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RESOURCE RECYCLING

THE EVOLVING TON EXPLAINED

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► Many North American municipalities are seeing declining tonnages of collected recyclables due to changes in culture and packaging. Our authors detail how the trend could result in higher industry costs and a need for renewed performance metrics.

In 2009, the City of Calgary became one of the last major Canadian cities to implement a mandatory curbside recycling program. During the first three full years of the program, which is available to over 300,000 single-family households, the amount of material collected was fairly consistent.

Then something changed. Calgary's single-stream recycling collection program is now in its sixth year of operation and is experiencing declining tonnages. Specifically, the weight of marketed recyclables collected has decreased from 58,000 metric tons in 2010 (the first full year of program operation) to slightly less than 53,000 metric tons in 2013. Information for 2014 to date shows that the downward trend appears to be continuing.

For a program that is relatively new, these declines come as a surprise, especially considering the high participation rates and the fact that approximately 5,000 households have been added to the program each year.

In May 2014, in an effort to better forecast and prepare for future tonnages and material types, and to target communication and education for the program in the future, the City of Calgary commissioned CM Consulting (in association with Kelleher Environmental, Sound Resource Management and Cheminfo Services, Inc.) to study the factors that are influencing this downward movement.

Key findings from the study suggest Calgary is not alone when it comes to declining recycling tonnages, and they indicate these

declines may not be related to a drop in program participation or material capture. Rather, they can be attributed to a host of societal factors and changes in packaging design, all of which contribute to lower tonnages of printed paper and packaging being generated at the household level.

Paper cuts

To see whether a change in program participation could explain the decline in recycling tonnages, the Calgary study examined recycling rates by material for 2010 and 2013. Findings show recycling rates for individual materials have, for the most part, remained steady since the introduction of the program, with some gains in old corrugated cardboard (OCC).

However, the collection tonnages for some materials have changed dramatically. Of all materials collected in Calgary's single-stream program, printed paper (newspapers, magazines and flyers) and paper packaging (cardboard and boxboard) experienced the largest tonnage declines since 2010. This is significant, because Calgary has a high share of printed paper (66 percent of material collected by weight in 2012 and 64 percent in 2013), relative to other materials. The relatively high percentage of paper in the program can be primarily attributed to Alberta's highly successful beverage container deposit return program, which keeps most glass,

PET, milk jugs and aluminum cans out of the curbside recycling stream.

The study also looked at waste composition studies in Calgary for the last 15 years to estimate the amount of recyclable materials disposed, and therefore not captured by the recycling program. Results showed the share of paper going to landfill is also on the decline, while the share of plastics ending up in landfill is increasing.

In order to determine whether similar recycling trends were being observed elsewhere, the study also collected data from other municipalities in Canada and the U.S. that are comparable in size to Calgary. Table 1 summarizes the trends observed in each of these jurisdictions from 2010 to 2013.

The findings show Calgary is not alone when it comes to dropping recycling tonnages. In fact, nearly 90 percent of those programs surveyed have recorded recyclable weight declines since 2008 on a per household basis, and in some communities the reductions are quite dramatic.

Like Calgary, the programs reviewed showed notable declines in printed paper and other materials in 2009. For example, Toronto, Peel Region, Hamilton and Ottawa (all in Ontario) and Seattle each saw declines of at least 15 percent from 2008 to 2009. The average decline of printed paper per household for the 20 largest municipalities in Ontario for that year was 21 percent.

Meanwhile, contrary to what was happening with printed paper and paper packaging tonnages, the study found the amount of plastics collected was increasing. This makes sense – many communities have been expanding the list of plastics collected in their programs. However, because the weight of plastics is lower than that of other packaging materials, this expansion in plastics recycling collection has virtually no impact on the total tonnages collected.

Metal recycling tonnages have remained fairly stable in most jurisdictions. However, like plastics, they have virtually no impact on the total weight collected because they make up only a small amount of the total.

