

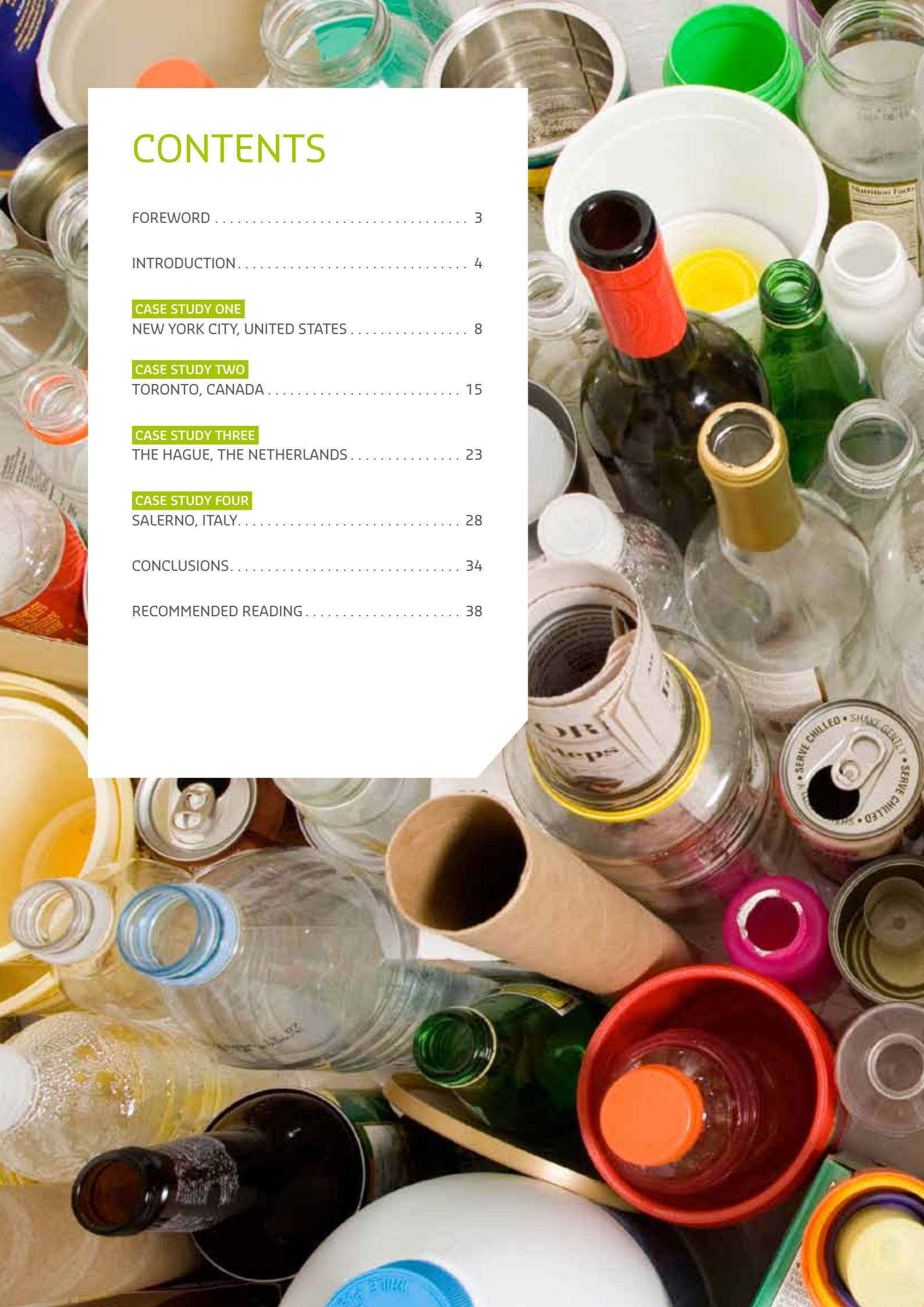
## LOOKING UP

International recycling experience  
for multi-occupancy households



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# FOREWORD

The issues and problems associated with achieving improved recycling levels in multi-occupancy housing are not new. Since the earliest days of kerbside recycling schemes, such housing has shown significantly poorer recycling performance than that of single family homes. The specific reasons have been documented many times and include lack of storage capacity both inside the home and outside the building, convenience for householders and engagement of residents. Some progress has been made over the past few years, but solutions remain difficult to find and implement.

For cities with high proportions of multi-occupancy housing the overall recycling rate is inevitably depressed. The Mayor emphasises the importance of the issue by raising it at the head of the introduction to his London draft municipal waste management strategy published in January 2010:

“However all London boroughs face challenges in providing good quality, convenient, cost effective recycling collection services for flats and multi-occupancy buildings – which account for 50 per cent of London’s housing stock. Improving recycling rates from flats – currently around 10 per cent – will therefore be essential to improving London’s recycling rates.”

Of course, this is not just a London or UK issue. Cities throughout the world suffer from similar concerns and difficulties. New major multi-occupancy housing stock can have solutions included in the fabric of the development, but older buildings in a number of different countries have similar problems of space and householder engagement.

SITA UK and its sister companies in the SUEZ ENVIRONNEMENT group provide collection services for many of the world’s great cities. Exchange of information within the group forms a critical element of technical progress in collection and other waste management processes and systems. Facilitating such dialogue is at the core of solution development.

This report and the associated conference held at London’s City Hall on 17 November 2010 provide the opportunity for an exchange of information on the topic of multi-occupancy housing using international examples. We have gathered experts from international cities to advise on current practice, performance and development. The international experts are not associated with SITA UK or the SUEZ ENVIRONNEMENT group and offer independent opinions.

The objective is to provide an opportunity for comparison, helping to inform the debate for those responsible for municipal strategy and delivery of recycling collection services.

We hope you find the report useful and welcome your feedback.



**David Palmer-Jones**  
CEO of SITA UK



# INTRODUCTION

Kit Strange, Resource Recovery Forum

## THE NEED FOR MORE EFFECTIVE MULTI-OCCUPANCY RECYCLING

Inevitably, recycling programmes are driven by the regulatory and policy framework in which they operate. Apart from doing things legally and properly, this also means planning for compliance with targets and aspiring to perform well against key indicators. This usually means that local authorities gear their collection programmes towards higher tonnages at lower costs. Consequently, it is hardly surprising that multi-occupancy housing has not been a top priority for most local authorities in the past, with easier wins to be secured from other sections of the demographic profile. Of course, local authorities with a significant proportion of their households in high-rise buildings or flats have had to confront the challenges and take steps to implement recycling schemes for their multi-occupancy housing.

In England, recycling rates have more than tripled in less than a decade (**Figure 1**)<sup>1</sup> making easy wins harder to find.

There are also social equity factors at work, including the right of all householders to have fair and convenient access to recycling facilities.

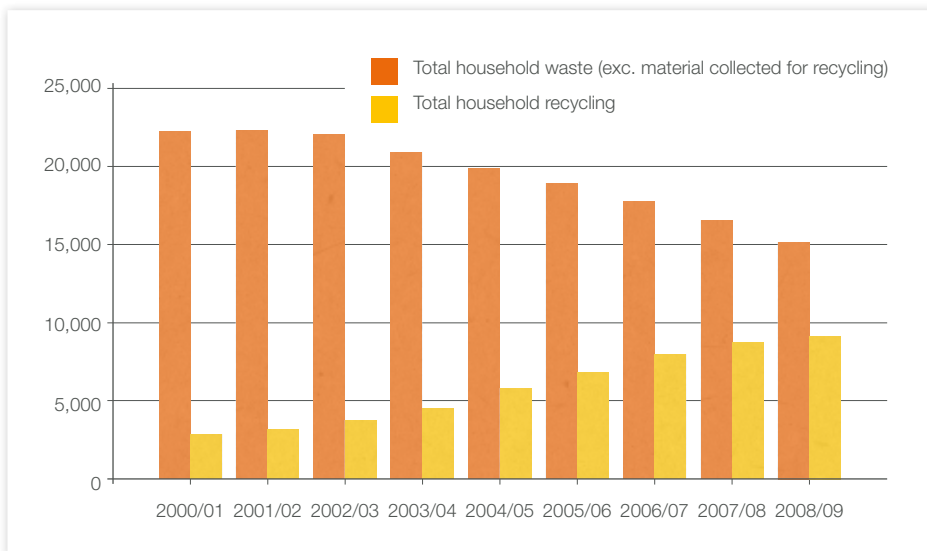
## THE UNITED STATES

In 1999, the US Environmental Protection Agency reported<sup>2</sup> that one in six American homes are located in buildings or complexes with five or more units. Residents in these households were frequently left out of community kerbside recycling programmes, often against their wishes. Benefits of waste reduction programmes in this housing type were found to include:

- + decreasing waste disposal costs for building owners and households.
- + bringing buildings into compliance with applicable recycling laws/regulations.
- + helping achieve local and state recycling goals.
- + making recycling accessible to more of the community.

Also in 1999, the US Environmental Protection Agency highlighted<sup>3</sup> the savings that could be won by tackling recycling in these more challenging areas. **Figures 2** and **3** show the benefits to be achieved through increased levels of recycling in multi-family housing.

The following year in California, the Sacramento Regional County Solid Waste Authority adopted an ordinance to give multi-family communities the same opportunities to recycle as those living in single family homes<sup>4</sup>. This applied to all multi-family communities with more than five units, including apartment complexes, mobile home parks, multi-storied residential units, senior housing-care facilities and large condominium complexes not served by residential recycling programmes.



**Figure 1.** Recycling and recovery rates in England 2000/1 – 2008/9 (thousand tonnes)

<sup>1</sup> [www.defra.gov.uk/evidence/statistics/environment/wastats/archive/mwb200809.xls](http://www.defra.gov.uk/evidence/statistics/environment/wastats/archive/mwb200809.xls)

<sup>2</sup> US Environmental Protection Agency (1999). Complex recycling issues: strategies for record-setting waste reduction in multi-family dwellings. EPA-530-F-99-022. October 1999.

<sup>3</sup> US Environmental Protection Agency (1999). Multifamily Recycling A Golden Opportunity for Solid Waste Reduction. EPA530-F-99-010. April 1999.

<sup>4</sup> Sacramento Regional County Solid Waste Authority (2000). Multi-family Communities Recycling Guide Implementing SWA Ordinance 5: A Step by Step Guide for Owners & Managers. May 2000.

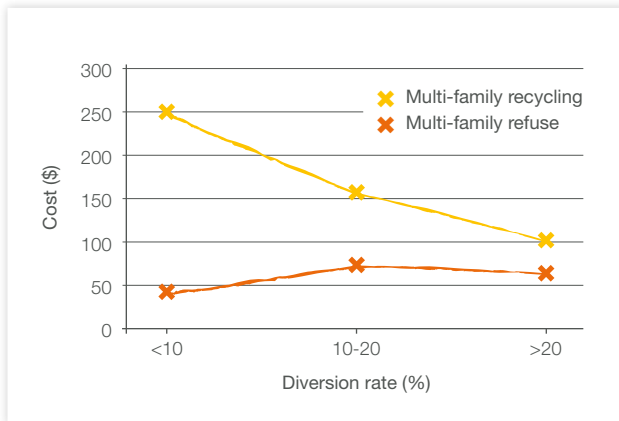


Figure 2. Multi-family waste and recycling collection costs

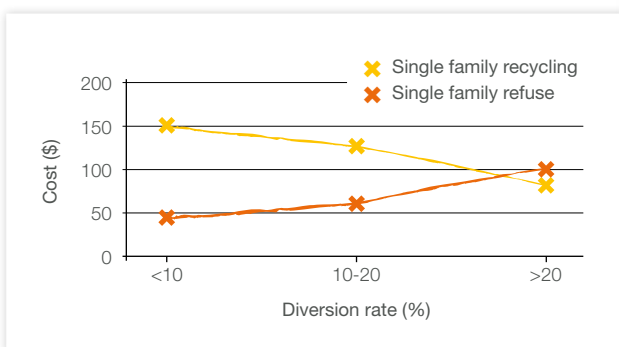


Figure 3. Single family waste and recycling collection costs

The US Environmental Protection Agency reported in 2001<sup>5</sup> that multi-family recycling is often overlooked by public sector planners. The reason for this omission was suspected to be the fact that multiple dwelling units are often considered part of the commercial sector and many local governments exercise little control over this sector. Where refuse is collected under individual contracts between landlords and competing private firms, recycling is often similarly unregulated. Another reason was thought to be the perception that apartment dwellers are less likely to participate in recycling programmes than single family dwellers. Nonetheless, many communities were shown to have established and maintained successful multi-family recycling programmes. In Minnesota, a 2002 State Auditor's report<sup>6</sup> identified multi-family recycling as a key opportunity to increase recycling.

A range of examples from the United States have shown that multi-family recycling does bring benefits. By early 2006, the California agency Calrecycle reported on multi-family recycling successes across the state<sup>7</sup>.

#### CITY OF TUSTIN, ORANGE COUNTY

Tustin has 4,400 units involved in its multi-family recycling programme. The city provides bins with recycling collection at no cost to the complex owners and residents. The hauler provides educational materials to the residents when they deliver new bins. The complex managers monitor the use of the bins to make sure they are being used properly.

#### MENDOCINO COUNTY

The Mendocino Solid Waste Management Authority employed a bilingual recycling outreach specialist to promote recycling at multi-family residences. Before the specialist was hired, an attempt to bring recycling into these complexes failed. With the initiative, an intensive outreach and education effort was put into effect.

#### SAN DIEGO COUNTY

The County's Management of Solid Waste ordinance was designed to help haulers and complexes work together to implement recycling at multi-family complexes. The ordinance requires haulers to provide recycling containers and multi-family complexes to separate designated recyclable materials from the general waste. With haulers and complexes working cooperatively, they have been able to reduce the county's waste disposal. In addition, with reduced waste collection and increased recycling, the waste collection rates for complexes are being reduced.

<sup>5</sup> US Environmental Protection Agency (2001). Multi-family Recycling: a National Study. EPA530-R-01-018. November 2001.

<sup>6</sup> Eureka Recycling (2004). Exploring multi-family recycling: tools for the voyage.

<sup>7</sup> [www.calrecycle.ca.gov/LGCentral/Library/infoCycling/2006/Spring.htm](http://www.calrecycle.ca.gov/LGCentral/Library/infoCycling/2006/Spring.htm)

Research elsewhere (including England<sup>8</sup>) does show that householders have overwhelmingly positive attitudes towards recycling schemes. Historically, low recycling rates may be linked more to resource and logistical issues that directly affect participation – such as lack of storage space in older housing stock, socio-economic status and poor service provision – rather than to negative local attitudes.

A decade ago, the public authority in Seattle was working to encourage multi-family recycling<sup>9</sup>. Seattle's evaluation of contract bids emphasised services to multi-family complexes. Since 1994, six companies signed up 60 per cent of Seattle's 5,400 buildings or 70 per cent of tenant units (retirement homes, rooming houses, nursing homes, off-campus housing, as well as apartment buildings and condominiums). By 2000, the city was pushing hard to secure an 80 - 90 per cent participation rate.

