

Current State

Ontario Blue Box Paper Fibres

Final Report

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in association with



Love Environment

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1. Introduction

1.1 Background to Current State Project

Revenues from the sale of paper fibres collected and processed through Ontario's Blue Box system are the cornerstone of the system, contributing 70% or more to total system revenues. Markets into which paper fibres from Ontario's Blue Box are sold have changed in the last five years and continue to change. The amount and type of printed paper and packaging in Ontario's Blue Box system is also changing. As part of the SCOP (Supply Chain Optimization Project), Stewardship Ontario contracted with Kelleher Environmental in April, 2011 to carry out research to identify how paper fibres from Ontario's Blue Box system are currently managed. This report sets a baseline from which future planning and scenarios can be developed. It includes the following information:

- A description of the current quantities of paper fibre available, recycled and not captured by the Ontario Blue Box system;
- How fibres are collected, processed and marketed in the current system;
- End markets used by the current Ontario Blue Box system and
- Identification of issues that are currently changing including the composition of Blue Box fibres

Suggestions are also included on targets for increased capture of Blue Box paper fibres.

1.2 Current State Project Report Structure

The Current State Fibre Project Research is presented in this report in the following sections:

- Section 2 describes the study approach and methodology
- Section 3 presents fibre quantity estimates (available, recycled and currently disposed/not recovered), and identifies areas where fibre recovery could be increased
- Section 5 summarizes how paper fibres are collected and processed in current Blue Box programs in Ontario:
- Section 6 identifies end markets to which Ontario paper fibres are sold
- Section 7 identifies fibre revenues by paper fibre material stream, how these have changed over time and dynamics which have changed revenues
- Section 8 presents information on US paper fibre statistics and export markets
- Section 9 describes the Ontario Blue Box system five years ago, today and five years into the future if no interventions take place and
- Section 10 presents a summary of findings and recommendations for additional research

2. Current State Research Approach

2.1 General Approach

The workplan involved a number of components:

- A literature search (internet, websites and journals), literature review and distillation of key points found in the literature;
- Review of the extensive amount of existing information on the Ontario Blue Box system (including the recent Best Practices Report by KPMG and the recent Public Sector MRF report by AECOM among other sources);
- Review of data on amounts of printed paper and paper packaging generated, diverted and disposed (not recovered for recycling) in Ontario through the Municipal Datacall, Stewardship Ontario data and other relevant sources;
- Interviews with key players in the Ontario Blue Box recycling chain for paper fibres including:
 - Private sector and public sector recycling collectors and haulers;
 - MRF (material recycling facility) operators;
 - Paper processors, paper brokers and end markets;
 - Staff from industry associations representing the forest products as well as paper packaging products in Canada and the US
 - Purchasing agents as well as technical staff from paper mills ;
 - Paper industry experts representing various aspects of the paper supply chain;
 - Other key informants identified through the research.
- Documentation of research findings in the Current State Ontario Blue Box Paper Fibres Report

2.2 Definitions Used For The Current State Project

In the paper recycling business, fibres are classified by “grades”¹. Each grade is made up 3 components:

- **Primary Material:** The main ingredients in the bale;
- **Outhrows:** Additional fibre material that in small quantities will not impact the mill process but in quantities above the percentage specified will cause the final material to get rejected at the grade or recipe indicated;
- **Prohibitives:** .Any materials which by their presence and in excess of the amount allowed, will make the packaging unusable as the grade specified and/or any materials that may be damaging to equipment.

Table 1 provides definitions for the different grades of paper stock as developed by the Institute of Scrap Recycling Industries (ISRI) in its *Guideline for Paper Stocks PS-2007–Export Transactions (2007)*. The guideline lists 51 paper grades plus a category titled *Specialty Grades*.

¹ The Institute of Scrap Recycling Industries (ISRI) in its Guideline for Paper Stocks

In the table:

- **Outthrows:** The term “Outthrows” is defined as “all papers that are so manufactured or treated or are in such a form as to be unsuitable for consumption as the grade specified.”
- **Prohibitive Materials:** The term “Prohibitive Materials” is defined as:
 - Any materials which by their presence in a packing of paper stock, in excess of the amount allowed, will make the packaging unusable as the grade specified.
 - Any materials that may be damaging to equipment.

Table 1: Definitions of Fibre Grades and Specifications²

Grade	Definition	Prohibitive Materials	Out-throws
(1) Soft Mixed Paper	Consists of a clean, sorted mixture of various qualities of paper not limited as to type of fiber content.	may not exceed 2%	may not exceed 10%
(2) Mixed Paper	Consists of a clean, sorted mixture of various qualities of paper containing less than 10% of ground wood content.	may not exceed ½ of 1%	may not exceed 3%
(6) #6 News	Consists of newspaper as typically generated from news drives and curbside collections.	may not exceed 1%	may not exceed 5%
(8) Special News, De-ink Quality #8 ONP	Consists of sorted, fresh newspapers, not sunburned, free from magazines, white blank, pressroom over-issues, and paper other than news, containing not more than the normal percentage of rotogravure and colored sections. This grade must be tare-free.	None permitted	1/4 of 1%
(11) Corrugated Containers (OCC)	Consists of corrugated containers having liners of either test liner, jute, or kraft.	may not exceed 1%	may not exceed 5%
(14) Fiber Cores	Consists of paper cores made from either chipboard and/or linerboard, single or multiple plies. Metal or plastic end caps, wood plugs, and textile residues are not acceptable in this grade.	may not exceed 1%	may not exceed 5%
(37) Sorted Office Paper (SOP)	Consists of paper, as typically generated by offices, containing primarily white and colored groundwood-free paper, free of unbleached fiber. May include a small percentage of groundwood computer printout and facsimile paper.	may not exceed 2%	may not exceed 5%
(39) Manifold Colored Ledger (MCL)	Consists of sheets, shavings, and cuttings of industrially-generated printed or unprinted colored or white groundwood-free paper. All stock must be uncoated and free of nonimpact printing. A percentage of carbonless paper is allowable.	may not exceed 1/2 of 1%	may not exceed 2%

² INSTITUTE OF SCRAP RECYCLING INDUSTRIES, INC. Guidelines for Paper Stock: PS-2007–Export Transactions. Paper Stock: Export Transactions. SCRAP SPECIFICATIONS CIRCULAR 2007. <http://www.international-recycling.com/files/USPS2007PaperExport.pdf> Accessed June 23, 2011.



Grade	Definition	Prohibitive Materials	Out-throws
(40) Sorted White Ledger (SWL)	Consists of uncoated, printed or unprinted sheets, shavings, guillotined books, and cuttings of white groundwood-free ledger, bond, writing, and other paper which has similar fiber and filler content.	may not exceed 1/2 of 1%	may not exceed 2%
(41) Manifold White Ledger (MWL)	Consists of sheets, shavings, and cuttings of industrially-generated printed or unprinted white groundwood-free paper. All stock must be uncoated and free of nonimpact printing.	may not exceed 1/2 of 1%	may not exceed 2%
Specialty Grades	The grades listed below are produced and traded in carload and truckload quantities throughout the United States, and because of certain characteristics (i.e., the presence of wet strength, polycoatings, plastic, foil, carbon paper, hot melt glue), are not included in the regular grades of paper stock. However, it is recognized that many mills have special equipment and are able to utilize large quantities of these grades. 3-S Plastic Coated Cups 6-S Polycoated Milk Carton Stock		
Not Defined by ISRI			
HardPack OCC/OBB	Some municipalities market an OCC/OBB mix (called hardpack). The ratio of OCC to OBB varies depending on a mill's feedstock requirements but in Ontario it is generally 60% OCC to 40% OBB and other paper materials.	may not exceed 1%	may not exceed 3%

2.3 Ontario Blue Box Programs Which Were Focus of Research

The Ontario Blue Box program includes 212 separate programs, all of which collect most paper fibres. Many of the 212 programs collaborate with their neighbours on collection, processing and marketing of paper fibres.

For this study, the focus was placed on collecting reasonably comprehensive information on programs which together added up to at least 80% of the paper fibres collected in Ontario at this time.

Information from other programs was collected where practical and not time intensive to do so.

Table 2 shows that 17 programs in Ontario together account for 80% of the paper fibres managed through the Ontario Blue Box Program. These 17 programs are:

- All GTA municipalities (York, Durham, Toronto, Peel and Halton);
- West of GTA: Niagara, Waterloo and Hamilton;
- SW Ontario: London, Essex-Windsor and Bluewater;
- East of GTA: Ottawa, Quinte (Bellville, Trenton, etc) and Peterborough;
- North of GTA: Barrie, Simcoe and Sudbury.

Addressing an additional 5 programs brings the total to 85% of fibre collected in Ontario. The five additional programs are:

- East of GTA: Kingston
- West of GTA: Guelph and Oxford
- North of GTA: Thunder Bay and Sault St Marie

Table 2: Ontario Blue Box Programs That Collect 80% and More of Blue Box Fibre (2009 Data)

P.C.	Municipal Group and Program Name	Total Households Served	Total Fibre Tonnes ³	Fibre Marketed (kgs/hhld)	Identification of Single Tier or located within Regions, Counties or Districts		80%	85%	90%	95%
20	TORONTO, CITY OF	943,794	112,981	119.71	Toronto					
270	PEEL, REGIONAL MUNICIPALITY OF	395,000	71,081	179.95	Peel					
97	YORK, REGIONAL MUNICIPALITY OF	308,852	60,173	194.83	York					
441	OTTAWA, CITY OF	369,271	49,928	135.21	Ottawa					
6	DURHAM, REGIONAL MUNICIPALITY OF	203,969	34,918	171.19	Durham					
1	HALTON, REGIONAL MUNICIPALITY OF	171,478	34,168	199.26	Halton					
172	HAMILTON, CITY OF	206,672	28,318	137.02	Hamilton					
53	WATERLOO, REGIONAL MUNICIPALITY OF	191,170	26,464	138.43	Waterloo					
357	NIAGARA, REGIONAL MUNICIPALITY OF	162,552	26,351	162.11	Niagara					
50	LONDON, CITY OF	162,087	20,679	127.58	Middlesex					
18	ESSEX-WINDSOR SOLID WASTE AUTHORITY	153,529	18,626	121.32	Essex					
335	SIMCOE, COUNTY OF	122,877	16,353	133.08	Simcoe					
183	GREATER SUDBURY, CITY OF	61,353	10,670	173.91	Greater Sudbury					
186	BLUEWATER RECYCLING ASSOCIATION	68,449	8,626	126.02	Huron					
87	QUINTE WASTE SOLUTIONS	64,893	8,486	130.78						
14	BARRIE, CITY OF	53,408	8,457	158.35	Simcoe					
293	PETERBOROUGH, CITY OF	34,632	6,949	200.64	Peterborough					
324	KINGSTON, CITY OF	50,299	6,711	133.41	Frontenac					
123	THUNDER BAY, CITY OF	49,069	5,669	115.54	Thunder Bay					
36	GUELPH, CITY OF	44,993	5,088	113.09	Wellington					
878	OXFORD, RESTRUCTURED COUNTY OF	42,626	4,988	117.03	Oxford					
55	SAULT STE. MARIE, CITY OF	33,708	4,905	145.52	Algoma					

³ 1) Total Fibre Tonnes includes tonnes collected and marketed as Fibre, and allocated Fibre from reported commingled materials.

²) Program was not active and/or data were not available in 2008.

³) Program was not active and/or data were not available in 2009.



Current State - Ontario Blue Box Paper Fibres - August, 2011

601	KAWARTHA LAKES, CITY OF	38,393	4,590	119.55	Kawartha Lakes					
12	NORTHUMBERLAND, COUNTY OF	36,579	4,465	122.07	Northumberland					
179	BRANTFORD, CITY OF	38,798	4,415	113.80	Brantford					
89	MUSKOKA, DISTRICT MUNICIPALITY OF	45,653	4,036	88.40	Muskoka					
429	CHATHAM-KENT, MUNICIPALITY OF	47,315	3,858	81.55	Chatham-Kent					
88	PETERBOROUGH, COUNTY OF	34,279	3,606	105.21	Hastings					
103	SARNIA, CITY OF	40,698	3,303	81.16	Lambton					
34	NORFOLK, COUNTY OF	27,935	3,046	109.05	Norfolk					
143	NORTH BAY, CITY OF	20,841	2,782	133.46	Nipissing					
21	WELLINGTON, COUNTY OF	31,404	2,774	88.32	Wellington					
190	BRUCE AREA SOLID WASTE RECYCLING	32,914	2,646	80.39	Bruce					
239	OTTAWA VALLEY WASTE RECOVERY CENTRE	18,247	2,342	128.32	Renfrew					
75	ORANGEVILLE, TOWN OF	9,851	2,326	236.15	Dufferin					
786	HALDIMAND, COUNTY OF	19,343	2,287	118.26	Haldimand					
214	CORNWALL, CITY OF	21,548	2,221	103.08	Stormont, Dundas & Glengarry					
56	ORILLIA, CITY OF	14,200	1,990	140.13	Simcoe					
430	TIMMINS, CITY OF	20,301	1,814	89.35	Cochrane					
8	STRATFORD, CITY OF	13,583	1,760	129.60	Perth					
531	BRANT, COUNTY OF	13,331	1,698	127.38	Brant					
41	OWEN SOUND, CITY OF	9,380	1,665	177.49	Grey					
338	COCHRANE TEMISKAMING WASTE MANAGEMENT BOARD	19,502	1,397	71.64	Cochrane					
279	AUGUSTA, TOWNSHIP OF	2,973	1,391	467.90	Leeds & Grenville					
233	ST. THOMAS, CITY OF	15,908	1,332	83.72	Elgin					
523	MINDEN HILLS, TOWNSHIP OF	6,553	1,166	177.97	Haliburton					
67	BROCKVILLE, CITY OF	9,524	1,045	109.71	Leeds & Grenville					
361	CLARENCE-ROCKLAND, CITY OF	8,466	1,006	118.88	Prescott & Russell					
294	RUSSELL, TOWNSHIP OF	5,002	990	197.83	Prescott & Russell					
271	NORTH GLENGARRY, TOWNSHIP OF	4,693	956	203.66	Stormont, Dundas & Glengarry					
249	HAWKESBURY JOINT RECYCLING	10,428	909	87.16	Prescott & Russell					
	Provincial Total	4,912,694	675,166	137.43			543,229	570,591	604,692	638,407
					% of Total Fibres:		80%	85%	90%	95%
					No. of Programs:		17	22	31	51



The information collected on each of the target 85% programs included:

- The amount of paper fibres collected (available through the Municipal Datacall);
- The MRF where the material was processed (available through the Municipal Datacall);
- Bales of material produced by the MRF (MRF operator interviews);
- Locations where the material was marketed or sold (identified generally through interviews with MRF operators);
- Changes in market conditions over time, and anticipated changes in the foreseeable future (interviews with MRF operators, industry association representatives and industry experts).

2.4 End Market Research

Each municipal representatives and private sector MRF operator interviewed was asked to identify the different paper fibre grades produced at the MRF (e.g. #6 news; #8 news; OCC, mixed paper, hardpack, etc.) and the markets to which the different paper grades were sold. Interviewees were also asked if they knew the fate of the paper fibres at the end markets (i.e. the products made at the mills where they were sent).

Given that the paper recycling industry in North America wide, and more recently has become a global industry, with a steady increase in the extent to which paper fibre materials are shipped to China, India, South Korea, more recently Vietnam and other overseas markets in Asia in particular, some research time was expended to identify some global market dynamics, in particular closures and consolidations of mills and businesses that traditionally recycled paper fibres from the Ontario Blue Box program, and the different dynamics of overseas export markets in the last few years.

3. Quantities of Paper Fibre Materials Available, Recycled and Disposed By Ontario Households Using The Blue Box System

3.1 Amounts of Residential Blue Box Printed Paper and Packaging Available and Recycled In Ontario, 2003 to 2009

Tables 3, 4 and 5 present the amounts of Blue Box printed paper and paper packaging available and recycled in the Blue Box Program from 2003 to 2009, along with the estimated recycled rate by broad paper fibre category which includes:

- Printed paper - newsprint, magazines and catalogues, telephone books and other printed paper and
- Paper packaging - Old corrugated containers, gabletops, aseptic containers, paper laminants, old boxboard.

Table 3: Blue Box Printed Paper and Paper Packaging Materials Available, Recycled and Recycling Rate in Ontario, 2003 to 2005

Data Year	2003			2004			2005 *		
Material	Quantity Available (tonnes)	Quantity Recycled (tonnes)	Recycling Rate (%)	Quantity Available (tonnes)	Quantity Recycled (tonnes)	Recycling Rate (%)	Quantity Available (tonnes)	Quantity Recycled (tonnes)	Recycling Rate (%)
Newsprint - CNA/OCNA	264,800	198,666	75%	283,483	213,943	75%	268,224	215,716	80%
Newsprint - Non-CNA/OCNA	136,400	102,334	75%	134,699	101,656	75%	128,557	103,390	80%
Magazines and Catalogues	95,100	68,898	72%	96,349	72,240	75%	97,267	73,043	75%
Telephone Books	15,000	11,254	75%	16,090	12,143	75%	21,090	16,961	80%
Other Printed Paper	127,800	49,463	39%	129,368	51,519	40%	122,082	47,408	39%
Printed Paper Total	639,100	430,615	67%	659,989	451,501	68%	637,220	456,518	72%
Old Corrugated Containers	140,000	100,279	72%	141,800	107,357	76%	165,706	115,230	70%
Gabletop Containers	12,800	1,222	10%	12,900	1,638	13%	15,145	2,100	14%
Paper Laminants	42,000	420	1%	42,500	425	1%	37,673	377	1%
Aseptic Containers	2,800	268	10%	2,800	356	13%	3,543	456	13%
Old Boxboard	130,500	54,712	42%	132,200	58,573	44%	127,388	67,674	53%
Paper Packaging Total	328,100	156,901	48%	332,200	168,349	51%	349,455	185,837	53%



Table 4: Blue Box Printed Paper and Paper Packaging Materials Available, Recycled and Recycling Rates in Ontario, 2006 to 2008

Data Year	2006 *			2007 *			2008		
Material	Quantity Available (tonnes)	Quantity Recycled (tonnes)	Recycling Rate (%)	Quantity Available (tonnes)	Quantity Recycled (tonnes)	Recycling Rate (%)	Quantity Available (tonnes)	Quantity Recycled (tonnes)	Recycling Rate (%)
Newsprint - CNA/OCNA	259,570	235,716	91%	269,247	236,301	88%	255,785	224,344	88%
Newsprint - Non-CNA/OCNA	124,409	112,976	91%	129,047	113,257	88%	125,176	109,790	88%
Magazines and Catalogues	89,653	79,815	89%	91,112	80,013	88%	91,339	80,112	88%
Telephone Books	14,431	13,105	91%	19,933	17,493	88%	15,392	13,500	88%
Other Printed Paper	117,200	57,232	49%	120,303	53,018	44%	121,206	59,844	49%
Printed Paper Total	605,263	498,844	82%	629,642	500,082	79%	608,898	487,590	80%
Old Corrugated Containers	162,846	124,807	77%	162,847	125,610	77%	169,170	155,563	92%
Gabletop	14,433	2,233	15%	14,836	2,317	16%	15,184	3,576	24%
Paper Laminants	37,094	371	1%	38,387	384	1%	39,289	393	1%
Aseptic Containers	3,413	485	14%	3,941	503	13%	4,252	784	18%
Old Boxboard	123,774	73,299	59%	127,666	73,931	58%	130,538	85,092	65%
Paper Packaging Total	341,560	201,195	59%	347,677	202,745	58%	358,433	245,408	68%

Table 5: Blue Box Printed Paper and Paper Packaging Available , Recycled and Recycling Rate in Ontario, 2009

Data Year	2009			
Material	2011 sales	Quantity Available (tonnes)	Quantity Recycled (tonnes)	Recycling Rate (%)
Newsprint - CNA/OCNA	188,163	226,370	196,010	87%
Newsprint - Non-CNA/OCNA	139,537	110,781	95,924	87%
Magazines and Catalogues	53,751	85,585	74,107	87%
Telephone Books	9,561	13,852	11,995	87%
Other Printed Paper	55,770	118,782	61,305	52%
Printed Paper Total	446,782	555,370	439,341	79%
Old Corrugated Containers	117,292	173,400	159,077	92%
Gabletop	13,931	14,638	3,944	27%
Paper Laminants	24,964	38,504	385	1%
Aseptic Containers	6,041	4,082	925	23%
Old Boxboard	147,735	127,275	71,172	56%
Paper Packaging Total	309,963	357,899	235,503	66%
Printed Paper & Paper Packaging Total		913,267	674,843	74%



The amounts of printed paper and packaging generated (available) from 2003 to 2009 are presented in Figure 1.

- The **printed paper** category tonnage available has decreased from a high of 660,000 tonnes in 2004 to 608,000 tonnes in 2008 and 550,000 tonnes in 2009. The 2010 printed paper tonnage available is likely to be lower than in 2009 because of decreasing newspaper amounts. The dramatic reduction between 2008 and 2009 is mainly as a result of rapidly diminishing amounts of newsprint in the Ontario market.
- The amount of **paper packaging** generated (available) has increased from about 330,000 tonnes in 2003 and 2004 to a value of 358,000 tonnes in 2008 and 2009.
- **Total printed paper and packaging** amounts varied from a high of 992,000 tonnes in 2004 to 967,000 tonnes in 2008 and a dramatic drop to 913,000 tonnes in 2009. It is expected that the 2010 will be lower again.