Finally, one somewhat surprising result

Table 1 | Changes in recycling weights per household per year for 15 municipalities

Canada	Years for which statistics are available	Change 2010 to 2011 (kg/hh)	Change 2011 to 2012 (kg/hh)	Change 2012 to 2013 (kg/hh)
Calgary	2010-2013	-5 percent	-1 percent	-9 percent
Regional District of Nanaimo, BC	2008-2013	-10 percent	3 percent	-2 percent
Metro Vancouver, BC	2008-2012	-3 percent	-8 percent	N/A
Richmond, BC	2010-2013	-6 percent	-7 percent	-7 percent
Edmonton, AB	2011-2013	N/A	-1 percent	-2 percent
Winnipeg, MB	2006-2013	-3 percent	4 percent	11 percent
Toronto, ON	2003-2012	-2 percent	-5 percent	N/A
Peel Region, ON	2003-2012	1 percent	-7 percent	N/A
York Region, ON	2003-2012	-6 percent	-1 percent	N/A
Ottawa, ON	2003-2012	-2 percent	-5 percent	N/A
Niagara Region, ON	2003-2012	1 percent	-5 percent	N/A
Hamilton, ON	2003-2012	-2 percent	-6 percent	N/A
Halifax, NS	2003-2013	3 percent	-3 percent	-2 percent
United States				
San Francisco	2010-2012	-1 percent	-1 percent	1 percent
Seattle	2003-2013	-1 percent	-4 percent	-1 percent
Source: CM Consulting				

from the study: In some municipalities, the amount of glass has actually increased slightly in recent years. This trend was attributed anecdotally to a preference by some consumers for glass as a food package for health reasons.

What's behind the shift?

The findings of this research (and many other recycling-oriented studies) show that in just the last few years larger societal and lifestyle trends have fundamentally changed the composition and quantity of material collected in recycling programs. Here are some of the major factors at play:

Paper plummet

Paper, especially newsprint, has represented a significant share of the material collected in recycling programs since the beginning of curbside recycling. However, increasing use of the Internet has and will continue to reduce the amount of newsprint and paper available for recycling.

In Calgary, the declines in printed paper from 2012 to 2014 are the direct result of scaling back and closures in the local newspaper sector. The Calgary Herald, for instance, dropped its Sunday edition in 2012, and in 2013 it introduced a smaller

format paper with fewer pages.

Another factor is the obsolescence of printed phone books. In June 2010, Yellow Pages Group announced that the last set of phone books would be delivered to Calgary homes in January 2011, unless people specifically request them.

Demand for convenience

Changes in eating habits, attitudes toward cooking and busier lifestyles have resulted in a growing demand for convenience foods and ready-to-go meals. Recent studies project the growth rate for these types of products to be between 3.4 and 5.1 percent from 2013 and 2018. This growing demand for convenience is reflected in food packaging innovations, some of which are discarded in the trash.

Changing consumer demographics have also contributed to the increase in demand for packaged convenience foods. The Canadian population is on average getting older – the number of people aged 65 or older is expected to double in the next 20 years – and many of these consumers seek smaller packages and ease of meal preparation.

Lightweighting

Increasing costs of packaging materials, higher transportation costs and marketing pushes in the “green” space have driven

both large brand owners and innovative new companies to find ways to reduce the weight of product packaging or offer more concentrated products (think laundry detergent).

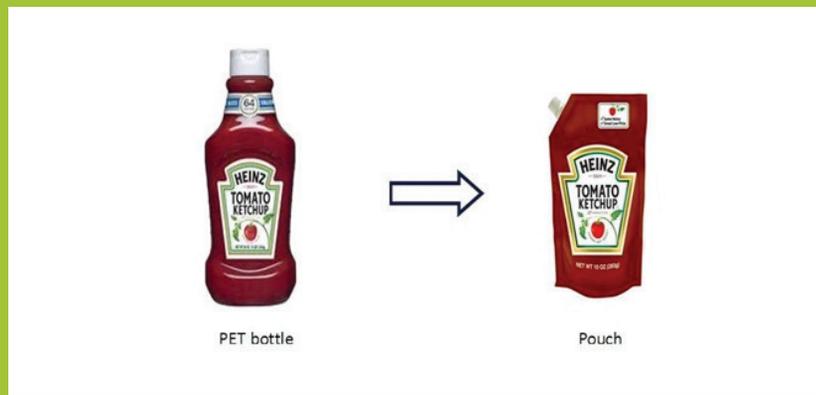
PET bottles on store shelves today are as much as 50 percent lighter than they were just five years ago. The market has also seen an increase in lightweight glass bottles: According to the Glass Packaging Institute, the average weight of a beer bottle has declined by 40 percent since 1970.

