Implementation of a Sustainable Financing System For Solid Waste Management in Ontario

Discussion Paper #7

Cost and Diversion Impacts of Sustainable Financing Systems

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E&E Fund Project #160

Prepared For

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1. Introduction

The purpose of the research carried out in the preparation of this Discussion Paper was to identify two key pieces of information of interest to Stewardship Ontario and Ontario municipalities:

- Evidence on the impacts of sustainable financing structures on the costs of municipal waste management systems, with a particular focus on recycling systems, and whether there were sustainable financing models which lowered the costs of recycling, and
- Evidence on the impacts of sustainable financing systems on municipal solid waste diversion, with a particular focus in their impacts on tonnes of material recovered through the recycling system, and more specifically whether there were sustainable financing models which increased the tonnage of materials recycled.

Municipalities contacted during the research who had implemented sustainable financing systems of interest to this study did not have the "before and after" cost or diversion data needed to answer the two research questions, therefore various literature sources were used to quantify known cost and diversion impacts of sustainable financing systems for solid waste management.

One of the most reliable sources of data used in this analysis is from a 2001 City of Toronto study funded by the Waste Diversion Organization. This study carried out a thorough "before and after" analysis of the impacts of different financing mechanisms (mostly bag limits , variable can subscriptions and PAYT) on the amount of recyclables, leaf and yard waste and other divertable material collected, as well as the amount of garbage disposed. However, the study did not address cost impacts.

The AMRC completed a research project under Stewardship Ontario's E&E Fund (project 191) on the impacts of financing models on system costs, and recycling costs in particular. In each of the communities studied, it was difficult to separate the impacts of various different system changes. Information from the City of Stratford analyzed by AMRC in E&E Project # 191 (September 2006) was nonetheless considered relevant to this study and is included in this Discussion Paper.

The reasons for implementing sustainable financing systems vary from community to community. In some cases, a lower tier municipality has been forced to adopt a flat fee and PAYT system to accommodate system changes within the Region, as in the case of Victoria, B.C. In other cases, the reasons had little to do with promoting waste diversion but are related to reducing worker injury and benefit claims, as in the case of City of Vancouver's new variable container program.

Many of the communities highlighted over the past several discussion papers have had their sustainable financing program in place for well over a decade. Efforts to gain insight into the relevant impacts on recycling program costs and impacts have been disappointing. Interviews with key staff resulted in similar responses - historical records are unattainable and staff involved in design and implementation of the program have long since retired or moved on. The historical or institutional memory of the impacts on cost were not documented and have been lost in most cases.

This paper has relied on reports prepared in the mid to late 1990's, detailing program implementation and some impacts on waste diversion. Any reference to system cost impacts (positive or negative) is based on report findings and insights provided during staff interviews.

The paper research has led to the conclusion that utility fee structures can be designed to increase recycling through building in incentives to encourage recycling and recovery of recyclables, as well as providing financial and other disincentives to dispose of waste.

More research is required to ascertain whether these financing structures in particular have any impact on system costs. This information is best collected through on the ground research projects identified to collect very specific program data.

2. Programs Reviewed In The Discussion Paper

Table 2.1 summarizes the key features and characteristics of the recycling programs reviewed as part of this cost and diversion analysis.

Table 2.1: Selected Sustainable Financing Programs Evaluated for Cost and Diversion Impacts

Community	System Highlights	Year of Program Launch and Description	Program Description
British Columbia			
Regional District of Nanaimo (population 127,000)	- separate cost centre - all costs covered by flat household fee on utility bill with sewer and water charges - Partial PAYT program	- 1991 - partial PAYT - 1 can weekly garbage collection (urban households) – additional garbage requires sticker - weekly garbage and recycling collection	- no change in program since launch - partial PAYT - 1 can weekly garbage collection (urban households) – additional garbage requires sticker - weekly garbage and recycling collection - all costs covered in annual flat fee charge on utility bill with sewer & water
City of Victoria (population 74,000)	- separate cost centre - all costs covered by flat household fee on utility bill with sewer and water charges - Partial PAYT program	- 1992 - partial PAYT – 2 cans weekly garbage collection– additional garbage requires sticker - weekly garbage, bi-weekly recycling services	- partial PAYT - 1 can weekly garbage collection (reduced in 1996) – additional garbage requires sticker - weekly garbage, bi-weekly recycling services - all costs covered in annual flat fee charge on utility bill with sewer & water
City of Vancouver (population 661,000)	- separate cost centre - all costs covered by flat household fee until 2006 then moved to variable rate subscription - full PAYT program	- 1998 - partial PAYT - 2 cans weekly garbage collection – additional garbage requires sticker - Weekly garbage and recycling services - All costs covered in annual flat fee charged on property tax bill	- in 2006, the City launched a variable rate subscription program - residents pay variable rates for different sizes of container - weekly garbage and recycling services - All costs covered in annual fee charged on property tax bill - Residents can still purchase stickers for additional garbage
Alberta			
City of Edmonton (population 666,000)	- Waste management department within the City - costs paid by flat household fee combined with property taxes - flat fee charged on utility bill with electricity and water - NO PAYT program - 4 bags/wk by-law but not enforced	- 1995 - weekly garbage and recycling services - annual flat fee covers disposal activities and property taxes cover collection activities - blue bag recycling program introduced in 1999	- weekly garbage and recycling from April to October and every 10 to 12 days from November until March introduced about 10 years ago. - annual flat fee covers disposal activities and property taxes cover collection activities - garbage charged on monthly utility bill with sewer and water

Community	System Highlights	Year of Program Launch and Description	Program Description
City of St. Albert (population 53,100)	- separate cost centre - all costs covered through variable rate subscription - full PAYT program	- 1994 flat fee introduced with all costs removed from property tax - 1996 variable rate subscriptions system introduced for garbage and yard waste - residents can choose to subscribe to can or sticker system	- residents can choose to subscribe to can or sticker system (6 different subscription levels available) - residents can still purchase stickers for additional garbage - weekly garbage collection, bi-weekly yard waste collection during summer months and recycling depots - all costs covered in annual fees on bi-monthly utility bill
Ontario			
City of Stratford (population 30,100)	- waste management department - full PAYT	- 1997 full PAYT implemented - residents required to purchase a sticker for each bag of garbage placed at the curb	- no significant change to the program - full PAYT - residents required to purchase a sticker for each bag of garbage placed at the curb
City of Ottawa (population 812,100)	- Garbage collection and disposal financed through separate household fee of $79.80 (2006), and removed from property tax financing	- 2006 –impacts - unlikely because garbage collection and disposal is based on a flat fee	- Garbage collection and disposal financed through separate household fee of $79.80 (2006), and removed from property tax financing
City of Kingston (population 117,000)	- Disposal related costs removed from residential tax bill. All residential properties pay special levy for disposal – shown as “fees and charges” on property tax bill	- Implemented 2006 - too early to determine if any impacts, - unlikely because garbage disposal is based on a flat fee	- Implemented in 2006

3. Waste Management System Impacts

3.1 Regional District of Nanaimo, British Columbia

Waste Management System Description
Prior to 1991, householders within the Regional District of Nanaimo were required to contract individually with haulers or to self-haul to the local landfill. The Region did not provide waste or recycling collection services. In 1991, the Regional District of Nanaimo decided to bring in compulsory garbage and recycling service for all single family households to ensure that garbage was properly disposed. The Region also wanted to design the residential service to be fully paid through a flat fee and the budget operated on a zero net basis. This has been the case since 1991.

Impacts of Sustainable Financing on Recycling
Most customers who had subscribed to a collection service previously saw their costs go down by about 30 per cent with the new, larger compulsory program. However, those who had self-hauled did not appreciate the compulsory additional costs. Prior to program implementation, the Region assumed that the contractor would require 3 garbage trucks and 2 recycling trucks to service the Region; in fact, the reverse happened, the contractor needed 2 garbage trucks and 3 recycling trucks which was attributed to the significant movement of material out of the garbage stream and into the recycling stream as a result of the PAYT program.