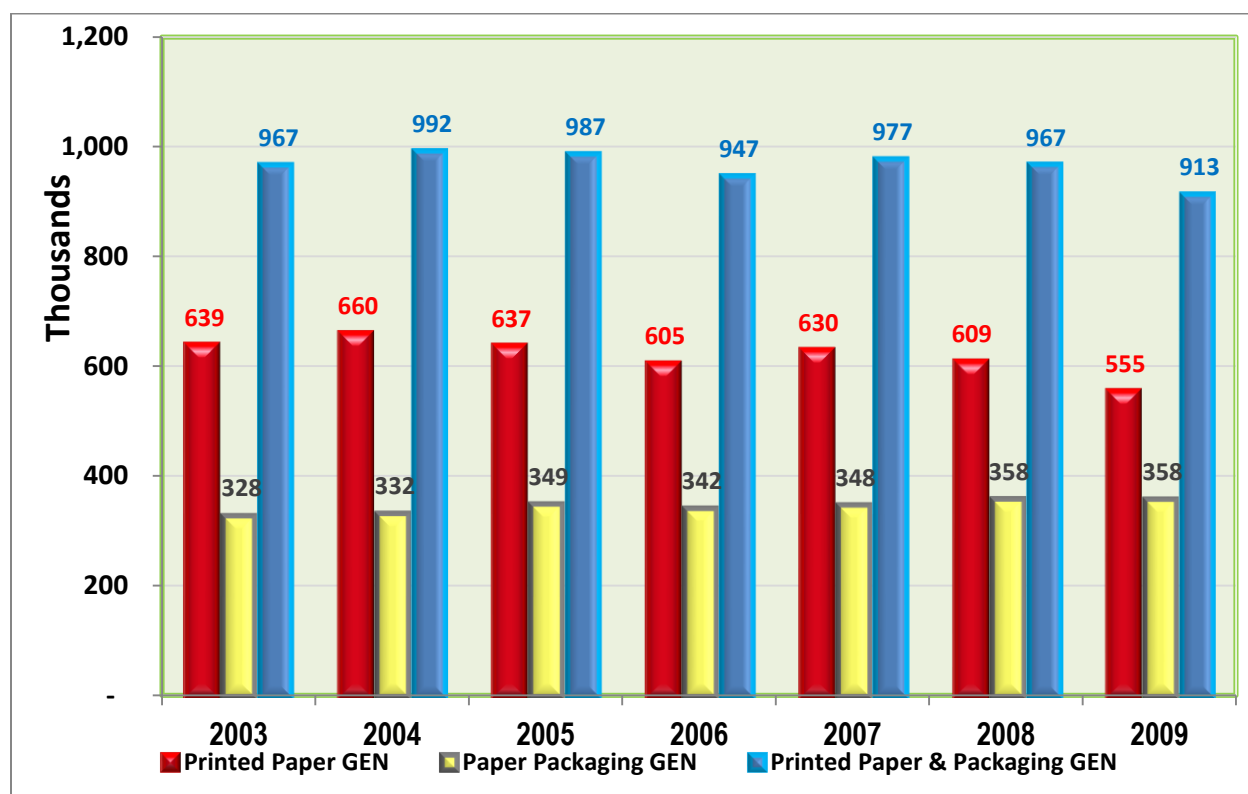


Figure 1: Ontario Blue Box Printed Paper and Paper Packaging Available 2003 to 2009 (tonnes)

The amounts of PPP recycled in the Ontario Blue Box has changed over time as shown in Figure 2.



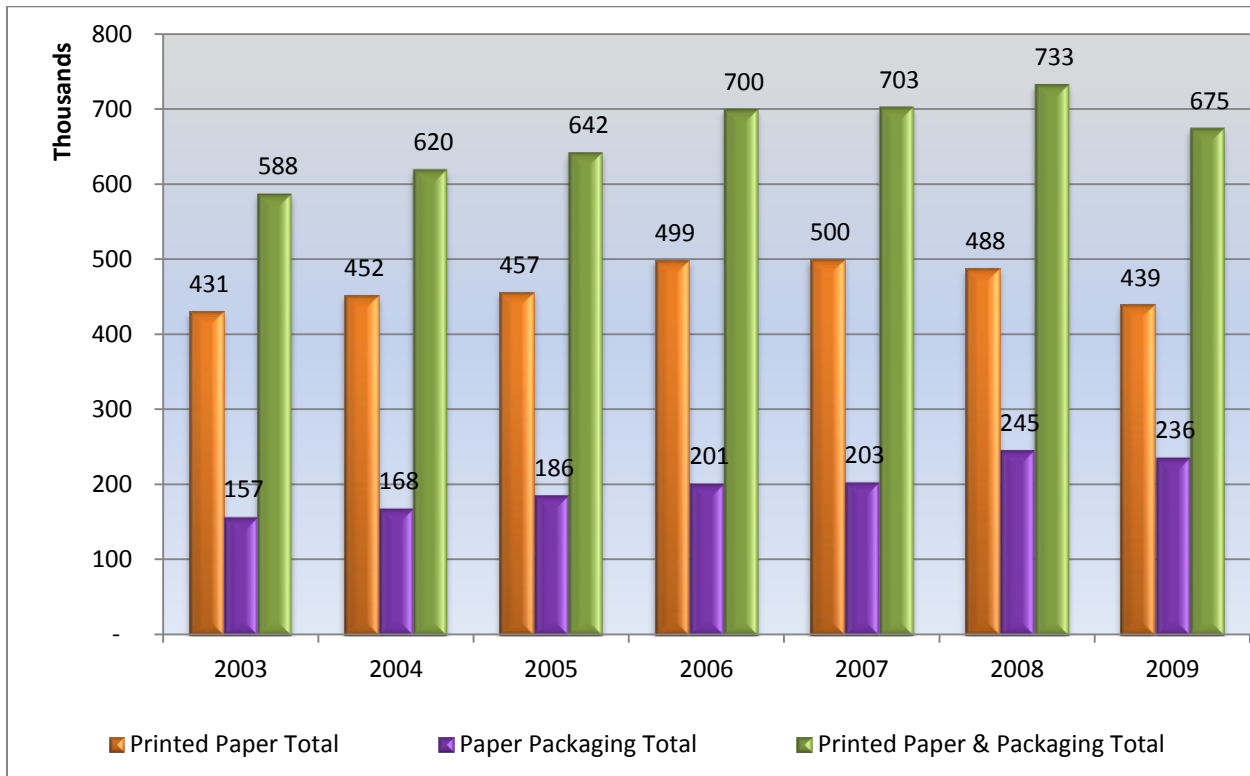


Figure 2: Amount of Printed Paper and Packaging Recycled in The Ontario Blue Box System, 2003 to 2009

Figure 3 shows the calculated recycling rate for printed paper and packaging as well as for the total paper fibre category. This figure shows the steady increase in the recycling rate for paper packaging from 48% in 2003 to 66% in 2009. The recycling rate for printed paper has also grown steadily from 61% in 2003 to 74% in 2009.

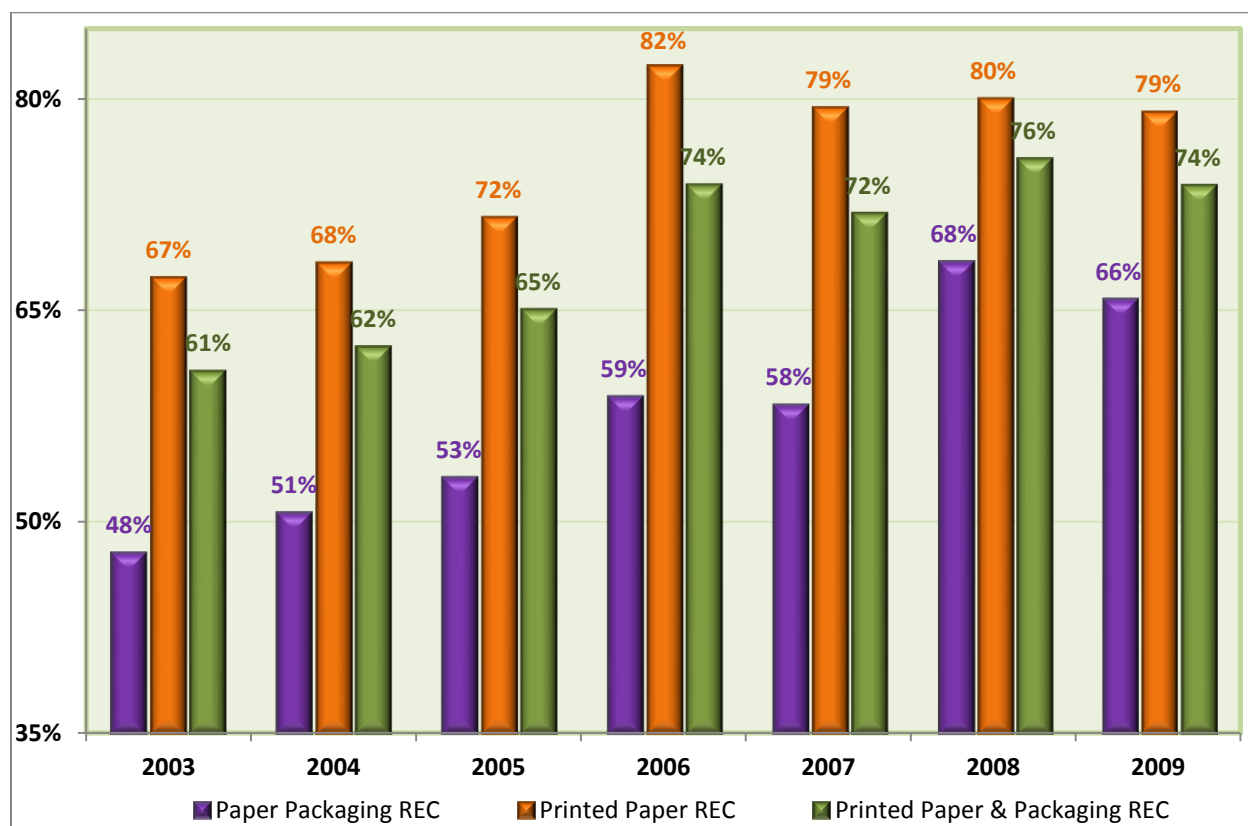


Figure 3: Recycling Rate for Printed Paper and Packaging, 2003 to 2009

It is worth looking at the numbers for ONP separately from other fibres, as the ONP values have a significant impact on the overall totals. As shown in Figure 4 and Table 6, the amount of ONP available (generated) peaked at a value of 418,000 tonnes in 2004 but declined in 2005 and 2006. There was an increase in 2007, a drop in 2008 to 380,000 tonnes, and a significant drop of 43,000 tonnes to 337,000 tonnes in 2009. The implications of this ONP trend, which is expected to continue, are discussed elsewhere in this report.

Table 6: ONP Quantities Available and Recycled, 2003 to 2009

Year	ONP Generated (tonnes rounded)	ONP Recycled (tonnes rounded)	ONP Disposed (tonnes rounded)	Recycling Rate (%)
2003	401,000	301,000	100,000	75%
2004	418,000	315,000	103,000	75%
2005	396,000	319,000	78,000	81%
2006	383,000	348,000	35,000	91%
2007	398,000	349,000	49,000	88%
2008	380,000	334,000	47,000	88%
2009	337,000	291,000	45,000	86%



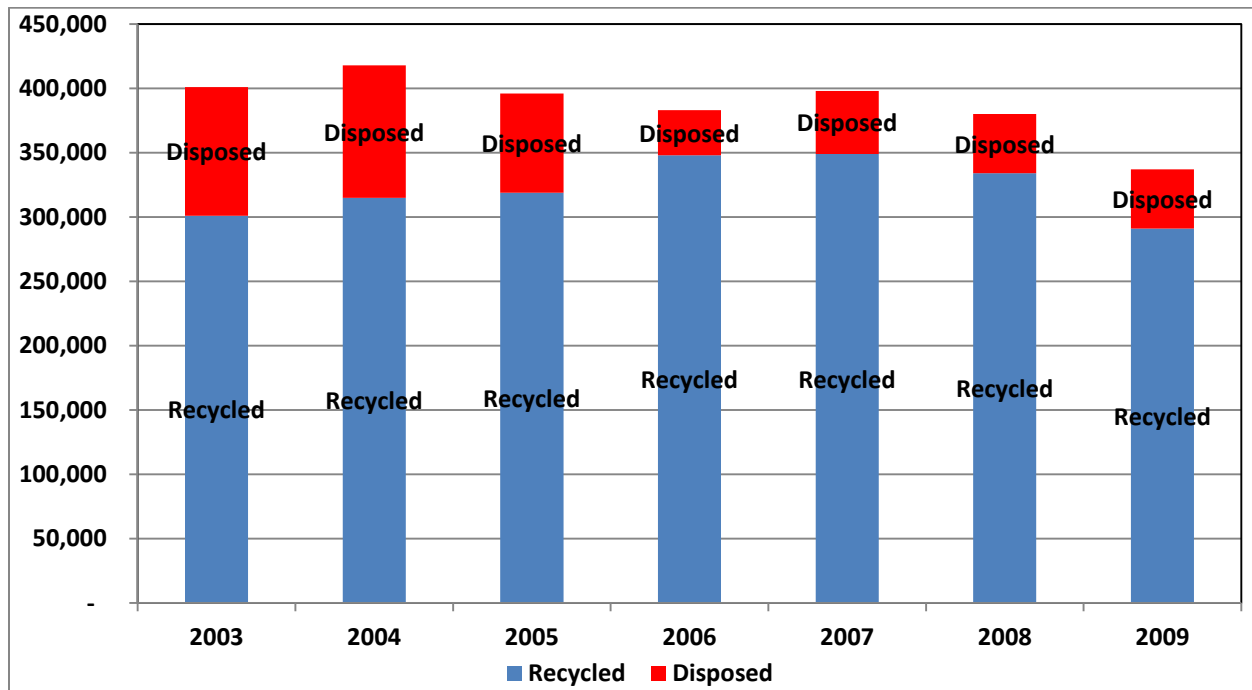


Figure 4: Amount of ONP Available, Recycled and Disposed in Ontario, 2003 to 2009

Figure 5 shows the amount of printed paper and paper packaging disposed in Ontario between 2003 and 2009. The figure shows the dramatic drop in tonnages disposed from a value of 380,000 tonnes in 2003 to 238,000 tonnes in 2009. The additional 140,000 tonnes recycled not only preserves landfill capacity but also has a value of about \$14 million at market prices paid in mid-2011.



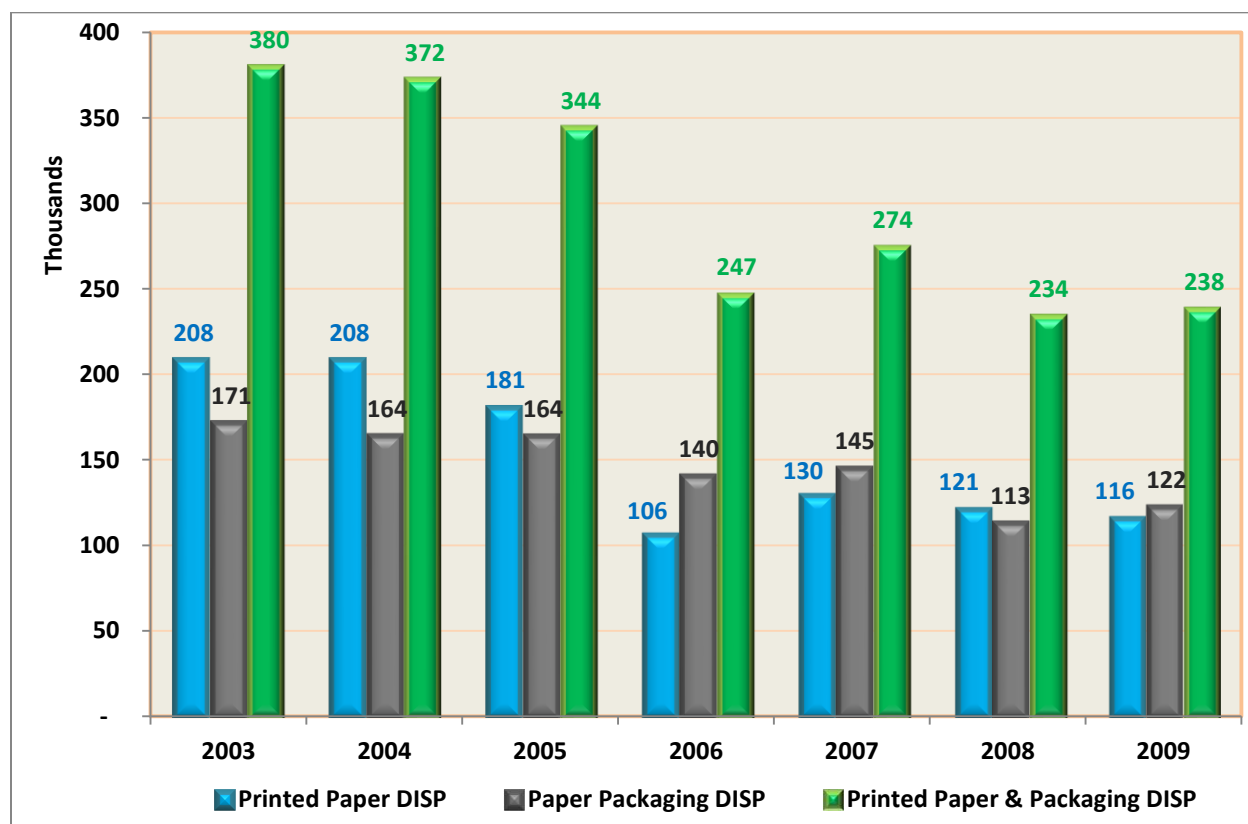


Figure 5: Amount of Printed Paper and Paper Packaging Not Captured (Disposed) 2003 to 2009

3.3 Residential Printed Paper and Paper Packaging Available, Diverted and Disposed in Ontario In 2009

This section examines data for 2009 in greater detail, in order to identify potential opportunities to increase the capture of paper fibres in the Ontario Blue Box system.

Table 7 summarizes the amount of printed paper and paper packaging generated (available), recycled and disposed in Ontario in 2009, which is the most recent year for which information is available at the time the research was carried out.

Table 7: Ontario Blue Box Paper Fibre Quantity Estimates, 2009 (tonnes)

	Generated	Diverted	Disposed
Total Printed Paper and Paper Packaging	913,267	674,843	238,425
Printed Paper	555,359	439,341	116,029
Paper Packaging	357,898	235,502	122,396

The table shows that a considerable amount of printed paper and packaging were generated (over 900,000 tonnes) in 2009, and were therefore available for recycling. The amount diverted was almost 675,000 tonnes, for an overall diversion rate of 75% (higher at 79% for printed paper and lower at 66% overall for paper packaging). Even though a considerable amount of PPP was recycled in 2009, and the recovery rate is at a healthy 75%, an estimated 238,425 tonnes of printed paper and paper packaging were



disposed. At an average revenue of \$100/tonne, the value of the disposed paper fibres is at least \$24 million at summer, using prices in place in mid-2011.

Revenues from ONP (old Newspapers) have been the backbone of the Ontario Blue Box system since its inception. ONP numbers generated and therefore recycled are dropping for a number of reasons discussed in Section 4. Even though ONP as a percentage of printed paper is dropping, the amount of ONP recycled (291,934 tonnes in 2009) is still 66% of the printed paper tonnage recycled in 2009. Therefore, even though ONP numbers are dropping, the material is still an important element of the Blue Box system, and will continue to be for the next few years.

3.3.1 Sources of Available Residential Paper Fibres in the Blue Box Stream

Figures 6 and 7 present the sources of the printed paper and packaging available in the Ontario Blue Box system in 2009. As shown in Figure 6, newsprint makes up 61% of the total, with magazines and catalogues making up an additional 15%. Telephone books account for 3% of the printed paper category, and this will likely decrease over time - see Section 4. Other printed paper makes up 21% of the available tonnage.

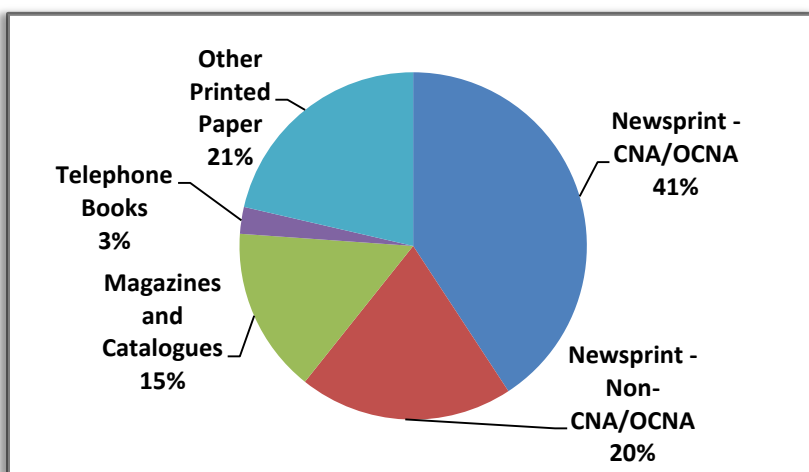


Figure 6: Sources of Printed Paper Available in Ontario Blue Box, 2009

Figure 7 presents the sources of available paper packaging in the Blue Box system. Old corrugated containers (OCC) make up almost half of the total category, with boxboard accounting for an additional 36%, or over one third of the category. Paper laminants make up 11% of the category with gable tops accounting for about 4%. Aseptic containers make up a small percentage, at just 1% of the total.