Material substitution

In the consumer packaging marketplace, many brands are moving from glass packaging to plastic or aluminum. While glass continues to be the preferred packaging material for products such as pickles and sauces, products such as olive oil, mayonnaise and ketchup are now being packaged in various plastic materials.

In addition, glass, metal and heavier plastics are increasingly being replaced by new types of flexible packaging (stand-up pouches for baby food, for example). Figure 1 shows an example of a ketchup brand that transitioned from glass to PET to pouches over time. While containers such as cartons are recyclable, many multi-layer packaging designs cannot be effectively recovered in municipal recycling programs because they contain a number of different plastic resins that are difficult to separate.

Figure 1 | An example of the packaging shift



means more trucks) as well as processing costs. As an example, consider the costs of collecting one ton of recyclables in 2002 compared with today. Because today's average load of recyclable materials is much more voluminous than it used to be – due to more plastic containers and less paper being collected – it takes more trucks and more frequent trips to the MRF to collect a ton.

To illustrate these cost differences, Stewardship Ontario's activity-based

costing model calculates the costs attributed to different materials in terms of collection, processing and scrap value. As illustrated in Figure 3, the materials which seem likely to rise in coming years in Calgary's program are all the most expensive materials per pound (in terms of collection and processing). Plastic laminates (like flexible pouches) and plastic film, for example, carry net costs of close to \$2,000 per metric ton. In comparison, the collection and process-

The evolving ton

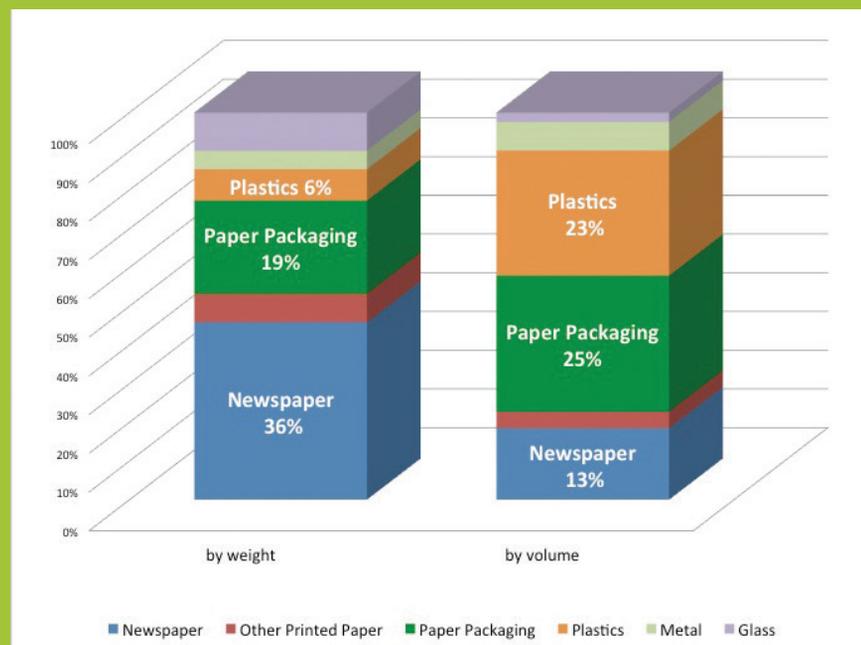
The decline in printed paper, together with the increased lightweighting and substitution of traditional packaging materials like glass and plastic, means that recycling programs will need to collect more volume in order to maintain tonnages.

Figure 2 illustrates the difference between weight and volume measurements for recyclables. The statistics are from Ontario – weight-to-volume measurements are available from Stewardship Ontario for the province's curbside program. The figure demonstrates that while plastics only account for 6 percent of all recyclables from the residential sector by weight, the category makes up 23 percent of the total volume. Newsprint, on the other hand, accounts for more than one-third (36 percent) of the total weight, but accounts for only 13 percent of the volume.

So what does this mean for municipalities? First and foremost, cities can expect higher costs.

