illustrated in Table 2, the study shows greater variability of results from one sector to another. The results are relatively similar between the two studies for the “Full-service restaurants” and “Wholesalers” categories. In addition, non-weighted averages of sub-samples of these two studies are similar.

TABLE 2

Comparison of Recovery Rates in Québec (current study, 2011) and those in California (2006) for Certain Types of Businesses

| SECTORS | QUÉBEC | CALIFORNIA |
|--------------------------|--------------|--------------|
| Fast-food restaurants | 34.4% | 49.6% |
| Full-service restaurants | 52.6% | 54.0% |
| Grocery stores | 68.0% | 87.0% |
| Hotels | 67.2% | 20.9% |
| Hardware stores | 63.4% | 53.8% |
| Wholesalers | 60.9% | 59.3% |
| Non-weighted average | 58.1% | 54.1% |

3.4 COMPOSITION

OF MUNICIPAL CURBSIDE COLLECTION

Serving Businesses

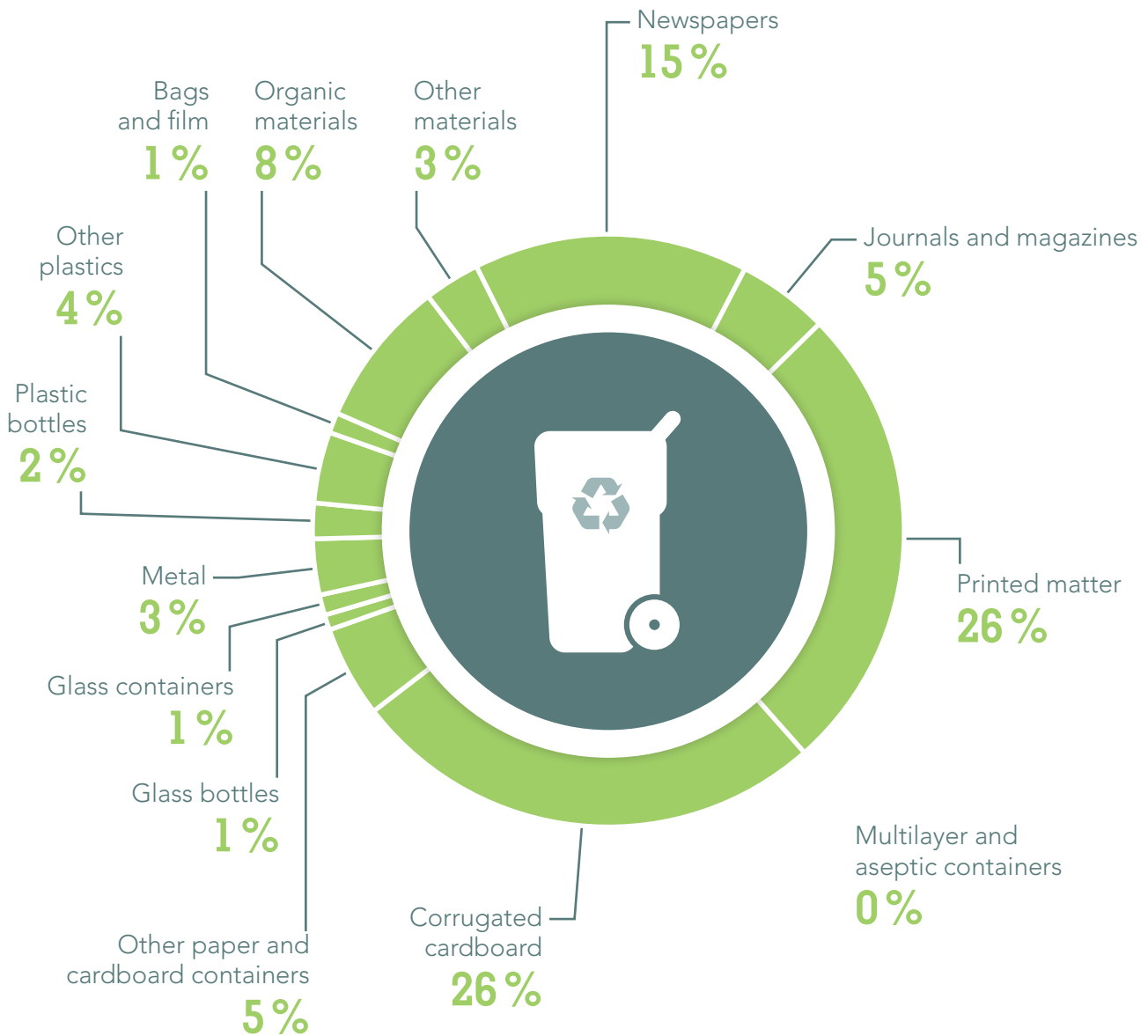
The results of the survey conducted as part of the 2008 characterization study show that almost 60% of businesses participate in municipal curbside collection targeting the recovery of paper, cardboard, glass, metal and plastic. For these businesses, the composition of recovered materials is presented in Figure 4. We can see that newspapers and magazines account for a proportion similar to that in residential curbside

collection, i.e. approximately 20%, and corrugated cardboard accounts for a share that is 2.5 times greater than that in residential curbside collection. Conversely, glass accounts for only 2% in businesses vs. 19% in residential curbside collection. We also note that there is 11% contamination by organic and other materials, which is higher than in residential curbside collection, where this type of contamination is only 2%.