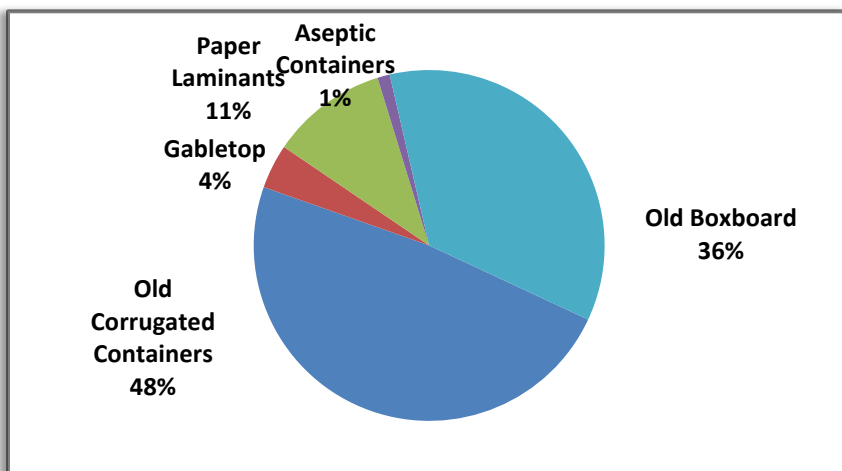


Figure 7: Sources of Paper Packaging Available in the Ontario Residential Waste Stream 2009

3.3.2 Paper Fibre Material Not Captured By The Ontario Blue Box System In 2009

The amounts of printed paper and paper packaging recycled are presented throughout this section. What is of interest to the remainder of this report is the amount of paper fibres which is not currently captured. Strategies to capture this fibre are discussed elsewhere in this report.

Figures 8 and 9 present the breakdown of the materials which are not currently captured in the Ontario Blue Box system. These total about 238,000 tonnes in 2009, made up of 116,000 tonnes of printed paper and 122,000 tonnes of paper packaging.

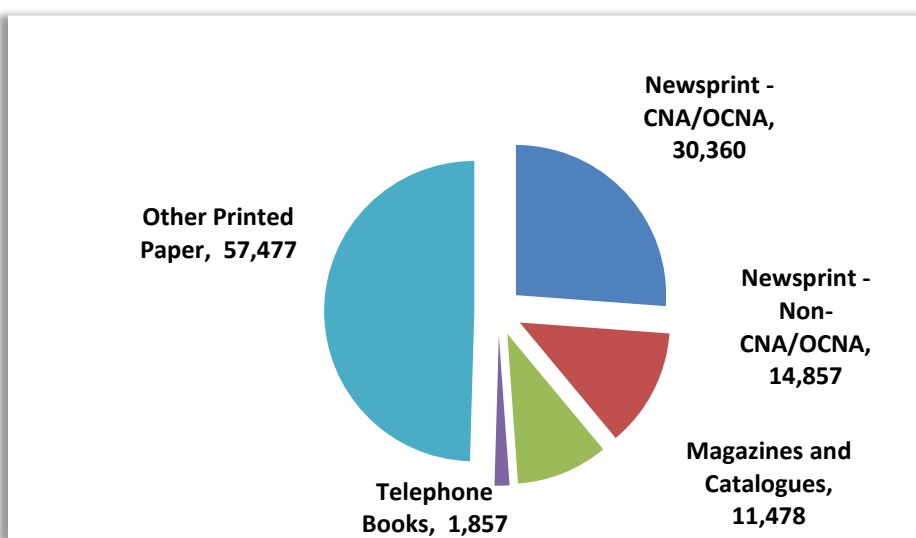


Figure 8: Composition of 116,000 Tonnes of Printed Paper Disposed From Residential Sources, 2009

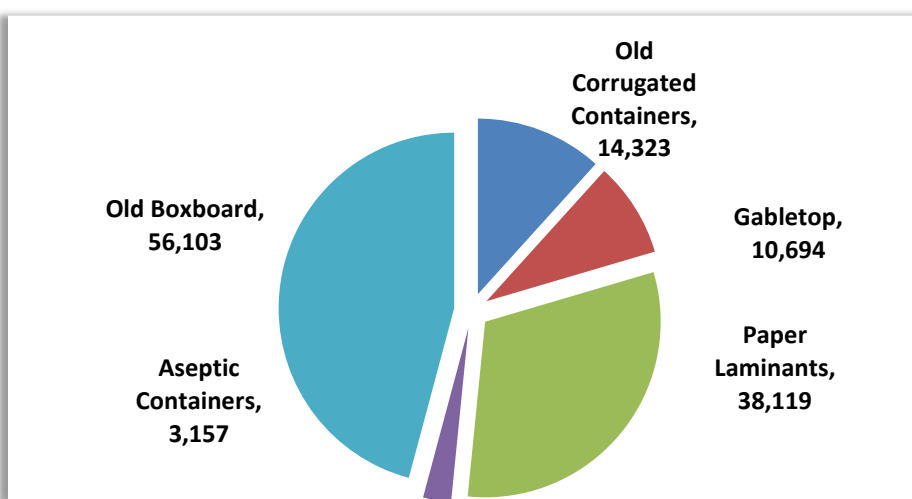


Figure 9: Breakdown of 122,000 Tonnes of Paper Packaging Disposed from Residential Sources in Ontario, 2009

3.4 Summary - Residential Paper Fibre Quantities In Ontario

This section has reviewed paper fibre quantities generated and recycled in Ontario's Blue Box system from 2003 to 2009. Key trends noted were:

- A rapid decline in printed paper amounts from 2008 to 2009: this decrease is expected to continue. The implications for Ontario's Blue Box system need to be addressed;
- While recycling rates are good, an estimated 238,000 tonnes of paper fibres are not currently captured in the Blue Box system. If even half of this amount were captured, it would result in a revenue stream of \$12 million at current prices (mid-2011). A strategy to tackle this loss should be developed;
- The amount of residential writing paper in the waste stream is expected to rise over time as home offices continue to be established. Many home offices shred all of the paper they generate. Shredded paper is problematic at most MRFs. A strategy to address shredded paper is needed.

4. The Impact Of Changing Waste Composition On Paper Fibres In The Ontario Blue Box Program

4.1 Introduction

Kelleher Environmental was hired by City of Toronto in 2010 to evaluate the extent to which future lifestyles and packaging format changes would impact on the materials in the Blue Box system over time. The City were embarking on a ten year business planning cycle and wanted assurance that they were accounting for potential future revenue losses as a result of lower amounts of fibre in their Blue Box system.

Results of the City of Toronto research (which are broadly applicable to Ontario) are briefly discussed in this section, as they are relevant to some of the issues laid out in this Current State Fibres Research Report, and of particular relevance for future system planning by

4.2 Trends That Will Change The Ontario Blue Box Composition

The Blue Box waste stream composition is changing for a number of reasons. While there are dramatic changes to the range and type of plastics in the Blue Box, printed paper and paper packaging amounts and composition are also changing. Trends related to printed paper and paper packaging of interest for future Blue Box system planning are briefly noted in this section.

One of the most dramatic reductions in fibre generation noted to date in the province was the 14% drop in fibre tonnages delivered to Toronto's MRFs from 2008 to 2009. This in part triggered the city's own interest in examining the long-term potential financial and diversion impacts of changes in its blue box stream.

Generally speaking, old newspaper (ONP) recycling generates about one-third of residential MRF revenues. ONP is the lowest cost per tonne revenue stream in a MRF because it is primarily a mechanized, high volume negative sort (and for that reason about 85% of the ONP available at the curb in the province is already recovered).

System-wide, changes like this can be expected to have a significant impact on long-term system costs of Ontario's Blue Box system

Twelve trends noted in the *Toronto Future Blue Bin Study* completed for City of Toronto by Kelleher Environmental in 2010 include:

- Decline in Newsprint Generation and Recovery
- Reduction and/or Elimination of Telephone Directories
- Increased Fine Paper and Office Paper Available For Recycling From Residential Sources
- Significantly Increased Internet Sales
- Light-Weighting Paper (and other) packaging
- Increased Use of Multi-Layered Packaging
- Material Substitution to reduce packaging weight
- Increase in Paper (but mainly plastic) Bio-Based Packaging



- Growth of “Smart Packaging” applications (e.g. RFID tags)
- Move towards Sustainable Packaging (e.g. lifecycle analyses)
- More Traction on Design for the Environment (DfE) applications in packaging

4.3 Impacts Of Future Trends On Blue Box Composition

Two broad economic factors will impact on the amounts and composition of materials in the Blue Box over time. These are:

- the level of future economic activity/growth and
- future energy pricing (and the related impact on overall consumption patterns and waste generation).

A number of different blue box future scenarios are possible. But most scenarios share a few core, similar attributes (with differing degrees of penetration):

- A trend towards smaller, busier households where convenience is paramount
- An ageing population with smaller packaging sizes and increasing snack, take-out and ready-to-eat food
- Rising health awareness and green issues influencing consumer choices
- Active on-line information and sales growth
- Continued packaging innovation - e.g. smart and sustainable packaging
-

The City of Toronto study research concluded that the following Blue Box trends are likely:

- steadily declining newspaper and hard copy magazine consumption;
- virtual disappearance of “hard copy” telephone directories
- growth of in-home office paper consumption/recycling
- significant growth in corrugated container generation in homes (i.e. due to on-line sales)
- continued growth in gabletop and/or aseptic container consumption
- 25% increase in overall plastics generation, especially pouches, mixed rigid containers and film applications (i.e. displacing heavier glass and metal and competing with paper packaging applications)
- continued growth in the use of multi-layer and flexible packaging (for paper and plastics)
- emergence of bio-plastics as a packaging material
- increased substitution of heavier for lighter packaging;
- increased light-weighting across packaging materials;
- continued substitution within plastics packaging categories
- decline in the use of steel, glass and aluminum containers

Figure 9 presents the projection of the decline in newsprint production anticipated by a study undertaken in Finland in 2008.



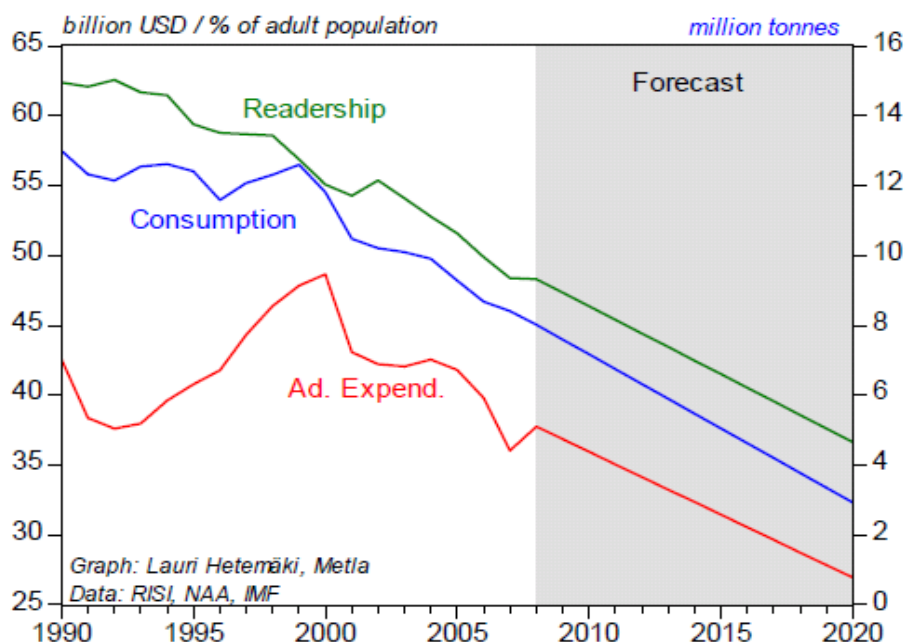


Figure 10: Projected Decline in Newspaper Readership, Consumption and Advertising Expenditure 2008 to 2020

Many publications and presentations now predict similar trends.

Figure 10 presents projections of internet sales in Canada to 2012. These projections impact on Blue Box quantities as many internet sales are delivered in corrugated containers. An increase in the OCC amounts in the Blue Box have been noted by many Ontario MRF operators in the last few years.



Figure 11: Projected Growth In Internet Sales (as a % of Total Sales)



An overall 20% increase of total packaging in the Ontario Blue Box was predicted in the City of Toronto study, using detailed waste audit data for City of Toronto and in consultation with City of Toronto staff. A similar, broader calculation needs to be completed for the Province of Ontario at some point.

Up to 75% of gross recycling revenues for many Ontario programs come from the fibre stream. Less fibre (e.g. less newspaper) means higher per tonne program costs.

The material specific costs of managing Blue Box materials vary widely. Paper fibres (and steel & aluminum) are comparatively cheap to recover. Plastics and composite paper packaging recycling are already expensive; they will get more expensive as additional “hard to manage” multi-layer materials are added to future programs.

Table 8: Projected Impacts of Waste Composition on Printed Paper and Packaging In City of Toronto Blue Box in 2021

Material	Trend Based On Stewardship Ontario Data For Province Of Ontario	Economic and Energy Conditions	Key Influencing Factors
Newsprint ONP	ONP down 5%	Down 40-50% over 10 years	-younger generation switching to electronic media -community newspaper segment is strong, but remains small - some have projected 70% decline over 10 years
Phone Books	Phone books increased 2% over 5 years	Hard copy phone books eliminated	-electronic phone number access takes over - more by-laws prohibiting annual distribution - phone companies voluntarily ceasing annual distributions
Magazines	Down under 4%	Down 20% over 10 years	-main-line print magazines suffer -niche markets continue to grow
Other Printed Paper	Down over 5%	Up 20% over 10 years	- growth of in-home printers - growth of home based businesses - reduction in mail in general and paper junk mail specifically
Old Corrugated Containers	Up 18% over 5 Years (or about 3.5% per year)	35% growth over 10 years	- OCC continues as the workhorse of on-line sales
Gabletop & Aseptic Cont.	Up 25% over 5 years	50% growth over 10 years	-reflects trend towards continued strong growth in flexible packaging
Old Boxboard	0 growth over 5 years	0 growth over 10 years	- OBB getting displaced by OCC and plastics-based flexible packaging
Paper Packaging Total	9% growth over 5 years (about 2%/year)	20% growth over 10 years	-overall decline in all paper in the blue box is somewhat offset by the increase in OCC and in-home fine paper - general trend is less paper and thus less paper related revenues

Putting these specific fibre generation estimates into the context of the overall Blue Box stream, the Table presents Kelleher Environmental's preliminary estimates potential impacts in urban Ontario blue boxes in 5 and 10 year's, based on an analysis using City of Toronto waste audit data for single family households.



Table 9: Summary By Broad Material Category Of The Projected 5-Year and 10-Year Material Generation Rates for Large, Urban, Single Family Households In Ontario

Material Category	Single Family Household Generation (kg/sfh/yr)	Projected 5-year generation rate	Projected 10-year generation rate	10-year projected Increase or Decrease
Total Paper	251.97	228.87	205.77	-18%
Total Plastics	78.84	85.63	92.42	+17%
Total Metal	23.97	23.93	23.90	flat
Total Glass	32.52	24.39	16.26	-50%
Total Printed Paper and Packaging	387.3	362.82	338.35	-15%

5. Collection And Processing Of Paper Fibres In The Ontario Blue Box Program

The Ontario Blue Box system includes over 200 programs, many in small communities. Twenty one (21) of these programs (referred to as "Top 21" programs) market 85% of the fibres recovered in 2009. It was agreed at the Progress Meeting on 5th July, 2011 that these 21 programs should be the focus of the study.

5.1 Fibres Marketed By "Top 21" Ontario Blue Box Programs In 2009

The amounts of paper fibres marketed by the "Top 21" programs which market 85% of Ontario's residential paper fibres (in thousands of tonnes in 2009), along with the households served and fibre recovered (in Kg/household) are presented in Table 10 and Figure 12.

Table 10: Paper Fibres Marketed (Tonnes) and Kg Per Household By "Top 21" Ontario Programs in 2009

Municipal Group and Program Name	Total Hhlds Served	Total BB Marketed Tonnes	Total Metal, Plastic, Glass Marketed Tonnes	Total Fibre Tonnes ¹	Fibre Marketed (kgs/hhld)	Identification of Single Tier or located within Regions, Counties or Districts
TORONTO, CITY OF	943,794	142,106	29,125	112,981	120	Toronto
PEEL, REGIONAL MUNICIPALITY OF	395,000	88,177	17,096	71,081	180	Peel
YORK, REGIONAL MUNICIPALITY OF	308,852	76,915	16,742	60,173	195	York
OTTAWA, CITY OF	369,271	61,561	11,632	49,928	135	Ottawa
DURHAM, REGIONAL MUNICIPALITY OF	203,969	45,225	10,306	34,918	171	Durham
HALTON, REGIONAL MUNICIPALITY OF	171,478	42,138	7,970	34,168	199	Halton
HAMILTON, CITY OF	206,672	38,876	10,558	28,318	137	Hamilton
WATERLOO, REGIONAL MUNICIPALITY OF	191,170	35,192	8,728	26,464	138	Waterloo
NIAGARA, REGIONAL MUNICIPALITY OF	162,552	36,005	9,653	26,351	162	Niagara
LONDON, CITY OF	162,087	25,945	5,266	20,679	128	Middlesex
ESSEX-WINDSOR SOLID WASTE AUTHORITY	153,529	22,786	4,160	18,626	121	Essex
SIMCOE, COUNTY OF	122,877	23,432	7,080	16,353	133.08	Simcoe

GREATER SUDBURY, CITY OF	61,353	14,638	3,968	10,670	173.91	Greater Sudbury
BLUEWATER RECYCLING ASSOCIATION	68,449	11,179	2,553	8,626	126.02	Huron
QUINTE WASTE SOLUTIONS	64,893	11,206	2,720	8,486	130.78	Simcoe
BARRIE, CITY OF	53,408	11,797	3,340	8,457	158.35	Simcoe
PETERBOROUGH, CITY OF	34,632	8,786	1,838	6,949	200.64	Peterborough
KINGSTON, CITY OF	50,299	8,760	2,049	6,711	133.41	Frontenac
THUNDER BAY, CITY OF	49,069	6,221	552	5,669	115.54	Thunder Bay
GUELPH, CITY OF	44,993	7,682	2,594	5,088	113.09	Wellington
OXFORD, RESTRUCTURED COUNTY OF	42,626	6,900	1,912	4,988	117.03	Oxford
SAULT STE. MARIE, CITY OF	33,708	6,140	1,235	4,905	145.52	Algoma
KAWARTHA LAKES, CITY OF	38,393	5,955	1,365	4,590	119.55	Kawartha Lakes
NORTHUMBERLAND, COUNTY OF	36,579	5,669	1,204	4,465	122.07	Northumberland
BRANTFORD, CITY OF	38,798	5,613	1,198	4,415	113.80	Brantford
MUSKOKA, DISTRICT MUNICIPALITY OF	45,653	5,658	1,623	4,036	88.40	Muskoka
CHATHAM-KENT, MUNICIPALITY OF	47,315	4,879	1,020	3,858	81.55	Chatham-Kent
PETERBOROUGH, COUNTY OF	34,279	4,560	954	3,606	105.21	Hastings
SARNIA, CITY OF	40,698	4,217	914	3,303	81.16	Lambton
NORFOLK, COUNTY OF	27,935	4,138	1,092	3,046	109.05	Norfolk
NORTH BAY, CITY OF	20,841	3,634	852	2,782	133.46	Nipissing
ONTARIO TOTAL	4,225,172	775,991	171,299	604,692	135.10	ONTARIO TOTAL

Figure 12 presents the information in graphical format. The figure clearly illustrates that Toronto is a dominant program, marketing 113,000 tonnes of fibre. This is followed by Peel at 71,000 tonnes and York at 60,000 tonnes. The figure also shows that 10 programs marketed over 20,000 tonnes of fibres each in 2009.