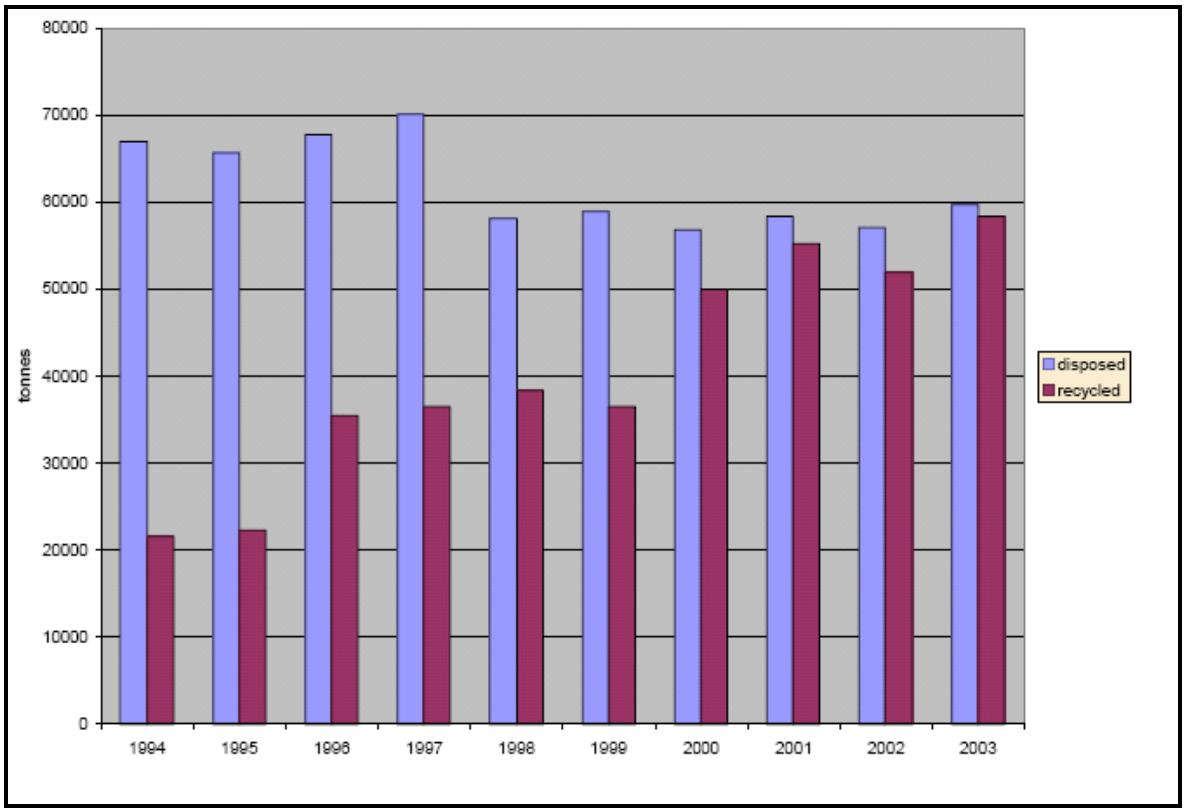
Because there was no garbage or recycling infrastructure prior to 1991, the Region has no baseline data with which to compare changes in recovery rates with the introduction of PAYT. As a policy, the RDN is reluctant to provide diversion tonnages due to changes in provincial legislation that has impacted diversion (e.g. with the introduction of the provincial beverage containers stewardship program, the region lost lots of glass and weight in their recycling programs). Furthermore, the Region does not disaggregate weights from single family and IC&I waste generators. With the various programs in place, the diversion rate in the RDN increased from 45% in 1998 to 57% in 2003.

Figure 3.1 shows changes in waste disposal and recycling over time.

The conclusion is that recycling increased substantially.

Available Information on Impacts of Sustainable Financing on System Costs
In 1996, the Region responded to citizen demands for a reduction in annual fees. The RDN modeled a series of collection alternatives and estimated that by switching to bi-weekly garbage collection (weekly during the summer) with the bi-weekly recycling, it could reduce costs by 25-40%. This option was not adopted. Residents also requested smaller containers at reduced rates; however, the cost to provide the service resulted in nominal cost savings to the Region and, subsequently, the idea was dropped.

Figure 3.1: Increase in Recycling and Decrease in Disposed Tonnes in the Regional District of Nanaimo, 1994 to 2003



3.2 City of Vancouver, British Columbia

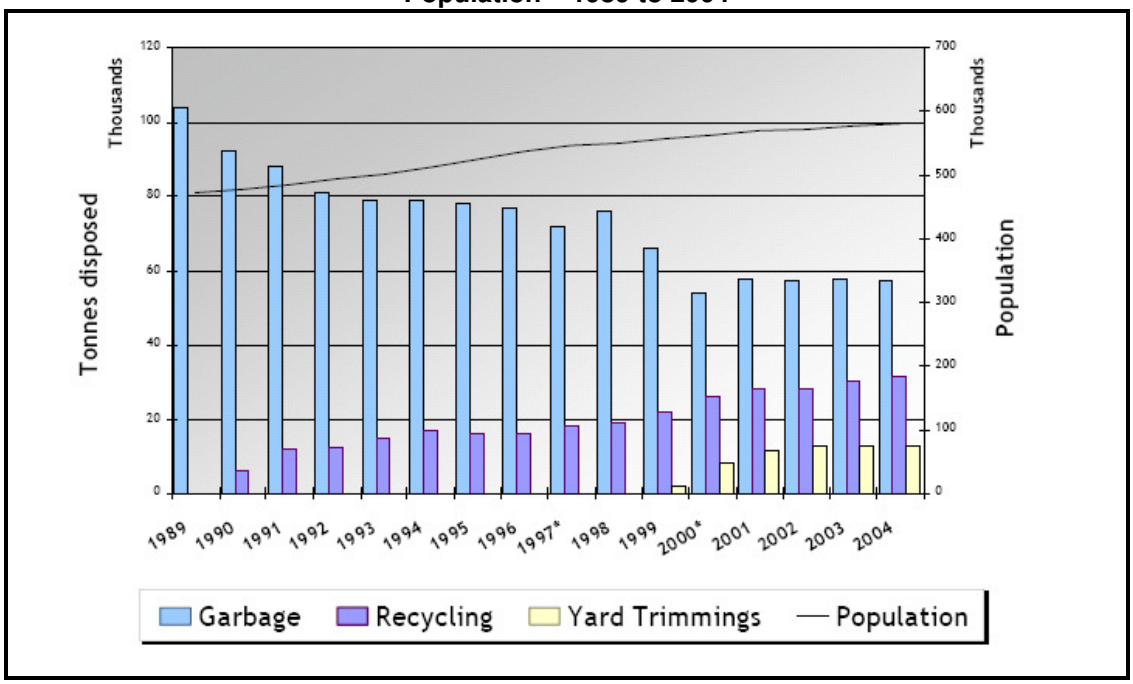
The City's budget operates on a net zero basis (revenue neutral) with Council approval of the rates every year. With the introduction of the flat fee and PAYT system in 1998, city staff claim that the city experienced a drop in garbage generation and an increase in recycling, which is reflected in the tables and charts presented below (Table 3.1 and Figure 3.2).

Staff highly recommend the separate fee approach to relieve the burden on property taxes and increase waste management departments' control over budget. Furthermore, it is considered more equitable (higher valued properties no longer pay more for waste management services despite possibly generating less waste) and removes the bias against commercial properties. The separate fee approach coupled with full cost accounting provides budget stability and an opportunity to capture lifecycle costs of landfilling operations.