Almost **60%** of businesses
PARTICIPATE in municipal
CURBSIDE COLLECTION

FIGURE 4

Composition of Municipal Curbside Collection Serving Businesses



4. INTERPRETATION and Conclusion

An in-depth study of the data again confirmed the great variability of data for the business sector as compared to that in the residential sector as to type of materials generated and composition. Nevertheless, certain conclusions of this second analysis provide a new point of view on residual materials management in businesses.

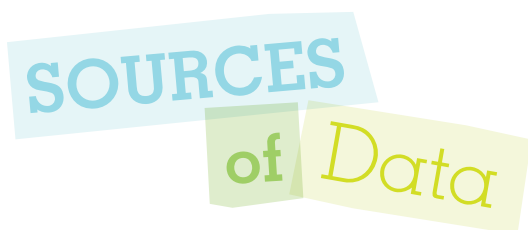
First, we note that the rates of participation in curbside recycling and recovery rates achieved are often comparable to results observed in the residential sector, which is contrary to general opinion that businesses recover less. The rate of participation in municipal curbside collection is 60%, to which we should add businesses served by specific materials collection. Moreover, the 60% overall recovery rate is comparable to that observed for residential curbside collection. That rate of recovery is, in fact, similar to the 53% recovery rate of the entire industrial, business and institutional sector, as calculated by RECYC-QUÉBEC in its *Bilan 2008 de la gestion des matières résiduelles au Québec*.

In addition, the characterization shows that residual materials generated by businesses contain relatively few beverage containers. Even if residual materials generated by certain sectors such as bars and restaurants contain significant volumes of beverage containers (up to 15% for bars), for the overall business sector, these materials account for only 2%. Moreover, when we look more closely at materials recovered from businesses through municipal curbside collection, we note that over 75% of materials are fibres – mirroring residential curbside collection.

As part of this 2nd analysis of business characterization results, ÉEQ did not attempt to calculate the overall per tonne generation in this sector. Calculations of composition and recovery rates, which are all “relative” data, are sufficiently strong to be published, while this is not the case for tonnage data, which are “absolute” data. Subsequent studies will eventually produce a quantification of materials generated by the business sector. That being said, we should remember that the assessments produced by RECYC-QUÉBEC for 2006 and 2008 were based on the hypothesis that businesses and institutions account for some 15% of quantities recovered through municipal curbside collection, to which we should add volumes recovered by private collections to get a more complete picture.

Over the next years, a number of measures will contribute to further increase recovery rates by businesses. Focused initiatives will result in increasing their rates of recovery, as did the Table pour la récupération hors foyer that, since 2007, has enabled 2,000 more establishments in the hotel, bar and restaurant sector to be served. Also, an increasing number of municipalities offer curbside collection to businesses, which will encourage the smaller among them to contribute to the recovery of recyclable materials.

Over the coming years,
a number of **MEASURES** will contribute
to **INCREASING** the **RATE OF RECOVERY**
in **BUSINESSES**



SOURCES of Data

Main Source:

RECYC-QUÉBEC (2009). *Caractérisation des matières résiduelles du sous-secteur commercial au Québec 2008-2009*. Study conducted in cooperation with BFI Canada, the Conférence régionale des élus de Montréal, the City of Montréal and Éco Entreprises Québec, 28 p.

Additional Sources:

California Environmental Protection Agency (2006). *Waste Disposal and Diversion Findings for Selected Industry Groups*, 139 p.

RECYC-QUÉBEC (2009). *Bilan 2008 de la gestion des matières résiduelles au Québec*, 20 p.

RECYC-QUÉBEC and Éco Entreprises Québec (2009). *Caractérisation des matières résiduelles du secteur résidentiel et des lieux publics au Québec*, 24 p.

Société des alcools du Québec (2010). *2010 Annual Report*, 98 p.

Statistics Canada (2006). *Nombre d'entreprises selon la taille et le groupe d'industrie pour le Québec, Business Register*; excerpt from RECYC-QUÉBEC and ÉCO ENTREPRISES QUÉBEC (2009). *Caractérisation des matières résiduelles du sous-secteur commercial au Québec*, 28 p.

APPENDIX 1: COMPOSITION OF RESIDUAL MATERIALS SPECIFIC to Certain Types of Businesses

The following charts illustrate the composition of materials for the six types of businesses for all types of collections covered by the sampling.