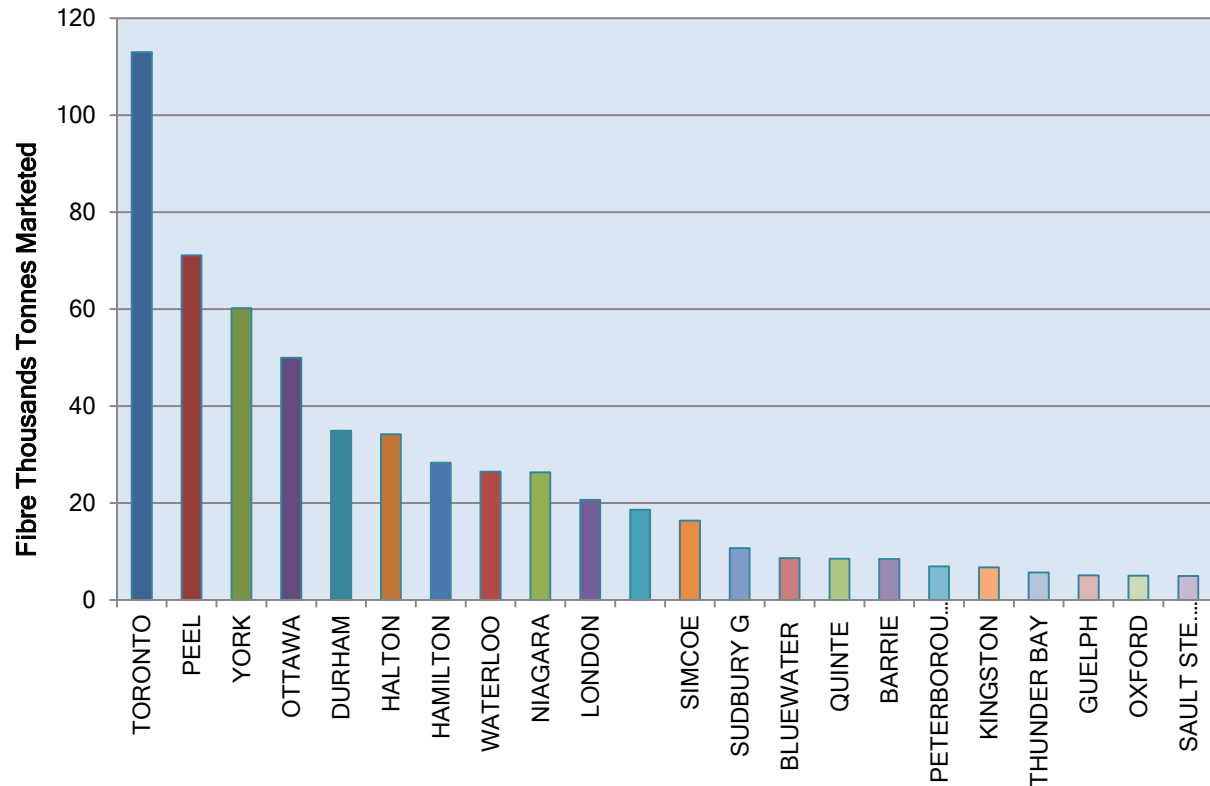


Figure 12: Blue Box -Programs That Market 85% of Ontario Fibres , 2009

The figure also shows that over 500,000 tonnes of fibre are marketed from 13 of the Province's 200+ programs. Any fibre strategy to be developed should therefore focus initially on a small number of programs where the greatest impact is likely.

Figure 13 shows how the cumulative amount from different programs contributes to the total fibre marketed in Ontario. The figure shows that over half of the fibre marketed in the Province is from five programs: Toronto, Peel, York, Ottawa and Durham. Three of these programs are single stream (Toronto, Peel and York in the GTA) and the remaining two operate 2-stream programs (Durham and Ottawa).



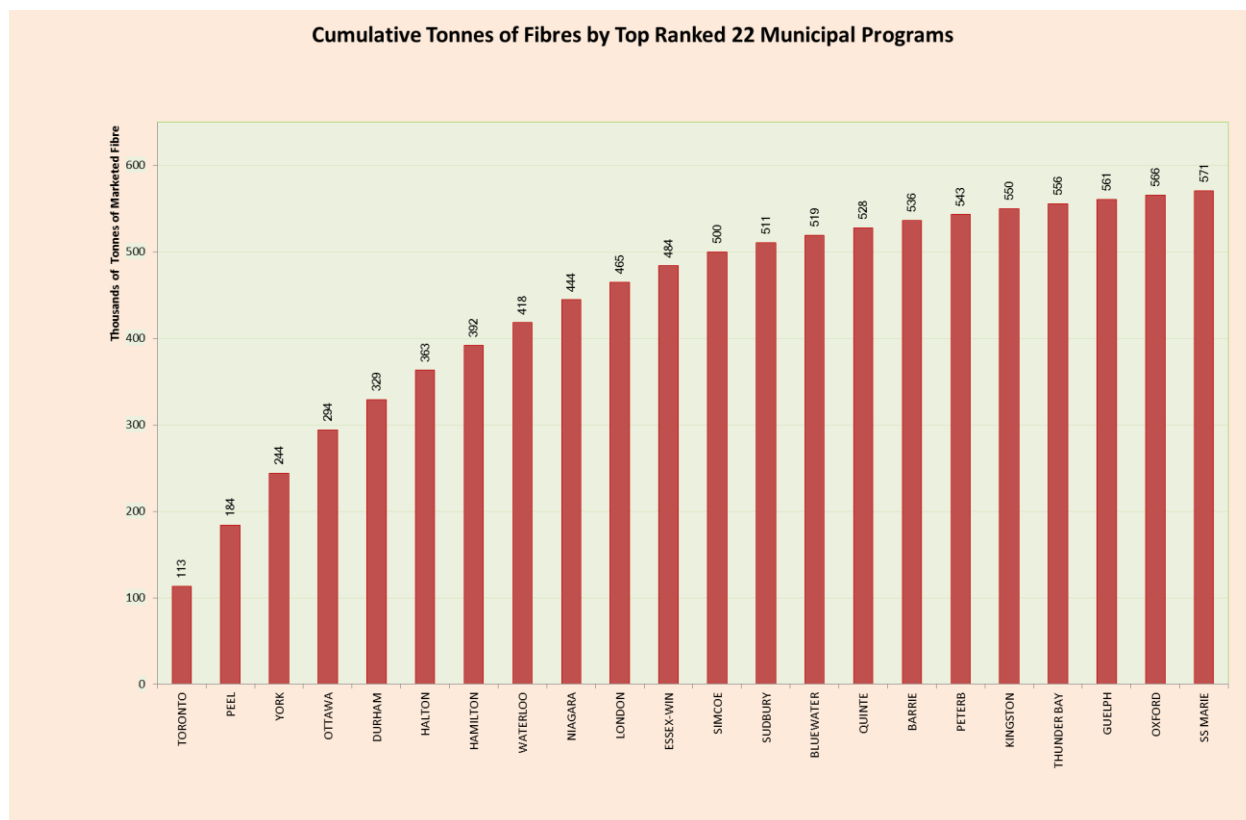


Figure 13: Cumulative Tonnes of Paper Fibre Marketed By Largest Ontario Programs, 2009

5.2 Processing of Paper Fibres in Ontario Blue Box Programs

Fibres collected in Ontario's Blue Box program are processed in a network of MRFs throughout the Province. The MRF system is a mixture of public and private sector ownership and operation. The MRFs are predominantly owned by municipalities, with most processing contracted to private sector operators. In a few cases (Toronto, Halton, etc) processing takes place at a MRF which is privately owned and operated, under contract to the municipality.

Also in a few cases (Essex-Windsor, Guelph, Niagara), the MRF is operated by staff related to the municipality. In the case of Niagara, the MRF is operated by Niagara Recycling, a not for profit local non-government organization which provides employment to special needs staff.

Good detail has been collected on the publicly owned MRFs through a study sponsored by Waste Diversion Ontario (WDO) and carried out by AECOM in 2010-2011.

Blue Box materials are collected in these programs through either:

- Single stream systems - where fibres and containers are collected together and are separated at more complex MRFs or
- Two-stream systems - where fibres and containers are collected separately, and are processed in technically simpler MRFs (in theory).

Table 11 identifies the operators for the MRFs which process fibres from large Ontario programs.

Table 11: Processing of Paper Fibres In Ontario MRFs

Single Stream Programs	Single Stream MRF Operators	Two Stream Programs	Two Stream MRF Operators
Toronto	Canada Fibres - Dufferin (until 2013) Canada Fibres - New Merchant MRF Cascades Recovery Inc - Scarborough Merchant MRF (until 2012)	Ottawa	Cascades Recovery Inc
Peel	Canada Fibres	Durham	Cascades Recovery Inc
York	Miller Waste Systems	Hamilton	Canada Fibres
Halton	Emterra (until 2014)	Waterloo	Canada Fibres
Bluewater	BRA (Bluewater Recycling Association) - 2-stream until 2010; then converted to single stream	Niagara	Niagara Recycling (not for profit NGO)
Guelph	City of Guelph	London	Miller Waste Systems
		Essex Windsor	EWSWA (Essex Windsor Solid Waste Authority)
		Simcoe	Misc
		Sudbury	Canada Fibres

The table shows that there are a few key players in the processing business, with the two dominant key players (Canada Fibres and Cascades Recovery Inc) very heavily linked to the paper industry. With the award of the recent Toronto merchant MRF contract to Canada Fibres (capacity 140,000 tonnes per year), Canada Fibres has become the dominant player in Blue Box fibre processing in Ontario. Canada Fibres also handles significant amounts of IC&I fibres, and re-processes fibres from a number of Ontario programs. The company has also recently started re-processing MRF residue (for Peel and others).

Miller Waste Systems and Emterra also operate a few MRFs in Ontario, although Emterra involvement in Ontario is now limited to Halton, with the new London contract awarded to Miller.

Cascades Recovery Inc operate two Ontario MRFs (Ottawa and Durham), and recycle significant amounts of IC&I fibres. The company is owned by Cascades, a large paper company in Canada. Cascades Recovery Inc have MRFs in every province in Canada and operate the MRF which processes recyclables from the City of Calgary curbside program.

All of the private sector MRF operators also process material from the IC&I sector.

5.3 Single Stream And Two Stream Systems

As noted previously, Ontario Blue Box materials are collected and processed in either:

- Single stream systems or
- Two-stream systems .

Table 12 presents tonnages of fibres marketed by Ontario programs in 2009 , by either single stream and two stream systems. The table shows that over half of the fibre marketed was processed through one of the single stream programs (four large programs in the GTA include Toronto, Peel, York and Halton). The Bluewater system converted from two-stream to single stream in 2010, but is shown as a 2-stream system in the table.

There was a move towards single stream MRFs and collection systems a few years ago in some communities at the same time as Green Bin collection systems were launched. This history is described in more detail later in this report.

Table 12: Fibre Marketed By Significant Single Stream and Two Stream Systems in Ontario, 2009

Single Stream	Single St Paper Fibre Tonnes	Two Stream	Two Stream Paper Fibre Tonnes	Two Stream Below 10k t/y	Two Stream Paper Fibre Tonnes
Toronto	112,981	Ottawa	49,928	Bluewater	8,626
Peel	71,081	Durham	34,918	Quinte	8,486
York	60,173	Hamilton	28,318	Barrie	8,457
Halton	34,168	Waterloo	26,464	Peterborough	6,949
Guelph	5,088	Niagara	26,351	Kingston	6,711
Sudbury	10,670	London	20,679	Thunder B	5,669
		Essex W	18,626	Oxford	4,988
		Simcoe	16,353	Sault	4,905
TOTAL SS	294,000	TOTAL 2S	222,000	TOTAL 2S <10 k tonnes/yr	55,000

In theory single stream systems result in higher capture rates for materials, as residents simply put all of their recyclables into one container. Single stream systems should save on collection costs, as only one stream of material is being collected. Additional residues are produced at the MRF but the net effect is expected to be a higher net capture of materials. Data presented later in this section do not necessarily prove this to be the case based on Datacall information, but considerable analysis is needed to confirm this.

A number of issues and concerns have been raised in connection with single stream systems:

- Single stream systems produce higher residue rates (discussed later) than 2-stream systems, although the next generation of single stream MRFs reportedly have lower residue rates⁴;
- Single stream systems have difficulty producing clean fibre streams; markets prefer cleaner fibres from 2-stream systems where they can find this material;
- Data from Ontario have not shown that single stream systems produce higher capture rates.

⁴ Tim Buwalda, SAIC

Interviews carried out during the project research identified varying opinions regarding single stream systems from processors and end markets.

Jerry Powell of Resource Recycling reports that hauling efficiency improvements typically range from 25 percent to 30 percent, and worker safety incidences plummet. In addition, anytime you move from a bin to a cart, per-household recovery levels move higher. Many SS systems attain fairly high compaction levels, but paper industry representatives like SS systems because of the higher recovery levels.

There are many modified SS systems in the Pacific Northwest, referred to as “glass-plus programs.” Residents use their cart for all recyclables except glass. Their old curbside bin is used for glass, and residents are asked to set out the glass bin only when it’s full. Glass is collected in small bins in the underbelly of the truck, or the driver calls in the address and a separate small truck picks up the glass. In several Oregon communities, other items are collected in plastic bags in the glass bin (small batteries, small household electronics, etc.).

No community to date has abandoned a SS system. The large investment in trucks and carts and the significant changes to the labor pool from improved collection efficiencies provide major barriers to moving back to a dual-stream system.

Two stream systems on the other hand are still commonplace in Ontario. They reportedly (depending on the source) are more efficient at recovering clean and marketable fibre materials. Many large communities in Ontario continue to operate 2-stream systems, including Ottawa, London, Durham, Hamilton and Niagara. Hamilton and Ottawa are exploring a move to single stream when current contracts expire. Apparently Ottawa has decided not to pursue the single stream option because of resident feedback during a recent public consultation process⁵

5.4 Analysis of Ontario Municipal Datacall Performance Data On Single Stream And Two Stream Systems

Information available on tonnes of fibre marketed and also on overall program costs through the 2009 Municipal Datacall was used to compare the performance of single stream vs 2-stream programs. The information provides some very general comparisons, but is impacted by a number of variables in addition to the single stream vs 2 stream variable. Some of the other key variables are:

- the proportion of multi-family vs single family households in the municipality;
- The level of service provided to multi-family households;
- Frequency of garbage collection (weekly vs bi-weekly; participation and capture is generally higher when garbage is collected by-weekly)
- Whether a Green Bin program is in place;
- Curbside collection policies (bag limits, user pay, etc)

The number of multi-family households in each of the programs is presented in Figure 14, which shows that a few communities have significant numbers of multi-family households. Toronto dwarfs all other programs, with almost 500,000 multi-family households. Two other communities have close to 100,000 multi-family households: Peel has 96,000 and Ottawa has 118,000.

⁵ Dan Lantz, Cascades Recovery Inc



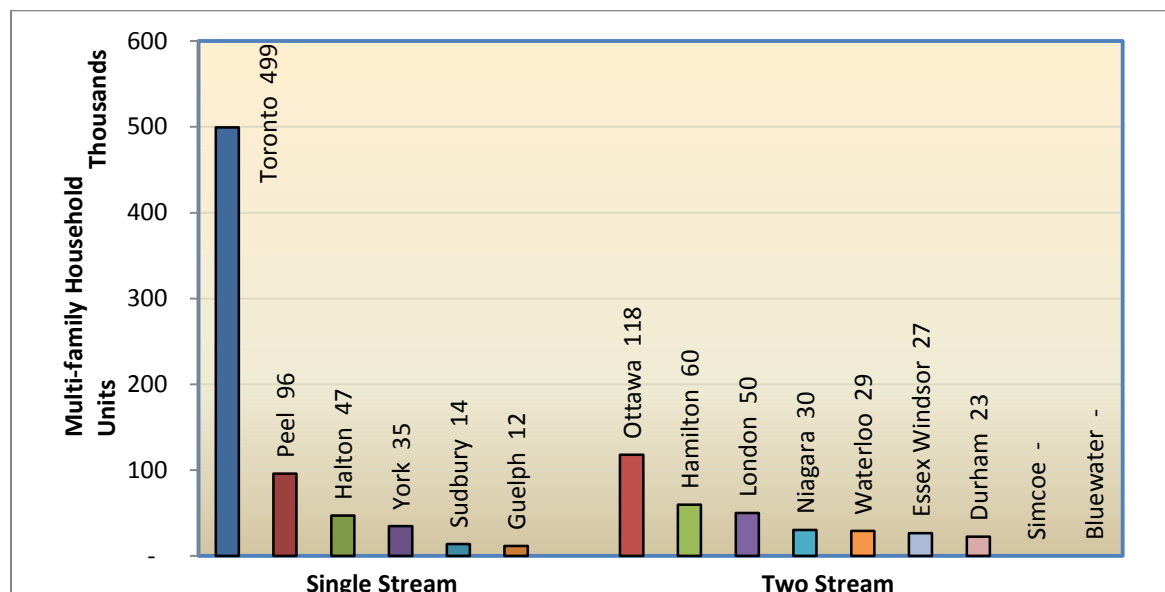


Figure 14: Number of Multi-Family Households In Large Ontario Blue Box Programs

The percentage of households in each community which are multi-family households is presented in Figure 15, again showing that Toronto is an exceptional case in Ontario, as over half of the housing is in multi-unit dwellings.

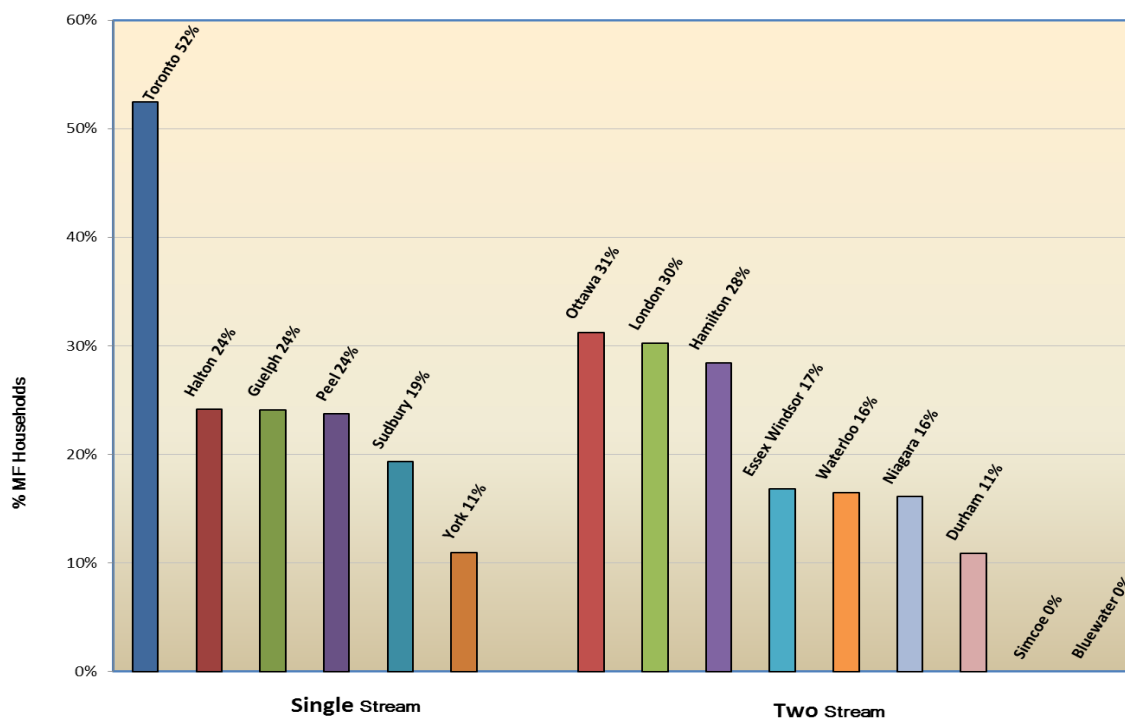


Figure 15: Percentage of Multi-Family Households In Large Ontario Blue Box Programs



5.4.1 Kg Per Household Of Paper Fibres Recovered in Selected Ontario Residential Programs

Table 13 presents information on the comparative kg/hh collected in single stream vs 2-stream programs.

Table 13: Relative Kg Per Household of Paper Fibres Recovered In Single Stream Compared To Two-Stream Ontario Programs

Single Stream	Fibres Tonnes	SF HHlds 2010	MF HHlds 2010	Total HHLDS	kg/hh
York	60,173	283,491	34,890	318,381	189
Peel	71,081	308,000	96,000	404,000	176
Halton	34,168	147,830	47,060	194,890	175
Sudbury	10,670	57,946	13,908	71,854	148
Toronto	112,981	453,048	499,314	952,362	119
Guelph	5,088	36,807	11,689	48,496	105
2-Stream	Fibres Tonnes	SF HHlds 2010	MF HHlds 2010	Total HHLDS	kg/hh
Durham	34,918	185,024	22,635	207,659	168
Waterloo	26,464	147,203	29,019	176,222	150
Niagara	26,351	156,994	30,194	187,188	141
Hamilton	28,318	150,231	59,734	209,965	135
Ottawa	49,928	259,243	117,854	377,097	132
Simcoe	16,353	125,920	n/a	125,920	130
Bluewater	8,626	68,449	n/a	68,449	126
London	20,679	115,537	50,100	165,637	125
Essex Windsor	18,626	131,603	26,667	158,270	118

The information is presented graphically in Figure 16.