Florida's Department of Environmental Protection made recommendations<sup>10</sup> in 2010 to achieve a new state-wide recycling goal of 75 per cent by 2020. Today, Floridians collectively recycle 28 per cent of their solid waste. Some of the Florida Department of Environmental Protection recommendations in the report included:

- + to require state agencies to meet the 75 per cent goal.
- + to apply the recycling goal to counties with a population greater than 100,000 and to cities with a population greater than 50,000.
- + to require commercial recycling in large counties and cities to include multi-family residential units such as apartments and condominiums, as well as institutional facilities such as schools and hospitals.
- + to create a recycling business assistance centre to promote markets for all recyclables, organic and inorganic.

## THE UK

Researchers in England<sup>11</sup> explored the role of transience in kerbside recycling performance in Portsmouth, one of the most densely populated cities in Europe. The study confirmed that recycling in an urban environment is difficult. UK authorities failing to meet their targets are predominantly those cities where medium and high density housing causes problems for collections that rely on householder segregation of waste. Lower recycling rates in many of the UK's big cities has a major impact on national recycling rates. The achievement of higher rates nationally is therefore directly linked to improvements in the most densely populated parts of Britain.

Since urban areas are likely to become more densely populated, a key issue was found to be population transience, which is greater in urban areas. It seems that once the recycling habit is established it is difficult to break. Changes in physical circumstances are drivers for ceasing recycling: a change of address, a change in occupants, a bin going missing.

A report in 2006<sup>12</sup> noted that one third of all households in Scotland are in multi-occupancy properties, which face particular difficulties in the storage and collection of recyclables. The Government recognised that the challenge for local authorities is to implement viable recycling schemes for these properties in a cost-effective manner.

Effective actions for increasing recycling rates in areas with high rates of population flux and high population densities include targeted, timely communications campaigns, especially for university students, and guidelines for new build properties.

<sup>8</sup> Martin et al (2005). Social, cultural and structural influences on household waste recycling: A case study. M. Martin, I.D. Williams, M. Clark. *Resources, Conservation and Recycling* 48 (2006) 357–395. doi:10.1016/j.resconrec.2005.09.005

<sup>9</sup> [www.jgpress.com/BCArticles/2000/070052.html](http://www.jgpress.com/BCArticles/2000/070052.html)

<sup>10</sup> [www.dep.state.fl.us/waste/quick\\_topics/publications/shw/recycling/75percent/75\\_recycling\\_report.pdf](http://www.dep.state.fl.us/waste/quick_topics/publications/shw/recycling/75percent/75_recycling_report.pdf)

<sup>11</sup> Timlett & Williams (2009). The impact of transient populations on recycling behaviour in a densely populated urban environment. R.E. Timlett, I.D. Williams. *Resources, Conservation and Recycling* 53 (2009) 498–506. doi:10.1016/j.resconrec.2009.03.010

<sup>12</sup> SISTech et al (2006). Multi-occupancy property recycling feasibility project. Final report for Scottish Executive. March 2006. ENV/SIS/001/04.

## SCANDINAVIA

In the early 1990s in Denmark, researchers concluded<sup>13</sup> that local authorities should work on the need to provide collection systems that build on many people's positive attitude to sorting their waste, recognising that even well-motivated householders can perform badly due to force of habit or lack of appropriate knowledge. When the goal is to change consumer behaviour, the management of the physical conditions and the management of information are equally important.

Researchers studying factors in recycling efforts in Swedish households<sup>14</sup> found that both economic and moral motives influence recycling rates. Convenience matters in the sense that property-close collection in multi-family dwelling houses leads to higher collection rates. The strength of moral norms explained a large part of the variation between households, but the importance of these norms in driving recycling efforts diminished if improved collection infrastructure made recycling easier.

## THE FAR EAST

Efficiency of waste recycling is a key determinant of a city's environmental sustainability. Like other pro-environmental activities, recycling cannot be successfully accomplished by one or two people, but needs community-wide involvement with minimal free-riding by the majority. A study in Hong Kong<sup>15</sup> assessed the impacts of reward schemes on waste recycling behaviour of residents in 122 private high-rise high-density housing estates. The researchers found that reward schemes had a significant positive relationship with the per-household weight of recyclables collected.

## AUSTRALASIA

Best practices guidance from the Australian state of Victoria<sup>16</sup> noted that recycling services to single-dwelling domestic households can divert more than half of domestic waste from landfill, while the present recovery level from multi-occupancy housing is often significantly less than this. Faced with increasing multi-occupancy development and habitation, the agency (Sustainability Victoria and its resourcesmart initiative) recognised the importance of incorporating best practice waste management systems in all new multi-unit developments to increase resource recovery and to improve overall environmental and social outcomes.

## CHALLENGES

Since 2008, for the first time in history, most people are living in urban areas<sup>17</sup>. Metropolitan authorities in industrialised countries are now delivering services to an ever higher proportion of their residents living in multi-occupancy housing; a more challenging task than faced by their suburban and rural counterparts.

If designed or managed poorly, waste management facilities within multi-occupancy housing are a perpetual irritation, which worsens as the building ages. Planning at the design stage can save a great deal of difficulty and inconvenience for residents, building managers and collection crews throughout the future life of the building.

Furthermore, the increasing global trend towards urbanisation at the expense of rural communities will propel urban recycling to become an ever-increasing proportion of the national recycling performance. Low recycling rates in urban areas will drag down national recycling performance. The UK, with its challenging national recycling targets, can ill-afford to neglect this key constituency.

Hence, there are many reasons why multi-occupancy housing should be recycling more. There is already a wealth of relevant research, and much practical experience available, with more research detailed within this report.

<sup>13</sup> Thogerson (1994). A model of recycling behaviour, with evidence from Danish source separation systems. *Int. J Research in Marketing*. 11. (1994) 145-163.

<sup>14</sup> Hage et al (2009). Norms and economic motivation in household recycling: Empirical evidence from Sweden Olle Hage, Patrik Söderholm, Christer Berglund *Resources, Conservation and Recycling* 53 (2009) 155-165.

<sup>15</sup> Yung Yau (2010). Domestic waste recycling, collective action and economic incentive: The case in Hong Kong. *Waste Management*. doi:10.1016/j.wasman.2010.06.009

<sup>16</sup> Sustainability Victoria (2009). Draft Best Practice Guide for Waste Management in Multi-unit Developments.

<sup>17</sup> [www.unfpa.org/pds/urbanization.htm](http://www.unfpa.org/pds/urbanization.htm)

# CASE STUDY ONE NEW YORK CITY, UNITED STATES

 Samantha MacBride, Columbia University School of International and Public Affairs

## BACKGROUND

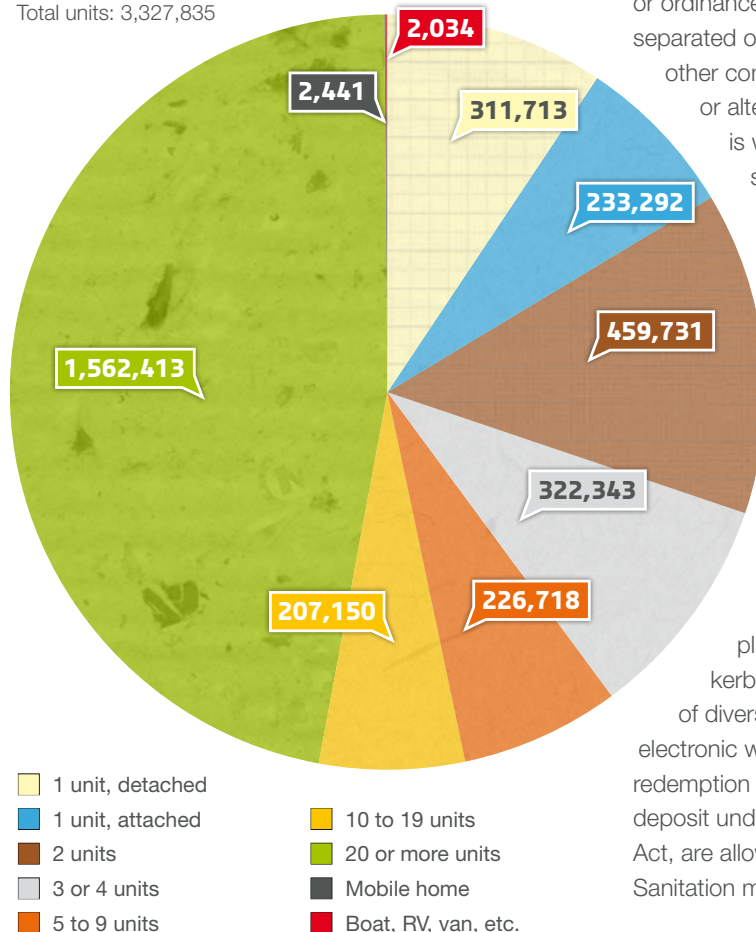
New York City has a population of 8.3 million, with the following characteristics<sup>1</sup>:

- + 44.6% white
- + 25.1% African American
- + 11.8% Asian
- + remainder Native American, Native Hawaiian

Nearly two-thirds (60.2 per cent) live in family households and the average household size is 2.68 persons. One half (52.2 per cent) speak English only, 47.8 per cent speak a language other than English and of them 23.5 per cent speak English less than 'very well'. Around 15.7 per cent of all residents fall below a defined poverty level of roughly US\$20,000 per household.

The housing stock comprises 3.3 million housing units, of which 91 per cent are occupied.

**Figure 1.** New York City housing units  
Total units: 3,327,835



## EXPERIENCE

In the United States, 'diversion' does not include diversion to energy-from-waste, which is considered disposal along with landfilling. Recycling, composting, re-use and in some jurisdictions, though not New York City, waste prevention (estimated) may be counted as diversion.

There is no national waste policy beyond that governing the safe construction of landfills and incinerators; and the handling, transport, treatment and disposal of hazardous industrial wastes. There are no national diversion goals or targets, or other policies to tax or charge disposal. Waste policy is instead set by individual US states and varies widely from state to state. Cities and towns are the most active in implementing waste policy and may enact local or county laws to supplement, but not contradict, state laws.

## STATE AND CITY LAWS

The General Municipal Law of New York State mandates that all municipalities in the state adopt a local law or ordinance requiring that solid waste be source separated or segregated into recyclable, reusable or other components for which economic markets or alternate uses exist. New York State law is weak in comparison to some other US states (especially California), but is more robust than others (especially those in the southeast US).

Local Law 40 of 2010 (a New York City law) sets diversion goals for kerbside and containerised collections from households and public institutions, and for total Department of Sanitation managed waste, which also includes street cleaning functions (Figure 2). The law allows kerbside and containerised collections of paper recycling and commingled metal, glass and plastic recycling to count as diversion for the kerbside and containerised stream. Other types of diversion, including the recycling or re-use of electronic waste, textiles, garden wastes, and the redemption of beverage containers bearing a five cent deposit under the New York State Returnable Container Act, are allowed to be counted in the Department of Sanitation managed diversion total.



New York City's fraction of garden waste (called 'yard waste' in American English) is very small: four per cent citywide. While small quantities of autumn leaves are collected for composting at Department of Sanitation facilities from suburban areas of New York City, the impact on the overall city diversion rate is very small. Unlike many London boroughs, there is no source-segregated organics collection for composting. Thus, to all intents and purposes, 'diversion' is the diversion of paper/cardboard (one stream) and commingled metal/glass/plastic (a second stream).

Year	Department-managed solid waste recycling goal (%)	Kerbside and containerised waste collected by the Department recycling goal (%)
2011	16%	16%
2013	19%	18%
2014	21%	19%
2016	24%	21%
2018	27%	23%
2019	30%	24%
2020	33%	25%

Figure 2. Local Law 40 goals

Separation of paper/cardboard in one set-out, and commingled metal/glass and containers/plastic containers in a second is mandatory for all New York City residents and public institutions receiving Department of Sanitation collection under Local Law 19 of 1989.

Commercial recycling in New York City is mandatory, with similar set-out requirements, under Local Law 87 of 1992. There are no goals or targets for commercial recycling.

## NEW YORK CITY DEPARTMENT OF SANITATION

One agency, the New York City Department of Sanitation, serves the entire City of New York for residential and institutional (governmental/non-profit) waste collection. New York City is divided among five large boroughs and into administrative subdivisions called Community Districts, of which there are 59. Community Districts are political districts with representatives in the city legislature (called the City Council) and simultaneously operational districts with a sanitation garage housed in each district serving collection routes in that district. Each Borough has a Supervising Officer overseeing District garages and offices. The Department of Sanitation has approximately 10,000 employees, both civilian and uniformed. Uniformed workers, of which there are approximately 8,000, include those involved in the operations of waste collection, street cleaning and snow removal.

## MANAGING WASTE COLLECTION

90 per cent of all Department of Sanitation managed waste consists of material generated from residents and institutions. 90 per cent of this total is collected manually at kerbside, with the remaining 10 per cent served by automated containerised collection. Kerbside collections are two to three times weekly for refuse and once weekly for recycling.

Collected refuse is consolidated at one of roughly fifteen privately operated waste transfer stations, which operate under contract to the City. Loads are either trucked or sent out by rail to disposal outside New York State. 90 per cent of refuse collections are sent to landfill and 10 per cent to energy-from-waste facilities.

Collected recycling is taken to private processors located in and around New York City, which also operate under contract to the City. Processing costs are diminished by revenue sharing when the price of recycled commodities rises above a certain point.

New York City is different from many other cities, including London, in that there are no common-use bins placed at street level for residents to use for refuse or recycling from home. Litter baskets and 'public space recycling' baskets are meant to be used for the refuse and recycling, respectively, that arises from pedestrian use. It is illegal to dispose of household refuse in a litter basket. Large common-use bins are not employed because:

- + the extreme density of many neighbourhoods makes placement untenable.
- + bins would likely be misused by residents (over-filled, recycling contaminated, etc).
- + it may be simply that there is no tradition of this collection method in New York City.

In New York City it is common to see black plastic bags (sacks) of refuse next to clear-bagged and separated paper/cardboard, and clear-bagged and separated commingled metal/glass/plastic piled high at kerbside on collection day. The Department collects all material set out at kerbside on the day of set-out. There are strict fines for setting materials out at the wrong time or wrong day, as well as for littering and illegal dumping (fly-tipping).

## MULTI-OCCUPANCY COLLECTION

Since the inception of New York City's residential programme in 1989, multi-unit buildings have received the same frequency of collection as single and two family housing, and have been required to follow the full recycling programme requirements regardless of where they are or how many units they have. This contrasts with other US jurisdictions. Many smaller cities exempt multi-unit dwellings from recycling entirely<sup>2</sup>. Other larger cities opt to handle multi-unit recycling through separate programmes from those serving recycling from single and two family homes<sup>3</sup>.