FIGURE 5
Composition of Residual Materials - Other Businesses

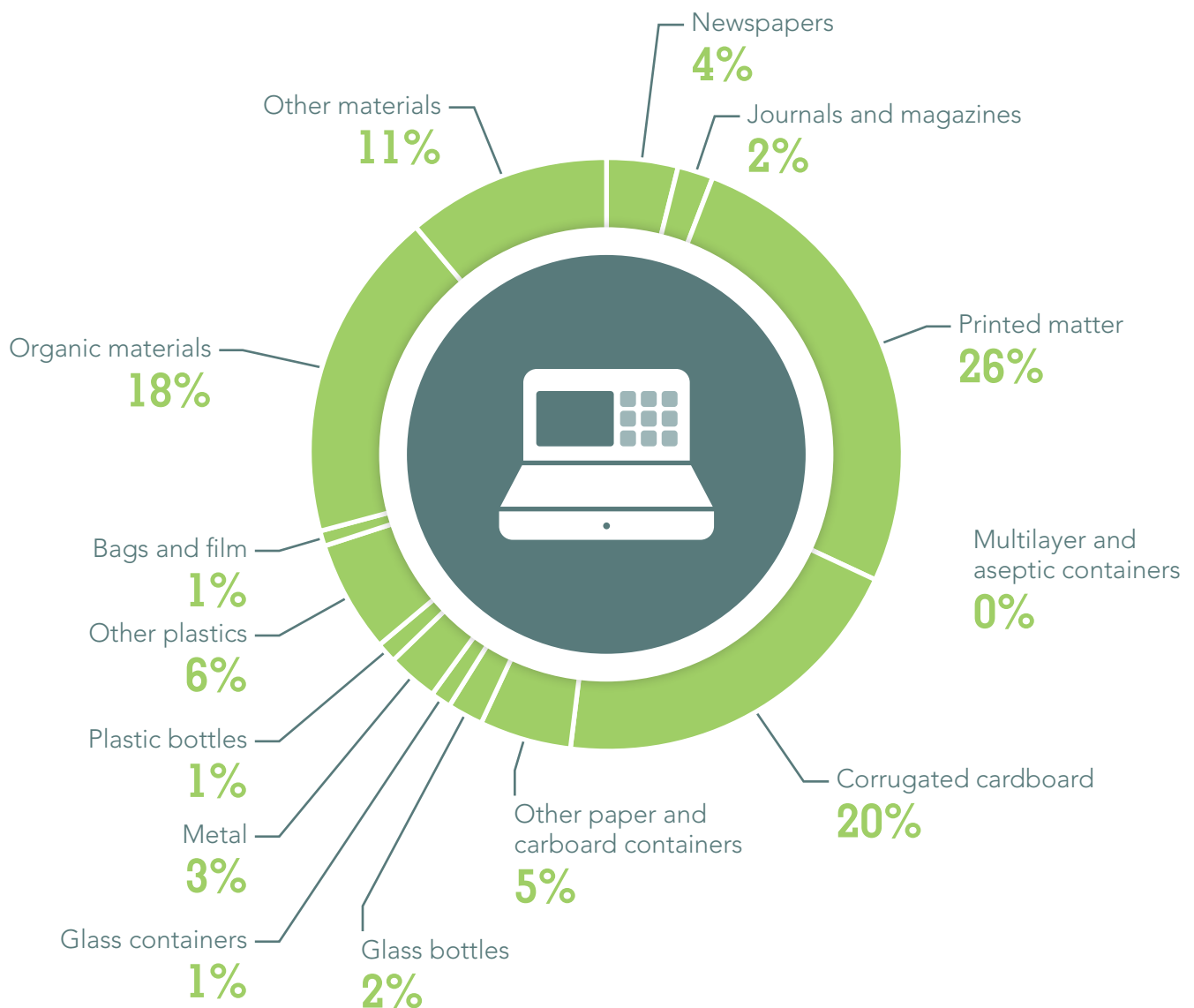


FIGURE 6
Composition of Residual Materials - Bars

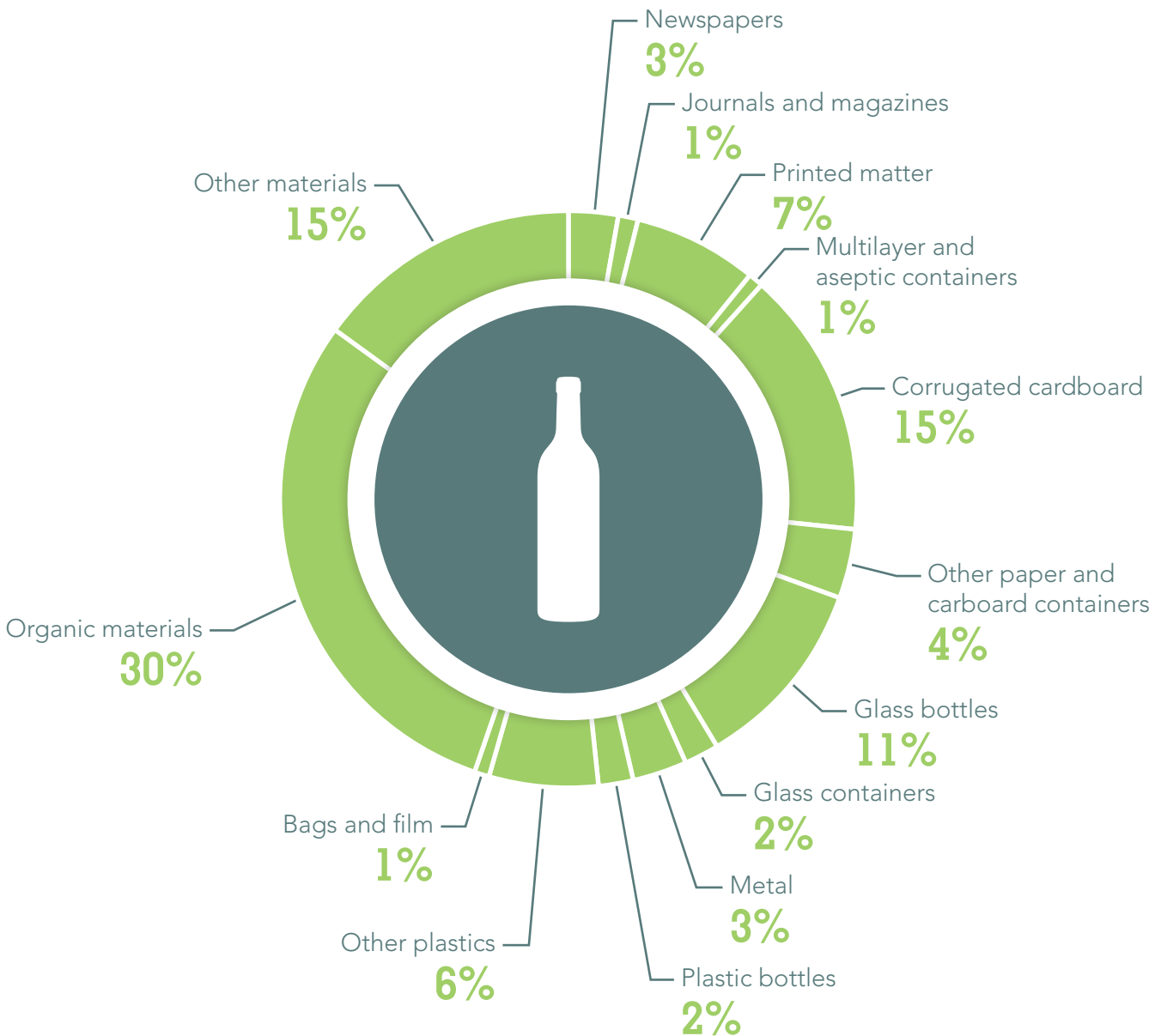


FIGURE 7

Composition of Residual Materials - Furniture, Electronics, Appliances, Clothing, Sports Equipment, Leisure and Musical Instruments