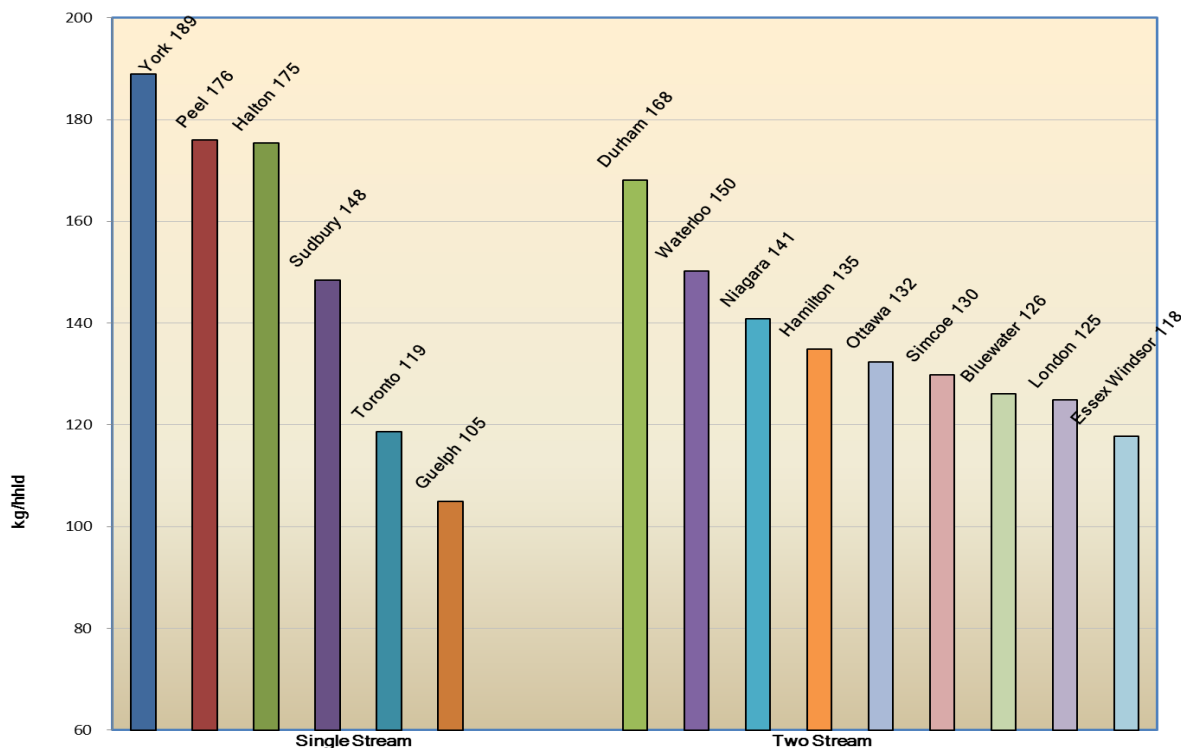


Figure 16: Paper Fibre Recovery Rates (kg/hh) in Single Stream vs 2-Stream Ontario Residential Programs

In general, it is not possible to draw any definitive conclusions on the relative kg/hh recovered through the single stream vs 2-stream programs. Based on Figure 15, the amounts recovered per household seem similar. A supplementary analysis should evaluate to the extent possible recovery rates in single vs 2-stream communities and how these change based on the curbside collection policies (bag limits, collection frequency, etc) in place.

One recommendation from this part of the research is to try to separately identify recyclables collected from single family households separately from those collected from multi-family households in communities with a significant (> 20%) multi-family component.

5.4.2 Relative Costs Of Single Stream And Two Stream Programs

Information on the relative 2009 program costs of the 21 programs of interest to the study were obtained from the 2009 Municipal Datacall. The information is presented by program in Table 14 and is presented graphically in Figure 17.

Table 14; Single Stream and Two Stream Gross and Net Costs Per Tonne (\$/t) From 2009 Ontario Municipal Datacall

Program Name	Marketed BB Tonnes	Gross Costs Per BB Tonne	Net Cost Per Tonne Marketed 2009
Single Stream			
GUELPH, CITY OF	7,682	\$591	\$501
TORONTO, CITY OF	142,106	\$376	\$289
PEEL, REGIONAL MUNICIPALITY OF	88,177	\$372	\$288
GREATER SUDBURY, CITY OF	14,638	\$327	\$285
HALTON, REGIONAL MUNICIPALITY OF	42,138	\$210	\$190
YORK, REGIONAL MUNICIPALITY OF	76,915	\$289	n/a
Two Stream			
BLUEWATER RECYCLING ASSOCIATION	11,179	\$513	\$444
SIMCOE, COUNTY OF	23,432	\$280	\$258
WATERLOO, REGIONAL MUNICIPALITY OF	35,192	\$306	\$231
LONDON, CITY OF	25,945	\$271	\$226
DURHAM, REGIONAL MUNICIPALITY OF	45,225	\$319	\$220
NIAGARA, REGIONAL MUNICIPALITY OF	36,005	\$309	\$213
HAMILTON, CITY OF	38,876	\$292	\$209
ESSEX-WINDSOR SWA	22,786	\$285	\$192
OTTAWA, CITY OF	61,561	\$284	\$190

The information on gross and net costs per tonne is presented graphically in Figure 17.

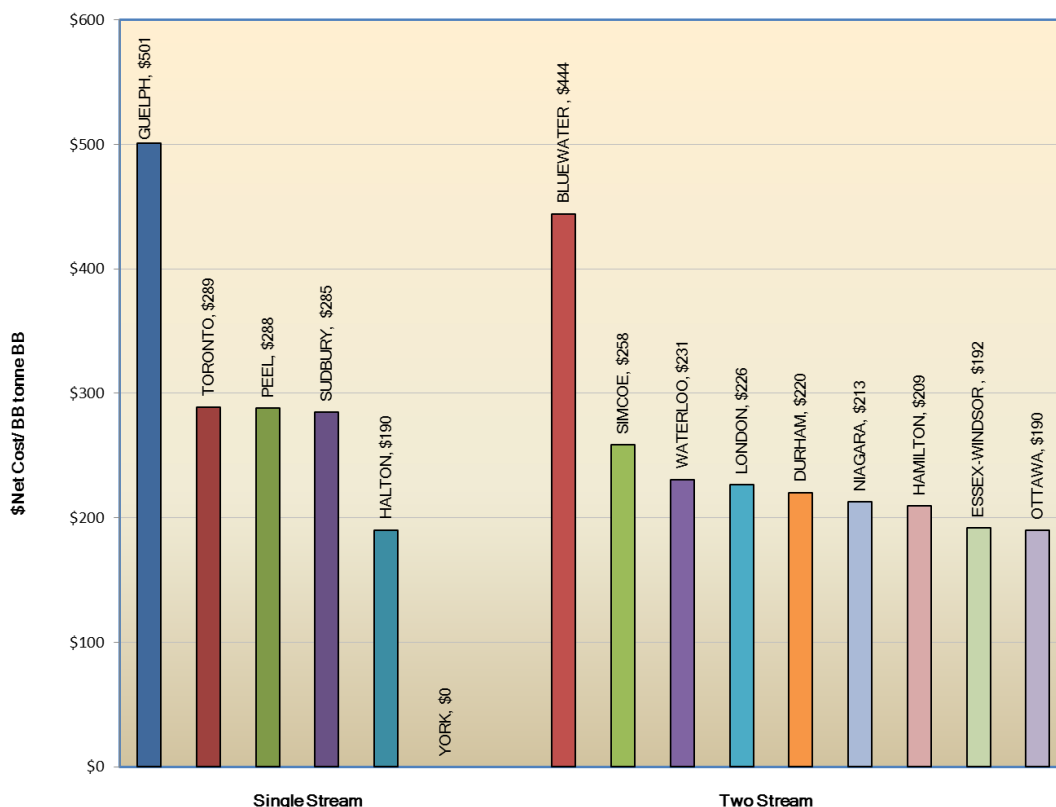


Figure 17: Net Costs Per Tonne For Selected Ontario Programs 2009

Again, the figure implies that the net cost per tonne for single stream programs is higher than for 2-stream programs, with the net cost per tonne of most 2-stream programs between \$190 to \$200/tonne.

Numerous factors impact on the gross and net costs per tonne. Significant additional analysis would be required to identify the key influences on costs in these programs.

5.5 MRF Residue Rates

As discussed previously, single stream systems report higher residue rates than 2-stream systems.

Significant amounts of fibre are being lost in MRF processing residues.

The default MRF residue rates in the Municipal Datacall for programs that do not know or measure their MRF residue rates are:

- 6.89% for 2-stream systems and
- 13.29% for single stream systems

Ontario programs are supposed to report their measured MRF residue rates if the numbers are available, but many simply report the default value, particularly if their actual MRF residue rates are higher.



Some actual MRF residue values for single stream MRFs obtained from other projects include:

- Toronto 20.5%
- York 11.9% and
- Halton 7.3%

Table 15 presents a preliminary estimate of the amount of MRF residue produced by the programs included in this study.

Table 15: Estimated MRF Residue Produced By 21 Largest Ontario Residential Recycling Programs

Program Name	Marketed BB Tonnes	Residue Rate	BB Residue Tonnes	Program Type
TORONTO	142,106	20.50%	36,644	Single Stream
PEEL	88,177	13.29%	13,515	Single Stream
YORK	76,915	11.90%	10,389	Single Stream
HALTON	42,138	7.30%	3,318	Single Stream
SUDBURY	14,638	13.29%	2,244	Single Stream
GUELPH	7,682	13.29%	1,177	Single Stream
OTTAWA	61,561	6.89%	4,555	Two Stream
DURHAM	45,225	6.89%	3,347	Two Stream
HAMILTON	38,876	6.89%	2,877	Two Stream
NIAGARA	36,005	6.89%	2,664	Two Stream
WATERLOO	35,192	6.89%	2,604	Two Stream
LONDON	25,945	6.89%	1,920	Two Stream
SIMCOE	23,432	6.89%	1,734	Two Stream
BLUEWATER	11,179	13.29%	1,713	Two Stream
ESSEX-WINDSOR	22,786	6.89%	1,686	Two Stream
Single Stream Total	382,837	13.27%	69,001	
Two Stream Total	289,020	6.89%	21,387	
GTA Total	394,561	12.0%	67,213	
Total	671,857	9.9%	90,388	

The sources for the tonnes of MRF residue are presented in Figure 18.

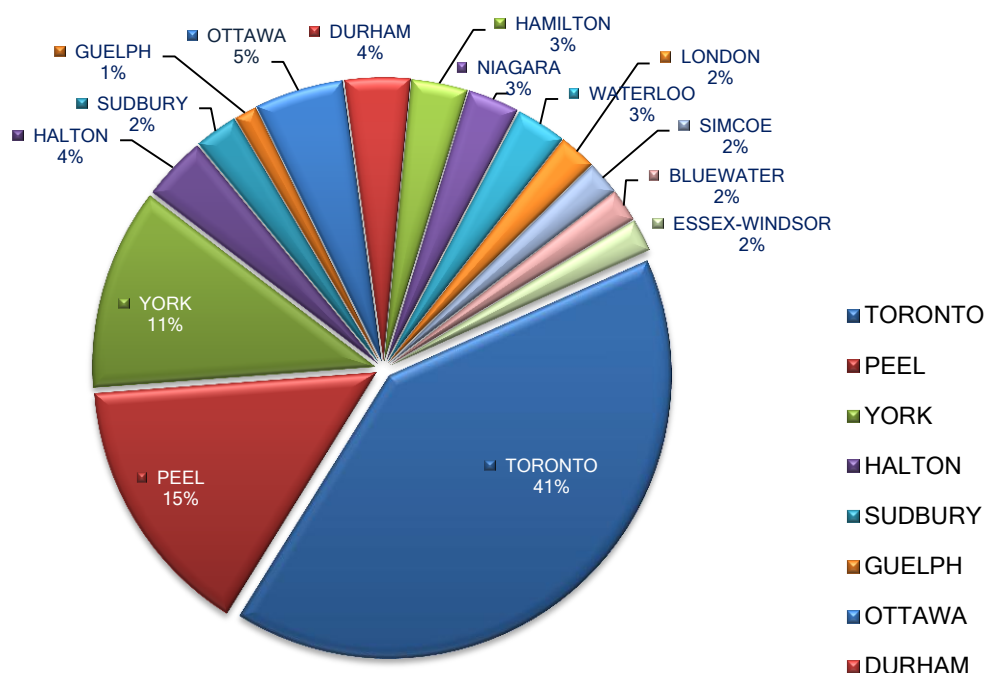


Figure 18: Sources of MRF Residue In Ontario, 2009

The figure shows that significant amounts of MRF residue are produced by the Toronto program (over 36,000 tonnes). Peel produced over 13,000 tonnes in 2009, followed by York which produced over 10,000 tonnes. Canada Fibres is processing some Peel MRF residue at this time, as well as MRF residue from Sudbury. In an interview carried out as part of the study research, Canada Fibres indicated that 40% of the MRF residue was paper fibres and half to 60% of this total could be recovered through additional processing. Residue from the York MRF is sent to Dongara for processing into a RDF (refuse derived fuel).

The table and figure show that a total of about 90,000 tonnes of MRF residue are produced by the programs included in this research study. At an average disposal rate of \$60 to \$100 for transportation and landfill, disposal of MRF residue is a \$5.4 to \$9 million annual cost to the Ontario Blue Box system.

About 70,000 tonnes/year of MRF residues are produced from single stream programs. About 60,000 tonnes of this total is produced in the GTA. An additional 20,000 tonnes are produced at 2-stream MRFs.

No publicly available information was available on MRF residue audits, to show exactly the composition of MRF residues that are currently disposed. Table 16 presents information on MRF residue composition, measured in a study completed for Region of York in 2006. This is the most recent publicly available information available. It shows that almost 40% of the York MRF residue was made up of paper fibres, a result which is consistent with the information collected through interviews.

Table 16: Blue Box Residue From Region of York MRF

MRF Residue Recyclables ⁶		York Blue Bin Residue
<i>Baseline Compaction Ratio:</i>		<i>1.62:1</i>
Paper		
ONP	14.7%	1,396
Mixed Fine Paper	6.8%	645
OCC	4.3%	405
Boxboard	5.2%	491
Magazines	3.1%	299
Molded Pulp	0.6%	60
Directories	2.1%	196
Books	2.4%	228
Kraft	0.5%	46
Total Paper	39.6%	3,765
Plastic		
PET (compacted)	5.7%	545
PET (not compacted)	2.3%	217
PET Packaging	1.5%	138
HDPE (compacted)	1.6%	151
HDPE (not compacted)	2.6%	246
Gable Top & Aseptic Containers	3.3%	314
Other Containers (#4,5,7 compacted)	1.3%	127
Other Containers (#4,5,7 not compacted)	1.5%	143
Total Plastic	19.8%	1,881
Metal Containers		
Aluminum (compacted)	0.7%	66
Aluminum (not compacted)	0.2%	23
Aluminum Foil	0.4%	33
Steel (compacted)	0.3%	27
Steel (not compacted)	0.7%	64
Total Metal Containers	2.2%	212
Glass		
Glass (large)	5.1%	483
Glass (small)	1.2%	115
Total Glass	6.3%	598
Total Recyclables	67.9%	6,456
Non - Recyclables	32.1%	3,058
Total weight (tonnes/yr)		9,514

The York MRF audit data indicate that MRF residue is about 40% paper and 20% plastic. Applying a 40% value of the figure of 70,000 tonnes of single stream MRF residue, an estimated 32,000 tonnes of paper fibre is discarded in current MRF residue. If 50% of this could be recovered, it would increase paper

⁶ Single Stream Blue Box Material Compaction Audit Study Regional Municipality of York. Prepared for York Region SWM Branch. by AET Consultants Inc. Oct 2006



recovery by 16,000 tonnes per year. The value of this paper is \$1.6 million, before processing costs. More importantly, disposal costs for this paper would be reduced by \$1 to \$1.6 million.

The CIF is already involved in MRF residue research.

5.6 Summary

This section has presented an analysis of data related to the processing of fibres in the Ontario Blue Box system. Additional research would be required on some of the issues raised to refine the estimates, but based on the research carried out for this study, a number of points are worth noting:

- 21 programs recover 85% of the fibre marketed in the Ontario Blue Box Program
- 13 programs together market 500,000 tonnes of fibres per year
- Any fibre strategy to be developed should focus initially on a small number of programs where the greatest impact is likely.
- Additional analysis is required should the costs and recoveries of single stream vs 2-stream programs be of interest - there are a number of confounders which make a simple analysis of limited value
- Data should be collected separately on fibres and other Blue Box materials collected in Blue Box programs in communities where multi-family households make up 20% or more of the total household count
- A preliminary estimate indicated that the disposal costs for MRF residues are \$5.6 to \$9 million per year and the value of the discarded fibres is \$3.2 million. An analysis is needed of the value of a MRF residue re-processing strategy, to identify what level of recovery is technically feasible
- MRF residue audits are needed to confirm the composition of MRF residue currently being discarded. Numerous MRF residue audits have been completed by Ontario municipalities but the information is not public



6. End Markets For Paper Fibres From The Ontario Blue Box Program

The use of recycled fibres from the “urban forests” of residential and IC&I recycling programs has become a cornerstone of the printed paper and paper packaging industries both in Canada and around the world. This section of the report briefly describes on how recycled content now regularly makes its way into the paper and packaging systems. The report takes a historical look at end markets mills that have come and gone over the years (mainly in Ontario) and presents a set of tables that summarize the key markets today, again with an emphasis on markets for residentially collected blue box material. Finally, this section looks at changing conditions that are expected to affect mills and markets in the future, and the impacts on revenues.

Revenues are discussed in Section 7.

6.1 Use of Recycled Paper Fibres

Material composition and economics determine the paper grades that are best suited for each paper mill's process. In the mill, a pulper breaks down the recycled paper into individual fibres, leaving contaminants available for removal. Once the fibres are separated and screened of unwanted debris, the fibres are re-formed to new products such as newsprint, paperboard (boxboard), containerboard (linerboard and corrugated medium paperboard grades) and tissue. Recovered paper grades are selected based on the finished product's fibre requirements and the mill's recovered fibre processing capabilities. Fibre length/strength, colour, ink, component coatings and contaminants found in each recovered paper grade must be compatible with the mill's fibre preparation system.

Recovered paper grades are matched with the optimal end-user. The recovered paper market is comprised of a large group of independent packers, municipal MRF operators and recovered paper brokers. There are hundreds of grades of recovered fibre, but the two most common grades (until recently) were ONP (old newspapers) and OCC (old corrugated containers). With the changing composition of the recovered paper fibre stream discussed in Section 4, mixed paper is starting to be a more commonly produced bale at most or all MRFs that process Ontario Blue Box material.

Many grades are defined between the MRF/packer/broker and the mill on a case-specific basis to meet the unique requirements of the paper mill. Each recovered fibre in the process has value, and is used, because of its unique properties that allow paper mills to:

- Produce quality-competitive and cost-competitive finished products
- Operate 24 hrs/day/365 days year at high levels efficiency and reliability, and
- Benefit from employing a majority of the mill's installed capital equipment.

Figure 19 illustrates the various products that are made from different recycled fibres.

The yield is critical to profitability of paper mills. As an example, Abitibi Thorold reports a yield of approximately 73% from a tonne of recycled newsprint.



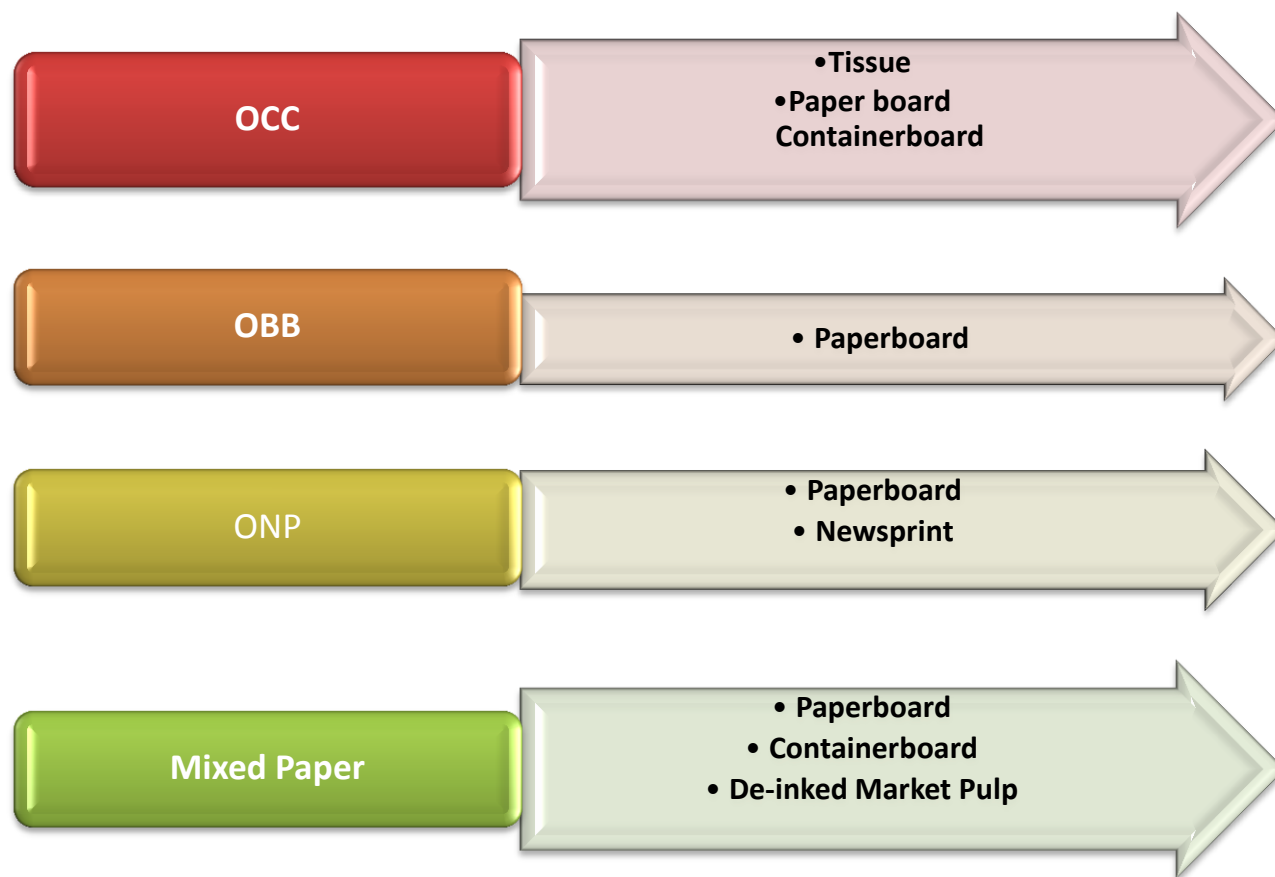


Figure 19: Products Manufactured From Recycled Paper Fibres

6.2 Paper Fibre End Markets in Ontario Until The Mid-2000s

In Ontario, the main market historically for old newspapers has been to recycled newsprint mills. There are only four 100% recycled content newsprint mills in North America left today - one of which is the Abitibi Thorold plant. Some ONP is also used as furnish for paperboard manufacturing. Some is also used for making molded pulp egg cartons and building applications (e.g. roofing material).