As shown in **Figures 3** and **4**, diversion and capture rates are better in higher income zones of New York City, even in very dense areas, such as in parts of Manhattan, where buildings of ten or more units predominate. Low income, more than multi-unit housing status per se, has consistently been shown to coincide with lower diversion and capture rates since the inception of the City's recycling programme. It is believed that this lacuna is not due to lack of education among low-income residents, but is instead due to the lower levels of staffing services (caretaking and janitorial) that low-income buildings receive.

Density and income grouping	Diversion	Capture	Annual, metric tonnes		Population	Household	Annual, kg			
			Refuse	Recycling			Refuse/capita	Refuses/household	Recycling/capita	Recycling/household
High density/ High income	25%	48%	270,248	89,042	983,818	589,929	274.7	458.1	90.5	150.9
High density/ Medium income	16%	43%	83,298	14,611	281,040	107,269	296.4	776.5	52.0	136.2
High density/ Low income	10%	31%	468,337	51,717	1,448,359	553,704	323.4	845.8	35.7	93.4
Medium density/ High income	18%	43%	142,375	11,291	502,342	216,093	283.4	658.9	22.5	52.3
Medium density/ Medium income	16%	48%	760,512	30,794	2,433,228	910,496	312.6	835.3	12.7	33.8
Medium density/ Low income	11%	35%	370,210	95,375	1,137,981	418,979	325.3	883.6	83.8	227.6
Low density/ High income	18%	52%	387,857	155,370	1,153,300	405,928	336.3	955.5	134.7	382.8
Low density/ Medium income	13%	43%	78,318	84,084	218,910	74,290	357.8	1,054.2	384.1	1,131.8
Citywide	16%	43%	2,561,155	149,211	8,308,163	3,327,835	308.3	769.6	18.0	44.8

**Figure 3.** New York City diversion, capture and generation

Data sources: New York City Department of Sanitation collections fiscal year 2010, American Community Survey 2006

Density and income grouping	Metal, paper, cardboard, glass and designated plastic containers	Garden waste	Food scraps	Other source-separable organics	Diapers (Nappies)	Non-designated plastics (sacks, durables)	Electronic wastes	Household hazardous waste	Construction and demolition wastes from households	Other
High density/ High income	35.7%	2.0%	15.3%	14.1%	3.3%	12.2%	0.1%	0.2%	3.5%	13.6%
High density/ Medium income	25.1%	2.9%	22.7%	12.0%	3.5%	13.7%	0.4%	0.3%	5.2%	14.3%
High density/ Low income	25.0%	1.0%	25.3%	11.4%	4.3%	12.8%	0.3%	0.3%	4.7%	14.8%
Medium density/ High income	23.9%	4.0%	20.1%	14.3%	4.1%	11.0%	0.7%	0.3%	5.4%	16.2%
Medium density/ Medium income	19.3%	3.5%	25.1%	12.4%	4.2%	12.4%	0.7%	0.3%	6.6%	15.5%
Medium density/ Low income	24.3%	2.9%	22.3%	11.8%	4.0%	11.9%	0.5%	0.2%	6.6%	15.5%
Low density/ High income	18.7%	13.0%	17.5%	12.5%	3.4%	10.1%	0.3%	0.2%	8.5%	15.8%
Low density/ Medium income	19.3%	8.8%	19.5%	13.0%	4.3%	10.6%	0.4%	0.3%	8.6%	15.5%
Citywide	23.37%	4.95%	21.4%	12.4%	3.89%	11.84%	0.42%	0.27%	6.28%	15.18%

**Figure 4.** New York City composition of disposed refuse

Data source: New York City Waste Characterisation Study 2004-05

Table notes: Median household income for the census tract is in the top third/high income, middle third/medium income, lowest third/low income. No New York City households are low density/low income by this definition. Greater than two thirds of all housing units are in units of 10 units or more/high density, 3 - 9 units/medium density, 2 units or less/low density. Total population and households do not reflect sum of income/density groupings due to anomalies with the data source, the American Community Survey of 2006.

<sup>2</sup> Ferenback, Pete, 'Passed Over', Waste News Digital Edition, 29 April 2008

<sup>3</sup> Staff, 'Waste News Municipal Recycling Survey, 2007', Waste News, 7 February 2007

## COMMUNICATION AND COMMUNITY ENGAGEMENT

The Department of Sanitation has always conducted the bulk of its outreach in multi-unit dwellings, and in the late 1990s and early 2000s targeted low-income, high-density zones for enhanced multi-lingual education and outreach. This work continues to this day. The Department's communications strategy includes mass mailings, an extensive website ([www.nycwasteless.nyc.gov](http://www.nycwasteless.nyc.gov)) and ongoing fieldwork in a variety of settings, including public schools ('state schools' in British parlance). The recycling programme was rolled out between 1989 and 1993 by Community District, and between 1995 and 1997 the range of recyclable materials was expanded. In 1997, the programme that is in place today was active citywide. Between 2002 and 2004, due to contracting problems and the post 9/11 fiscal crisis, plastic and glass recycling was temporarily suspended from the kerbside programme, although metal and paper/cardboard recycling continued. In 2004, the full programme was reinstated under a new, long-term contract with a recycling processor for metal, glass and plastic.

Community engagement takes place at a variety of levels of governance, with citizens voicing their views at Community Boards (which are organised at the Community District level), to the legislature (called the City Council – but note that this means the sitting legislative body, not a governing body as it does in the UK), and to other local elected officials including Borough Presidents, the Public Advocate, and the Mayor. Siting decisions for waste facilities require a public hearing and extensive public participation in the permitting process.

## THE NEW YORK CITY APARTMENT BUILDING RECYCLING INITIATIVE

Starting in late 2006, the Department of Sanitation launched a new education programme, the New York City Apartment Building Recycling Initiative. This initiative is open to residents eighteen years and older in any of the over 150,000 residential buildings of three units or more in New York City, as well as to the superintendents, managers and other staff who work at these buildings. It extends to all areas of the city, from the extremely densely populated boroughs of the Bronx, Brooklyn and Manhattan to more suburban style areas in Queens and Staten Island, where there are still substantial numbers of residential buildings with three units or more.

Via mass mailings, literature distributed at real estate industry functions, and the internet, the initiative programme recruits interested residents in apartment buildings to be trained as the recycling educator and facilitator for their apartment building. The programme's strategy is for the participant(s) to provide on-site expertise to answer fellow residents' recycling questions, to keep an eye on the maintenance and set-up of the building's recycling area(s), and generally to improve communication thereby reducing the anonymity and increasing the transparency of recycling in the building. Participation involves a series of mutually reinforcing aspects:

- + Enrolment in the programme by a resident immediately prompts telephone and email outreach to the management of that building, not only to verify that they have approved the resident's participation, but to invite the management and building staff to participate in the training aspects of the programme. From the outset, resident and management are brought together as a team<sup>4</sup>.
- + After enrolment, buildings receive a non-enforcement related site visit by Recycling Outreach staff, usually within a few weeks of sign-up, to assess a baseline status of and conditions for recycling in the building.
- + Participants are encouraged to attend a training session, led by a programme facilitator, which includes a review of the basics of recycling with hands-on exercises and discussion of issues particular to recycling in multi-unit buildings. Training sessions, which run for three hours, are held in the evening every two months at the Bureau's offices.
- + After participants attend a training session, the Bureau provides a 'report card' – a building evaluation based on the site visit with suggestions on how to improve recycling in the building.
- + Participants have ongoing access to a programme facilitator via phone and email who knows their building and can provide support, information and encouragement. At each point in the initiative process, participants are given samples, order forms, and information on how to obtain recycling decals, building posters, brochures and other educational materials in large quantities, at no cost.

<sup>4</sup> In some cases, the management will not approve the resident's participation. The resident can then join the Apartment Building Recycling Initiative as a 'friend', which entitles them to attend the trainings and receive educational materials, but not to distribute recycling literature in the building, until such time as management does approve their role. To date, there are 47 initiative friends.

To date, some 418 buildings have enrolled in the programme, representing 36,000 units of multi-unit housing. One of the more surprising aspects of the programme, which appeared as soon as it was launched, was a strong interest on the part of building staff to enrol with tenant volunteers as a team. It is common for tenants and their 'supers' (as caretakers are called) to come to training together, as well as for building management companies to enrol their staff and recruit tenant co-volunteers themselves. Partnership between resident and caretaker is a core aspect of the programme.

The New York City Apartment Building Recycling Initiative represents a highly transferrable model for use by other municipalities, particularly heavily urbanised areas, many of whom find multi-unit recycling to be particularly challenging. All that is required for the initiative is a population in which some apartment dwellers have the interest and enthusiasm to participate. The nature of the initiative leaves most of the structuring of involvement up to the participant. Beyond attending training, receiving samples of educational materials and staying on the list for periodic emails, participants are encouraged to work for change in their buildings in whatever way suits the culture and practices of that particular small 'community'.

## ECONOMICS

The Department of Sanitation has a budget of roughly US\$1.3 billion dollars. This translates to around US\$156 per person per year for refuse and recycling collection, street and lot cleaning, snow removal, and associated education, administrative and maintenance expenses. These services are funded entirely out of the general tax base. Residents are not charged directly for service.

As there is more refuse than recycling set out at the kerbside, costs for the latter are higher despite the use of longer collection routes and in some cases dual-bin trucks to improve collection efficiencies. Per ton costs for disposal are higher than for recycling. There is revenue sharing from the sale of paper and cardboard. When market prices for plastic and metals reach a certain level, complex contractual provisions allocate some of the surplus to reduce the processing cost. The Fiscal Year 2010 Mayor's Management report lists the following per ton costs:

- + refuse collection cost per ton: US\$228
- + recycling collection cost per ton: US\$516
- + paper and cardboard revenue per ton: US\$10
- + refuse disposal cost per ton: US\$148
- + recycling processing cost per ton: US\$60

As the Apartment Building Recycling Initiative entails only minimal administrative and training work, and mobilises existing educational resources, it is extremely cost-effective. No new staff were hired to implement the initiative. Registration, training sessions and ongoing support are folded into existing Outreach functions. Essentially, the programme has zero added cost to the budget.

## LESSONS LEARNED

### INCOME REFLECTS LEVEL OF BUILDING STAFF

Low-income, dense neighbourhoods have diversion rates far lower than other areas. In New York City, multi-unit recycling rates in wealthy sections of Manhattan are among the highest citywide, averaging around 30 per cent, while recycling rates in economically stressed areas – Harlem, the South Bronx – are in some cases in the single digits. It seems likely that multi-unit buildings, especially ‘high-rises’ (residential buildings of more than ten floors), are far more associated with public housing in Europe than they are in the US, especially in New York City. In New York, while there are around 180,000 units of housing provided by government agencies, privately owned and managed buildings in the hundreds of units are just as likely to be luxury condominiums as they are to be middle-class rentals or low-income communities.

Why would the recycling rate be better the higher the income of the neighbourhood? This is another phenomenon that is found internationally. In Europe, because multi-unit buildings tend to be low-income public or council housing, it may be difficult to separate the two phenomena. Not so in New York City. There, one conventional explanation is that among lower-income New Yorkers, there is less educational awareness about the recycling programme. However, years of telephone research contracted for by the Department has consistently shown this not to be the case. Regardless of neighbourhood or family income, New Yorkers are able to identify what to recycle at quite high rates (70 to 90 per cent correct). In low-income zones, something else is at play.

Low income is not associated with low knowledge, but it is associated with certain housing characteristics, in particular the level of service from building staff. The building superintendent, as he is called in New York City, often lives on the premises and is in charge of cleaning halls, maintaining boilers, and compliance with all building codes. Depending on the size of the building and, importantly, the rents or condominium fees paid, he may or may not have janitorial and other staff to help him. In poorer areas, he may be in charge of a number of buildings, stretching the property owner’s dollar further. Regardless, the superintendent is the gatekeeper of recycling compliance. If anyone is going to hang signs telling residents what and how to recycle, set up the recycling and refuse receptacles, empty and bag the contents, and even pick the contamination out of the recycling and the recyclables out of the trash, it is going to be the superintendent.

### BUILDING DESIGN

The question of building set-up for recycling was the subject of research conducted by the Department of Sanitation within the context of a citywide residential Waste Characterisation Study in 2005. The Department selected around 150 buildings, each over ten residential units, throughout New York City. Over a period of one week, the refuse and recycling set out by these buildings was collected in special trucks so that each building’s waste, including how much of it was properly recycled, could be assessed separately. After the special collection week, Sanitation staff visited each building to conduct an on-site assessment of how refuse and recycling arrangements were set up. This assessment did not test residents’ knowledge; it relied on observation of basic building characteristics (number of floors, units, presence or absence of an elevator, etc), condition of the building (broken windows, hallway lighting) and the condition, signage and receptacle arrangements in common areas within and outside each building. Because set-outs were collected in a standard Sanitation truck, residents had no knowledge that their refuse or recycling was under scrutiny. And because observation of the building happened after collection, there was no way that observation bias could come into play.

Using multiple regression, a statistical consultant tested the relationship between independent variables representing building characteristics, building condition and recycling setup, and dependent variables including building diversion rate, capture rate and contamination rate. What was found was crucial to understanding how some obstacles to multi-unit recycling might be practically overcome. First, a clearly labelled recycling area with clearly labelled recycling containers was the biggest predictor of recycling success. Buildings that had both of these features had diversion rates that were, on average, around seven points higher than those without. They also had higher capture rates and lower contamination rates. Second, the number of common areas with a refuse container but no recycling bin affected the diversion rate negatively. For each lone refuse container, the diversion rate fell about 1.5 points. Third, having a refuse chute in the building greatly diminished the building's capture rate. If residents had the option of simply tossing materials into a chute leading to a trash compactor on their floor, they were less likely to bring recyclables to a common area. On average, buildings with functional refuse chutes had capture rates that were almost 11 points lower than buildings without chutes. On the other hand, having refuse chutes decreased the contamination level of recyclables by almost 13 points. Other basic structural characteristics – number of floors, etc – were irrelevant to recycling performance. What was determinate related to signage and receptacle setup.

This was good news, because it was something that the Department of Sanitation could act on. Recycling compliance has, since 1989, been enforced in New York City through ticketing and fines. Unfortunately, single and two-family dwellings bear the brunt of this enforcement, because in those cases the responsibility for failure to recycle, or contaminating recycling with trash, is unequivocal – the ticket holds up in court. In multi-unit situations, tickets go to the building owners. While the Department does ticket for egregious and repeated multi-unit violations, it cannot hold owner-managers accountable for smaller scale tenant violations, and it can't trace these back to the tenants. However, it can ticket buildings for failure to post notices or provide proper receptacles in the common area and these findings suggested that the Department should continue to do so.