Increasing volume relative to weight affects the costs of collection (more volume

Figure 2 | A metric ton of residential recyclables (Ontario, 2012)



Source: Stewardship Ontario

ing cost for glass is \$108 per metric ton, and for steel it's \$129 per metric ton.

Tracking using a moving target

The implications of a changing recycling stream for municipalities is reflected in a quote by Geoff Rathbone, former general manager of solid waste management services for the City of Toronto. At an arbitration meeting to determine pricing and funding details for part of the Ontario curbside program in 2014, he stated the following about the stream of material his department handles:

“It used to be maybe 60 percent old newspapers, which are cheap to collect and process and easy to sell. We could sell it for more than it cost us to process. Now the majority of [program] material is plastic, which is expensive to collect and process. ... Ten years ago, we would get a [metric ton] of plastic from about 35,000 plastic water bottles. Now it takes about 70,000 bottles to recover a [metric ton] of plastic.”

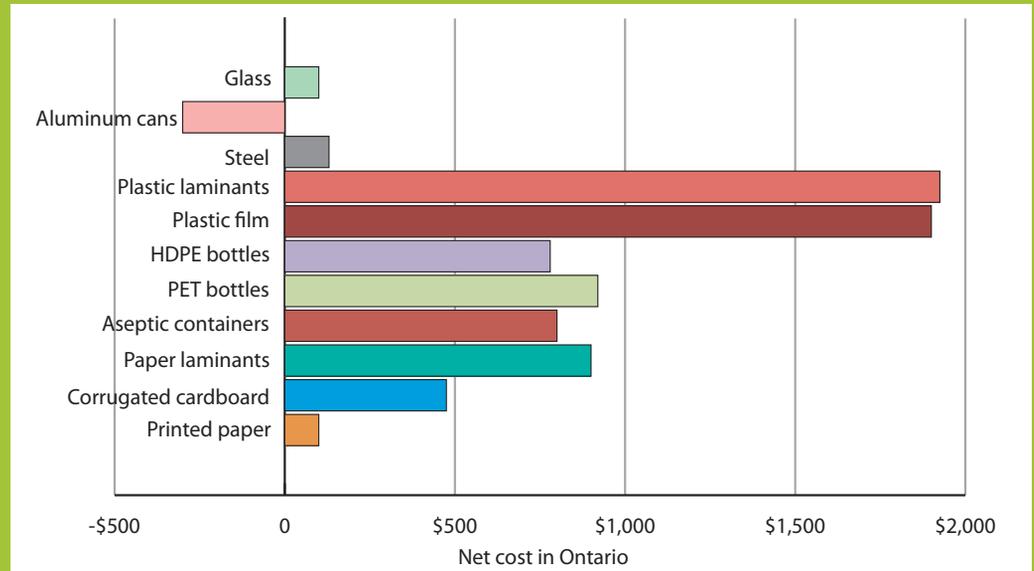
Current materials and packaging trends will also shape the way performance is measured over time.

Tracking performance and planning for the future using weight as a primary performance metric is a continually moving target – weight is determined not only by the number of units purchased and consumed, or where they are consumed and discarded, but also by how much each unit weighs.

As heavier plastics and traditional packaging materials like glass and metal are replaced with smaller and lighter weight materials, increasing (or even maintaining) recycling targets will be challenging.

There is considerable discussion in the waste management community at this time

Figure 3 | Net recycling cost per metric ton in Ontario's program (2013)



Net recycling cost is determined by adding collection and processing costs and subtracting revenues.
Source: Stewardship Ontario

that tons diverted and rate of diversion may not be the best way to measure recycling performance over time. Other performance metrics such as weight per capita diverted or greenhouse gas reduction achieved need to be considered and applied.

Looking ahead

Jurisdictions across North America have been and will likely continue to experience declines in recycling tonnages. These declines are unavoidable because they are a result of larger societal, lifestyle and packaging trends.

It is likely that, over the longer term, these trends will have a significant impact on waste diversion performance as currently measured and on the economics of municipal recycling programs.

Uncertainty surrounds the future composition of the recycling stream, and it's also unknown to what degree collection will be required by municipalities (in terms of financial, human and physical resources)

and what future processing capacity is required. The issue of declining tonnages collected in recycling programs should be carefully considered and can inform future planning decisions, both for Calgary and other cities in North America. **RR**

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