Table 3.1 - City of Vancouver Program Details and Impacts on Diversion and Costs, 1998 to 2006

	1998	1999	2001	2004	2006
Program highlights and changes	- Partial 3 bag PAYT implemented - all waste management costs removed from property taxes - residents received weekly curbside recycling and weekly garbage collection	- PAYT reduced to partial 2 bag program - yard waste collection introduced	-two component garbage fee introduced with a fixed service fee and a unit cost fee which cover different aspects of the service (fixed collection cost and variable unit size of bin)	- no significant program change	- variable rate container program implemented whereby residents can choose between 5 sizes of garbage containers and pay according to the size - residents can choose between 4 sizes of yard waste containers & pay according to the size
Solid waste charges	Garbage - $97/yr Recycling - $45/yr Stickers - $1.50/each	Garbage - $89/yr Recycling - $36/yr Yard waste - $34/yr Stickers - $1.50/each	Garbage - $95/yr Recycling - $26/yr Yard waste - $28/yr Stickers - $1.50	Garbage - $91/yr Recycling - $21/yr Yard waste - $35/yr Stickers - $1.50	Garbage –$70-$147/yr Recycling - $20/yr Yard waste –$43-$62/yr Stickers - $2
Waste disposed					
tonnes	76,000	66,000	57,800	57,400	63,200
% disposal rate change from 1997 (base year)	+5%	-10%	-23%	-25%	-22%

Figure 3.2 - City of Vancouver Garbage, Recycling and Leaf and Yard Waste Tonnages and Population – 1989 to 2004



Impacts on Recycling

Although the tonnes of waste disposed have decreased steadily between 1998 and 2004, the City has experienced an increase in waste generated over the past couple of years, which coincidently coincides with the implementation of the automated cart program. Since the City has experienced an increase in waste generation rates in all three sectors (residential, IC&I and C&D) staff have concluded that the increases correspond to the thriving economy being experienced in the region, rather than the change in the waste collection system.

The City has not conducted any analysis on changes in system costs and waste diversion impacts from the implementation of the variable container system in 2006. However, staff have noticed a spike in yard trimmings being diverted and an increase in the amount of garbage disposed (based on tonnes delivered to waste disposal facilities) but has not conducted any analysis to determine why. Staff speculate that with the booming economy people are buying more products with packaging which cannot be recycled.

Table 3.2 presents a more detailed assessment of the impact on waste generation rates (garbage, recycling and yard trimmings) as a result of the implementation of the automated variable cart program in 2006. The year 2005 is used as the base year for comparison, and available data for 2006 and 2007 are included in the table. A labour disruption occurred in the Solid Waste Division from 20th July to 14th October, 2007 resulting in the discontinuation of City collection of residential garbage, recycling and yard trimmings during this time.

Table 3.2: Waste Generation and Diversion Impacts of Cart Program, 2005 to 2007[1]

Year	2005 (baseline yr)	2006	2007*
Population	597,628	606,901	611,869
Waste Disposed (tonnes)	56,540	63,220	54,660
Recyclables Diverted (tonnes)	25,868	25,994	23,584
Yard Trimmings Diverted (tonnes)	14,512	17,700	15,950
Total Residential Waste Managed	**96,920**	**106,914**	**94,194**

In order to better understand the waste generation and diversion impacts from the implementation of the automated cart program without the anomalies or distortion caused by the labour dispute in 2007, an attempt was made to compare only the first six months of data from each year including data from 2008, as shown in Table 3.3.

Total tonnages in Table 3.3 are divided by the total population for City of Vancouver. It might be more accurate to divide recyclables and yard trimmings by 350,000 (the approximate serviced population), and recyclables by 600,000 (the approximate serviced population). The garbage numbers include some IC&I tonnage.

Table 1: Waste Generation, Diversion and Disposal for First Six Months of 2005 to 2008

Year	2005 (baseline yr)	2006	2007	2008
	(6 month period - January to June)			
Waste Disposed				
Tonnes (Jan-June)	28,100	31,230	32,060	30,810
% change compared with 2005		+11%	+13%	+8%
Recyclables Diverted*				
Tonnes (Jan-June)	9,824	10,160	10,112	10,320
% change compared with 2005		+3.4%	+2.9%	+5.0%
Yard Trimmings Diverted				
Tonnes (Jan-June)	6,220	7,410	10,150	9,720
% change compared with 2005		+19.1%	+63.2%	+56.3%

** for households receiving curbside collection only (assumes 80% of annual reported recycling tonnages)

[1] *Note: The City of Vancouver experienced labour disruption from 20th July to 14th October, 2007 resulting in the discontinuation of City collection of residential garbage, recycling and yard trimmings during this time.
** for households receiving curbside collection only (assumes 80% of annual reported recycling tonnages)

Impacts on Costs

Recycling costs have declined steadily over the past years (($45/hh in 1998, $36 in 1999, $26 in 2001 and $21 in 2004) because the revenues per tonne of recyclables have continued to increase and the cost of the contractor's collection services have steadily decreased over time.

City staff have offered two main reasons for the variation in garbage costs over time. The first is the variation in the annual cost per tonne of transferring and landfilling the garbage, which does not correlate with the implementation of user fees. The second main reason is a decline in the garbage tonnes collected and thus a decline in transfer and landfilling costs. The city experienced a significant reduction in the amount of garbage collected after the launch of its yard waste collection program. Yard waste, which was previously collected as part of the garbage collection service, is now collected as part of the yard waste collection service.

The primary reason for introducing the variable rate system with the automated collection was to reduce worker injury and improve worker safety. The reduced Worker's Compensation Board (WCB) claims translate to system cost savings, although this is related to the new collection system (the automated cart), not the method of system financing.

In the past, time loss related to sanitation operation injuries was high and costing the City approximately $500,000 per year in WCB claim payments and WCB levy surcharges. In 2002 approximately 82% of the WCB injury hours in Sanitation Operations were from garbage and yard trimmings collection crews (it was estimated that in 2002, garbage and yard trimmings collection crews were lifting, on average, over 6 tonnes (13,000 lbs.) per worker per day).

According to staff, the automated container system has been enormously successful in achieving the goal of lowering worker injuries. The variable container system saved the city $220,000 in worker injury related claims in 2006.

Additional advantages of automated collection identified by the City include:

- An increase in the diversity and longevity of the workforce that is able to collect waste due to a significant reduction in the physical requirements;
- Further implementation of a PAYT structure to provide further incentive to users to reduce the amount of waste disposed as well as to increase equity in the funding of the collection programs;
- A number of environmental benefits including the elimination of plastic bags for yard trimmings collection and better lane aesthetics as the carts are always neatly returned, are very durable, and are resistant to animals;
- An increase in convenience to the user who will no longer have to concern themselves with weight limits. The wheeled carts are easy to move. The lid is always on the cart. Wheeled carts are much simpler to use for yard trimmings than yard cans, plastic bags, or bundling branches.

The disadvantages of automated collection identified by the City included:

- Higher program costs, mainly due to the supply and ongoing replacement of wheeled carts to users. Currently, the additional cost of automating is approximately $890,000 per year for garbage (an average increase of $10 per user per year or 11%) and approximately $700,000 per year for yard trimmings (an average increase of $8 per user per year or 25%). Note that the average yard trimmings user will save a further $2 per year in not purchasing plastic bags;
- Fewer collection staff in Sanitation Operations (approximately 11 fewer workers). The staff reduction will be accomplished through attrition, resulting in no layoffs to current full time employees. This reduction could be partly offset by a potential increase in full time positions in Equipment Services;
- Manual or semi-automated collection will still be required for approximately 10% of the users due to lane and set-out configurations.

Financial Implications

Since 1998, surplus contributions from the Solid Waste Collection Programs to the Solid Waste Capital Reserve (SWCR) accumulated to $4,500,000 mainly from recycling material revenues that were higher than forecasted due to market fluctuations. The estimated costs to implement the full automated variable rate container program are presented in Table 3.4.