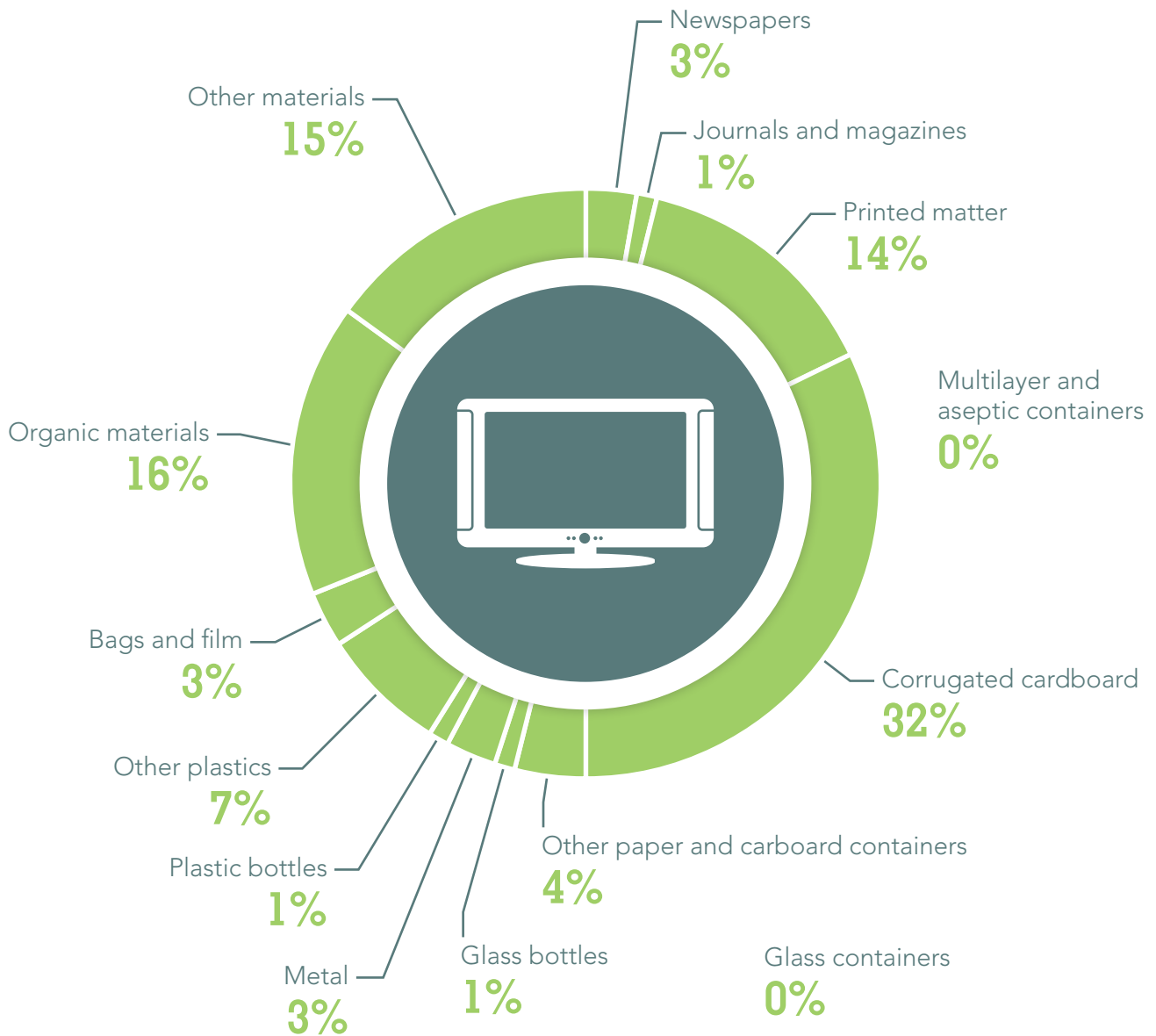


FIGURE 8

Composition of Residual Materials - Automobile Sales, Repair