The primary (and most valuable) market for recovered OCC has always been the numerous containerboard mills in Ontario, Quebec and the US. OCC is also used in tissue manufacturing and paperboard. Today across Canada, there are 13 containerboard mill sites, among which 8 produce 100% recycled content (the balance blend recycled and virgin pulp, still with an average of 82% recycled content).

The sole consistent market for OBB (and for hardpack - i.e. OBB mixed with OCC) is paperboard mills. As with OCC, 10 mill sites in Canada produce boxboard grade paper packaging; 7 of these use 100% recycled content.

Mixed residential paper has three potential markets, not including export which has become the major destination for much of this material recently. This grade can be used in paperboard and containerboard (as noted above) production and as part of the de-inked market pulp market.

Some recycled fibres - e.g. polycoat and aseptic packaging - are more recent additions to the recycling stream. The major market for these products are tissue mills. Tissue production one of the forestry sector's strongest growth segments - North American tissue demand has grown an average of 2% per year over the last decade. Globally, tissue demand is expected to grow at 3% annually in the coming years.

All of these fibres can also go to lower grade applications, depending on market prices and conditions. Some paper grades (e.g. kraft paper) cannot use much recycled content because of strength performance requirements. Consequently, kraft paper produced domestically only contains 17% recycled content material.

In January 2005, Stewardship Ontario prepared a report for Waste Diversion Ontario entitled *Ontario Blue Box Markets Overview*. The major domestic newsprint mill at that time was Abitibi Thorold. Some ONP was also supplied to the Sonoco and Strathcona paper packaging plants in the Quinte area. Other key markets included Kruger in Montreal, White Birch in Quebec City (formerly Diashowa) and Atlantic Packaging in Whitby (i.e. before its closure). The major domestic OCC/containerboard mills were Atlantic, Cascades, Sonoco and Strathcona, with "exports" to Smurfit in the US, Kruger in Montreal and various other mills in Quebec and the US.

Much has changed from the list of markets at that period of time: Abitibi in Thorold is still in business but operating at half capacity as one newsprint line has been closed due to reduced demand for newsprint; the Sonoco plant in Brantford has closed, as has Abitibi in Kenora, Domtar Cornwall, Cascades Ottawa and Thunder Bay, Tembec Smooth Rock Falls, Weyerhaeuser Dryden, Norampac Red Rock and Uniboard New Liskard.

In December 2007, a follow up report was prepared by AMRC for WDO (*Disposition of Residential Blue Box Materials - December 2007*). At that time, 58% of all blue box materials (about 475,000 tonnes) was sold to end users and brokers in Ontario. Only 6% of materials were reported as sold into the US and only 4% into China.

Of the 457,000 tonnes of printed paper that was marketed: 198,000 tonnes was sold to brokers and 259,000 tonnes was sold to end users and processors. Of the total, 11% went to brokers and 42% to end users in Ontario. About 13% went to both Canadian brokers and end users outside Ontario. Only 4% went directly to the US and 5% to China.

Of the 171,000 tonnes of paper packaging marketed in 2006, 85,000 were sold to brokers and 86,000 tonnes were sold to end users and processors. 18% went to brokers and 33 % to end users in Ontario; 18% went to brokers and end users in other parts of Canada; about 11% to the US and only 2 % (reported) to China.

6.2 Markets Used Today by Ontario MRFs Processing Blue Box Materials (2011)

Table 17 summarizes the markets used by the largest curbside programs in Ontario for fibres. The information on end markets used was obtained through interviews with MRF operators, as the specific end market information is no longer collected through the Municipal Datacall for confidentiality reasons.

This issue should be re-visited, as the end market information is a critically important piece of information that Stewardship Ontario needs to collect on an annual basis, and questions regarding end market locations should be added back into the Municipal Datacall. Where confidentiality is a concern, municipalities can simply indicate that they are not at liberty to share the information.

Table 17 shows that there are a number of local Ontario and Quebec industries that are critically important end markets to ensure the sustainability of the Blue Box program.

Table 17: Main End Markets for Paper Fibres Used By Ontario Blue Box Programs, 2011

Material	Key Markets Used By Ontario Municipalities (2011)	Comments
ONP (Old Newsprint)	Abitibi Thorold, Ontario Kruger, Montreal White Birch, Quebec Strathcona - small amount from Quinte for clay coated spiralwound)	Exports to China increasing
OCC (old corrugated containers)	Atlantic - 2 sites Scarborough, Progress Ave Cascades- Norampac - 6 locations - Cabano, Jonquiere, Kinsey Falls, East Angus, PQ; Mississauga and Trenton, Ont New Forest (Scarborough - owned by Atlantic) Strathcona, Napanee Sonoco, Trent Valley, Ontario Kruger, Montreal Kruger, Syracuse Smurfit, US Paperboard Industries, US GP, US Various other mills in Ontario, Quebec, US	New Forest mill in Scarborough is the first major new paper packaging mill investment in Ontario in decades
Hardpack (mix of OCC and Boxboard) and OBB (boxboard)	Mills in Ontario (e.g. Sonoco) Quebec and Michigan	Some processors no longer make hardpack bales - leave OBB as part of mixed papers New Norampac plant coming on line in Niagara Falls NY - European-like technology (i.e. lightweight containerboard)
Mixed Papers	Some tissue mills in Ontario and Quebec	Mostly shipped overseas - China, South Korea, India, Vietnam
Polycoat Papers	Overseas (South Korea) through brokers Some markets in US (Norampac, Niagara Falls: Fibrek, West Virginia, etc) at tissue mills with hydro-pulpers	

7. Revenues from Fibres in the Ontario Blue Box Program

7.1 Background

In the very early days of the evolution of Ontario's Blue Box program (the early 1990's), the aluminum can was heralded as the "the gold in the system" that would drive blue box recycling in future years. Aluminum cans are by far the single most value commodity recycled. The current system collects about 22,000 tonnes of aluminum each year and, with a current value of about \$1750/tonne, this represents over \$38 million to the recycling system. But the real backbone - the workhorse - of Blue Box recycling has proved to be printed paper and paper packaging.

Looking back five years (in 2005), paper materials represented 71% (by weight) of the dry recyclables available. Over 80% of what was being captured was paper. Paper fibres were by far the major revenue sources for municipalities and program operators, providing \$62.9 million (62%) in program revenues that year.

Over the past 3 reporting periods for which public information is available, the City of Toronto reported that:

- between 71% to 75% of their material revenues are from paper
- 10% of their revenues are from aluminum, and
- 10% to 12% of revenues from HDPE and PET

Over the past 8 years (i.e. since 2003), the composition of ONP in Toronto Blue Box bales has reportedly fallen from 81% to 38%.

From 2007 to 2009 total reported Blue Box system revenues fell from \$106.7 million to \$105.9 million to \$60.8 million. Average per tonne revenues showed a similar pattern: from \$118 per tonne in 2007 to \$113 in 2008 and \$69 in 2009. Over the three year span, WDO reported a "rolling average" revenue of \$100/tonne.

In 2009, total Blue Box tonnes collected were 870,000 (almost 60,000 tonnes less than the year before). Printed paper and paper packaging still represented over 77% of all Blue Box material recycled (50% of that 60,000 tonne decline was from falling ONP recovery). The growth in paper's percentage contribution to the Blue Box was mainly a result of the loss of "heavy" LCBO glass tonnes due to the implementation of the alcohol container deposit system.

While printed paper and paper packaging are still the "revenue workhorses" of blue box recycling in Ontario, three occurrences have taken place that affect blue box revenues now and into the future:

- The economic downturn of late 2008 severely depressed prices for all recycled materials into 2009. 2010 and 2011 are showing positive signs of recovery, but this may be short lived as the US and Europe - still Canada's two main trading partners - are recovering slower than hoped for. Even in recycling terms, the continued strength of China's economy is fortuitous.
- ONP quantities and quality have deteriorated. Quantity declines have been noted throughout the report and are expected to continue for the foreseeable future. ONP (and other fibre) quality is mainly a result of single stream recycling challenges and of generally poor curbside enforcement practices regarding what householders set out in their blue boxes.
- For the first time ever, Canada has become a net exporter of post-consumer fibre (PCF). Canada still imports large quantities of PCF, but the balance of trade has shifted sharply to exports.

Perhaps the single most important change (particularly in fibre recycling over the past 5 years) is that post consumer fibre has become a true global commodity. Prices vary according to economic activity and markets seek to create a global supply and demand balance. The price of virgin fibre is still an important part of the equation since, as secondary materials become more costly to producers, they may seek out more virgin pulp as a substitute.

Mills commonly substitute between one fibre for another depending on price and demand. As a rule, mills are less choosy about quality when the economy is strong (and supply is more competitive). As economic conditions weaken, mills are able to become “very picky” about what product they will buy at what price. The classification of #8 News is a good case on point. When ONP supply is tight, mills will allow levels of prohibitives and out throws simply to secure supply. When demand is soft, mills can reject (or pay less) for loads that don’t meet specifications.

7.2 Blue Box Paper Fibre Revenues By Material

Figure 20 presents historical spot prices for recycled fibres in Ontario dating back to 1994, when CSR started tracking and reporting on secondary material spot prices for all Blue Box materials.

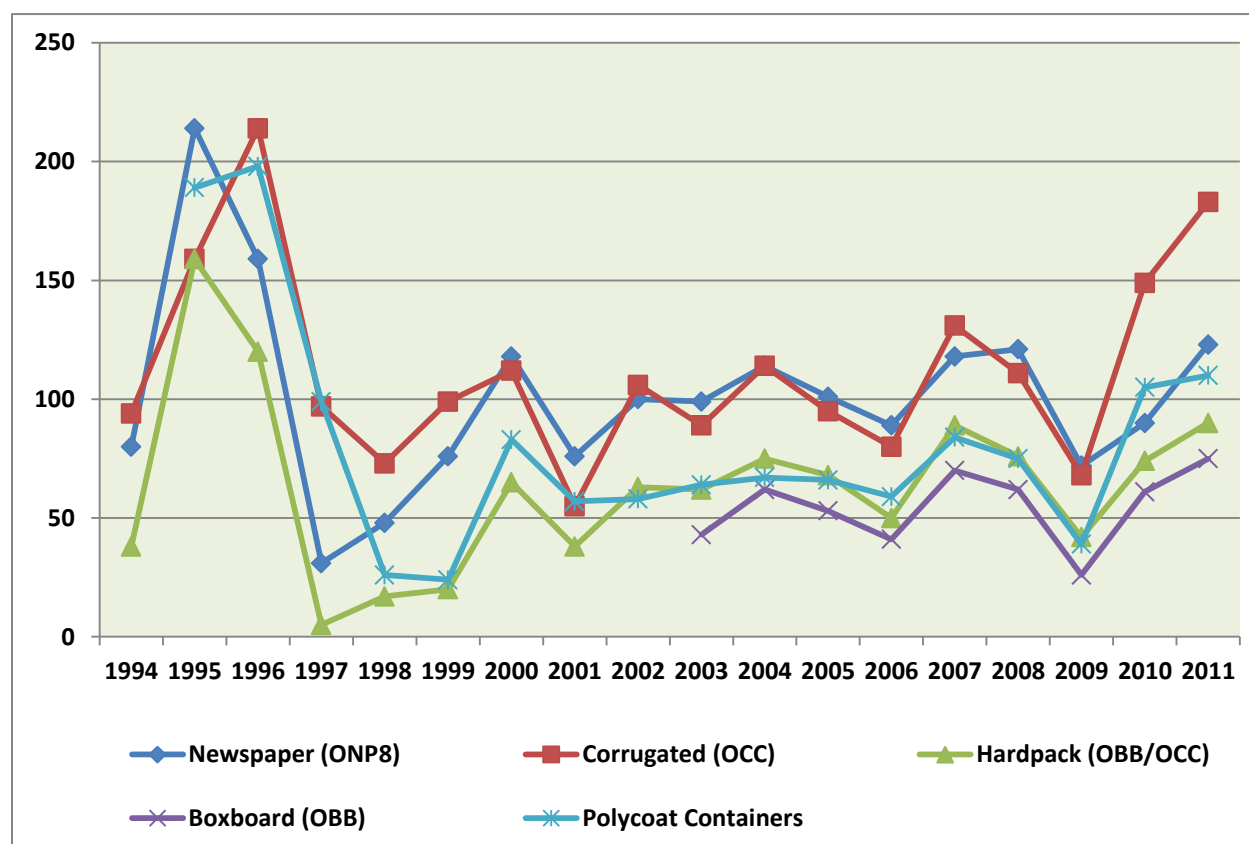


Figure 20: Revenues For Various Paper Fibre Grades From Ontario Blue Box, 1994 to 2011

The Figure speaks for itself. It shows price spikes at points of high demand - e.g. in the mid 1990's when China first began to enter the market in earnest and again in 2011, where once again international demand appears to be the main fuel. Troughs can be seen in the mid to late 2000s, with 2009 the lowest



price point since the late 1990s (mainly due to the global economic downturn beginning in the fall of 2008).

Some commodities - e.g. hardpack, OBB and polycoat - show less volatility either because they are generally less valuable in the first place (and unlikely to show high peak prices) or they are emerging markets (the price is set more by a supply push than true market demand).

Table 18 shows spot prices for Blue Box paper fibres in Ontario for 2011. Again, as noted above, current prices are high because of competing export demand, and they rose considerably during the period during which the research was undertaken. However, a sluggish US/world economy might make this current spike short-lived.

Table 18: Spot Prices For Paper Fibres In Ontario Blue Box, Summer, 2011

Commodity	Price (\$/tonne)
OCC (old corrugated containers)	\$180
ONP (#6 or #8 news)	\$130 - \$150
Mixed Paper	\$55/tonne January 2011 Buffalo \$128/tonne July, 2011 Toronto
Sorted Office paper (SOP)	\$204
Polycoat	\$114
Hardpack (OCC and OBB)	\$93
Boxboard (referred to as paperboard in the US)	\$77

7.3 Factors that Influence Paper Fibre Revenues

Historically speaking, three main factors influence post-consumer fibre pricing:

Material Supply and Demand - i.e. Economic Activity

Supply and demand are never in perfect harmony. As supply increase to meet demand, it inevitably creates over supply. As in any classic supply-demand relationship, initially prices increase, but begin to fall as too much material becomes available. For less efficient recycling mills - i.e. ones where margins are already tight - the higher cost of securing post-consumer fibre may lead to a mill no longer being profitable.

The decline in newsprint generation (and thus recovery) appears to be primarily a result of changing consumer patterns (i.e. less young people getting their news from the dailies, smaller paper sizes, etc.). By contrast, the quantity of a material like OCC is very much influenced by changes in the level of economic activity. When consumers are buying, more products are being shipped - often in boxes. As the demand (and price) for OCC rises, more and more businesses see value in increasing their own internal recycling activities. PPEC has estimated that OCC across Canada has achieved an 85% capture rate from IC&I (industrial, commercial and institutional) sources. Part of this is driven by the higher prices paid for OCC from all sources.

Product Quality

Much has been written in the trade press about the impact of single stream recycling on fibre quality. Paper mills are reporting significant increases in both prohibitives and out-throws in the material they receive from all curbside programs, but especially from single stream programs. The specifications for #8 "special, de-ink quality news" is NO prohibitives and total out-throws not to exceed ¼ of 1%. Cascades Recovery (operator of the Scarborough MRF serving half of Toronto) has reported overall MRF residue at 22% and sometimes higher. Cascades experimented with the installation of optical sorter technology



(from MSS) to try to remove the browns from their ONP stream. The technology was not up successful, although it did help as a secondary sort to reduce some of the container materials in the fibre stream.

Though not specifically a fibre quality issue, it has been noted that “clean streets programs” in some municipalities have resulted in drivers no longer leaving unacceptable recyclable materials back in the Blue Box to notify the householder that the material is not accepted in the municipality’s program. This is part of a larger problem of inadequate consumer education regarding what’s acceptable and what’s not in different Ontario programs. Cascades Recovery recently reported for example that they have managed to reduce MRF residue in their comparatively new single stream program in Calgary to about 6% as a result of a year long, active public education initiative.

Regulations - (e.g. Landfill Bans, Recycled Content Requirements, etc)

A third main factor that influence fibre revenues in Blue Box programs are regulations. The Ontario 3Rs Regulation require certain materials (including printed paper and packaging) to be recycled by Ontario municipalities, at half the level of service frequency as garbage service. This creates what is commonly called “supply push” recycling - i.e. material is diverted regardless of what markets exist to ensure it use. The inclusion, for example, of PET beverage containers on the required list was controversial at the time in Ontario because markets for R-PET were not yet well established.

More recently, decisions at the provincial (or more at the municipal level in Ontario) have been taken to ban some recyclable materials from landfill disposal. This again stimulates supply and in the short term at least, depresses prices. A more controversial example is recycled content regulations. New York (for recycled content in newspapers) and California (for recycled content in consumer plastic packaging) have been North American leaders in this type of legislation. The thinking is that just as some provincial and state level legislation cause new supply to occur, companion regulations that require brand-owners to use recycled material to a certain level in their manufacturing processes creates needed demand. So far, recycled content regulations have not made much headway in Canada, although green purchasing incentives - which are becoming more common - accomplish the same objective in a more narrow application.

7.4 Revenue Sharing And Market Trends

The research carried out for this study identified a wide variety of arrangements and incentives related to the marketing of Blue Box materials:

- Some municipalities market their own fibres (Durham, ESWA, Guelph and Quinte)
- Some municipalities rely on brokers to handle some or all of their materials -e.g. ReMM markets the containers for Peel and Hamilton on a per tonne fee; Toronto has its contractors market fibres and in one of its contracts municipal staff market the containers)
- In York (and soon to be the case in London), Miller markets all materials for the Region and the Region receives 95% of the revenues received
- In many smaller programs in Ontario in particular, the contract with the hauler/recycler includes revenues as part of the contractor fee

On the incentive side, perhaps the most interesting practice is the premium price paid (in Toronto and Peel for example) by the contractors on the fibre stream collected in each program. This practice clearly shows the value of securing the stream of materials to the contractors who have successfully won these bids.

Securing top value for materials that are recovered through a curbside recycling program is all about balancing risk and reward. As a rule, most municipal recycling programs operators are risk averse - i.e. if they retain the responsibility for marketing some or all of their Blue Box materials, they tend to seek out longer term (rather than spot market) contracts. Some of the more experienced municipal recycling

program managers dedicate some materials to long term contracts (on a bid basis) and some to spot markets to “hedge their bets”.

Increasingly, Ontario municipal program managers are tending to rely on program operators (who have the expertise) to market their program’s recyclables. Virtually all of the private sector recycling program operators now in Ontario have expert staff whose only job is to work the markets each and every day. As noted earlier, some municipalities choose to take on the risk (because of the potential return when prices are high) of retaining the revenue from material sales.

It is worth noting that the main reason for including a “three year average rolling revenue” in the Blue Box funding formula between stewards and municipalities in Ontario is this risk-reward balance. It is not uncommon for Blue Box material revenues to double or halve in a reasonably short period of time. The thinking behind the rolling revenue approach was that it would insulate both parties from the impacts of the volatility of the secondary material markets.

In the past, there has been some experimentation among municipalities in Ontario (and elsewhere , especially the US) to bundle their materials together to jointly market more tonnes and thus attract better prices. This approach also allows municipalities to cost share the expertise to “work the markets”. Sometimes called “coop-marketing”, none of the schemes to do this on a regular basis have survived in Ontario.

One of the issues that has gained some notoriety in recent years is the issue of shipping recyclables collected in Ontario programs to overseas markets. Three issues are at play:

- working and environmental conditions in Third World /overseas countries. While this has been mostly focused on waste electronics (and to some degree recycled plastics) it is also an issue for fibre markets;
- concern that Ontario is essentially exporting re-processing jobs to overseas markets, rather than have the potential benefits accrue locally, and
- the carbon footprint of shipping to distant markets. To some, the idea of shipping mixed recyclable material thousands of miles to - for example - separate out paper fibres to be used in manufacturing newsprint, then to be sold back to North America is not sustainable.

Export prices are attractive and provide a useful hedge against economic and market conditions in North America. For the foreseeable future, unless trade restrictions are imposed it can be expected that exports of paper fibres from Ontario Blue Box programs to overseas markets in China, India, Vietnam and South Korea will continue to grow. This is one element of the globalization of recyclable commodities in general and post-consumer fibres in particular.