## COMMUNICATION

In the education area, there was also reason to believe that the Department's approach was on the right track, but needed targeting to the crucial nexus of superintendent and tenants via building setup. Over the years, the Department's Bureau of Waste Prevention, Reuse and Recycling had developed and tested a set of recycling education materials that addressed signage and setup, including receptacle stickers, building posters, refrigerator magnets and small bookmarks summarising recycling basics. All of these materials had been printed and stocked in the thousands, and were regularly distributed by Departmental Outreach staff and via web-based and phone-based ordering systems. The right materials were in place, but their availability wasn't enough, clearly, as the city's recycling rate of 16 per cent attested. The New York City Apartment Building Recycling Initiative arose out of these findings and seeks to get these materials, along with targeted, practical information, into buildings.

## PLANS FOR THE FUTURE

There are approximately 150,000 apartment buildings in New York City and roughly two million units of multi-unit housing. The Apartment Building Recycling Initiative's achievements, which represent the recruitment of roughly two buildings a week, have yet to scratch the surface of the improvements that are needed in terms of tonnage. As the Department continues to develop this programme in the future, it intends to engage more and more with organised custodial/janitorial labour organisations, the residential real-estate industry, and tenant advocacy groups. It is also in the process of developing on-line training for building staff and tenants. The City is currently in a fiscal crisis, but when funding is available, it intends to market the programme through additional mass mailings and on-line/print advertisements (for which there currently is no budget allowed).

If and when new initiatives are launched to collect source-separated organics or other materials, the network of the Apartment Building Recycling Initiative participant buildings will be tapped for pilot testing.

# CASE STUDY TWO TORONTO, CANADA

👤 Maria Kelleher, Kelleher Environmental

## BACKGROUND

The City of Toronto is the capital of the Province of Ontario, Canada. Ontario has a population of almost 13 million. The City of Toronto has a population of 2.4 million. The housing stock is made up of:

- ➕ 450,000 single residential homes
- ➕ 526,000 multi-residential units in over 5,500 buildings

Diversity of race, religion and lifestyle help define and set Toronto apart from other world cities. Toronto is home to virtually all of the world's culture groups and is the city where more than 100 languages and dialects are spoken.

This presents a challenge for recycling programmes. Many new immigrants live in multi-family buildings, and the combination of language barriers and cultural differences need to be tackled through appropriate promotion and education programmes. Materials for Toronto's recycling programme are published in 23 languages.

Almost three-quarters of Torontonians aged 15 or older have direct ties to immigration. About half (52 per cent) are themselves immigrants, while another 22 per cent are second generation immigrants with at least one parent born outside of Canada. The remaining 26 per cent of the Toronto population (aged 15 or older) is comprised of individuals who were born in Canada to two Canadian-born parents<sup>1</sup>. The top five recent immigrant groups by country of origin are: China (10.8 per cent), India (10.3 per cent), Philippines and Hong Kong (each 6.9 per cent), and Sri Lanka (6.4 per cent)<sup>2</sup>.

The top 15 languages by mother tongue spoken in Toronto are English, Italian, Chinese, Cantonese, Portuguese, Punjabi, Spanish, Polish, Tagalog (Pilipino), Tamil, French, Urdu, Greek, Russian and Arabic<sup>2</sup>.

## EXPERIENCE

### CITY OF TORONTO WASTE DIVERSION OBJECTIVE

The City of Toronto has a 70 per cent waste diversion objective by 2010. Overall residential waste diversion, measured by the gap process used by Waste Diversion Ontario, was 44 per cent in 2009. The diversion rate for single family waste was 60 per cent and the diversion rate for multi-family waste was 16 per cent in 2009.

### SINGLE FAMILY WASTE COLLECTION SERVICE

Single family households receive kerbside collection of green bin kitchen organics weekly. Waste and recyclables (single stream) are collected kerbside bi-weekly. Leaf and yard waste is collected kerbside on a seasonal basis. One of the keys to success of the single family household diversion programme is the move to bi-weekly waste collection. Recyclable materials are processed in a single stream materials recycling facility.

### MULTI-FAMILY BUILDING WASTE COLLECTION SERVICE

The majority of multi-residential buildings in the City of Toronto receive front-end-lift bin collection services for waste and recycling from City contractors. There are 3,900 front-end-lift container collection stops, which include 3,300 multi-residential stops and 600 school and Agency, Board, Commission and Department facility stops. These stops do not represent individual buildings, but a single collection point. In some instances, several buildings may share a communal container storage area considered a single collection point by the City.

City staff estimate that there are approximately 4,000 multi-residential buildings receiving front-end-lift waste and recycling container collection from the City. The remaining 1,500 multi-family buildings which receive City of Toronto service are generally smaller walk-ups or buildings that cannot accommodate front-end-lift container collection. These are generally serviced by kerbside collection of carts which are shared among residents.

<sup>1</sup> Immigrants in Canada's Census Metropolitan Areas - Grant Schellenberg, Statistics Canada

<sup>2</sup> Statistics Canada 2001 Census

Each multi-residential building receives:

- + front-end-lift waste collection twice a week based on one of two collection schedules (Monday and Thursday, or Tuesday and Friday); and
- + recycling collection once a week (Wednesday or Thursday). The City is moving all multi-family buildings to front-end-lift bin collection for recycling also, but some buildings still use carts.

Buildings must purchase both the waste and recycling collection front loading bins.

As part of the waste collection service, the City provides recycling collection, bulky waste collection and is in the process of introducing source separated household organics collection free-of-charge. One of the challenges in the roll-out of the source separated household organics programme to multi-family buildings has been the lack of processing capacity for the collected organics. This will be resolved when the City builds a planned 75,000 tonne per year anaerobic digester at the Disco Transfer Station in Toronto. In addition, the City has introduced a household special waste and waste electrical and electronic equipment mobile collection programme that is available for use by multi-family buildings.

### MULTI-FAMILY CART BASED SUBSCRIPTION SERVICE

The City provides a cart-based, subscription collection service to multi-residential buildings for which front-end-lift container collection is not viable. These buildings receive in-house collection services using semi-automated waste and recycling vehicles, and are incorporated into the single family collection routes. City staff have identified 1,822 multi-residential subscription customers receiving waste, recycling and organic collection services. These customers are not part of the multi-unit volume based fee programme (described later) and are levied a separate 'subscription' fee structure.

For the subscription service, property owners select and purchase a set number of extra large waste bins and owners are billed for the selected number of bins at each collection frequency. Fees are:

- + \$399/bin bi-weekly collection
- + \$679/bin weekly collection
- + \$1,241/bin twice weekly collection<sup>3</sup>

### PROGRAM PERFORMANCE

The City of Toronto has invested significant time and effort in increasing residential and municipal waste diverted through the blue box and other programmes over time, particularly with the pressure to eliminate export of waste to Michigan landfills after 2010.

Diversion performance for the City of Toronto since year 2000 is presented in **Figure 1**.

**Figure 1** shows that multi-family diversion performance is considerably lower than single family diversion performance. One reason is that the single family programme has been in place for longer than the multi-family programme. More attention has been paid to the multi-family programme over the last few years and performance is improving.

A detailed breakdown of diversion tonnages by programme for 2001 to 2007 is presented in **Figure 2**.

**Figure 2** shows the steady decrease in waste landfilled from 671,000 tonnes in 2001 to just under 498,000 tonnes in 2007. This reduction has been achieved through a combination of policies (e.g. bi-weekly waste collection), education programmes and adding new materials to the diversion programmes, particularly the green bin programme, which was introduced between 2002 and 2005. The data is presented graphically in **Figure 3**.

**Figure 4** shows that in 2007, most of the diversion occurred through single family waste households, which have convenient diversion systems throughout the City. A much smaller amount of the total diversion is from multi-family buildings, where diversion is less convenient.

This illustrates the critical importance of convenience to recycling programme success. For instance, when recycling becomes as or more convenient than disposing of material in the general waste, recycling levels increase. As an example, changing to bi-weekly waste collection service for single family households has increased recycling levels anywhere from 13 per cent to 17 per cent in various Ontario communities. This approach has typically been introduced in Ontario communities at the same time as green bin service.



Year	Residential	Waste	Total diversion	Diversion rate
2001	Single family	395,034	213,382	35%
	Multi-family	276,028	30,419	10%
	<b>Total</b>	<b>671,062</b>	<b>243,802</b>	<b>27%</b>
2002	Single family	350,944	211,998	38%
	Multi-family	288,499	35,361	11%
	<b>Total</b>	<b>639,443</b>	<b>247,359</b>	<b>28%</b>
2003	Single family	330,474	247,350	43%
	Multi-family	290,848	39,485	12%
	<b>Total</b>	<b>621,322</b>	<b>286,835</b>	<b>32%</b>
2004	Single family	290,842	274,816	49%
	Multi-family	275,068	36,742	12%
	<b>Total</b>	<b>565,910</b>	<b>311,558</b>	<b>36%</b>
2005	Single family	270,444	309,262	53%
	Multi-family	257,434	36,888	13%
	<b>Total</b>	<b>527,878</b>	<b>346,150</b>	<b>40%</b>
2006	Single family	247,601	337,994	58%
	Multi-family	261,802	37,627	13%
	<b>Total</b>	<b>509,403</b>	<b>375,621</b>	<b>42%</b>
2007	Single family	226,787	326,313	59%
	Multi-family	271,022	40,978	13%
	<b>Total</b>	<b>497,809</b>	<b>367,291</b>	<b>42%</b>
2008	Single family	238,363	342,759	59%
	Multi-family	256,176	45,429	15%
	<b>Total</b>	<b>494,539</b>	<b>388,188</b>	<b>44%</b>
2009	Single family	213,311	316,006	60%
	Multi-family	257,068	47,885	16%
	<b>Total</b>	<b>470,379</b>	<b>363,891</b>	<b>44%</b>

Figure 1. Single family and multi-family waste diversion tonnages and rates, City of Toronto, 2001 – 2009

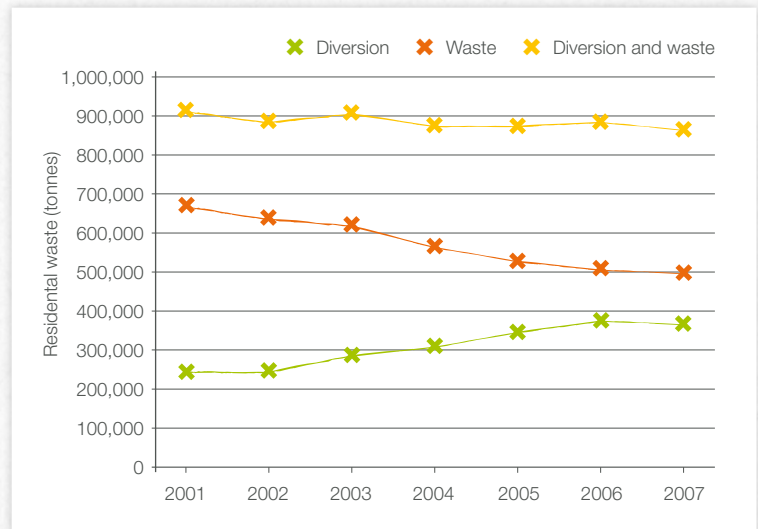


Figure 3. Decrease in waste and increase in diversion of residential waste, City of Toronto, 2001 – 2007

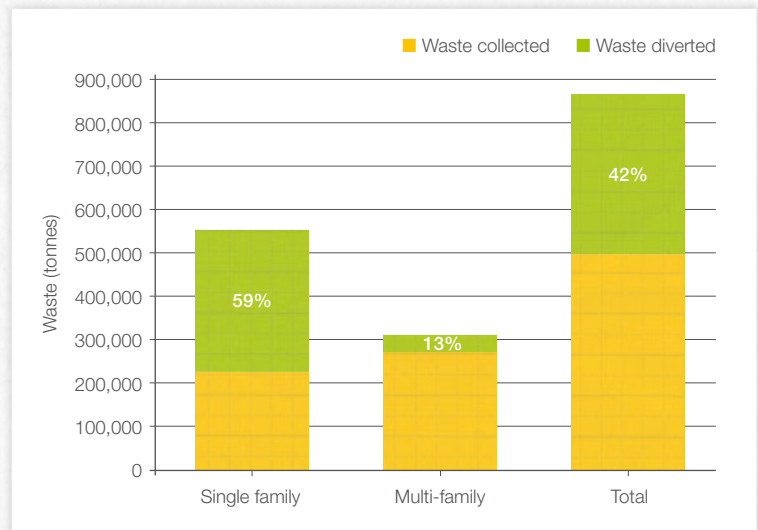


Figure 4. Comparative waste diversion from single family and multi-family households, City of Toronto, 2007

	2001	2002	2003	2004	2005	2006	2007
Blue/Grey box programme	133,922	134,623	143,853	147,936	158,116	163,385	154,799
Leaf/yard/Christmas trees	69,124	69,778	78,598	80,069	81,574	80,069	77,509
Backyard composting	17,340	17,791	18,171	18,324	18,460	18,554	18,652
Green bin source separated household organics		2,976	21,929	35,808	60,273	87,505	85,552
Environment days/Depots	2,184	2,112	2,408	2,858	843	768	860
Large appliances/Scrap metal	3,504	2,678	2,773	6,036	7,450	5,908	4,422
Grasscycling	10,051	10,085	11,650	11,635	11,936	11,680	11,296
Household hazardous waste	1,220	781	865	863	808	1,015	1,086
Beer store deposit return	6,457	6,535	6,588	6,629	6,690	6,737	6,545
LCBO deposit return							6,570
<b>Diversion</b>	<b>243,802</b>	<b>247,359</b>	<b>286,835</b>	<b>310,158</b>	<b>346,150</b>	<b>375,621</b>	<b>367,291</b>
<b>Waste</b>	<b>671,062</b>	<b>639,443</b>	<b>621,322</b>	<b>565,910</b>	<b>527,878</b>	<b>509,403</b>	<b>497,809</b>
<b>Diversion and waste</b>	<b>914,864</b>	<b>886,802</b>	<b>908,157</b>	<b>876,068</b>	<b>874,028</b>	<b>885,024</b>	<b>865,100</b>
<b>Diversion (%)</b>	<b>27%</b>	<b>28%</b>	<b>32%</b>	<b>35%</b>	<b>40%</b>	<b>42%</b>	<b>42%</b>

Figure 2. Annual diversion of residential waste, City of Toronto, 2001 – 2007 (tonnes)

## MULTI-FAMILY WASTE DIVERSION COMMUNICATION

The City of Toronto Communications Department develops and implements communication programmes for ten divisions including waste management, water use, climate change and Live Green, among others. The department has been involved in developing communications programmes and developing community outreach campaigns and website information for the blue box programme since 1989. The department includes twelve dedicated communications staff who carry out extensive public attitude research and qualitative research at the outset of each public education and outreach campaign.