and Parts

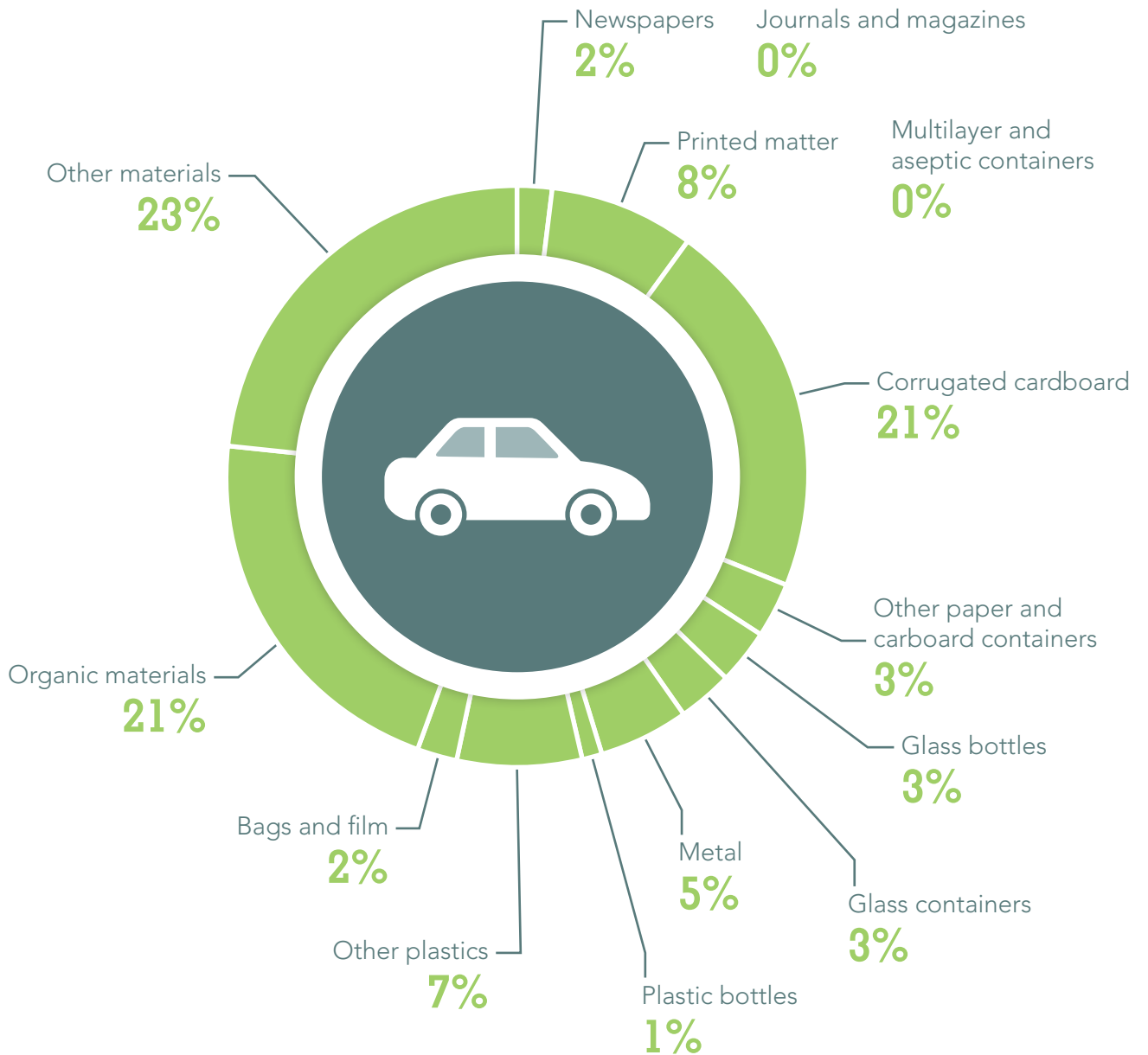


FIGURE 9

Composition of Residual Materials - Full-Service Restaurants

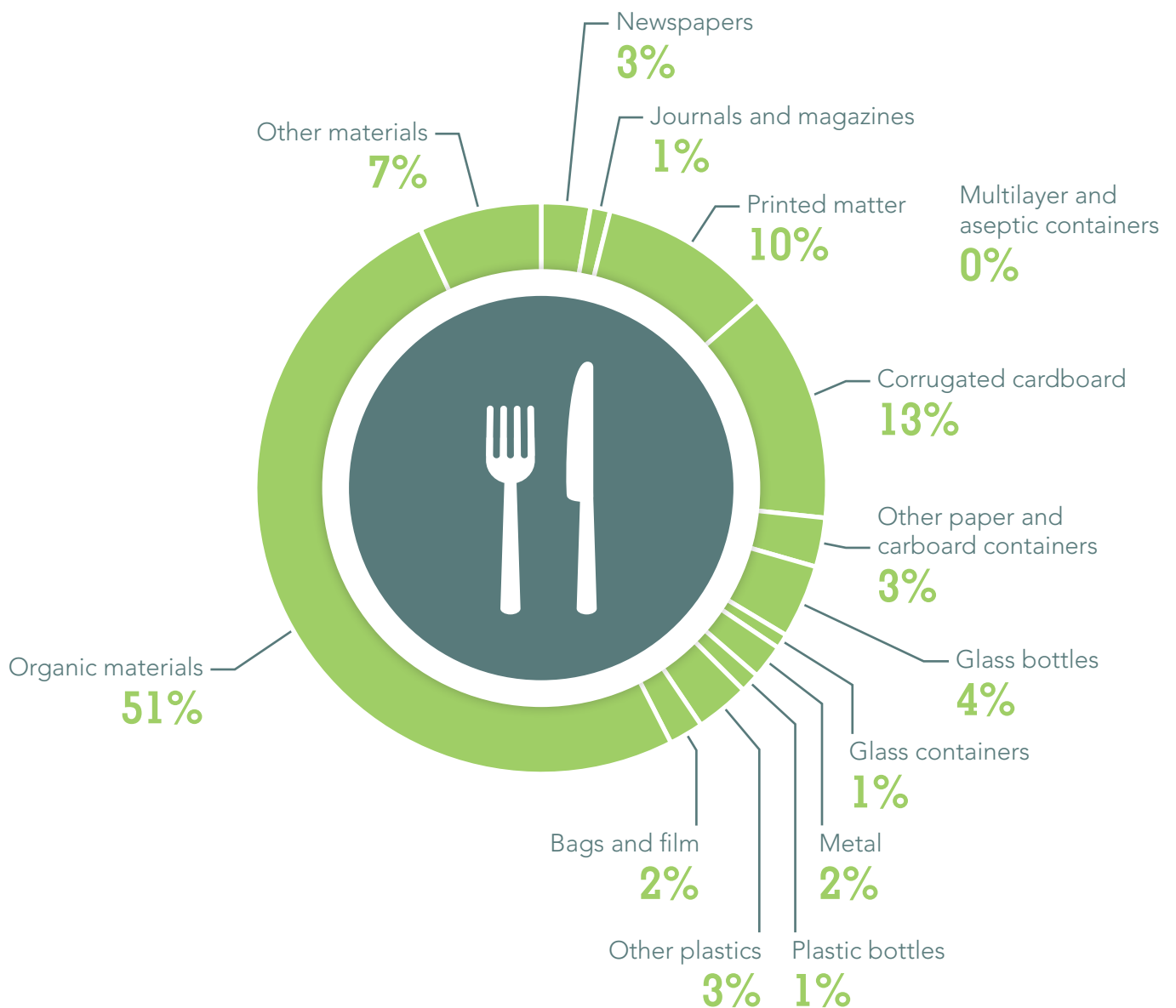
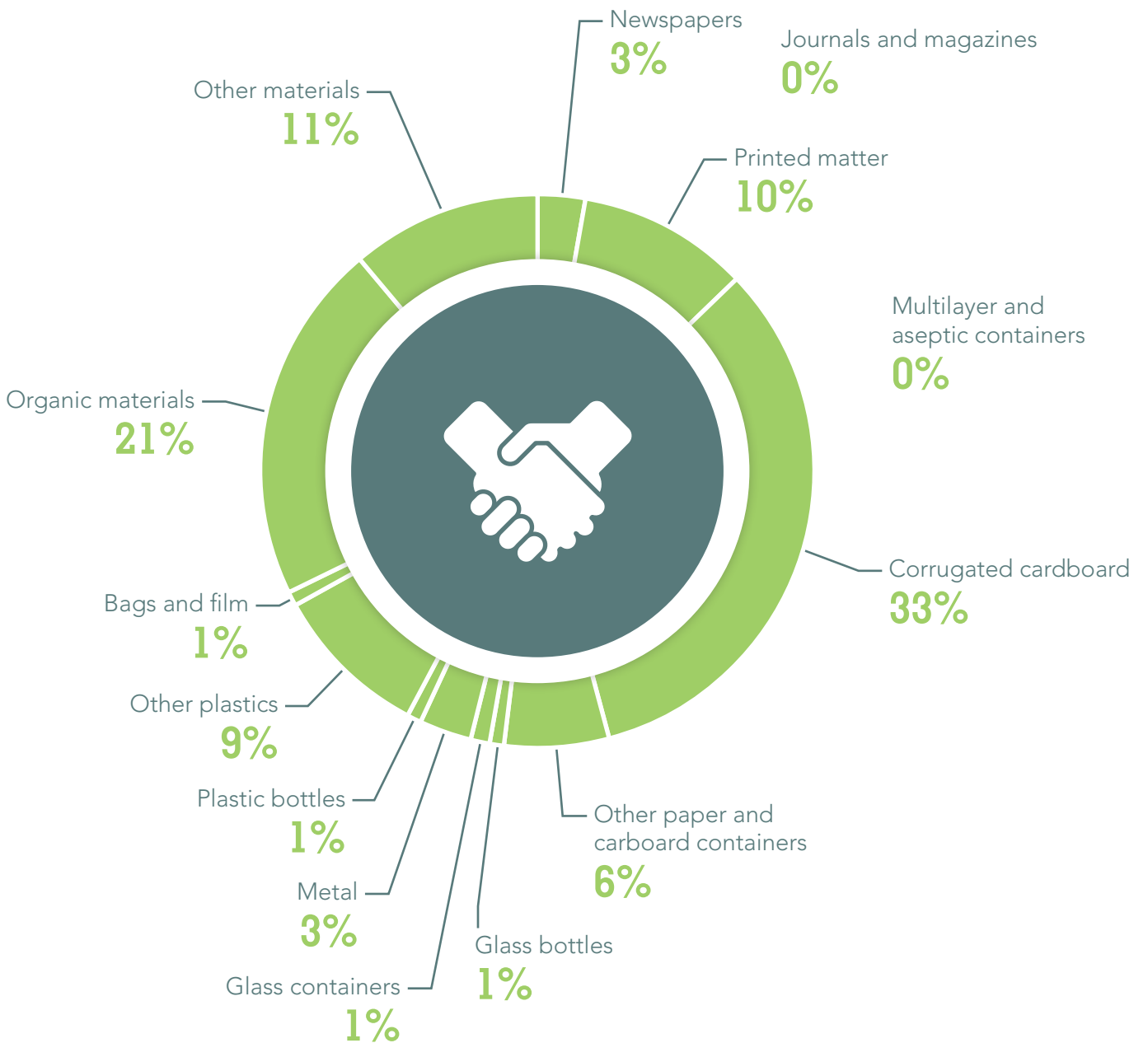