8. Export and US Paper Fibre Markets

The US and Canada are two tightly linked paper fibre markets. Fibres move back and forth across the Canada/US border seamlessly like other commodities. The state of the US fibre recycling industry and the current movement of US fibres to overseas markets impacts on Canadian markets and is discussed in this section.

This chapter of the report examines some key trends in fibre generation, recovery, collection, processing, end markets and imports/exports in the US in recent years. The implication of these trends on residential fibre generation and recycling in Canada in general (and in Ontario specifically) is also discussed, as well as the Chinese market and recent trends among UK market operators.

8.1 US Paper Fibre Statistics

The Environmental Paper Network, an association of US environmental organizations and other groups, recently released a report providing data and analysis on the pulp and paper industries, including recycling. Some of the key findings from this report - *The State of the Paper Industry 2011: Steps Toward an Environmental Vision* - include:

- Americans are using less paper: in 2009, the average North American used 504 pounds of paper, down from 652 pounds in 2005
- US paper recovery is at an all time record high: 63.4% in 2009, up from 46% in 2000
- Landfill “deposits” of paper are down: from 42 million tons in 2005 to 26 million tons in 2009.

Consumption of recovered paper in the United States increased slightly in May 2011 compared to April, but fell from the previous May, according to the American Forest & Paper Association (AFPA). The trade group reports that domestic consumption was up by 2% month-over-month, but down by 5% compared with May 2010.

During the first five months of 2011, AFPA reported that the United States consumed 3% less recovered paper compared with 2010. Meanwhile, the country exported 3% more recovered paper in April compared with March, and exports were up 13% during the first four months of the year

Key statistics on US fibre generation, markets and recycling include:

- US Fibre generation - 31% of MSW (municipal solid waste) generated (before recycling) in North America is paper. This is more than any other 2 categories of municipal solid waste put together.
- US Fibre markets - 31% of the paper and paperboard recovered in the US in 2010 went to produce containerboard; 12% went to boxboard, 8% to tissue and 4% to newsprint
- Exports of recovered paper to China and other nations absorbed nearly 40% of the paper recovered in the US in 2010 (over 20 million tonnes)

Key statistics on US fibre processing capacity include:

- US paper and paperboard capacity declined by 3.1% in 2010 to 91.05 million short tons (total capacity declined by 0.8% in 2008 and 2.5% in 2009).
- 22 machines and 12 mills were permanently closed in 2010 (7 additional machines and 2 mills are expected to close in 2011).
- The capacity is projected to contract by another 1.4% in 2011

8.2 US Paper Recycling Trends

Jerry Powell (editor of Resource Recycling magazine in Portland Oregon) made a presentation on the changing face of paper fibre markets in the fall of 2010. Key points from the presentation *Looking Forward: Trends and Issues Affecting the Recovered Paper Industry* are summarized below.

Theme #1: Declining Paper Fibre Generation

- North American newsprint shipments fell from 12.2 million tons in 2007 to 8.1 million tons in 2009. This represents a 34% loss in just two years.
- 84% of MRF managers interviewed by Resource Recycling magazine report flat to declining fibre volumes in 2009
- Lower demand for paper/paperboard is affecting producers across North America - i.e. the same kind of forces are at play in the US as in Canada. It is a challenge to compete with new investments and demand from overseas markets
- Recent bankruptcies include:
 - Abitibi & Blue Heron in newsprint and Caraustar,
 - Newark Group,
 - Smurfit-Stone in paperboard;
- Recent closure of recycling market include:
 - Caraustar (Chattanooga, Richmond & Charlotte),
 - IP (Albany);
 - Smurfit (Missoula) and
 - Sonoco (Rockton & Lancaster)

Theme #2: Supply Push - Still More Collection

- Despite the 2008-09 recession, more than 100 communities across North America launched or expanded local recycling efforts. This “supply push” trend is expected to continue.
- In Resource Recycling’s survey of municipal coordinators:
 - 47% report they are adding materials
 - 41% report expanding collection service
 - 19% have added gable-top packaging in the past year and
 - an additional 10% plan to add them in 2011

Theme #3: More Recycling, But With Fewer Players

- Mergers and acquisitions continue;
- the top fifty recovered paper processors handle nearly half of all collected fibre; they operate 612 plants with an average plant throughput of 3200 tons/month



- “Mega-MRFs on the rise” in the US as they offer cost savings per ton and low cost of freight (i.e. in the US, this is referred to as the “mega-MRF with spokes” model)
- US MRF managers say the greatest barrier to expanding existing plants is in-plant space constraints

Theme #4: Paper Recycling Industry Still Enjoys A Positive Public Image

- US recycling coordinators rate paper recyclers 3.9 on a scale of 1-5; this is a consistently high ranking;
- The paper recycling industry is ranked better than the glass and plastics industries and on par with aluminum (who - as an industry - often present themselves as the “champions of recycling”)

Theme #5: Stewardship Programs In The US Are Growing

- Extended Producer Responsibility is expected by some to “become the prevailing waste management model” (i.e. including household recovery of fibres)
- Experience in other jurisdictions suggests that full EPR will have winners and losers and that fibre recovery will be altered (as happened in Europe) - i.e. it shouldn't be expected that printed paper recovery schemes will simply “fold into” broad packaging EPR programs (separate residential fibre recovery is common in Europe)

Theme #6: Downstream Auditing Is Expected To Improve

- Major environmental health and safety issues related to the global trade recyclables of some recyclables (e.g. waste electronics) are being expanded to include all recyclables (ie including printed paper and packaging)

Theme #7: Revenue Losses And Energy Impacts Of Un-captured Paper Fibres

- Resource Recycling magazine reports that American households discard the equivalent of \$6.5 billion in unrecovered materials into landfill each year;
- The single largest cash value thrown away is paper, representing (by their estimate) \$3.1 billion in lost revenue
- Resource Recycling also estimates that the (additional) energy consequences of not recycling (at oil prices of \$75/barrel) result in over \$12 billion in lost energy value each year. This equates to over \$200 of value per household.
- By far the largest contributor to this “loss” is un-recycled fibres representing: 85 million barrels of lost oil, about \$6.4 billion in oil costs and a value per household of \$116 per year.

Theme #8. The Sustainability Challenge

- Its expected that waste management in general (and recycling in particular) is beginning to move forward towards better metrics - e.g. global warming and life-cycle issues
- Resource Recycling magazine asserts that “Recycling is far from being a sustainable practice ..and that's recycling's greatest challenge going forward”.

8.3 Overseas Markets - China, South Korea, India and Vietnam

One of the key findings of this study was the extent to which the Chinese paper industry, and its need for significant amounts of paper, now influences the Ontario Blue Box program end markets particularly for mixed paper. China does not have a significant pulp and paper sector, or significant forestry resources,



so has always invested heavily in infrastructure which relies on recycled fibres. China used to buy corrugated containers and other packaging from Western markets but now manufactures its own packaging and this trend is projected to continue.

The steady growth of the Chinese market has had a profound impact on the North American recycled paper market. The increased demand from China combined with an aging and declining domestic paper making business in North America has resulted in 20 million tonnes of paper being exported to China from the US in 2010.

For the Ontario Blue Box program specifically, the following trends are of note:

- More Ontario fibres are going to China;
- China provided a market when North American markets collapsed in late, 2008: the relationships developed at that time continue;
- There are a number of brokers in Ontario with solid connections to Chinese markets who are interested in supplying large amounts of fibre to Chinese mills;
- South Korea also has a healthy requirement for fibres - much of the polycoat containers collected in Ontario programs are shipped to South Korean mills through brokers such as REMM and Continental Paper Graders;

Notwithstanding the positive points noted above, there are concerns regarding the long term sustainability of overseas markets, in particular the Chinese market for a few reasons:

- There is significant concern that China will eventually recover sufficient material domestically and “pull the plug” on overseas suppliers, including the US and Canada;
- A free floating Yuan will mean an increase in the value of Chinese goods, making them less competitive and softening the demand for the goods, including the paper packaging, over time;
- China’s labour-cost advantage will slowly erode as environmental and labour standards rise; again this will impact on the price of Chinese goods long term
- China’s growing middle class will consumer more paper; “domestic” recovery will increase and imports may decline (long term)
- Some Chinese buyers are looking to eliminate MRF sorting by buying mixed loads of curbside materials and sorting the mixed materials in their own facilities. This presents an interesting opportunity for Ontario MRFs, some of which are beginning to send more mixed paper to China for a cost advantage of about \$10/tonne over prices paid in Canada.

Table 19 shows that Chinese demand for paper fibres is increasing, but Chinese domestic recovery is also increasing, with the result that total imports in 2010 were lower than in 2009.

Table 19: Domestic Recycled Paper Collection and Paper Imports To China, 2007 to 2010
(millions of tonnes)

Year	Domestic Recycled Paper Collection	Recycled Paper Imports	Total
2010	39.3	24.5	63.8
2009	34.1	28	62.1
2008	31.3	24.5	55.8
2007	28	23	50.7



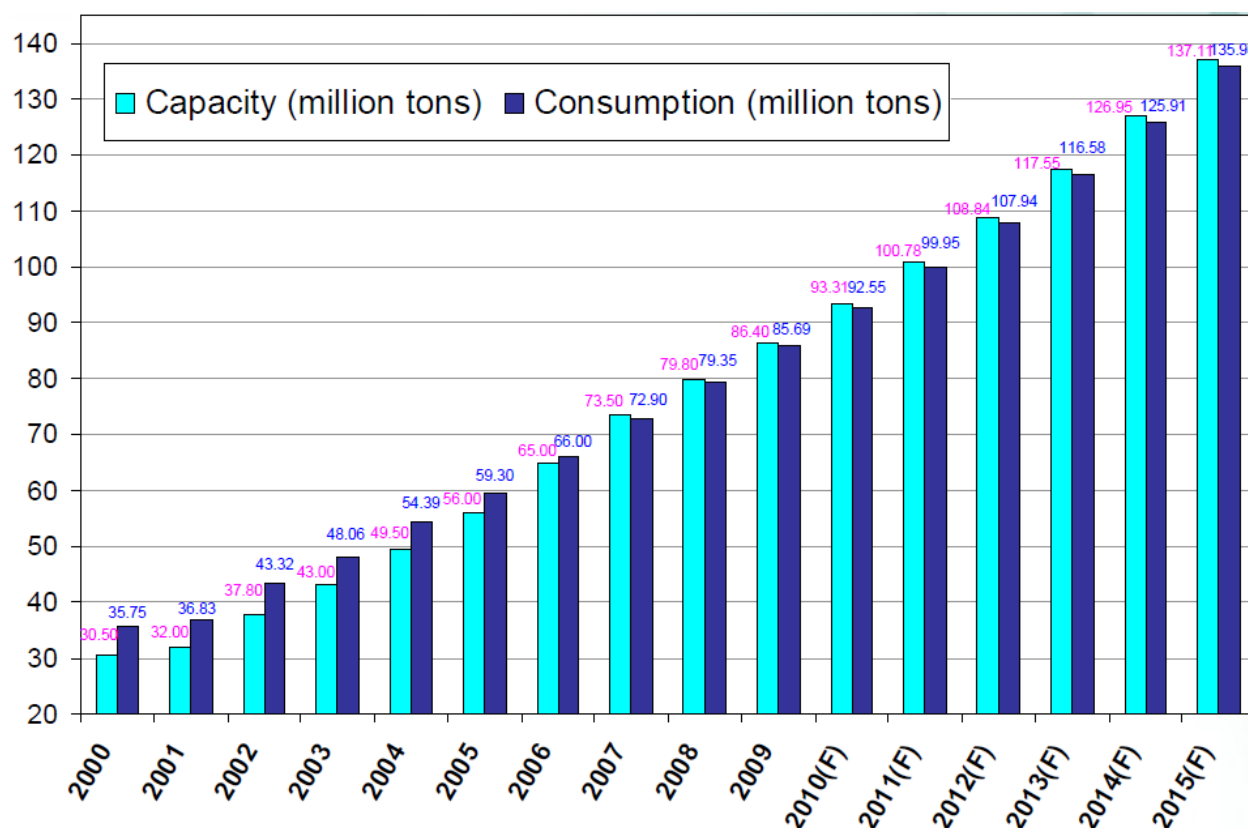


Figure 21: Growth of Paper Manufacturing Business in China, 2000 to 2015

8.4 UK Paper Market Developments

In the UK, a number of paper mills have entered the MRF business in order to:

- Secure supplies of paper for their mills and
- Ensure that the quality of paper entering their mills is acceptable for their machinery.

One example of a recent move in this direction is the construction of a large MRF at the UPM paper mill in Shotton, UK. UPM is a large paper company based in Finland with mills in the UK and throughout Europe. The company needs 3 million tonnes of paper fibre annually.

A MRF with a capacity of 280,000 tonnes/year of residential recyclables was constructed at the paper mill, and opened in July, 2011. The MRF expects to process 120,000 tonnes/year of paper for the mill. The total mill requirement is 640,000 tonnes annually. The remaining paper will come from miscellaneous paper brokers and suppliers to UPM.

The MRF was constructed for a capital cost of 17 million british pounds (\$28 million Cdn), and received a grant of 10% of the cost from the Welsh government. It uses six TITECH sorting machines for paper fibre cleanup.



8.5 Summary and Implications for Ontario and Canada

The US economy is about ten times the size of Canada's. Trends in the US show the same decline in fibre materials available for recycling from households as has been noted in Canada. Supply push pressures in both countries are bringing into the recovery stream more multi-layer and laminated fibre (and plastic) packaging to be recycled. Both Canada and the US are seeing movement towards larger, more efficient mills and towards industry consolidation. Finally Canada and the US have always had a vibrant exchange of recycled paper imports and exports. All signs indicate that the US will continue to be a key post consumer fibre (and finished paper and packaging) trade partner. All signs also indicate that China in particular will grow as a dominant force in international recycled fibre/finished paper product trade, although the implications for long term exports are less clear.

9. Ontario Blue Box Paper Fibre Recycling Five Years Ago, Today and Five Years Into The Future

The Ontario Blue Box system has undergone many changes since its inception in the City of Kitchener in 1981 (this year marks its 30th anniversary). The curbside recycling system that was piloted in Ontario soon spread across the province and has since gone global and become an international symbol for positive environmental action.

While there are many stakeholders involved (including millions of Ontario householders), Stewardship Ontario is the steward for the overall Ontario Blue Box system and currently pays 50% of net system costs.

This section looks at the Blue Box system 5 years ago, today, and what it would look like in 5 years time with no interventions or consolidations

9.1 The Ontario Blue Box of 2006 - 5 Years Ago

The biggest change in curbside recycling in Ontario - and this has had a direct impact on fibre recycling in particular - has been the growth of single stream programs. Single stream recycling brings with it many things: certainly overall increased residential waste diversion (especially organics), but also impacts on the quality and quantity of fibres recovered. Almost none of this was in place in Ontario five years ago. How the system continues to evolve and adjust to this reality is likely one of the key stories of the next five years for Ontario's blue box as well.

In 2006:

- The Ontario Blue Box system diverted a then record 850,000 tonnes, exceeding the previous year's recovery by over 65,000 tonnes.
- Total quantities of blue box materials generated and available to be recycled were about 1.34 million tonnes
- The blue box diversion rate that year was 64%.
- Printed paper generated had declined to 605,000 tonnes, more than 30,000 tonnes lower than 2005 and 55,000 tonnes lower than 2004.
- Printed paper recovery had grown to almost 500,000 tonnes, 40,000 tonnes more than 2005 for a printed paper recovery rate of 82%.
- ONP recovery that year was 91%.
- Overall printed paper generation declined slightly in the next two years; ONP available and recovered declined by 5,000 and 10,000 tonnes respectively.
- Total paper packaging generated in 2006 (about 341,500 tonnes) was about 10,000 tonnes higher than two years previous and was about 20,000 tonnes less than two years later.
- Paper packaging recovery was over 201,000 tonnes in 2006 and grew more than 40,000 two years following.
- The overall recycling rate for paper packaging was 59% in 2006; OOC recovery was 77% in 2006 and grew to 92% in 2008; OBB grew from 59% to 65%.



Blue Box System Profile in 2006

Key features of the Blue Box System in 2006 were:

- The only major single stream program fully operational for any length of time was in Toronto (started July 2003 - mainly to support organics diversion); Guelph and Northumberland were also in place, as wet/dry systems, but both are comparatively small and expensive programs; York had been on-line since 2005 and Peel was just coming on-line
- The predominant form of recycling was two stream recovery, either with containers and fibres collection on alternating weeks or both collected bi-weekly
- There were 60 MRFs in the province (52 handling blue box materials);
- 56% of Blue Box material was handled by municipal MRFs.
 - 46% were owned by private sector, but 75% were already privately operated
- There was just over 1 million tonnes of processing capacity, with a projected shortfall of 40% in 10 years time
- There was one optical sorter installed in the province (in Ottawa) to sort plastic containers; separating “browns” in the fibre stream not yet seen as an issue
- Waste export to Michigan/the US and organics growth (i.e. single stream changes) were front and centre. Mixed broken glass was a significant issue for the Blue Box system
- Total single stream organics collected that year across the province was about 200,000 tonnes (50,000 more tonnes came on in 2007)
- Total gross blue box system costs for 2006 were about \$240 million;
- Net Blue Box system costs (i.e. net of revenue) were \$154 million; average costs were \$163/tonne

Blue Box System Market Conditions In 2006

Key market conditions for the Blue Box System in 2006 were:

- In 2006, the trend towards growing post consumer fibre (PCF) exports from across Canada continued - from a low of about 630,000 tonnes in 2000, exports had almost doubled - to about 1.1 million tonnes in 2006.
- Imports declined - from just over 2.7 million tonnes in 2000 to about 2.1 million tonnes by 2006.
- Contraction of the domestic fibre processing industry was already well underway by the mid 2000s
- Mills like Sonoco in Brantford, Abitibi in Stephenville and Kenora, Domtar Cornwall, Cascades Ottawa and Victoria, Tembec Smooth Rock Falls, Weyerhaeuser Dryden, etc.).
- High energy, labour and environmental management costs were cited as the key problems - energy alone was 1/3 of most mill costs
- Recycled and virgin fibre markets were relatively depressed due to a lack of print demand
- Paper was the major revenue source for municipalities. They provided \$62.5 million in revenue in 2005 - i.e. 62% of total blue box revenues
- ONP - the Abitibi mill was at its peak (two newsprint lines running) at this time and was consuming 450,000 tonnes of ONP a year (some of this demand was met by import); average #8 ONP prices were \$89/tonne (almost \$50 less than spot prices today)
- OCC markets were the lowest in 10 years (i.e. going forward and back, other than 2009) at \$80/tonne (less than half today's price)
- Hardpack and OBB spot prices were lower in 2006 than any other year (other than 2009); OBB recovery lagged OCC recovery by about 20%
- Gable top and tetra generation/steward sales was less than 18,000 tonnes in total; recovery was 15% as markets were just beginning to be developed for these materials
- The laminates category (showing virtually no recycling) hovered around 40,000 tonnes generated since the start of tracking its sales and recovery in 2003



- Asian investment in fibre processing is booming in the mid-2000s. China was building a 400,000 tonne/year newsprint plant; Vietnam announced plans to invest \$2 billion in new capacity.
- Recycled ONP sales in Ontario grew higher into 2007 but this was driven by domestic need and international demand.
- Asia was clearly emerging as something more than an “occasional market”.

9.2 The Ontario Blue Box Today (2011)

The most recent Blue Box generation and recovery data available is from 2009 (as of August, 2011). It still identifies useful trends compared to 2006, and tells something about where the Ontario Blue Box system appears to be headed in the next five years. It will be very important to update the information in this report when the 2010 Municipal Datacall information is finalized, as it will be the second or third year of significant trend changes in Blue Box material composition and recycling rates. The information in this section will also change somewhat based on the 2010 Municipal Datacall data.