Table 3.4: Implementation Costs For City of Vancouver's Fully Automated Collection

ONE TIME IMPLEMENTATION COSTS	YARD TRIMMINGS	GARBAGE
Containers		
- wheeled carts	$6,750,000	$6,000,000
- cart delivery	$270,000	$270,000
- cart decals	$100,000	$100,000
Trucks		
- outstanding capital (early fleet replacement)	$250,000	$650,000
Implementation		
- cart delivery coordination	$165,000	$165,000
- billing changes	$85,000	$85,000
- promotion/advertising	$85,000	$85,000
- coordinator	$90,000	$90,000
- hotline staff	$75,000	$75,000
- driver/mechanic training	$10,000	$60,000
- increased operating cost during transition	$220,000	$220,000
Total Estimated Implementation Cost	**$8,100,000**	**$7,800,000**
FUNDING OF IMPLEMENTATION COSTS	**YARD TRIMMINGS**	**GARBAGE**
Solid Waste Capital Reserve		
- Solid Waste Collection Surplus (total $4.5 M)	$2,250,000	$2,250,000
- Loan from Solid Waste Capital Reserve	$5,850,000	$5,550,000
Total Funding	**$8,100,000**	**$7,800,000**
UTILITY FEE IMPACT	**BEGIN 2006**	**BEGIN 2007**
Annual Loan Repayment ($5.85 M & $5.55 M)	+$660,000	+$630,000
Change in Annual Operating Cost	-$70,000	+$150,000
Cart replacement costs	+$110,000	+$110,000
Total Annual Increase	+$700,000	+$890,000
Average Fee Increase per Customer	+$8	+$10

3.3 City of Victoria, British Columbia

With the introduction of the PAYT program, the City of Victoria and the three other core municipalities experienced an 18% decrease in the volume of waste sent to landfill from 1991 to 1992. The original program permitted residents to place two cans of garbage at the curb without requiring extra tags. In 1996, the City reduced the number of "free" cans/bags to one.

Impacts on Recycling
As a direct consequence of implementing the partial PAYT program, the City experienced a reduction in its waste collection routes from 9 routes to 8 routes which also resulted in reduced staffing requirements.

City staff have not maintained historical records of the impacts of system changes over time. However, according to the supervisor, the City has been stuck at 42% diversion rate for the last 8 years (includes yard waste). Information on the impact of the PAYT program on waste diversion is based on past reports. However, at the time, the information was recorded by the Capital Regional District and combined with three other communities. See Table 3.5 below.

Table 3.5: Available Information on Diversion and Cost Impacts of System Financing Change in City of Victoria*, British Columbia, 1992 to 2005

	1992	1997	2000	2005
Program highlights and changes	- Partial 2 bag PAYT implemented - residents received bi-weekly curbside recycling and weekly garbage collection	- PAYT reduced to partial one-bag in 1996 - residents received bi-weekly curbside recycling and weekly garbage collection	- no system changes	- rates increased in 2002 - no other system changes
Solid waste charges	Flat fee - $130/year $2/each	Flat fee - $147/year - stickers $3/each	Flat fee - $147/year stickers $3/each	Flat fee - $150/year - -stickers $3.50/each
Recycables diverted				
tonnes*	7,374	8,395	10,760	12,978
Per capita	0.16	0.16	0.18	0.20
% recycling rate change from 1991 (base year)	+11%	+11%	+30%	+45%

* based on tonnages collected by CRD for four core municipalities: Victoria, Oak Bay, Esquimalt and Saanich.

Impacts on Waste Management System Costs
No information was available, aside from the very slight increase in the flat fees charged over time.

3.4 Capital Regional District (CRD), British Columbia

In January 1992, a partial PAYT system was introduced in the Capital Regional District (CRD)'s four core municipalities: Oak Bay, Esquimalt, Victoria and Saanich.

Impacts on Diversion
Since 1991, the CRD has established various bans to prohibit the disposal of specific materials when viable recycling alternatives exist. These regional bans have proven to be highly effective. To date, bans

on paper, corrugated cardboard, drywall, tires and other recyclable materials have diverted over 500,000 tonnes of material and have saved four years of landfill space.

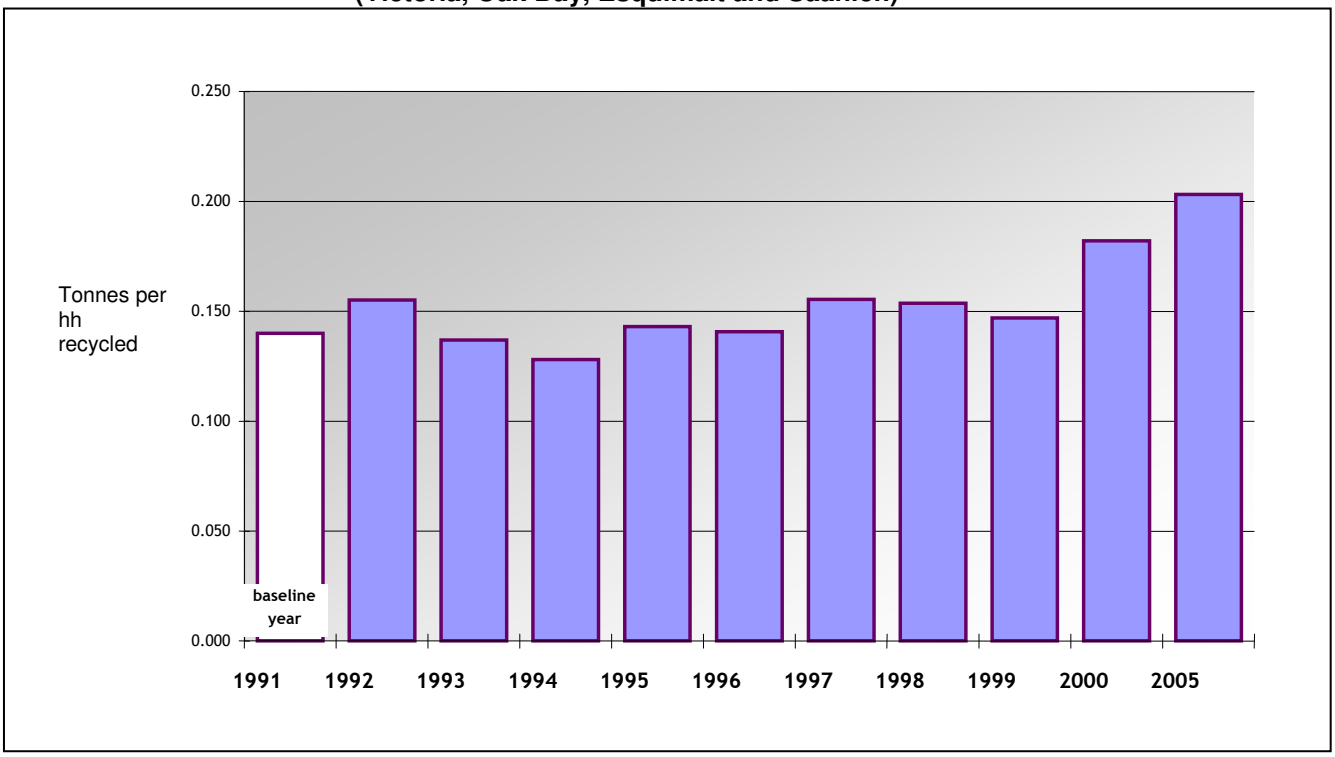
An 18% reduction in the amount of waste sent to landfill was observed in the four core municipalities after the first year of the program. Data for waste to landfill separated out for the four core municipalities was unavailable. Table 3.6 shows the % increase in recycling year on year compared to the base year. The data does not lead to any particular conclusion on the long term impacts of the financing change. The greatest impact is generally seen the first year after the change, as the financing structure is not designed to encourage diversion through variable rates in the longer term.

Figure 3.3 shows the gradual increase in recycling tonnes over time.

Table 3.6: Impacts of PAYT on Recycling in the Capital Regional District Four Core Municipalities (Victoria, Oak Bay, Esquimalt and Saanich), 1992 to 1999

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999
% Change from base year (1991)		10%	-2%	-9%	2%	0%	11%	10%	5%

Figure 3.3: Annual Tonnes Recycled Per Household, 1991 to 2005
Capital Regional District 4Core Municipalities
(Victoria, Oak Bay, Esquimalt and Saanich)



Impacts on Costs

In April 2006, the CRD banned organic materials, including grass, flowers, leaves and shrubs, from disposal at the landfill. Since the CRD allocates $35 out of $85 per tonne tipping fee to fund waste diversion programs (including curbside recycling and yard waste collection) in the region, it is experiencing a reduction in funds due to reduced amount of yard waste entering the landfill (also, it is expecting to implement source separated organics collection in the next couple of years). Consequently,

it has announced increased in tipping fees of $5/tonne each year for the next 3 years to cover programs costs.