FIGURE 10

Composition of Residual Materials - Services

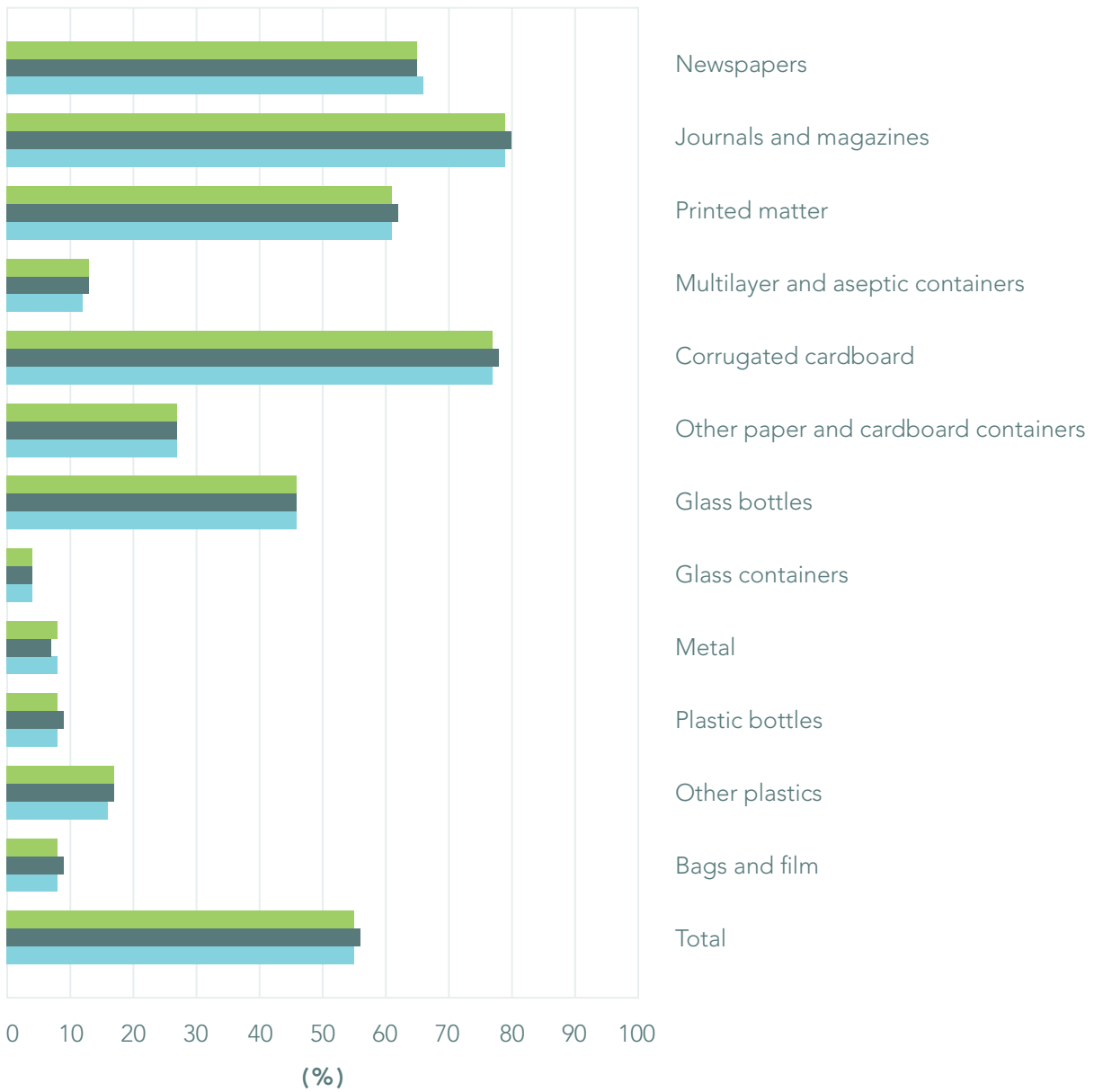


APPENDIX 2: SENSITIVITY Analysis

Optimistic / pessimistic scenarios were applied to test the impact of hypotheses used to estimate the 20% missing data. In one case, estimated values were increased by 50% and, in the other, the same values were reduced by 50% in order to observe the effect on the final results of the study. These scenarios were applied to the rate of recovery by material and by type of business.