Communications materials and outreach programmes focusing specifically on multi-family recycling and other waste diversion include:

- + WasteWatch newsletters
- + Advertising in lobbies and elevators
- + Transit shelter ads
- + Media releases
- + Calendars
- + Letters to property managers/superintendents
- + Toronto Recycles information cards in 23 languages
- + Handbook for property managers/superintendents
- + Information and best practices seminars
- + In-unit container information and distribution
- + Help line
- + Website
- + 3Rs Ambassador programme
- + Surveys and/or focus groups

## Calendar

A special Recycling Calendar for Apartment Buildings and Condominiums was developed and delivered the week of 18 December 2009, with over 500,000 calendars delivered. The calendar featured a full page promotion for the 3Rs Ambassadors Volunteer Programme on the February 2010 page.

## 3Rs Ambassadors

The 3Rs Ambassadors Programme was promoted through a newly developed Recycling Calendar for Apartment Buildings, a mail-out to property owners/building managers at buildings that currently receive contracted solid waste services, and an email to the Mayor and all City Councillors. Recruitment of volunteers began when information sessions were held in November 2009 and January 2010. In total, 73 people have attended the training sessions and 44 people have submitted the volunteer application forms. Training for the first 27 ambassadors was completed by February 2010, with the remaining 17 trained in Spring 2010.

## In-unit recycling containers

To help multi-unit building owners and managers increase recycling, the City initiated a three-year programme to provide free in-unit recycling containers (with a choice of bags or plastic containers marked with instructions on how to recycle). Owners and managers were first notified in November 2008 and given the opportunity to place orders for the containers. Delivery began at the end of March 2009. Buildings are eligible for 10 per cent above their unit count on their first orders. In the second and third year of the programme, buildings are eligible for 10 per cent for replacements. New developments coming on line are eligible for 10 per cent above their unit count.

In 2009, 132,062 bags and 201,675 plastic containers were delivered for a total of 333,737 containers. This represents approximately a 68 per cent uptake of buildings that are serviced as multi-residential dwellings (predominantly those buildings that are nine units and up).

### Communication literature

Communication literature focused on multi-family unit waste diversion includes:

- + report card letter and package and translations
- + newsletter for superintendents and property managers
- + elevator posters and translations
- + articles for newsletters
- + handbook for property managers/superintendents
- + advertisements for elevators

### Outreach

The City has developed an extensive outreach programme involving surveys, focus groups and information and best practices seminars:

- + Seminars – Beginning in the spring of 2008, the City conducted ten seminars throughout the City targeting building owners, property managers and superintendents to explain the new multi-family levy system (described later), provide best practice waste reduction tips and opportunities, and explain the need to complete a waste management plan for the building. Tenants were welcome to attend the seminars as well. Over the two week period that the seminars were held over 460 people attended.
- + Focus groups and surveys – A number of surveys and focus groups were conducted to test different in-unit containers and preferences by tenants, and to understand attitudes and behaviours of tenants on general recycling issues and the new levy initiative. In addition, different messages were tested to determine clarity and impact.

### Regulatory requirements

Under the Ontario 3Rs regulations, communities of over a certain size are required to provide a convenient recycling service (at half the frequency of the waste service) and collect a prescribed list of materials from single family households. The 3Rs regulations require owners of multi-family buildings to provide a recycling service, but these are generally not enforced. Most larger Ontario municipalities provide a recycling service to multi-family buildings.

Toronto also requires new multi-family buildings to include recycling considerations in the design of their buildings and provide one of the following options:

- + No chute provided that there is a central solid waste collection and waste diversion facility on the ground floor and subject to approval of the General Manager.
- + Single chute with a tri-sorter.
- + Two separate chutes with the capability of adding a dual sorter if and when the organics waste collection (green bin) programme is implemented.
- + Three separate chutes with one closed off until the organic waste collection programme is implemented.
- + Collection capabilities on each floor provided all applicable regulations governing storage of waste and recyclables and the design of such storage are met.

## THE CITY OF TORONTO WASTE UTILITY SYSTEM

The City of Toronto's Sustainable Financing Plan (Proposed Initiatives and Financing Model to Get to 70% Solid Waste Diversion by 2010) was approved by Council in June 2007. The March 2005 Business Plan indicated that significant capital expenditure was required from 2004 to 2014 to build the infrastructure needed to meet the 70 per cent waste diversion objective. A seven per cent annual increase in the solid waste management budget was projected.

In a report to Council in May 2007, staff recommended that the cost of the solid waste management programme be removed from the broad property tax base and instead that the City implement a volume based, solid waste rate structure better related to a property's residual solid waste needs. Staff stressed that a volume based rate structure would provide individuals with the opportunity and means to reduce their generation of waste and in doing so manage their household expense<sup>5</sup>.

The key elements of the financing redistribution to reach the 70 per cent waste diversion rate are presented in **Figure 5**.

The City of Toronto introduced the Multi-Unit Residential Volume Based Solid Waste Management Fee in July 2008 to provide a financial incentive for building owners to reduce waste, and to provide the financing to establish the infrastructure required to meet the City's 70 per cent waste diversion objective. The levy approach was expected to boost the multi-family recycling programme diversion rate in order to help the City achieve its 70 per cent solid waste diversion goal by 2010.

The programme was designed as an 'all or nothing' approach. In order to receive waste collection service from the City, buildings were required to participate in the City's waste diversion programmes. Buildings that opted out of the waste collection service are not eligible to receive the separate recycling service from the City. The amount of waste picked up was recorded (assuming all bins set out were full) and was converted to a value of cubic yards per unit per month. Per unit charges to the building are shown in **Figure 6**.

The programme targeted all multi-residential buildings, with eight or more units, receiving front-end bin waste collection services. City staff developed several iterations of the levy before finally settling on one that most closely approximated the single family variable fee approach (small, medium, large, extra large, extra large plus).

The City of Toronto faced a showdown with condominium and apartment buildings over the levy system from about Autumn 2009 when the full impacts of the levy became clear to building owners and managers, and substantial fees were charged to buildings who set out high volumes of waste.

The City of Toronto introduced a new levy system in July 2010 (**Figure 7**) which eliminated the small, medium, large and extra large categories, and charges for waste purely based on the cubic yards picked up.

The new fee is based on a compaction ratio of 2:1 instead of the former 3:1 ratio.

The City permits a base volume of waste per unit for which no additional fees (beyond those collected through the property tax system) apply. The allowable base volume of waste is based on 0.852 cubic yards of compacted waste per unit per year and 1.704 cubic yards of un-compacted waste per unit per year. Any waste generated beyond the base volume is charged the waste fee.

The fee includes collection of general waste, recyclables, yard waste, green bin organics, bulky items, electronics, white goods and household hazardous (special) waste.

The fees are based on mandatory participation in the waste diversion services and are an 'all or nothing' programme. Buildings cannot opt to use another waste collection service and receive city provided recycling and other waste diversion services.

The 2010 City budget had 465,000 multi-family units on City service. Other units receive private collection. By December 2009, there were 371,995 units on the City system. In the July 2010 report to council, 411,757 units were reported on City service. City staff estimate that they will recover an additional five per cent of units for a serviced total of 421,227 units. This number is still 40,000 units less than the original budget total and represents a loss of income to the solid waste utility.

<sup>5</sup> Proposed Initiatives and Financing Model to Get to 70% Solid Waste Diversion by 2010.  
Report to Executive Committee, City of Toronto From Solid Waste Staff, dated 14 May 2010

	Estimated households	2007 annual 'base' cost			Additional annual cost to fund 70% diversion		Total annual cost	
		% of solid waste management budget	\$m	Per household	\$m	Per household	\$m	Per household
Single family kerbside	482,000*	55%	\$101	\$209	\$30m	\$62	\$131	\$271
Multi-family bulk pick-up	526,000	45%	\$82.5	\$157	\$24m	\$46	\$106.5	\$203
<b>Total</b>	<b>1,008,000</b>	<b>100%</b>	<b>\$182.5</b>	<b>\$182</b>	<b>\$54m</b>	<b>\$54</b>	<b>\$237.5</b>	<b>\$236</b>

**Figure 5.** Annual per household calculations for the City of Toronto solid waste levies, 2007

\* The number of single family households was subsequently reduced due to some double counting related to houses with two or more apartments

Equivalent bin size	Lookup table unit	Lower limit yd <sup>3</sup> /unit/month	Upper limit yd <sup>3</sup> /unit/month	Fee adjustment* \$/unit/mo
S	yd <sup>3</sup> /unit/month	0	0.0472	-\$0.58
M	yd <sup>3</sup> /unit/month	0.0482	0.0756	\$1.50
L	yd <sup>3</sup> /unit/month	0.0766	0.1511	\$4.00
XL	yd <sup>3</sup> /unit/month	0.1521	0.2267	\$6.50
XL+	Additional cubic yard fee**	0.2277	1	\$28.67

**Figure 6.** City of Toronto's former multi-levy fee chart (July 2008 – June 2010)

\* The fee adjustment builds in the annual fee rebate.

\*\* Any waste generated beyond the XL limit of 0.2267/yd<sup>3</sup>/unit/month was billed at a rate of \$28.67 per yd<sup>3</sup>.

	Previous levy (up to July 2010)	New levy (July 2010 onwards)
Annual waste fee (per unit/per year)		
Small bin equivalent (base rate)	\$150.00	\$175.00
Medium bin equivalent	\$175.00	n/a
Large bin equivalent	\$205.00	n/a
Extra large bin equivalent	\$235.00	n/a
Excess waste over base: uncompacted (per yd <sup>3</sup> )	\$9.56	\$12.81
Excess waste over base: compacted (per yd <sup>3</sup> )	\$28.67	\$25.63
Solid waste rebate: (per unit/per year)	\$157.00	\$175.00

**Figure 7.** Comparison of old and new City of Toronto multi-family levies

## LESSONS LEARNED

### DIFFERENCES BETWEEN SINGLE FAMILY AND MULTI-FAMILY DIVERSION

Diversion at multi-family units is substantially different to single family units for a number of reasons:

- + Multi-family residents are often tenants rather than owners and therefore are not as invested in the community as property owners.
- + Some multi-family building residents are transient in nature.
- + Multi-family residents are often new immigrants or newcomers to the city and are not familiar with recycling services.
- + Recycling is less convenient in multi-family residences where people must bring their recyclables to the ground floor or basement for drop-off. Experience has shown that drop-off recycling only gets a third to half the capture rate of kerbside service which is very convenient.
- + Where recycling containers are located outside or in building basements, participation is lower (because of cold weather in winter and security concerns in basements).
- + There is little space for storing recyclables in multi-unit building apartments where storage is at a premium.
- + Waste disposal through a chute system is more convenient than bringing recyclables to the ground floor, basement or outdoor containers, therefore residents often dispose of recyclables rather than recycling.

### PRIVATE SECTOR COMPETITION FOR MULTI-FAMILY BUILDING COLLECTION

The City of Toronto was somewhat caught by surprise by the speed with which multi-family buildings left the City system when a competitive private sector price was offered. The levy structure as originally designed (to be parallel to the single family system) did not provide simple cost savings options for buildings which reduced their set-outs. City staff had to fairly rapidly redesign their levy system to make it simpler to understand and provide simpler cost reductions for decreased set-outs.

There has been no private sector competition for the single family collection routes to date.

## PLANS FOR THE FUTURE

The City is currently installing radio-frequency identification tags on all bulk lift bins which it services through its contractors (about 15,000). The tracking system will be fully operational in 2011.

Organics collection will be rolled out to all multi-family buildings over time. It is currently only offered to buildings which request the service, as limited processing capacity is currently available for collected organics.

The City is building a 75,000 tonne per year anaerobic digester at the Disco Transfer Station. Gas from the digester will be cleaned, upgraded and injected into the natural gas pipeline and used to fuel city waste trucks and other vehicles.

The City will stop trucking waste to Michigan at the end of 2010 and will dispose of waste at the Green Lane Landfill in London, Ontario, about two hours drive from Toronto.

The Ontario Waste Diversion Act is currently under review. While stewardship of tires, waste electronics and household special waste is funded by industry stewards, currently 50 per cent of the cost of the blue box recycling system is funded by industry stewards. There is a proposal that this amount be increased to 100 per cent industry funding in the coming years. The impacts on city collection system financing is not known at this time.

# CASE STUDY THREE

## THE HAGUE, THE NETHERLANDS

 Peter Floor, Avalex

### BACKGROUND

Avalex is a public, government dominated waste collection company, based in the area around The Hague, Netherlands.

### STRUCTURE AND MARKET POSITION

Avalex is a joint operation between six participating municipalities: Delft, Leidschendam-Voorburg, Midden Delfland, Pijnacker-Nootdorp, Rijswijk and Wassenaar.

Each municipality is represented in the General Board of Avalex by two Aldermen (members of a municipal assembly or council) appointed by the various councils. This legal structure is common in the Netherlands, although most publicly-owned waste companies are privatised.

The benefit for the participating municipalities in the joint operation is that they retain their influence on operations and policies, but have a much lower risk profile than before (when each had its own small collection service).

The statutory goal of Avalex is the effective and efficient planning and performance of waste services for all participants. The organisation makes agreements on service levels, quality of deliverables and costs.

### HISTORY

Avalex was founded in 2001 and since then the service area has grown from 120,000 residents (in two local authorities) to the current 306,000 (in six municipalities). This growth is not only based on the fact that municipalities prefer the structure with participation, but also on the successes achieved in cost reduction. In 2006, the average cost per household was €242. This had fallen to €201 in 2009. Avalex's budget for 2011 anticipates an average cost level per household of €180, a reduction of 25 per cent in six years. A tenth of the company's revenue comes from commercial contracts with 2,500 customers.

With continued expansion, the logistics of waste collection has improved accordingly. A key factor in the cost savings to date lies in the negotiating of better contracts for waste treatment due to larger volumes (economies of scale). Incineration contracts expired in 2009 and a European tender resulted in 33 per cent lower costs, saving almost €4 million per year.

Avalex operates from two locations, The Hague and Delft. The company's transfer station is also in Delft, from where the residual waste stream from Avalex's activities, along with two other municipalities (130,000 tonnes per year), are transported by ship to the incinerator over a distance of 200 kilometres. Water transport saves around 2.5 million kilometres road transport each year.

In total, 170 people are employed and 40 temporary workers are hired on a daily basis for loading waste vehicles. The company operates 60 collection vehicles for kerbside collection, underground collection and transport.

### GEOGRAPHY

Avalex services 306,000 citizens in 146,000 households (averaging 2.1 people per household), spread over 206 square kilometres. The population density varies greatly in the Avalex area, from 4,200 people per km<sup>2</sup> in Delft (Class 1: high density) to 370 per km<sup>2</sup> in Midden Delfland (Class 3: low density).

Some 71 per cent of the citizens live in a single family house, while the remaining 29 per cent live in multi-family houses. The highest percentage of multi-family housing is in Delft (38 per cent) and the lowest in Midden Delfland (11 per cent).

## WASTE STATISTICS

The municipalities served by Avalex generate 170,000 tonnes of waste per year, an average of 555 kg per person.

The average volume of waste per inhabitant for 2009 was 558 kg, equivalent to 1,205 kg per household. This is about eight per cent above the national average. The areas with a higher density (Urban Class 1) produce less waste per inhabitant (441 kg) than the areas in Urban Class 3 (578 kg). Statistics indicate a decrease in total per capita waste arisings of four per cent since 2006.