The city expects an increase in its $2 million budget starting next year with the planned tipping fee increase at the CRD Hartland Landfill.

This experience shows the untended consequences of policies to increase diversion. In this case, the funding of the recycling program suffered because of an effective ban on leaf and yard waste, thus reducing landfill revenues. The lesson for other municipalities is that they need to carefully think through the consequences of changes in tonnages on their funding dollars. [2]

3.5 City of Edmonton, Alberta

In July 1995, a flat utility fee was adopted to cover part of waste management system costs. This reduced the amount required from the tax base from 80% to 50% of total system costs. Over time, the flat fee has gradually replaced the tax base as a financing source for waste management.

In 2000, the flat fee covered 57% (~$79/yr) of residential waste management expenditures, leaving the remaining 36% (~$50/yr) covered by the tax base and 7% by tipping fees and the sale of recyclables. The average cost per single family household (SFH) was $138 per year in 2000. By 2006, approximately 67% ($159/yr) of waste management expenditures were covered by the utility fee, 20% ($45/yr) by the tax base and 13% by tipping fees and revenues from the sale of recyclables.In addition, the residential waste management system is currently subsidized by taxes collected from businesses for $32/hhld per year, by revenues generated from tipping fees at the City's Clover Bar Landfill and byrevenues from the sale of recyclables.

In March 2008, City Council approved of the formation of a waste management utility effective 1st January, 2009. Under the utility, residents will pay for all waste services through the monthly utility fee and all monies collected from the property tax will be eliminated. The City Council did not approve of a Pay-As-You-Throw program.

Impacts on Diversion
Flat fees are not typically expected to impact on waste diversion, as they do not send a clear message to residents that they can save money by recycling.

The impact on waste to landfill and diversion of the flat utility fee in 1995 is difficult to analyze. Between 1994 and 1995, both waste and recycling tonnages dropped. The City attributed the decline to several factors including:

- introduction of the utility fee;
- decline in population;
- National Packaging Protocol and
- number of blue boxes being used.

The utility fee alone does not provide a direct incentive to reduce waste. The decision to pay for all waste management system costs through a flat fee beginning in January 2009 will not impact waste diversion behaviours, since City Council also decided not to endorse the movement to a pay-as-you-throw system at the same time.

The city attributes an increase in recycling rates with the introduction of the blue bag program in 1999. The convenience of the blue bag system has led to a steadily increasing volume of materials collected,

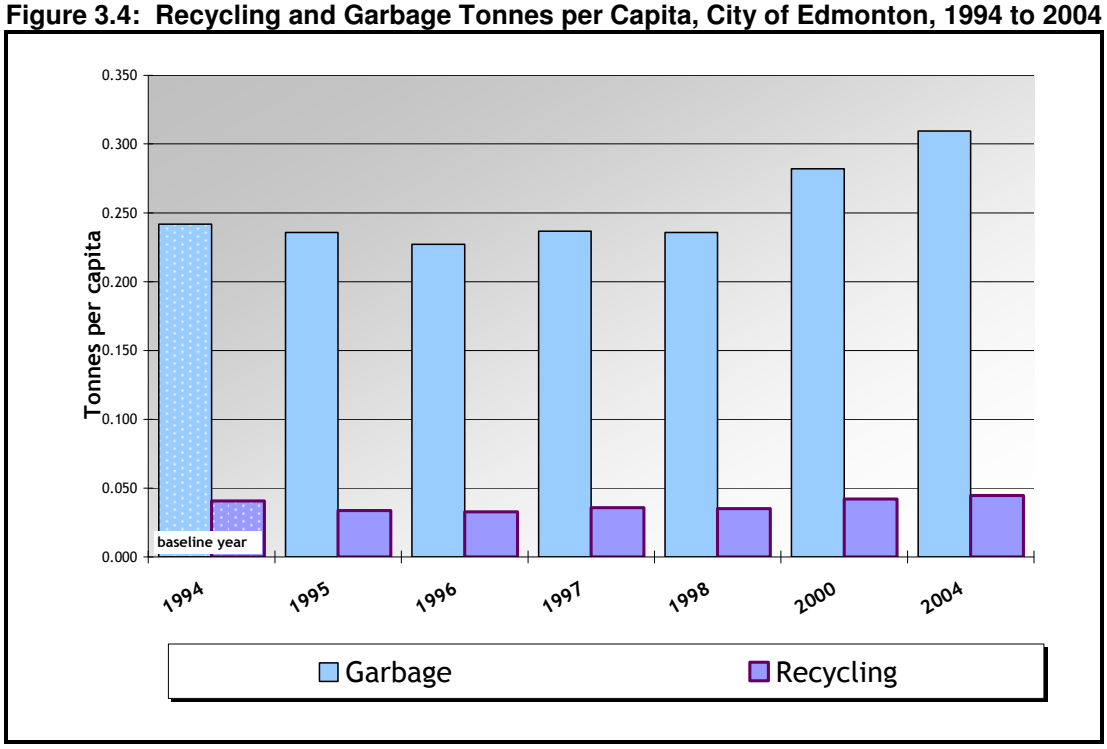
[2] For the same reason, municipalities should not rely solely on the revenues from user pay programs to fund their diversion programs.

from just over 22,000 tonnes in 1997 to 31,500 tonnes in 2004. Table 3.7 and Figure 3.4 show the change in waste disposal and recycling rates over time.

Table 3.7: City of Edmonton Solid Waste Charges and Recycling Tonnages 1995 to 2004

	1995	1998	2000	2004
Program highlights and changes	- flat fee introduced to cover portion of waste management costs with the remaining costs still covered through taxes - no PAYT program	- policy to gradually reduce use of tax base to cover waste management costs - no PAYT program	- mixed waste processing introduced - blue bag system introduced in 1999. - no PAYT program	- no PAYT program
Solid waste charges	Flat fee- $60/yr (50%) Taxes- $60/yr (50%) Total – $120/hh/yr	Flat fee- $60/yr (58%) Taxes- $44/yr (42%) Total – $104/hh/yr	Flat fee- $96/yr (69%) Taxes - $50/yr (31%) Total – $146/hh/yr	Flat fee- $145/yr (74%) Taxes - $46/yr (26%) Total – $197/hh/yr
Recycables diverted				
tonnes	20,794	24,270	27,666	31,533
Per capita	0.034	0.038	0.042	0.045
% recycling rate change from 1994 (base year)*	-17%	-6%	+4%	+10%
Waste disposed				
tonnes	~145,000	~150,000	185,000	218,823
Per capita	0.236	0.236	0.282	0.309
% disposal rate change from 1994 (base year)*	-2%	-2%	+17%	+28%

Figure 3.4: Recycling and Garbage Tonnes per Capita, City of Edmonton, 1994 to 2004



Impacts on Waste Management System Costs

There is no evidence to indicate that moving to the flat fee had a particular impact on system costs. Other factors would be expected to impact on costs, but not this particular financing feature.

3.6 City of St. Albert, Alberta

In January 1994, the waste disposal expenditures (private landfill tipping and recycling depot) were transferred from the tax base (resulting in a $35 tax reduction for the average ratepayer) to the utility bill as a flat fee of $3.00 per month. In 1996, the waste collection costs were transferred from the tax base (resulting in a $32 tax reduction for the average ratepayer) to the utility bill as a flat fee of $3.00 per month. The total flat rate was $6.00 per month and included costs for recycling, waste collection and transportation, and landfill and tipping fees. The city offers only depot recycling services.

