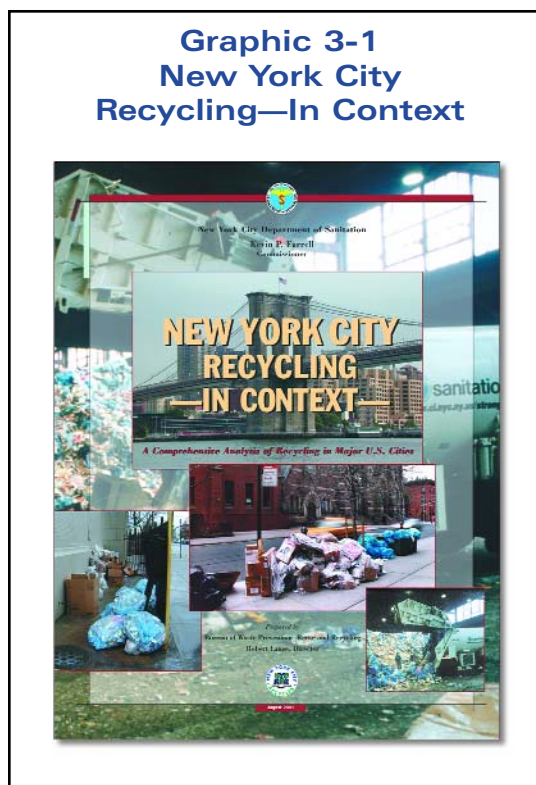


Chapter 3

LESSONS FROM OTHER U.S. CITIES

The previous two chapters provided an economic and historical context for New York City's residential recycling program. This chapter compares New York's program to those in several other major U.S. cities, following up on an earlier effort, *New York City Recycling—In Context* (Graphic 3-1). That 2001 report examined diversion rates in thirty of the largest American cities, investigating what went into calculating them and how comparable they were to New York's own rate.

This chapter takes a more in-depth look at four of those cities—San Francisco, Los Angeles, Chicago, and Seattle—to understand better how recycling works in each of them. The three tables in Appendix VI provide a snapshot of these cities' similarities and differences in terms of demographic characteristics, waste tonnages, and waste-management-program characteristics. Quantitative data for these snapshots has been compiled from a variety of sources, and is current to the most recent year published. Qualitative program descriptions reflect information available on cities' websites and published in trade journals.



But tables only present part of the picture. In fact, when comparing recycling and waste management among cities, an in-depth approach is necessary because a city's set of designated materials, curbside set-out requirements, collection methods and machinery, and MRF technology are linked in complex ways. The relationship between the public and private sector determines how these factors interact, both politically and fiscally. Facets of a city's recycling program have to be considered as part of a whole system, which itself operates within a set of demographic characteristics and markets unique to each municipality.

Because the issues are so complex, only four other cities are compared in depth: San Francisco, Los Angeles, Chicago, and Seattle. Their large size, innovative approaches, and high profiles as models for recycling make them good comparisons to New York City. There are, of course, other large, comparable cities (Dallas, Houston, Boston, Philadelphia), as well as smaller jurisdictions known for their creative approaches to recycling and composting (Minneapolis, San Diego, Portland, Toronto—to name a few). But our review of the results of a number of other research projects comparing program characteristics among other U.S. cities suggests that additional comparisons would not have added to the analysis (see Appendix II for further details).

The Case of San Francisco

When it comes to demographic factors that influence recycling, San Francisco (Photo 3-1) may be the most comparable city to New York in the United States. As city officials there observe, “recycling in San Francisco presents unique challenges because of the City’s geographic and cultural uniqueness.”¹ Many of these features can also be found in NYC, albeit at a larger and more intense scale.

Photo 3-1

Evening sets on the San Francisco skyline.

Demographically, San Francisco is one of the most comparable cities to New York.



While San Francisco’s population of nearly 777,000 is only a tenth of New York’s, and its area of around 50 square miles a sixth the size of the five boroughs, the two cities resemble each other in a number of ways (Photo 3-2). There are roughly 17,000 San Franciscans per square mile, a density second in the U.S. only to New York, where 26,000 residents pack into the same area. Both cities have a lot of historic housing—around 71 percent of New York’s and 78 percent of San Francisco’s residences were built before 1960. And compared to other places, both have far more households in multi-unit housing, though in New York this percentage is greater. In NYC, 63 percent of all housing units are in buildings of five or more units, as compared to 42 percent for San Francisco. In most cities this fraction is lower than 40 percent.