The goal for collection of recyclables for Urban Class 1 is set at 43 per cent, and for Class 4 at 56 per cent. In both classes, the Avalex municipalities show an underperformance, although the performance in Class 1 is double the national.

Year	Total waste (tonnes x 1,000)	Total waste collected		Total waste source separation organised by:	
		Unsorted residual waste	Gross domestic waste	Municipalities	Other
2004	9085	3935	790	4250	110
2005	9115	3960	810	4240	110
2006	9130	3960	805	4250	115
2007	9290	3965	775	4405	145
2008	9200	3945	770	4350	140
2009	9190	3890	735	4390	170

Year	Total source separated %	Of which:									
		Organic waste	Glass	Paper	Textiles	Demolition waste	Garden waste	Metals	Small chemical waste	Other	
2004	48.0%	15.5%	3.7%	11.3%	0.6%	7.5%	4.4%	0.8%	0.2%	4.0%	
2005	47.7%	14.9%	3.7%	11.5%	0.7%	7.5%	4.5%	0.7%	0.2%	4.0%	
2006	47.8%	14.2%	3.7%	11.8%	0.7%	7.6%	4.5%	0.8%	0.2%	4.3%	
2007	49.0%	14.2%	3.7%	11.9%	0.7%	7.7%	4.9%	0.8%	0.2%	4.9%	
2008	48.8%	14.0%	3.8%	12.2%	0.8%	7.5%	4.7%	0.8%	0.2%	4.9%	
2009	49.6%	14.5%	3.8%	11.8%	0.7%	7.5%	4.7%	0.8%	0.2%	5.7%	

Figure 1. Recycling percentages for household waste in the Netherlands, 2004 – 2009 (Utrecht University, Saving Materials 2010)



## EXPERIENCE

The Dutch Government implemented the First National Waste Plan in 2003. This plan contains goals for banning landfill and improving energy-from-waste solutions. This programme improved the overall percentage of waste recovery from 50 per cent (1985) to 83 per cent (2006), mainly due to achievements relating to construction, demolition and industrial wastes. The recovery percentage for household waste for 2006 is calculated at 51 per cent, with recent reports from the Utrecht University showing a recovery percentage for 2009 of 49.6 per cent.

In the Netherlands' current National Waste Plan 2 (2009 – 2021), the focus has changed. To reduce the negative influence on the environment and the use of virgin materials, priority is given to sustainable and efficient use of materials, from a lifecycle perspective and not only in the final waste-stage, but from raw material extraction through to final waste treatment.

The ambition for the next 12 years results in quantitative and qualitative goals for waste prevention and recovery in both the industrial sector and from households. The general goal for 2015 is to increase recovery rates from 83 per cent to 86 per cent. For household waste, the goal for 2015 is set at 60 per cent and this is a real challenge, since the industrial recovery percentage already reached 95 per cent (construction and demolition) and 93 per cent (industrial).

## IMPROVED RECOVERY FOR HOUSEHOLD WASTE

The cradle-to-cradle concept inspires us to focus on seven 'priority waste' streams:

1. Paper and cardboard
2. Textiles
3. Construction and demolition waste
4. Organic waste
5. Aluminium
6. Polyvinylchloride (PVC)
7. Gross domestic waste

## PRACTICE

Avalex operates five civic amenity sites for domestic waste. Inhabitants can bring their waste without charge, using their own Avalex-card to access the site. In 2009, 17,500 tonnes of residual waste was delivered to these sites and another 5,000 tonnes were collected using rear-end-loader vehicles.

In the last 20 years, the collection of glass and paper has been successfully implemented. In strategic locations (shopping centres and residential areas), containers have been placed for glass and paper. Each container serves around 750 households and more than 80 per cent of the glass and paper is successfully collected for recycling. Similar containers are placed for textiles, though collection is undertaken by charities.

Single family houses usually have two 240 litre bins, for organic waste and for residual waste. Avalex collects these weekly or fortnightly, depending on local policy preferences. Collection is carried out using rear-end-loaders.

Multi-family complexes are serviced by approximately 3,000 (and rising) collection containers (five cubic metres capacity), of which 60 per cent are placed underground. These are mainly located (around one container per 60-70 households) in areas of high population density. Collection is carried out using rear-end-loaders with a crane.

Avalex provides participating municipalities with a quarterly report on the recovery percentages and performance management, compared to the national goals and the national average which are set for the various types of housing density.

Communication on local waste policies (recycling goals, service schedules, complaints and delivery rules) is a joint effort between Avalex and the participating municipalities. Over the last few years, the company has successfully harmonised waste policies, which has brought savings.

Every year Avalex presents a sorting analysis on residual waste for all municipalities. The conclusion is that, despite the focus on collection of recyclables, a substantial volume of recyclables remain in the residual waste stream. It is noticeable that there are great similarities between the results of all four systems: 70 – 75 per cent of the residual waste stream contains recyclables.

	Organic	Paper	Plastics	Glass	Textiles	Metal	Other recyclables	Residuals
Underground collection	24%	19%	16%	5%	3%	3%	5%	25%
Container collection	20%	16%	14%	4%	3%	5%	6%	32%
Kerbside collection	24%	16%	19%	5%	3%	4%	5%	24%
Bags	29%	15%	16%	5%	4%	3%	4%	24%

Figure 2. Sorting analysis

Regardless of the collection system and despite efforts to increase recycling, there has been no significant improvement in source separation from household waste since 2004. It seems that the current systems have reached their limits and other incentives are now needed.

Statistics show that there is now a need to focus on paper, plastics, glass and textiles. If these can be prevented from reaching the residual waste fraction, the company can further reduce incineration by another 40 per cent.

## LESSONS LEARNED

### PAPER, GLASS, ORGANICS AND RESIDUALS

Collection of residual waste, organic waste, glass and paper is the domain of municipalities.

Multi-family housing is serviced with underground containers. Collection is planned based on the filling rate of containers, regularly with a normal frequency of twice per week. The containers for organic and residual waste are located in the immediate area of the houses, due to national regulations. Paper and glass containers (both surface and underground) are located in shopping areas and car parks.

The distance is a major barrier for people in terms of visiting these container parks on a regular basis. There can be a tendency to dump recyclables in the residual waste containers, which are located in their immediate vicinity.

Collection of paper can also be undertaken by local sport clubs and foundations, as an alternative for municipal subsidies. Municipalities make their own local agreements for these activities.

Single family houses are served with 240 litre bins. Some municipalities choose to provide three containers per household (for paper, organics and residuals). Kerbside collection is offered bi-weekly for residual and organic waste, with paper collection usually once each month.

### PLASTICS

Since 2010, the Dutch government has implemented a subsidised programme for collection of plastics. From Avalex's waste analysis, it is clear that every household produces on average 80 - 100 kg plastics per year. With the 'Plastics hero' programme, the company collects plastics with containers in shopping areas (one container per 650 households).

### TEXTILES

Textiles are collected by charities. They operate all over the country and receive permits from local authorities. The largest collection company (KICI) subsidises Amnesty International.

## PERFORMANCE

The performance in collection of recyclables does not meet expectations, especially in the Urban Class 1 municipalities. Lack of discipline and a high level of convenience have a negative influence on recycling and also on the quality of source separated materials. There is limited social control.

## SYSTEMS

The success of the chosen system depends highly on the discipline of the participating citizens. Greater efforts in communication and education do not necessarily lead to better results. The convenience of a personal container in the backyard, or a collective container at the front of an apartment building, can exert a negative influence on residents' good behaviour.

The distance to neighbourhood recycling areas is too great and there are no real incentives for citizens to change their behaviour. Despite the efforts and the results in recycling, local taxes on waste disposal for householders have increased every year.

The financial benefit of recycling is fully absorbed by communications and operational costs. The improvements of the current solutions are mainly driven by logistics efficiency, optimising routes and containerisation. Avalex will need to change focus from logistics to recycling and making logistics depend on the material possibilities.

Current systems, with a high level of convenience, do not support the policy of maximising material recovery. Only the most environmentally-conscious residents take responsibility and bring their recyclables to local facilities. More efforts in communication and education seem ineffective. Therefore, we must find a better incentive, such as money.

If a 'bringing-fee' for recyclables is offered and communication and education is focused on children aged 8–15 years, keenness to participate in recycling increases. Good behaviour (ie effective recycling) can lead to an income that covers the local taxes on waste disposal, for the Dutch this averages €200 per year.

## PLANS FOR THE FUTURE

If we focus on the seven priority materials in the National Waste Plan, we can look at the opportunities in material recovery and find ways to get the remaining recyclables out of residual waste. If this is done, and if the company adjusts logistics to suit these opportunities, we can make a difference.

These recyclables all represent a positive value, except organic waste. This value could be used as an incentive for bringing recyclables to our sites.

Avalex will start a pilot project early in 2011, opening 'recycling shops' in shopping centres, where people can bring recyclables (plastics, paper, glass, textiles, aluminium) and receive a payment for it. The first version of this business case shows a significant increase of income from recyclables, reduced waste disposal costs and a serious reduction in operational costs – enough for a family to earn back the local taxes on waste disposal, so there is an established relationship between benefits and costs on a family basis.

The communication and education will be focused on schools, with children between the age of 8 and 15 years old who are seen as the driving force to draw recyclables into the Avalex 'recycling shops'. In doing so, they receive their fees, contribute to a better environment and educate their parents.

# CASE STUDY FOUR SALERNO, ITALY

Walter Facciotto, CONAI

Enzo Favoino, Scuola Agraria del Parco di Monza

## BACKGROUND

CONAI is a private system, created and designed by companies. With more than 1,400,000 members – packaging producers and users – CONAI is the largest consortium in Europe. Its task is to manage the recycling and the recovery of packaging in all of Italy and to pursue the recycling and recovery objectives set by European legislation, first acknowledged in Italy by the Ronchi Decree (legislative Decree 22/97), which was replaced by the legislative Decree ‘Environment Regulations’ in 2006 (legislative Decree 152/06). The CONAI management was entrusted by law, on the basis of a unique model through which private systems effectively manage a matter of public interest: the protection of the environment. CONAI safeguards the environment by embracing the entire packaging lifecycle, from production to end-of-life management. To this purpose CONAI promotes the adoption of environment-friendly packaging at source, and then co-ordinates the recovery and recycling of packaging after use.

The CONAI model is based on the principle of shared responsibility which assumes the cooperation of all participants involved in waste management – from companies which produce and use packaging materials, to the Public Administration which make the regulations for waste management, and finally to the citizens who through the daily act of separating their waste start an ethical cycle for the environment.

The CONAI system is based on the activities of six consortia that represent materials that are used in the production of packaging: steel, aluminium, paper, wood, plastic and glass. Each consortium must, for each material, coordinate, organise and increase the take back of packaging waste (mainly from separated waste collection), the recycling and recovery processes.

## THE CONAI SYSTEM

The CONAI system is self-financing through the application of the ‘CONAI Environmental Contribution’ on packaging sold by the last packaging producer to the first packaging user. CONAI pays the received contributions to the Material Consortia which mainly use these funds to pay municipalities the ‘compensation fee’, as stipulated by the ANCI (National Association of Italian Municipalities) CONAI Agreement, for the take back of packaging waste from separated waste collection, on the basis of the quantity and quality of packaging waste. The last agreement, valid for five years starting from 1 January 2009, involves at present 7,000 municipalities and 50 million citizens. Starting in 2000, the amount of packaging waste coming from separated waste managed by the CONAI system has more than quadrupled. In the last year, the volume of managed waste grew by 10.5 per cent.

Nowadays, the CONAI system provides for the recycling of almost 65 per cent of packaging waste and of about 10 per cent for energy recovery, with a global packaging recovery of almost 75 per cent of packaging waste.

The results (**Figure 1**) achieved meet and exceed the goal established by European and national regulations for 2008.

In over ten years, the amount of recovered packaging has doubled and landfill packaging waste has been reduced by half (**Figure 2**).

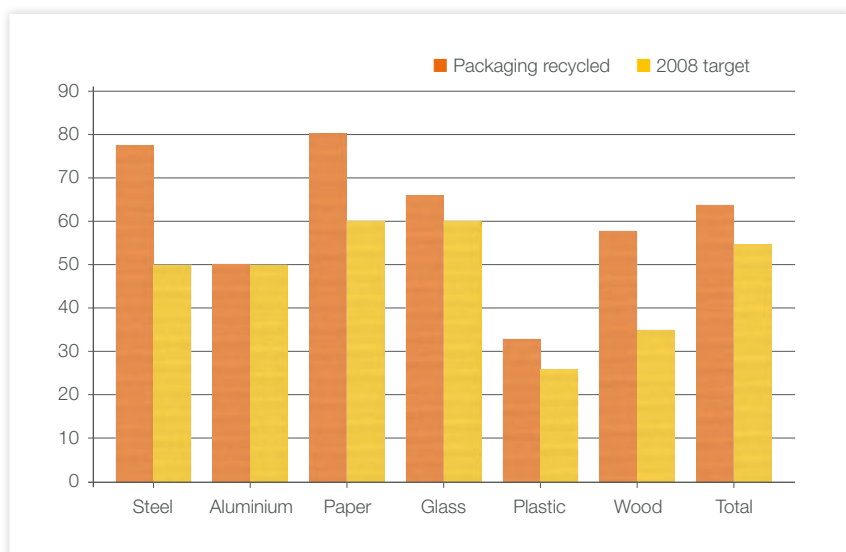


Figure 1. Packaging recycled 2009 (%)

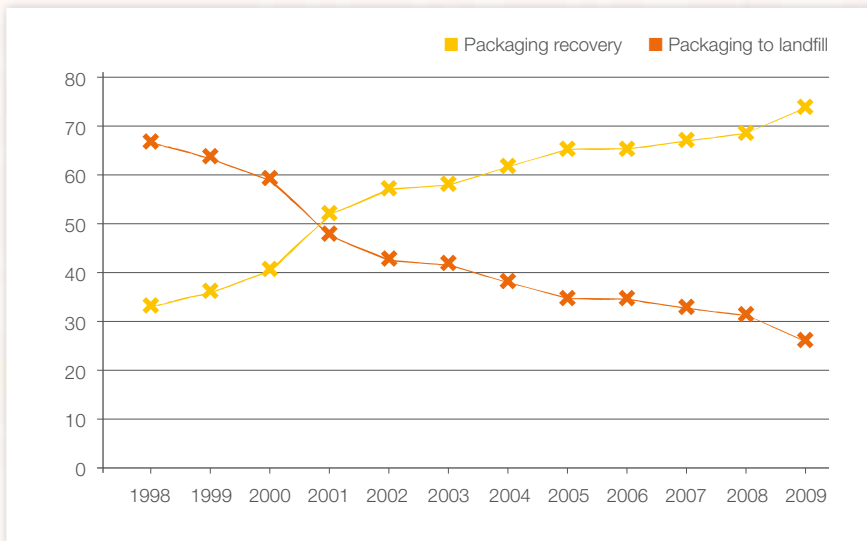


Figure 2. Packaging recovery and landfill 1998 – 2009 (%)

## EXPERIENCE

As part of several initiatives of CONAI to support the municipalities in the development of separation in the collection of municipal waste, the successful and positive collaboration with the local authorities of the City of Salerno is an example of implementation of best practice. This success has led to important results in terms of developing the collection and recycling of packaging waste.