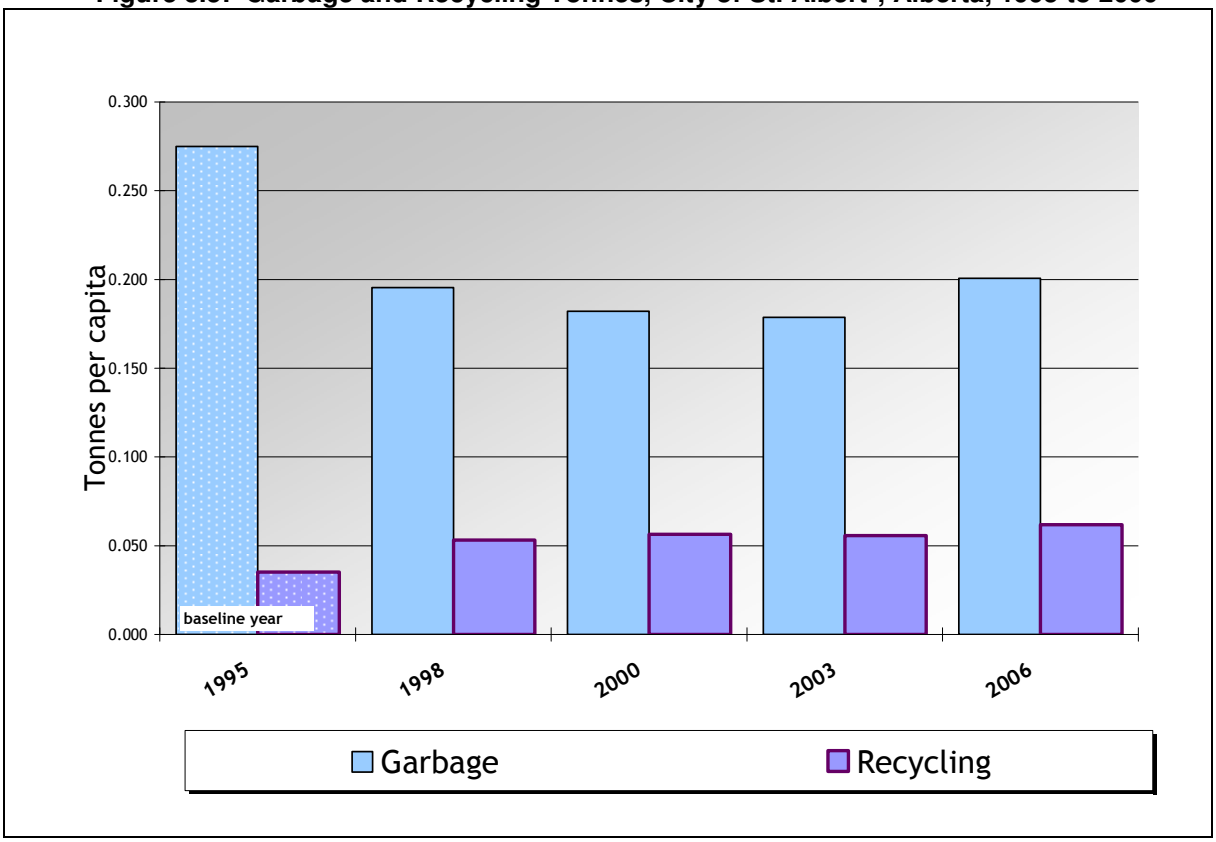
St. Albert was the first community in Canada to implement a variable rate container system in July 1996. Residents are given the option of subscribing to a bag/tag program or to a variable rate container program in this very elaborate system. The current fee structure allows residents to subscribe to a variety of different service levels and fees varying by collection container (bags or cans) and the number of containers permitted at the curb on a weekly basis (weekly or bi-weekly garbage set out). Staff claim that this comprehensive approach was in response to residents' demand for a flexible, pro-active way to reduce garbage and recycle more.

The variable container program experienced a 40% per capita waste reduction rate and a 51% increase in the recycling rate in the first two years after implementation. Table 3.8 and Figure 3.5 show the change in waste disposal and recycling rates over time.

Table 3.8: System Costs and Recycling Performance, City of St. Albert, Alberta 1998 to 2006

	1998	2000	2003	2006
Program highlights and changes	- variable rate container program implemented mid 1996 - 3 variable container systems available	- variable container program expanded - 4 variable container systems available - separate recycling and composting fee introduced	- no major program changes	- variable container program expanded - 6 variable container systems available
Solid waste charges	Flat fee - $54 - $162/yr Stickers -$1.50/each	Garbage - $32 - $194/yr Recycle/compost - $22/yr Stickers - $1.50/each	Garbage - $33 - $230/yr Recycle/compost- $39/yr Stickers - $1.50/each	Garbage - $19 - $230/yr Recycle/compost- $44/yr Stickers - $1.60/each
Recycables diverted				
tonnes	2,639	2,920	3,034	3,485
Per capita	0.053	0.056	0.056	0.062
% recycling rate change from 1995 (base year)*	+51%	+61%	+58%	+76%
Waste disposed				
tonnes	9,716	9,716	9,747	11,301
Per capita	0.195	0.182	0.179	0.201
% disposal rate change from 1995 (base year)*	-29%	-34%	-35%	-27%

Figure 3.5: Garbage and Recycling Tonnes, City of St. Albert*, Alberta, 1995 to 2006



Impact on Diversion

There was a significant increase in diversion (51% increase in 1998 compared to 1995 when the variable container system was implemented). Recycling per capita has increased slightly from 1998 and 2006. Waste disposal data for 2006 indicates a significant increase in tonnes disposed and per capita tonnes disposed.

Impact on Costs

The program implementation costs were $95,000 (most of which was associated with advertising and start up consulting). The program experienced a revenue shortfall the first year of the program due to the overwhelming number of residents that subscribed to the lowest level of subscription service of 1 can per week. The costs were partially off-set by a year end surplus of $77,000 generated by recycling revenues.

Lessons Learned

While the program has resulted in a reduction in garbage going to landfill, it has become an administrative nightmare according to staff. Initially the system was very simple. If the resident subscribed to 2 bags per week (or 1 can) then they were not required to use tags. Only those residents who subscribed to a higher level of service (a minority) were issued tags and required to use them. With the system change in 2000, the program became administratively cumbersome. The variation in choice of subscription level has resulted in high administration costs to monitor and change subscription services. According to staff, half of the subscription ordering time is spent explaining how the system works to residents. Tags must be placed on every bag of garbage and are distributed every six months. The six month distribution schedule was needed to reduce the number of left-over tags being given to neighbours or friends at the end of the year. Tags are not mailed but are delivered by meter readers or hired help.

Staff are looking at a simplified system in the future, possibly eliminating the 6 bag/3can option or moving to a partial PAYT program.

3.7 City of Stratford, Ontario

The City of Stratford, introduced full PAYT in 1997, charging $1.20 per bag at the curb but only $0.50 per bag at the landfill. All waste management costs are covered through the price of the tag, tipping fee revenues and other revenues. There are no waste management related expenses on the property taxes. Waste collection and disposal is self funded through user fees. The cost of the bag tag covers the cost to collect and dispose of the bag of garbage. Revenues, including tip fees at the landfill, cover the cost of the blue box program as well as administrative, staff wages, P&E and capital costs.

As discussed in previous Discussion Papers, the City experienced a 160% increase in self-hauled residential waste going to landfill within a couple years after program implementation, with the average vehicle discarding 2.1 bags (compared with 1.0 bags per household placed at the curb). Over time the tag prices at the curb and the landfill have been adjusted to reflect changing program costs and to discourage self haul of garbage to the landfill. Since 2001, the City has gradually increased the price of the bag at the curb from $1.20 to its present $1.75. The landfill fee has also increased from $0.50 per bag to its present $1.65 per bag. The result has been a noticeable decrease in the number of self-hauls to the landfill, although the amount curbside had remained effectively unchanged, as shown in Table 3.9 and Figure 3.6.