Based on available 2009 data, by 2009:

- The Ontario Blue Box system diverted 20,000 thousand tonnes more than 2006 (i.e. 870,000 tonnes).
 - This was almost 60,000 tonnes less than 2008 (marking the first time Blue Box tonnes recovery had declined since the inception of the program in the early 1980s).
- Total quantities of Blue Box materials generated and available to be recycled were almost identical between 06 and 09 - 1.33 million tonnes.
- The Blue Box diversion rate increased marginally from 64% to 65%.
- On the fibre side specifically;
 - printed paper generation had declined by over 110,000 tonnes between 2006 and 2009 (over 75,000 tonnes of that sales decline was ONP).
- Overall printed paper recovery fell about 60,000 tonnes - almost all of this decline in recovery was in ONP.
- On the paper packaging side, steward reported sales between 2006 and 2009 were flat; (around 310,000 tonnes).
 - Quantities available were about 20,000 tonnes higher in 2009 and the quantity recycled had grown by 35,000 tonnes. All of this growth was in OCC recovered; OBB recovery declined slightly.
 -

Blue Box System Profile 2011

Key features of the Blue Box System in 2011 are:

- Ontario has added big new single stream programs.
- Peel came on in 2006 (York was commissioned in July 05 at 90,000 tonnes and Peel in January 06 at 130,000 tonnes).
- Halton was added in 2008 (as was Bluewater, a much smaller program).
- Sudbury (April 2006) rounds out the list with over 300,000 tonnes of single stream paper fibre now being collected (compared to about 275,000 tonnes by two stream systems)
- With single stream recycling, co-collection has become commonplace, as has every other week garbage collection (commonly with restrictions on how much garbage can be set out)
- Toronto, Peel and Hamilton (among others) have launched aggressive multi-family recycling (and some organics diversion) programs; the results are still disappointing
- User pay programs are more common; so, even where organics are not collected curbside, more recyclables are being set out by residents (i.e. where capacity allows)



- Municipalities, CIF and private investors have upgraded parts of the provincial processing capacity: notable upgrades/new facilities include: Bluewater, London, Niagara, Durham, York and Toronto. CIF has also invested in transfer stations and “bigger recycling box” system improvements. There is a general agreement that further system investment is still required, but is stalled by uncertainty around long term Blue Box funding.
- Since 2006, more than a dozen optical sort systems have been installed - two of these were intended to sort browns from fibres (neither worked)
- There is a municipal trend/focus on “clean streets” and the lack of curbside enforcement (on bag limits, on what’s recyclable) continue to be a problem
- Private sector processing and collection of recyclables continue to grow market share; public ownership with privately tendered operation is also common; paper recycling companies (e.g. Canada Fibres and Cascades Recovery) have become major (and generally more innovative) program operators
- More material is sold by private operators (i.e. rather than municipal staff) compared to 2006. Some materials (mainly containers) are handled by brokers. Sales to overseas markets is now routine
- The major private sector operators have become sophisticated players at knowing what grades of paper make economic sense to separate to meet market conditions. There’s a growing awareness of out throws and prohibitive limits and newsprint is routinely used as the “dumping ground” for fine paper.
- There is an emerging trend towards both in-mrf and sub-contracting fibre clean up at a secondary facility, where economies of scale can support automation and separation into multiple grades
- The total tonnage of organics diverted curbside in 2010 was over 800,000 tonnes (about 300,000 of that was green bin waste, the balance leaf and yard waste). Consequently, 2011 **may** be the first year where curbside organics diversion (i.e. including leaf and yard waste) surpasses residential blue box recycling diversion
- Total reported gross blue box system costs for 2009 were about \$285 million; best practice modeled blue box gross costs were \$264 million; the final net best practice cost was \$184 million and the total steward obligation that year was \$91.8 million.

Blue Box Market Conditions in 2011

Key market conditions for the Blue Box System in 2011 are defined by many changes that have occurred in the recent past:

- In 2010, for the first time exports of PCF surpassed imports (Canada-wide).
- Canada imported about 1 million tonnes in 2010 (almost entirely from the US). This quantity was down 20% from the previous year due to declining paper production in Canada.
- Canada exported about 1.75 million tonnes of recovered PCF in 2010, up 20% from previous year.
 - Two-thirds of this was shipped to China;
 - half the exports were mixed paper (to Asia) and
 - one-third was OCC (split evenly between the US and China).
- A significant shift has taken place in the balance of trade in post-consumer fibres in Canada is the direct result of a large reduction in Canadian paper production over the past 10 years. This sets in play a new place for Canada in the PCF global marketplace.
- Very little of the ONP sold today from curbside programs in Ontario meets #8 News specifications.
- The Abitibi Thorold newsprint mill is now down to one line and is threatening closure due to the high cost of PCF and insufficient industry demand for 100% recycled content ONP.
- ONP prices are as high as they were when China first seriously entered the export market in the mid 90s



- Blue box recovery of OCC available from Ontario households exceeds 90% (nationally its about 65% and ICI recovery is estimated to be at about 85%);
- OCC pricing is at an all time high
- OCC availability from households may decline somewhat as fewer “discount retailers” allow customers to take OCC boxes home for free (the data doesn’t yet show this possible trend)
- OBB is the packaging material with the largest (numerical) growth potential in Ontario (i.e. 56,000 tonnes still available to be recovered).
- OBB prices are stable and it continues to be mixed in with either OCC or part of residential mixed paper as market conditions for more valuable fibres change
- Gabletop and aseptic containers are still a small component of the fibre packaging stream. Specialized markets have been developed
- Paper laminates - Three materials within this category - coffee cups, ice cream containers and spiral wounds have found some success in being recycled. This is very diverse stream of materials for which recycling markets are very hard to find.

9.3 The Ontario Blue Box Of 2016 - If No Interventions

Predicting the future is never easy. But based on the research for this and other recent projects, some anticipated changes in Ontario’s Blue Box fibre stream are presented below. These changes assume no major changes in economic activity (i.e. the economy is growing, all be it comparatively slowly), no “peak oil” crisis (i.e. that dramatically increase long range transport costs) and no major Blue Box system interventions (e.g. a move to 100% EPR for blue box materials).

9.3.1 Changing Blue Box Paper Fibre Composition To 2016

The changing paper fibre stream composition has been discussed elsewhere in this report. Specific implications for the Blue Box system five years into the future are:

- ONP availability continues to decline (by as much as 5% per year). Newspapers will continue to get smaller. Some publications will disappear
- Hard copy phone books are made available to householders on a request basis only
- Magazines in blue boxes decline but at a much slower rate than ONP (e.g. 1-2%/year).
- Main line magazines decline, but niche publications grow
- Other printed paper (including specialty coated paper) - up 10% over 5 years due to growth of in-home businesses and printers; some offset with less junk mail
- OCC generation is sensitive to economic conditions - i.e. a robust economy means more boxes are shipped.
- OCC availability is sensitive to pricing - if high OCC prices continue, less OCC “comes home” with householders. This is expected to be offset by increased Internet sales (i.e. virtually everything comes in a box).
- Current best estimate is that OCC availability (and recovery) will grow 10% over the next 5 years
- Gabletop and aseptic - strong growth continues - 25% over the next 5 years, but still a comparatively small market share of fibre packaging
- OBB available in the blue box over the past 5 years has remained stable; 5% growth over the next 5 years (i.e. back towards 2006/2007 levels) seems plausible
- An 8-10% decrease in total paper available in Ontario blue boxes is forecasted over the next 5 years



9.3.2 Changing Collection and Processing Systems By 2016

Key trends that we anticipate include:

- The debate of “1 stream vs. 2 stream” systems is expected to continue - no conversion of existing major two stream programs (e.g. Hamilton, Ottawa, London) is forecast over the next five years. London has just committed to a new large 2-stream MRF.
- No system which has converted to single stream will revert to two stream
- The new contract awarded to Canada Fibres sets much higher performance requirements than any previous Ontario contract. Some see this as the “model contract of the future”; others say it is “Toronto gone wild”. The truth is likely somewhere in between. The processing costs will be significantly higher than the contract it replaced and likely result in about \$5 million more per year to Toronto residents & stewards
- Two stream upgrades will also proceed: e.g. Durham, Ottawa & London. They may vie as “best in class” two stream model programs
- Regardless of the 100% EPR decision, some municipalities will continue to push more materials out of the waste stream and into the blue box (e.g. Toronto, Ottawa) over the next 5 years (more film, polystyrene & other rigid plastics)
- The days of cost effectively negatively sorting ONP may be replaced by the need to positively sort (as is currently done in Bluewater). That will further change the economics of ONP processing
- Shredded paper will continue to grow as a % of MRF residue. MRF residue re-processing is already underway on a trial basis. It is expected that this practice will grow (yielding up to 60% of recoverable plastics and fibres from “another run” through the system)
- There is no evidence that wide-scale processing system rationalization will occur - i.e. there’s no expectation that more than 2 or 3 very small plants will close
- Existing MRFs will focus on issues like film removal, bag breakers (more blue box overflow materials will be bagged), air separators for film and shredded paper and container separation systems; more focus on front end pre-sorts will be needed to handle composition changes, but that’s not likely to happen in the next 5 years
- On the fibre side, status quo is the most likely scenario (partly because of long term funding uncertainty). There will be further technology developments on the “browns issue” (one firm is looking at pre-heating waste paper for better identification - snow may be a problem!), but the timing is uncertain
- More residential blue box fibres/materials will likely be co-processed with ICI materials; more multi-family collected materials will likely be co-processed with single family collected materials.

9.3.3 Changing Markets For Processed Material

Based on a review of the literature, and interviews held during the project research, some of the following trends were noted:

- The global market for post-consumer fibre is on the scale of 210 million tonnes/year (RISI Recovered Paper Market Outlook, 2007).
- Canadian exports were a bit less than 2 million tonnes in 2010, so Canada is not a major player in this regard.
- The market for post-consumer fibres has become and will continue to function as a fully functioning international market with prices driven by global grade specific supply and demand patterns.
- Compared to the US, Canada’s mills are generally older and smaller, as consolidation has taken place, a number of Canadian mills have been closed.



- Canada is one of the world leaders in both recovering paper and the use of recycled content. Canada's current paper recovery rate is about 15% higher than the global average (only Europe is higher, due mainly to population densities, lack of landfill and higher paper recovery through energy conversion).
- On the recycled content side, paper packaging produced by Canadian mills is now 77% recycled content - a 30% increase over the past 30 years.
- Two thirds of the 30 Canadian mills sites producing paper packaging produce 100% recycled content (recycled content in OCC is 5% higher than in OBB - 82% vs. 77%)
- Domestic mills that are large and efficient (in terms of both energy use and technology investments) will continue to consume Ontario Blue Box collected materials.
- The closing of any one mill will effectively be replaced by another more modern system, be it in Canada, the US, Asia or Brazil.
- As noted earlier, the bigger issue is declining demand and declining ONP availability, not the mills to consume the product. Pricing is expected to remain strong
- OCC and OBB - Cascades-Norampac recently announced the construction of a new, state of the art, 450,000 tonne per year paper packaging plant in Niagara Falls New York. Once it is on line, this plant will consume 1500 tonnes/day. It has been estimated about 50% of the furnish for that plant will need to come for new sources (the remainder being "diverted" from existing older Norampac plants).
- Several Ontario programs report shipping OCC to the US and China already.
- The majority of OBB is either left in the OCC as a hardpack mix or left as part of the mixed residential stream. Again, this market is fully international and only domestic mills that are comparatively large, modern and efficient will survive.
- Gabletop/aseptic/laminates/and mixed paper - these categories are worth considering together (i.e. in terms of a five year horizon) simply because one can anticipate two inter-related market development directions.
- First will be pressure (e.g. from stewards paying fees) to find niche markets for their blue box bound packaging (witness the on-going coffee cup debate). As noted earlier, there has been success in this regard in the past five years on gabletop and aseptic container markets. Specialty markets will continue to develop.
- With shredded paper likely to continue to grow, there will be pressure to ever-expand what's acceptable in the mixed paper stream

9.3.4 Possible Future Trends That Affect The Value Chain

This report has identified five main trends that may help create changes in the value chain related to blue box fibre recycling moving towards 2016.

Trend #1: Less paper fibre packaging and printed paper tonnes, but more items and volume in the future

The composition is changing and household waste is being fractured into recyclable, blue box and organics streams. There will be on-going pressure from municipalities and householders to divert more. Making the system work is increasingly seen to be industry's problem.

Trend #2: Private sector recycling program operators become more sophisticated and strategic in managing their operations and sell market-specific materials (in the face of continual pressure to increase throughput, especially on paper fibres)

Residue re-processing, dedicated fibre clean up lines, blending IC&I and residential materials, dedicated systems for more contaminated multi-family streams, optical sorting applications and skilled MRF operators (who are not necessarily waste companies) are all changing the way the business operates.



Trend #3: Paper is an international commodity

Perhaps no country has undergone the level of change regarding its place in the paper business than Canada. We've gone from a major waste paper importer and producer to a waste paper exporter. The biggest new investment in paper packaging is very close to Ontario (Niagara Falls New York), but its not in Ontario.

Trend #4: Brand-owners and retailers now see packaging and waste as a strategic issue.

Brandowners regularly challenge their suppliers to do more to reduce packaging. OCC boxes disappear from the front of stores to become part of "back of store" diversion programs, serviced by the same innovative residential recycling operators. As every new type of blue box waste diverted from households gets more expensive to manage, government's attention turns to diversion performance from the ICI stream. Some conversion of Blue box and ICI recyclables management systems may be in the cards.

Trend #5: Technology catches up

Optical sorters are finally finding a place in the system, co-collection vehicles have some a long way and the ever present "browns issue" for fibres finally appears to be getting some needed attention. The technology at the "back end" of the consumer market system still has lots of catching up to do before it gets into the same league as the front end packaging innovations business.

10. Increasing The Recovery of Paper Fibres Through Ontario's Blue Box

10.1 Introduction

Figures 22 and 23 present the breakdown of the materials which are not currently captured in the Ontario Blue Box system. These total about 238,000 tonnes in 2009, made up of 116,000 tonnes of printed paper and 122,000 tonnes of paper packaging.

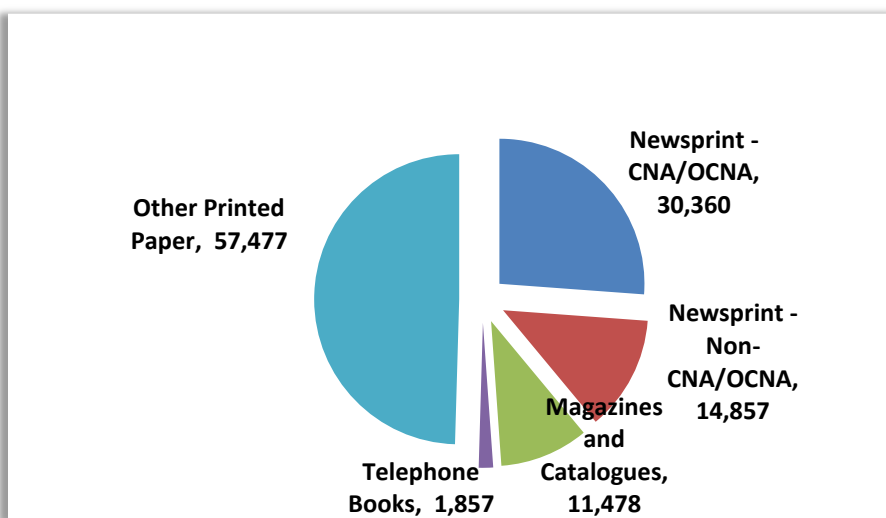


Figure 22: Composition of 116,000 Tonnes of Printed Paper Disposed From Residential Sources, 2009

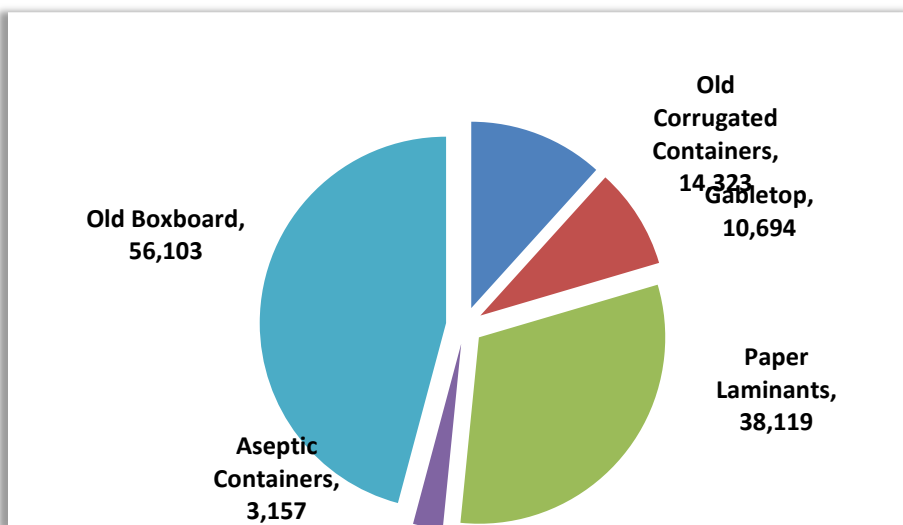


Figure 23: Breakdown of 122,000 Tonnes of Paper Packaging Disposed from Residential Sources in Ontario, 2009

Three areas for increased potential capture of paper fibres are:

- MRF residue processing
- Increased capture of writing papers and boxboard packaging from households and
- Increased capture of fibres from multi-family households.

Each of these areas are briefly described in the following sections.

10.2 Processing MRF Residues

As described in Section 5, the amount of paper fibres which could be recovered from additional processing of MRF residues needs to be confirmed through a technical assessment, but could be in the order of 20,000 tonnes per year.

Canada Fibres is already processing MRF residues from Peel and Sudbury, and MRF residue from York is sent to the Dongara facility. A more detailed analysis of the actual opportunity is needed to firm up this number and develop a detailed strategy and action plan.

It is anticipated over time that MRF residue numbers particularly from single stream systems will decrease as the “second generation MRFs” get better at recovering fibres.

10.3 Increased Capture of Paper Fibres From Multi-Family Households

There are 5.3 million households in Ontario of which 1.3 million are multi-family households. Multi-family households are growing at a much faster rate than single family households with intensification targets set by many municipalities and the Provincial Places To Grow policy.

Diversion is much lower in multi-family than single family households for a number of reasons including:

- Less space for storage of recyclables;
- Inconvenience of transporting recyclables to the basement or outside to put them in the bulk recycling bin;
- Transient occupants who are new to the community and not familiar with the recycling rules; and
- Non-owner residents who rent multi-family units and have less connection to the community, etc.

The Municipal Datacall does not separately track the amount of recyclables collected from single family vs multi-family households, therefore the estimates in this section are approximate and are based on various reports and waste composition audits available to the study team.

One recommendation from this study is that Stewardship Ontario should ask municipalities with greater than 20% multi-family households to begin to track multi-family recycling tonnages separately, so that this type of analysis and data tracking can become more refined in the future.

Toronto is the only community that keeps detailed records of tonnage collected from multi-family households separate from single family households. It is easier for Toronto to do this than for other communities as multi-family recycling service is contracted separately to Miller Waste Systems, and predominantly involves collection of bulk bins rather than curbside carts.

Based on available City of Toronto statistics, generation of fibres in multi-family households is estimated at 140 kg/hh/year. Current paper fibre recovery is estimated at 70kg/hh/year, or 50% capture. These numbers are similar to those identified through a CIF study of 75 multi-family buildings in Ontario which identified fibre generation rates of 157kg/hh/year, with capture at 81kg/hh/year, or 53% capture.

Based on the assumption that there is at least 70kg/hh of fibre not captured from Ontario multi-family households (and in fact, many Ontario multi-family households do not receive recycling service) the total opportunity is 91,000 tonnes, of which a portion could realistically be captured.

There are 1.3 million multi-family households in Ontario. Six communities contain the bulk of the multi family households, and together include 880,000:

- 500,000 in Toronto;
- 117,000 in Ottawa;
- 96,000 in Peel
- 60,000 in Hamilton
- 50,000 in London
- 47,000 in Halton

A strategy focusing on increasing fibre capture by 10 to 40kg/hh/year for multi-family households in these communities and possibly across the Province could increase fibre recovery by 10,000 to 40,000 tonnes per year. A three year time frame is considered realistic to implement this strategy.

CIF has funded a significant amount of work in the multi-family area. Lessons learned from CIF multi-family projects could be applied to the strategy.

10.4 Increased Capture of Mixed Paper From The Single Family Residential Waste Stream

Figures 22 and 23 show the printed paper and packaging not captured by the Ontario Blue Box program. It is not known how much of this total is discarded by single family vs multi-family households, but assuming that 91,000 tonnes are discarded by multi-family households, the remaining 147,000 tonnes are discarded by single family households, this equates to an average of 32kg/hh/year. A target should be set to recover half of this total, or 73,000 tonnes, over a period of 3 years.

While the overall recycling rate for newsprint is high, lower recycling rates are noted for boxboard and mixed paper. These two material categories, and particularly residential writing papers, should be the target of a new campaign.

One of the technical issues that need to be addressed is processing of the increasing amounts of shredded office papers from residential sources in Ontario MRFs.

11. Conclusions

The main conclusions from the Current State Ontario Blue Box Fibre Research Study are:

1. Fibre recovery through the Ontario Blue Box system is good, but could be better
2. 238,000 tonnes of fibres were not captured by the Ontario Blue Box system in 2009. This material has a value of \$23.8 million using today's market prices
3. Three areas are considered good targets for increased fibre recovery:
 - a. MRF residuals processing
 - b. Increased recovery from multi-family housing in 6 target communities and
 - c. A focus on increased boxboard and residential writing paper from single family housing
4. Together these three targets could increase the recovery of residential fibres by 100,000 tonnes over a 3-year period
5. Single stream processing is here to stay - no communities have reverted to 2-stream systems from single stream after the infrastructure has been put in place
6. Multi-family housing numbers will increase over time as intensification targets set by the Provincial government and official plans are implemented. Identifying ways to increase the capture of fibres from multi-family housing is a critical long term need for the Ontario Blue Box system
7. Better separation of information on tonnages diverted from single family vs multi-family households in Ontario communities is needed in order to develop better, more well informed multi-family recycling strategies. An effort should be made to start this process in the 2011 Datacall
8. The composition of the fibre stream is changing. An analysis is needed of the profound impacts this will have on Blue Box economics, as fibres have traditionally been the backbone of Blue Box revenues, accounting for 65% to 75% of Blue Box revenues over time
9. The amount of fibres is changing (decreasing) and the amount of plastics is increasing. The impacts of these changes on the Ontario Blue Box collection and processing system needs to be addressed and planned for.
10. Many Ontario and North American paper mills which were traditional paper fibre markets have closed in the last five years.
11. Export markets are here to stay, and may become an increasingly important part of the Ontario Blue Box system.