### THE CITY OF SALERNO, ITALY

Salerno covers a land-area of 59.75 km<sup>2</sup> with around 146,324 residents (ISTAT 31/12/2005) and a population density of 2,484 residents/km<sup>2</sup>. The City of Salerno consists of a group of high population density areas with tall vertical buildings, including a historic centre with both people and vehicle traffic where public spaces are reduced, a strong flow of tourism exists and there are many commercial users.

In 2006, Salerno's Municipal Administration launched a new initiative aimed at implementing a fully integrated cycle for the management of municipal waste which, in accordance with legislation at the time, was principally focused on reducing the production of waste and increasing separate waste collection. These two goals were a starting point for creating an efficient system for the recovery of materials and of energy from waste, which would then be used by various production processes both on a local and national level.

The work done was initiated with the creation of a business plan for an integrated municipal waste collection system developed on the basis that the city would exceed the minimum values set by legislation in Campania for separate waste collection at 25 per cent, reaching instead the very ambitious goal of 47.4 per cent.

The City of Salerno aimed to implement the 'door-to-door' collection of all product fractions, excluding only glass, throughout the municipality within one year. This collection system would be implemented through a start-up activity that was planned and organised in minute detail.

### Business plan implementation

The implementation of the integrated separate municipal waste collection business plan and the logistical support for the start-up activity for services involved – as a main player alongside the Municipal Administration – the National Consortium for the Recovery of Packaging, CONAI. Through a protocol agreement signed in October 2007 by CONAI, the City of Salerno and the Emergency Waste Commissioner, CONAI actively dedicated itself to the promotion and support of the new line of waste management taken on by Salerno up to its final implementation phase.

The tailor-made project was divided into several phases:

- + December 2007: Presentation of the Business Plan edited by CONAI in collaboration with the Municipal Administration.
- + January – May 2008: Procurement of equipment, means and materials for household collection and the launch of the start-up phase.
- + July 2008: Beginning of separate waste collection services for 30,000 inhabitants located in the western area of Salerno.
- + October 2008: Beginning of separate waste collection services for an additional 30,000 inhabitants.
- + October 2008: Beginning of the third start-up phase of 30,000 inhabitants.
- + January 2009: Beginning of equipment delivery, fourth start-up phase adding separate waste collection services for an additional 35,000 inhabitants.
- + September 2009: Total coverage of the city (150,000 inhabitants).

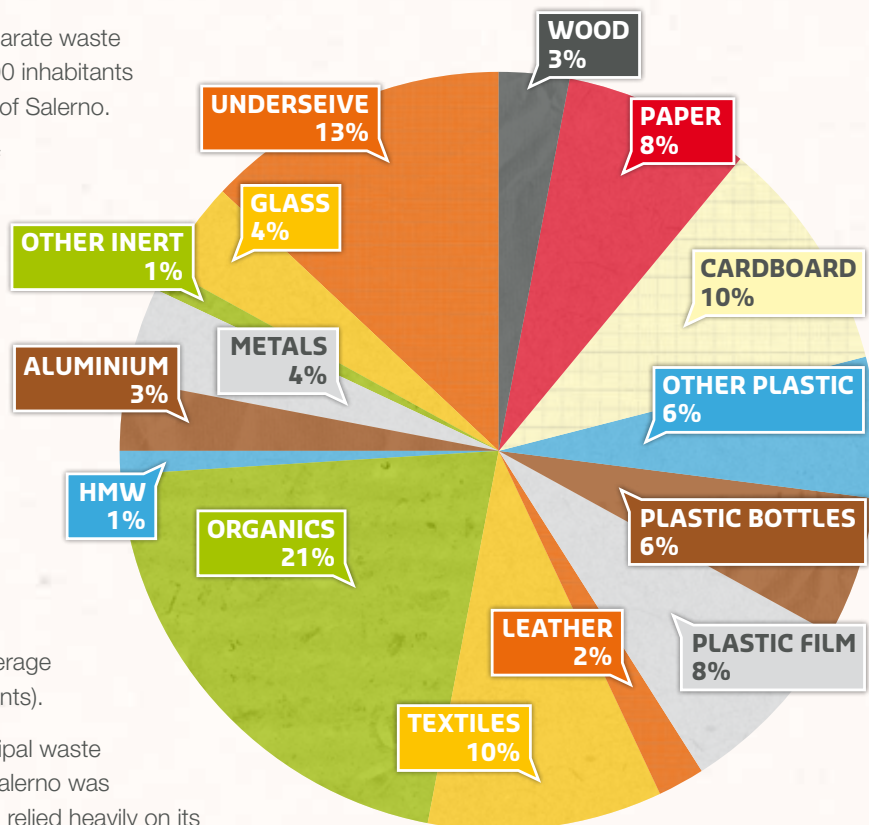
The integrated separate municipal waste collection plan for the City of Salerno was implemented by CONAI, which relied heavily on its own experience and on the purely technical support offered by SINTESI Srl.

During the preliminary implementation phases of the collection plan, characteristics like the socioeconomic condition of the area, its geographic location, the displacement of the population throughout the area and existing municipal waste volumes (**Figure 3**) were taken into consideration, because each of these aspects was significant for municipal waste management.

Municipal waste production (2005) metric tons	73,482
Municipal waste production per capita annually (kg)	512
Separate collection (2005)	11%

**Figure 3.** Production of waste prior to plan implementation

With regard to determining the various fractions present in the City of Salerno's waste, data was collected from the product analysis performed on mixed municipal waste entering the Parapoti and Sardone plants, found within the jurisdiction of the province (**Figure 4**).

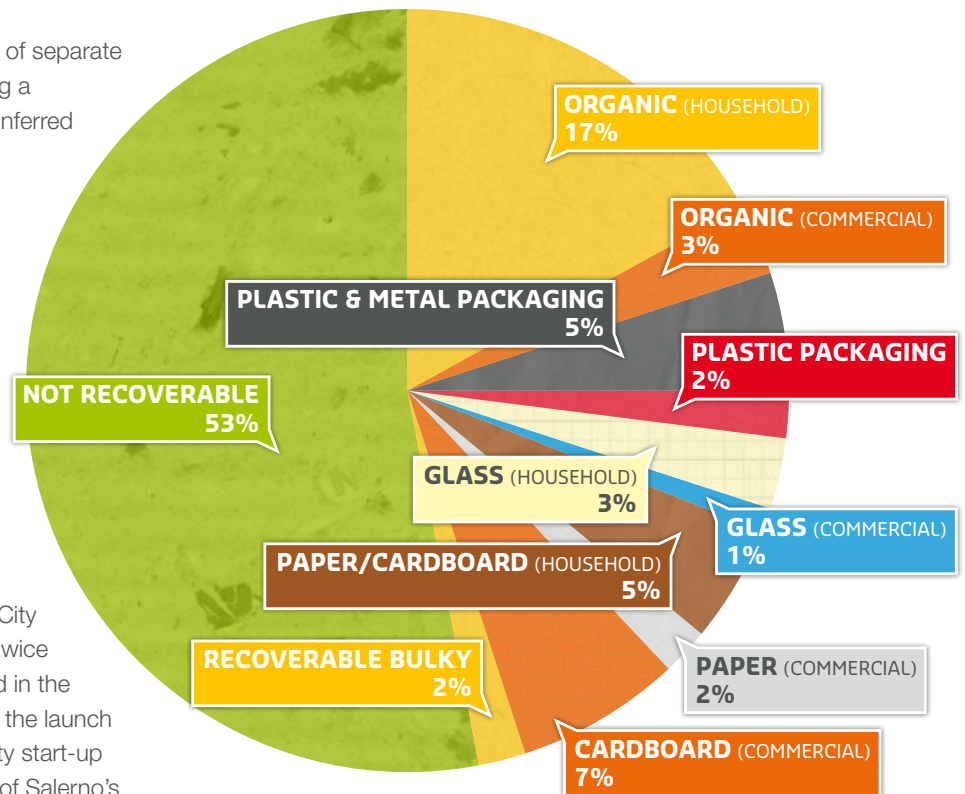


**Figure 4.** Composition of waste for the City of Salerno 2005 (%)

Based on the theoretical performance of separate waste collection calculated by applying a household-focused collection model (inferred from statistical studies conducted on adopted and established systems in various areas of Italy) and in reference to the product composition of waste produce by the City of Salerno, the separate waste collection targets set during the planning phase, expressed in terms of percentages and divided by single product fractions, are reported in **Figure 5**.

### LESSONS LEARNED

The collection plan developed for the City of Salerno was reviewed and revised twice following the discovery of issues found in the area both during the phase preceding the launch of services as well as during the activity start-up phase. **Figure 6** summarises the City of Salerno's general integrated collection model as officially approved by the Municipal Administration. It should be noted, however, that it was also modified and improved slightly during the start-up phase.



**Figure 5.** Initial separate waste collection targets (%)

Service	Collection type	User type	Standard frequency	Equipment type
Residual fraction	House	Household	1/7	Pail waste 40l + mobile waste container 360l (condominiums > 8 users)
	House	Commercial	2/7	Pail waste 40l / mobile waste container 360l / stationary waste container 1100/1600l
Organic fraction	House	Household	3/7	Materbi bag + pail waste 25l + mobile waste container 240l (condominiums > 8 users)
	House	Commercial	6/7	Materbi bag + pail waste 25l / mobile waste container 120/240/360l (condominiums > 8 users)
Paper	House	Household	1/7	White bag 60l LDPE, mobile waste container 120/240/360l (condominiums > 8 users)
Cardboard	House	Commercial	6/7	None
	House	Household	1/7	Blue bag 80l LDPE
Multi-material collection	House	Commercial	2/7	Blue bag 80l LDPE or mobile waste container 360l / stationary waste container 1700l
Glass	Proximity	Household	1/7	Burlap bags/nylon + stationary waste container 2000l
	Proximity	Commercial	1/7	Mobile waste container 360l / stationary waste container 2000l
Bulky waste	House (by request)		6/7	None
Ex HMW	At point of sale		1/30	Dedicated containers

**Figure 6.** The City of Salerno's general integrated collection model

Start-up activities for the launch of the new waste collection services provided by the City of Salerno, even before the official launch of equipment distributions teams for the various users and the initiations of dedicated information services, were supported by media events sponsored by the Municipal Administration and CONAI.

The fundamental steps that made up the start-up phase for the new separate waste collection services can be summarised as following:

- + An accurate estimate of the volume of condominium users, commercial users, companies and public offices which will be covered by the collection services.
- + Joint participation of condominium owners.
- + Delivery of equipment for separate waste collection (household kits, wheeled waste containers, etc).

The introduction of the new door-to-door collection replaced the older roadside collections with a very effective system. The City of Salerno's general integrated collection model has successfully transformed recycling in an area of predominantly apartment buildings and the service that now provides for 150,000 inhabitants has exceeded the targets that were set prior to the launch.

As highlighted by **Figures 7 and 8**, the gradual substitution of the previous collection system, based on roadside collection, with the new door-to-door system has nearly inverted the trend seen previously for waste management.

In addition, comparing the quantities of waste disposed during the January to June 2008/2009 period, we see a reduction of 52 per cent for an average reduction of more than 2,200 metric tons delivered monthly to waste disposal plants. During the same period, the quantity of waste recovered increased by 246 per cent.

Key ingredients in this outcome relate to the way in which the scheme was set-up and rolled-out over a two-year period. This involved meticulous work at the individual street block level in assessing the service provision to both commercial and domestic users (as well as municipal buildings). This included detailing of the equipment and containment types (in home caddies, external containers for residual, organic and recyclables) to ensure that appropriate capacities were in place to maximise the recycling potential.

The scheme roll-out was also made all the more effective through gaining the participation of the apartment block owners at an early stage, as well as the promotional activities and efficient delivery of the household kits and external bins across the City. The achievement of 72 per cent recycling was a collaborative effort between CONAI, the City of Salerno municipal authority, the public and condominium owners and is regarded as an example of best practice in relation to recycling provision to multi-occupancy homes.





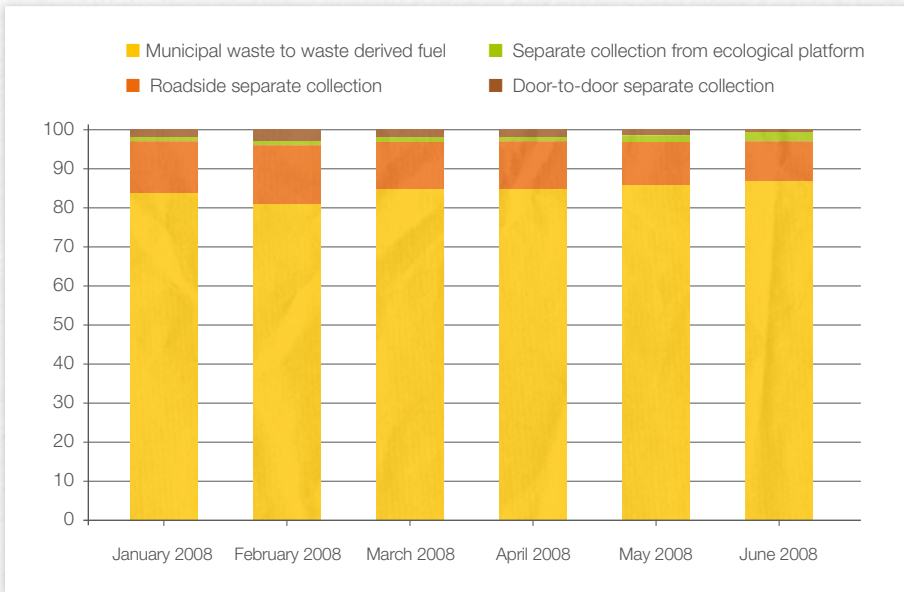


Figure 7. Collection performance before the project (%)