Table 3.9: Changes to Prices of Bags at Curbside and Landfill over Time

	1997	2000	2003	2006
Program highlights and changes	- full PAYT program implemented	- no program change	- cost of tags increased and moved to more equalization	- cost of tags increased
Solid waste charges	Curb - $1.20/tag Landfill - $0.50/tag	Curb - $1.20/tag Landfill - $0.50/tag	Curb - $1.50/tag Landfill - $1.40/tag	Curb - $1.75/tag Landfill - $1.65/tag

Figure 3.6: Total Amount of Residential Waste Landfilled between 1994 and 2004

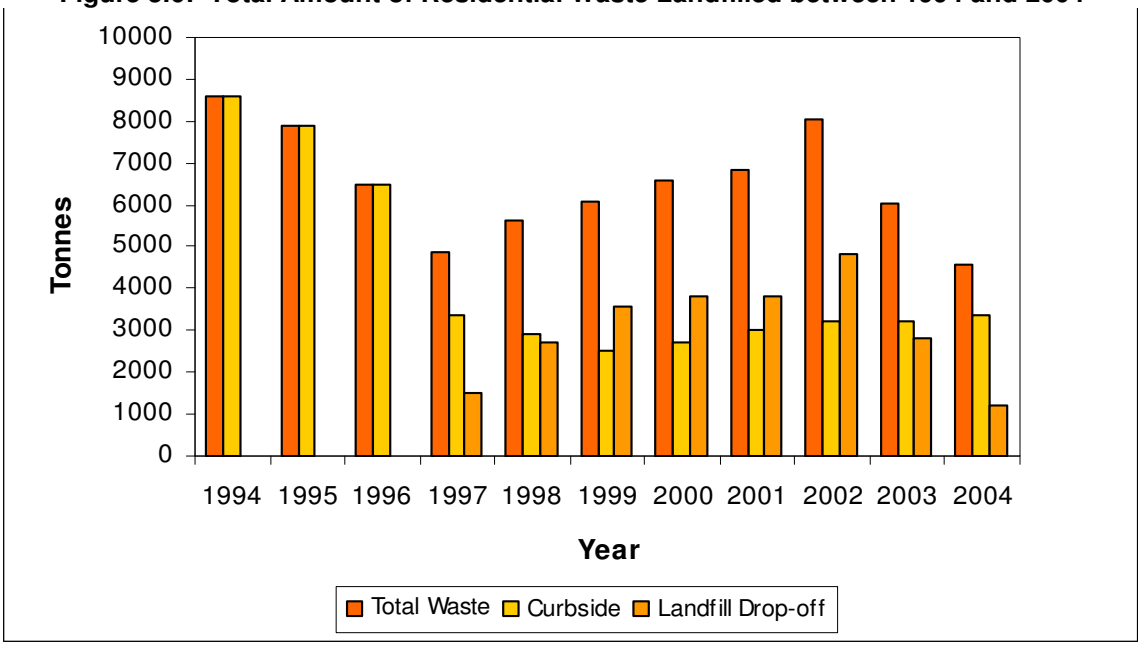


Figure taken from the report "**Optimizing the City of Stratford's Blue Box Program**" prepared by 2cg for Stewardship Ontario in April 2007

Impacts on Diversion

The experience in Stratford clearly shows that the public respond very strongly to economic incentives. When it was less expensive to take waste to the landfill, people trucked their waste to the landfill. When the landfill price went up sufficiently to be similar to the curbside pick-up cost, residents stopped using the landfill drop-off as much.

To analyze the impacts of a fee-based financing mechanism on recycling in Stratford, 2006 is the best year to look at, as this is the year when there was no financial incentive to drop off waste at the landfill: the cost of curbside and landfill drop-off are virtually the same.

Table 3.10 and Figure 3.7 show the changes in recycling and disposal rates as the curbside and landfill prices have been harmonized.

Table 3.10: Recyclable Tonnages and User Charges in City of Stratford, 1997 to 2006

	1997	2000	2003	2006
Program highlights and changes	- full PAYT program implemented	- no program change	- cost of tags increased and moved to more equalization	- cost of tags increased
Solid waste charges	Curb - $1.20/tag Landfill - $0.50/tag	Curb - $1.20/tag Landfill - $0.50/tag	Curb - $1.50/tag Landfill - $1.40/tag	Curb - $1.75/tag Landfill - $1.65/tag
Recycables diverted				
tonnes	2,004	2,144	2,347	2,996
Per capita	0.069	0.073	0.078	0.098
% recycling rate change from 1995 (base year)*	+43%	+51%	+62%	+105%
Waste disposed				
tonnes	4,868	6,621	6,127	5,840
Per capita	0.167	0.223	0.204	0.192
% disposal rate change from 1996 (base year)*	-26%	0%	-9%	-14%

Figure 3.7: Garbage and Recycling Tonnages - City of Stratford, 1996 to 2006

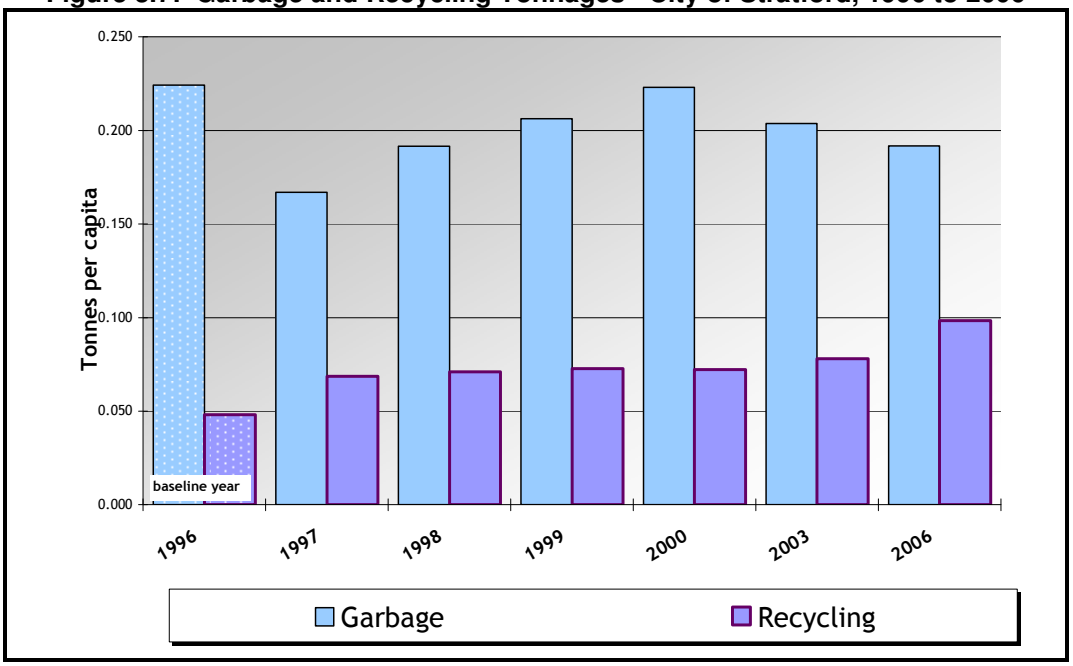


Table 3.11 presents detailed data for curbside waste, depot waste, Blue Box recycling, leaf and yard waste collection and total residential waste generated by year from 1996 to 2006. The table clearly shows that curbside garbage amounts have remained fairly stable from 1997 to 2006, but there are significant variations in the amount of garbage disposed at the depot. The very large amounts in 2002 and 2003 can be explained by the low tipping fee (waste may be commercial and from other locations).

Table 3.11: Detailed Residential Garbage, Leaf and Yard Waste and Recyclable Tonnages, City of Stratford, 1996 to 2006.

	Waste		Recycle	Leaf & Yard		Total LYW	Total
	Curbside	Depot	BlueBox	Depot	Curbside		Residential
1996	6,501	0	1,395	2,102	0	2,102	9,997
1997	3,368	1,518	2,005	1,849	0	1,849	8,741
1998	2,929	2,691	2,083	738	704	1,442	9,145
1999	2,537	3,549	2,144	1,212	546	1,758	9,988
2000	2,734	3,830	2,143	565	529	1,094	9,801
2001	3,026	3,807	2,182	1,437	604	2,040	11,055
2002	3,239	5,945	2,405	1,754	538	2,292	13,882
2003	3,232	2,795	2,546	478	658	1,136	9,708
2004	3,369	1,196	2,675	613	670	1,283	8,523
2005	3,235	1,816	2,762	387	636	1,023	8,836
2006	3,355	2,484	2,966	544	790	1,334	10,140

Discussions with Stratford staff in May, 2007 have not identified any clear reasons for the variations. Yard waste numbers have increased but there is no obvious explanation as to why the drop off garbage numbers have decreased yet the curbside garbage numbers have stayed relatively the same.