We see that, in both cases, there was a very small variation in final results. That may be partly explained by the fact that the estimates accounted for only 20% of all values. Moreover, the fact of applying the variation in quantities eliminated and quantities recovered in the same direction (increase and decrease) also explains the small variation observed in scenarios.

FIGURE 11
Recovery Rate by Material

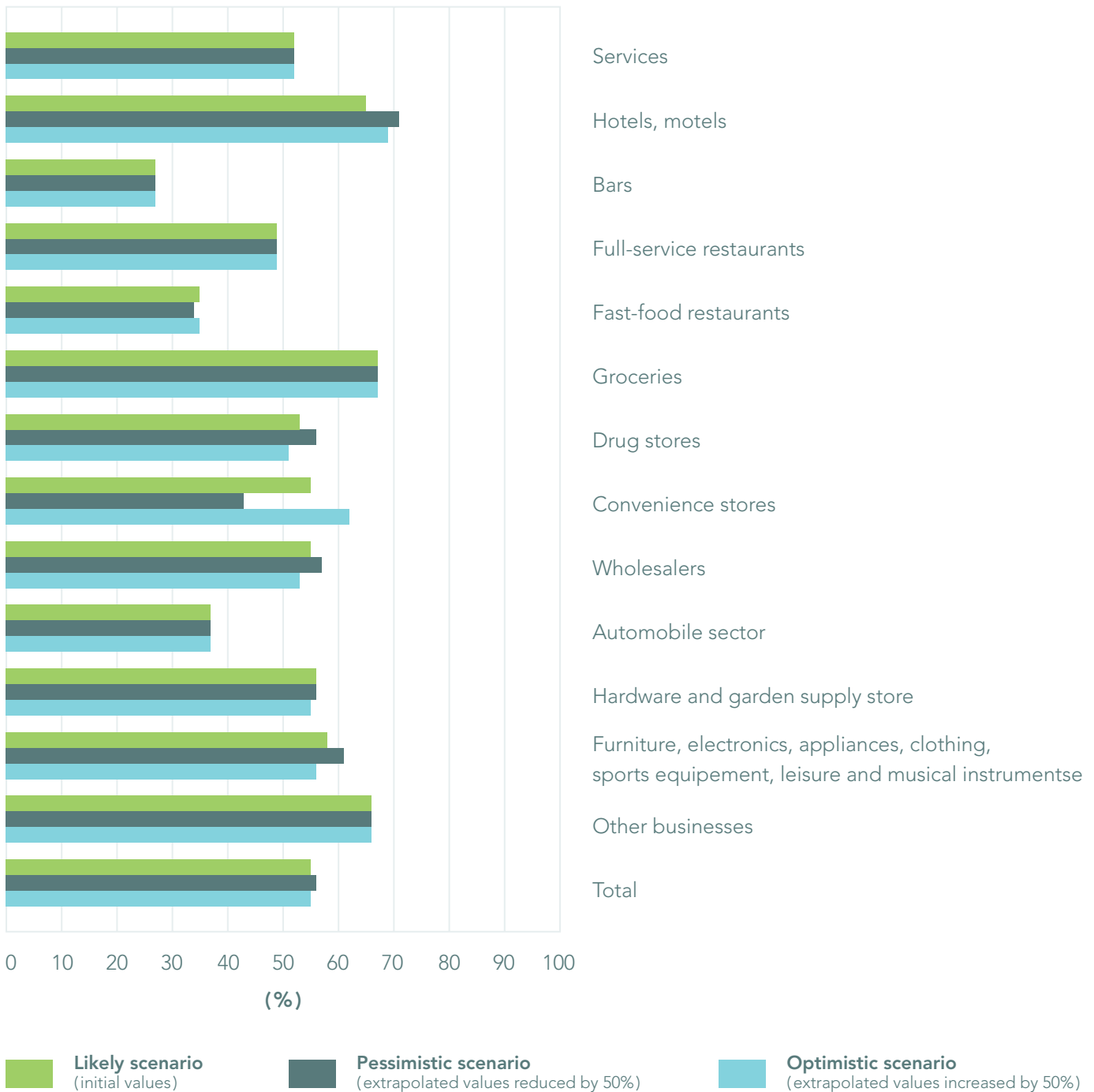


Likely scenario
 (initial values)

Pessimistic scenario
 (extrapolated values reduced by 50%)

Optimistic scenario
 (extrapolated values increased by 50%)

FIGURE 12
Recovery Rate by Type of Business





Éco Entreprises Québec is a private, non-profit organization. ÉEQ's mission is to represent companies with regard to their responsibility to finance their share of the net costs of municipal curbside recycling, to establish reasonable fees to ensure program financing and, in partnership with other stakeholders, to promote efforts to increase the quantities of recovered materials through curbside recycling at the lowest possible cost.

Éco Entreprises Québec

1600, René-Lévesque Blvd. West, Suite 600
Montréal (Québec) H3H 1P9

 514-987-1491

 1-877-987-1491

 514-987-1598

 service@ecoentreprises.qc.ca

WWW.

ECOENTREPRISES

.QC.CA