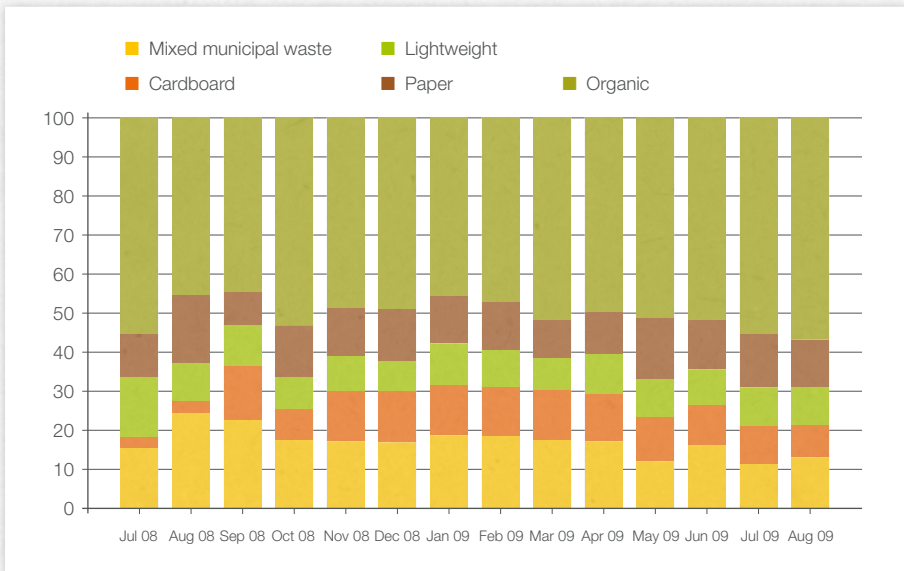


Figure 8. Collection performance post-project (%)

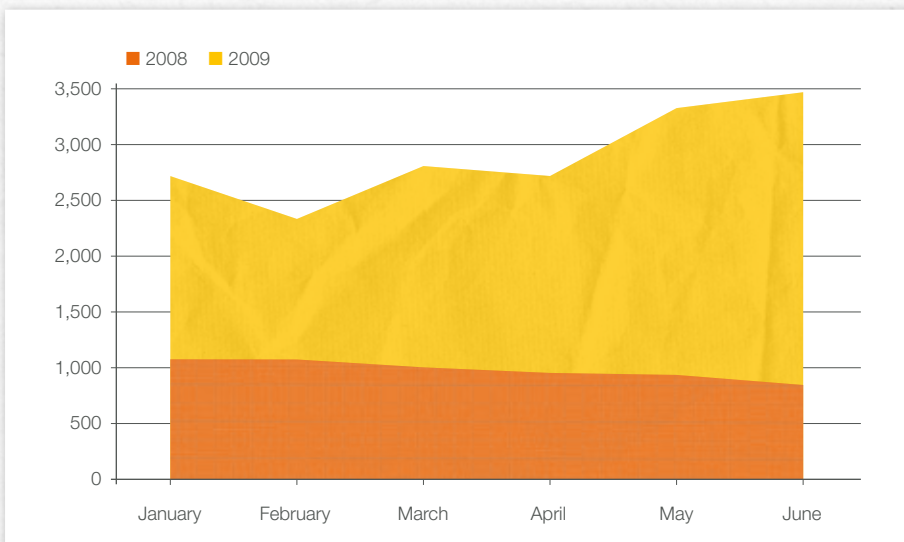


Figure 9. Comparison with recovered waste 2008/2009 (tons)

# CONCLUSIONS

Dr Julian Parfitt, Resource Futures

The four case studies provide contrasting approaches to recycling in multi-occupancy dwelling as well as differences in scheme history and the social profile of populations served (Figure 1). However, there are common factors that can be identified as key influences on performance. In addition, the case studies highlight a number of challenges: some are scheme-specific and others are more generic.

All of the multi-occupancy schemes operate on a large scale in municipal areas with significant populations in flats or high-rise, ranging from 89,000 residents in Delft to 5.8 million in New York City. All four case studies are therefore operating on a significant scale – in three of the four areas multi-occupancy accommodation accounts for the majority of their housing units.

Where a significant proportion of housing is ‘low-rise’ (Toronto and Delft) the relative ease of establishing recycling services for single family accommodation has resulted in multi-occupancy schemes receiving less attention, until recently.

Three of the areas exhibit the particular challenges associated with the operation of recycling schemes in multi-cultural, transient and lower income communities. In parts of Toronto, for instance, more than 100 different languages and dialects are spoken. Salerno, by way of contrast, has a resident population that consists almost exclusively of Italians.

## OVERALL PERFORMANCE

Although it is difficult to establish a consistent set of performance measures across such diverse case studies, the basic recycling rate reported ranged from less than 10 per cent in ‘lower income high density’ housing of New York City to the city-wide rate of 72 per cent in Salerno, following the successful launch of their new ‘door-to-door’ multiple-occupancy collection scheme.

Figure 2 sets out the performance achieved in relation to the range of materials targeted, the recycling targets set and future plans for scheme improvement.

The main difference in the range of materials targeted by multiple-occupancy schemes is that New York City and Toronto are not currently operating separate collections of organics (other than from a limited ‘by request only’ scheme in Toronto). The inclusion of organics is a significant factor in Salerno’s high recycling performance. By contrast, in the Delft scheme, where organics are collected in ‘near property’ bins alongside residual, no such boost in overall diversion was recorded and the target set for 2015 is lower than that for the pre-launch target set for Salerno.

Comparison of case study schemes by recycling rate alone represents only a single dimension of performance, as significant differences in waste composition between the case studies will influence the overall proportion of target materials available in the waste stream. Material capture rates for each of the key recyclables provides a picture of how well a scheme performs in relation to the target materials: a combination of how well the public participate and the extent to which they understand which materials the scheme actually requires. However, as it is a more complex measure to construct (compositional analysis of both the residual and separated streams is needed) it is not surprising that it is only reported in one case. In the New York City data, a very clear example is presented of the purpose of capture rate measurements. The reported results show significant variation in overall capture rate by area type, with lower capture rates found in ‘higher density and medium/ low’ income groups.

Case study area	% housing units multi-occupancy	Population served	Social profile	Historical perspective
Toronto	54%	1,296,000	Multi-cultural	Multi-occupancy schemes neglected relative to ‘low-rise’ schemes
New York City	70%	5,816,000	Multi-cultural	Long-established (since 1989)
Salerno	90%	150,000	Majority Italian	New door-to-door scheme (2008) replaced older, largely roadside scheme
Delft and surrounding areas	29%	89,000	Multi-cultural	Multi-occupancy schemes neglected relative to ‘low-rise’ schemes

Figure 1. Summary of case study areas characteristics

Area	Materials targeted							Recycling % achieved	Recycling % targets set	The future
	Metal cans	Card board	Paper	Plastic bottles/ jugs/ tubs	Glass bottles/ jars	Organics	Drink/ juice cartons			
New York City	✓	✓	✓	✓	✓	✗	✓	<ul style="list-style-type: none"> <li>Recycling rate data range: &lt;10-30%</li> <li>Low income/high density areas lowest</li> <li>Overall capture rate data range: 30-67%</li> </ul>	16% 'kerbside containerised waste' by 2011 and 25% by 2020	<ul style="list-style-type: none"> <li>Improve multi-occupancy performance (more outreach work)</li> <li>Possible source separated organics scheme</li> </ul>
Toronto	✓	✓	✓	✓	✓	✗ By request only	✓	16% in multi-occupancies	70% city wide	<ul style="list-style-type: none"> <li>Improve multi-occupancy performance (more outreach work)</li> <li>Regulatory requirements for multi-occupancy design to favour recycling</li> <li>Source separated organics scheme once processing capacity available</li> </ul>
Delft	✓	✓	✓	✗ 'Plastics hero': in shopping areas	✓	✓	✓	21% for multi-occupancies in the Netherlands as a whole	43% multi-occupancies by 2015	<ul style="list-style-type: none"> <li>Improve multi-occupancy performance through 'Recycling Shops' incentive scheme</li> </ul>
Salerno	✓	✓	✓	✓	✗ Road containers	✓	✓	<ul style="list-style-type: none"> <li>72% achieved post-launch (47% target exceeded)</li> </ul>	47% for new scheme, pre-launch	<ul style="list-style-type: none"> <li>Very high performance achieved</li> <li>Scheme design modified during start-up</li> <li>Detailed assessment of need carried out prior to start-up</li> </ul>

Figure 2. Comparison of materials targeted, scheme performance and future prospects

## SUMMARY OF INFLUENCES ON SCHEME PERFORMANCE

The main factors influencing multiple-occupancy recycling performance derived from the case studies are summarised in **Figure 3**. Although the pattern of factors concurs with the results of previous assessments in different urban environments, the case studies provide useful insight into the relative importance of one aspect over another and therefore provide useful lessons in a wider context.

### DESIGN ASPECTS THAT ENCOURAGE RECYCLING OVER DISPOSAL

Successful scheme design that provides adequate recycling capacity that is easy to access for those living in multiple-occupancy buildings is the most crucial factor. If containerisation and collection policy makes the scheme easy to use, then performance is likely to reflect this. Other policy measures, such as fiscal policies and enforcement, cannot be used very effectively to goad populations into recycling more if the scheme is inconvenient to use.

The situation is unlike kerbside collections serving single family accommodation, where there is a direct link between set-out, a particular property as a collection point and an individual waste producer. With multiple-occupancy, particularly in the case of rented property, if participation is low there is limited potential to influence the situation through the property owner.

Although space is often limited, particularly in older buildings, it is important that access to recycling container provision and the relative ease of use minimise the use of residual bins for disposal of recyclables. The clustering of recycling and residual bins together helps towards this aim, whereas the presence of lone residual bins within easy access reduces the capture rate for target materials.

The clear labelling of areas designated for recycling containers and the use of clear signage is another key aspect to reinforce recycling behaviour and improve ease of use.

## OUTREACH AND COMMUNICATIONS ACTIVITIES

The case studies provide a clear picture of the importance of communications activities and the need for active engagement with residents, owners and staff (particularly caretakers and janitors). Mass mail drops, posters and recycling calendars will have limited impact on their own. To quote the New York City case 'the right materials were in place, but their availability wasn't enough, clearly, as the city's recycling rate of 16 per cent attested'. Two examples of active outreach programmes in New York City's Apartment Building Recycling Initiative and Toronto's 3Rs Ambassadors scheme provide easily transferrable templates to engage with residents/ tenants, owners and apartment block staff in bringing about improved recycling performance.

By way of contrast, in the Delft scheme, the communications activity appears to have failed to change behaviours significantly to get householders to use recycling collection points in the street. Under this system, it is too easy to put recyclables into refuse bins that are usually located closer to housing than the recycling facilities (national regulations dictate that refuse containers are located in immediate proximity to the housing that they serve). Instead of further 'blanket' communications activity aimed at multi-occupancy homes, an incentives scheme is being piloted to reward householders for bringing materials to 'recycling shops'. Through this device householders can recover the costs of their annual waste tax and at the same time as actively engaging the younger population in recycling.

Outreach teams also carry out an important function in systematically assessing recycling arrangements in apartment blocks: the location, signage and suitability of the recycling arrangements. The case studies show that this painstaking 'block-by-block' assessment is crucial to the better performance of schemes, but highlights a common problem. In setting up Salerno's 'Separate Waste Collection and Materials Exploitation Project', detailed assessments were carried out across the city that looked at the allocation of containers to individual apartment blocks prior to the scheme roll out. This 'micro-level' work was a key ingredient of the scheme's success. This contrasts with the more usual 'one-size-fits-all' approach to recycling provision provided to apartments, where standard sets of bins are issued without a detailed prior assessment of likely volumes required at a particular site.

As a result, recycling capacity may be inadequate and result in low performance and general frustration amongst scheme users. Detailed retrospective assessment to achieve optimal recycling capacity can therefore result in significant uplift in performance when capacity issues are resolved.

The engagement of local 'recycling champions' within apartment blocks, the running of seminars to engage apartment block communities and detailed site assessments all take time. In the case of New York City, the commitment to direct engagement uses staff resources that are small in relation to the scale of the task. With the capacity to recruit two buildings a week, so far 36,000 units have been covered of a total that exceeds 2.3 million. It could take a very long time to cover a significant proportion of the total unless extra resources are found.

## THE LIMITED ROLE OF FISCAL MEASURES AND ENFORCEMENT ACTIVITIES

Charging for waste services to multi-occupancy properties in a way that incentivises higher diversion was discussed in relation to both of the North American case studies and the Avalex scheme in the Netherlands. In the latter it was observed that although recycling facilities are widely available to those living in multi-occupancy dwellings, they have not achieved high recycling rates (the residual waste stream contained 70 – 75 per cent recyclables). The local waste taxes (on average about €200/ household/year) continue to rise year-on-year, but this has not helped to promote behavioural change and higher recycling rates. In the New York City example, compliance with recycling has been enforced through ticketing and fines since 1989, yet in multi-occupancy buildings the recycling rate is still only 16 per cent.

These findings suggest a limited role for fiscal and enforcement measures when the root of the problem has not been addressed: the need for good scheme design reinforced by outreach and community engagement programmes. It remains to be determined whether or not the 'recycling shop' incentive scheme transforms recycling rates in Delft.

**IN SUMMARY**

Improvements to the recycling performance in multi-occupancy housing involves a rather different set of approaches to what has worked well in relation to increased kerbside recycling in low rise communities.

The case studies have shown that there is a need for detailed on-site assessments to improve the adequacy of recycling provision and resolve access issues. A considerable investment is also required in the form of community engagement work at the level of individual blocks of flats.

With multi-occupancy dwellings likely to account for a rising proportion of the UK housing stock in the future, it will be important to design recycling provision into the layout of new-build properties: a far more effective approach than attempting to retrospectively adapt limited space in older buildings.

Based on the evidence provided by the highest performing areas detailed in these case studies, there is no reason why the gap between ‘high rise’ and ‘low rise’ recycling rates in the UK’s cities shouldn’t be narrowed significantly in the near future.



Figure 3. Factors influencing recycling performance in multi-occupancy housing

# RECOMMENDED READING

**Complex recycling issues:  
strategies for record-setting waste reduction  
in multi-family dwellings**

US Environmental Protection Agency (1999)

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<http://tinyurl.com/3xb75sr>

**Multi-family Recycling:  
A Golden Opportunity for Solid Waste Reduction**

US Environmental Protection Agency (1999)

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<http://tinyurl.com/2vyd4uw>

**Multi-family Communities Recycling Guide  
Implementing SWA Ordinance 5:  
A Step by Step Guide**

Sacramento Regional County Solid  
Waste Authority (2000)

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<http://tinyurl.com/2uua6kf>

**Multi-family Recycling: a National Study**

US Environmental Protection Agency (2001)

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<http://tinyurl.com/347hlq3>

**Exploring multi-family recycling:  
tools for the voyage**

Eureka Recycling (2004)

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<http://tinyurl.com/2v9jyjx>

**Multi-occupancy property  
recycling feasibility project**

SISTech et al for Scottish Executive (2006)

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<http://tinyurl.com/3xq4zff>

**Draft Best Practice Guide for Waste  
Management in Multi-unit Developments**

Sustainability Victoria (2009)

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<http://tinyurl.com/34477wo>

**Property Manager's Guide to  
Recycling & waste reduction**

CalRecycle. (2010)

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<http://tinyurl.com/35ehw37>



SITA UK, SITA House, Grenfell Road  
Maidenhead, Berkshire SL6 1ES

[WWW.SITA.CO.UK](http://WWW.SITA.CO.UK)



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