Staff report that they have not experienced an increase in illegal dumping. Backyard burning is banned and the surrounding municipalities charge $2 per bag so they doubt that the garbage is going outside Stratford. City staff have applied for funding through Stewardship Ontario to conduct a waste audit on the front end residential and commercial bins at the landfill, as they suspect that a large quantity of commercial waste is being discarded in the residential bins and visa versa, which would impact the drop-off numbers at the landfill.

Impacts on Costs

In 2006, the Association of Municipal Recycling Coordinators (AMRC) conducted an analysis of six Ontario municipal user pay programs to determine financial impacts resulting from the implementation of user pay programs. The study reviewed the financial implications of the user pay programs in the following communities: the City of Brockville, the Town of Marathon, the County of Oxford (City of Woodstock), the City of Orillia, the City of Stratford and the Town of the Blue Mountains.

Table 3.12 presents the analysis of Stratford's user pay program taken directly from the AMRC's report, *Analysis of User Pay System Costs in Ontario (E&E Project 191)* prepared in September 2006. The analysis compared 1996 (pre-launch) system costs with 1998 (post-launch) system costs and concluded that cost changes were mostly related to new contracts. The AMRC commented that the adoption of user pay increased Blue Box tonnages and reduced the cost per tonne for the Blue Box program, even though overall costs were higher.

Table 3.12: City of Stratford User Pay System Analysis Conducted by the AMRC, 2006

Table 3.5.2 details total system and component cost trends. Gross system costs through the program launch period and indeed into 2005 show a steady increase, in marked contrast to net system costs which declined substantially in the launch year (50%), Post launch year net system costs were some 37% lower than pre-launch year costs. Blue box costs remained relatively stable through the user pay program launch period with moderate increases in other diversion program costs. The major factor in net system cost decline has been revenues from tag sales. Of note is the fact that 2005 net system costs are 53% lower than those in 1996, the pre-launch year.

Table 3.5.2 Detailed costs and timeline

	1996 (gross/net)	Launch (gross/net)	1998 (gross/net)	2005 (gross/net)
Waste	$434,043 / $402,294	$471,951 / $9,954	$467,854 / 77,900	$473,207 / $(122,209)
Recycling	$230,380 / $230,380	$238,266 / $238,266	$242,631 / $242,631	$566,035 / $383,080
Leaf & yard	$73,928 / $73,928	$87,109 / $87,109	$115,076 / $115,076	$54,616 / $54,616
HHW	$25,409 / $25,409	$28,913 / $28,913	$26,072 / $26,072	$29,601 / $29,601
Total	$763,760 /$732,211	$826,239 / $363,242	$860,632 / $461,678	$1,123,459 / $345,089
Timeline	• New contracts waste, recycling (1996, 2001)	• Bag tag program launched Jan. 1, 1997 ($1.20/tag)		• Aerosol cans now included in Bbox • Bag tag = $1.75
Notes	• Recyclables collected bi-weekly, waste weekly • Landfill is owned and operated by municipality			

Given that Stratford's blue box program costs remained relatively consistent through the user pay program launch period, the tonnage increase in the launch and post-launch years led to the expected reduction in unit. The substantial increase in unit cost in 2005 for blue box materials is more reflective of the new contract pricing (2001).

Gross unit costs for waste have been relatively stable since user pay program implementation, but net unit costs have seen a dramatic decline, due in significant measure to tag sale revenues.

Detailed per tonne costs

	1996 (gross/net)	Launch (gross/net)	1998 (gross/net)	2005 (gross/net)
Waste	$67 /$62	$96 / $2	$98 / $14	$94 / $-24
Recycling	$165 / $165	$119 / $119	$116 / $116	$205 / $139
Leaf and yard	$35 / $35	$47 / $47	$80 / $80	$53 / $53

3.5.3 Discussion

Given that there were no substantive changes in the waste management system (i.e., no program additions, frequency changes, new contracts, etc.), the immediate (launch and post-launch) impacts of Stratford's user pay program have perhaps been the closest fit to the 'expected' pattern in a user pay community, that is:

1. Decline in waste tonnage with introduction of user pay resulted in higher gross costs per tonne for waste;
2. Introduction of tag fee revenues to the system resulted in lower net costs per tonne for waste, and
3. Increase in recycling tonnage as a result of user pay resulted in lower per tonne costs for blue box collection/processing – a concrete example of the elusive 'next least cost tonne.'

The financial impacts of the introduction of user pay on total waste management system costs can be summarised as:

1. Reduction (37%) of total net system costs over the launch and immediate post launch period;
2. Reduction in total tonnes managed, and
3. Reduction in unit costs for new tonnes in the blue box.

This section was taken directly from the **AMRC report Analysis of User Pay System Costs in Ontario (E&E Project 191) prepared in September 2006.**

3.8 Other Studies

The AMRC surveyed all Ontario municipalities with bag limits or any form of user pay in 2005. The final Project Report was completed in December, 2005. By that time, there were 123 PAYT programs in Ontario, of which 58 were full user pay programs (a charge for every bag).

The percentage increase in recycling tonnage resulting from the implementation of bag limits and user pay in the communities surveyed were reported to be:

Bluewater:	50%
Bonnechere	10%
Edwardsburgh-Cardinal:	>30%
Hanover	>12%
Mono	>25%
Orangeville	> 20%
Orillia	>20%

The *AMRC User Pay System Costs Study* identified additional specific Blue Box related performance data for selected communities.

- The County of Oxford data is considered the most reliable, as the program made the change recently. Blue Box tonnages increased by 22% in the first year following implementation of the user pay program in 2003, and by 17% in the second year. Data for other programs dates back to the mid to late-1990's, and should be noted also:

- Brockville measured a 29% increase in Blue Box tonnage the year it launched a full user pay program in 1996. They reduced to a one-bag limit with $2 per bag for additional bags in 1996. They reported a 22% increase in 1997;

- Orillia measured a 23% increase in Blue Box tonnage in 1997 (the launch year for their 40-tag program). Blue Box tonnages increased by 37% in 1998.

The City of Toronto (2001) conducted a study on the impacts of user pay and bag limits on diversion. Results of the study which was completed in 2000-2001 are presented in Table 3.13, along with data reported by the Region of Peel on the impacts of their 3-bag standard, implemented in 2002/2003. In all cases, the impacts of any mechanism to limit the amount of waste disposed, or charge by waste disposed, clearly increases Blue Box tonnages.

Table 3.13: Impacts of Bag Limits and User Pay on Recycling in Six Communities

	Change in Amount of Residential Waste Disposed	Change in Amount of Recycling	Base Year Before Bag Limits and Unit Pricing Introduced	Comparison Year After Bag Limits and/or Unit Pricing
Peterborough, Ontario	-21%	+49%	1993	2000
Markham, Ontario	-8%	+6%	1997	2000
Georgina, Ontario	-38%	+46%	1996	1999
Barrie, Ontario	-16%	+22%	1996	1999
Orillia, Ontario	-23%	+31%	1996	1999
St Albert, Alberta	-38%	+51%	1995	2000
Peel, Ontario	-4%	+12%	2002	2003

4. Conclusions

This analysis attempted to answer two questions:

- Do sustainable financing systems reduce the costs of Blue Box programs and
- Do sustainable financing systems increase recovery of Blue Box materials?

The answer to the recycling question depends on the type of financing system chosen. Variable rate pricing systems which are fully self-financing can be designed to significantly increase the recovery of Blue Box materials. The types of approaches which are most effective are those which charge householders by the size of garbage container, limit the number of bags which can be set out, or charge for each bag, so that there is an economic incentive to reduce garbage set-outs.

The impacts of sustainable financing systems on overall waste management system costs, and on recycling costs in particular are less clear. The significant advantage of sustainable financing systems is that they force a full cost accounting discipline on the solid waste management group. All costs need to be fully allocated and identified, so that they can be recovered through the fees charged. No evidence was identified during the research that this necessarily leads to lower costs. Rather, it leads to a fully transparent costing approach.