Furthermore, in both cities, dense, old, multi-unit housing means much less yard waste than average. New York City’s heavily developed urban landscape yields relatively little in the way of grass clippings, leaves, and other yard organics. Yard waste in San Francisco makes up only a small part of residential discards as well.² In comparison, residential discards of grass, leaves, brush, clippings, and other outdoor organics make up 12 percent of waste in residential waste nationwide.³

Photo 3-2

Like New York City, San Francisco is densely populated, has a large number of older apartment buildings, and has relatively few yards.



A Privatized System

Despite these similarities, several aspects of residential-waste management in San Francisco are vastly different from New York City. First and foremost is San Francisco's *entirely privatized waste-management system*, for which residents pay monthly fees. Unlike many large, old U.S. cities, sanitation services in San Francisco have been privatized since the 19th century. Today, the same companies that operated nearly 100 years ago—Sunset Scavenger and Golden Gate Disposal—are still in business, although they are now both subsidiaries of Norcal Waste Systems, Inc., a California-based corporation. The City of San Francisco's Department of the Environment oversees Norcal's operations, and intervenes heavily in program design and other corporate policy matters surrounding waste reduction. But the city itself provides no collection or even billing services.

Sunset and Golden Gate offer recycling and, in most areas, green-waste collection along with refuse pickup to San Francisco's 300,000 households under a program called the "Fantastic Three"⁴ (Photo 3-3). Homeowners and apartment-building owners pay variable rates according to the size and number of refuse containers they use. Recycling containers—blue for commingled paper, metal, glass, and plastic; and green for food and yard waste—are provided at no extra cost.

Collection and Processing

In the past, San Francisco's residential refuse and commingled paper, metal, glass, and plastic recycling was collected in separate, manual, rear-loading trucks. With the implementation of the Fantastic Three program, collection methods changed. Refuse *and* recycling are now collected in one semiautomated, vertically split, dual-compartment, side-loading compactor truck (Photo 3-4). Households receive a separate organics collection using semiautomated, side-loading, single-compartment compactors.⁵ Collection costs average roughly \$120 per ton.⁶

Officials at the Department of the Environment note that "replacing four drivers and two trucks with two drivers and two semiautomated trucks and rerouting as the [Fantastic Three] program is rolled out has increased efficiency. However, no layoffs or job losses are projected because

Photo 3-3

San Francisco's privately operated "Fantastic Three" program features a blue bin for commingled paper, metal, glass, and plastic; a green bin for food and yard waste; and a black bin for refuse.



Photo 3-4

San Francisco's Norcal collects refuse and recycling in a semiautomated, vertically split, side-loading compactor truck.



of attrition and new recycling programs and processing.”⁷ Moreover, “as the program rolls out, route size and configuration are adjusted to address the great variability in density, geography and service levels (e.g. curbside vs. backyard or alley cart collection) . . . To serve some of the hilly, dense areas of the city . . . [the Norcal haulers] anticipate testing other vehicles.”⁸

Another feature affecting costs is the city’s use of single-stream collection for recycling. Unlike New Yorkers, San Franciscans recycle paper and metal, glass, and plastic containers in one bin. All materials are brought to the City’s MRF, “Recycle Central” (Photo 3-5). Discussions with the operations

manager there suggest few problems with the contamination of paper with glass shards (a phenomenon known as “glasspack”), despite the fact that loads are compacted. Recycle Central uses highly efficient sort screens that, when combined with the manual removal of paper early on the sort line, yield a very high-quality, paper end product. Metals are extracted at the MRF using standard magnetic and eddy-current technology, while glass and plastics are manually sorted. The MRF generates PET and mixed-resin bales which find good markets, both in the Pacific Rim and locally. Intact glass containers are manually color-sorted and much glass is sent to a second “glass MRF” or glass beneficiation facility for further, optical color-sorting.

San Francisco’s approach to contamination also influences its overall costs. In an effort to maximize recovery of plastics with established markets, the city’s program accepts all plastic resins. (Plastics that are not marketable are disposed of as residue.) As a consequence, food and other garbage items in the recycling are the only real sources of contamination. Under the city’s voluntary program residents are not required to recycle, so they face no adverse consequences for discarding recyclables with trash. Contamination of recycling, including the willful disposal of trash in a recycling bin, is handled by leaving the full recycling bin at the curb uncollected with a note, possibly followed up by a discussion between the vehicle driver and the homeowner.⁹ In its recyclables-composition estimates, San Francisco claims a residue rate of around 5 percent.¹⁰

The city also achieves economies by composting both yard and food waste. In 2001, Sunset and Golden Gate collected 80,000 tons of organics from San Francisco businesses and households (most came from restaurants and food stores). The organics were delivered to the same transfer station that is used to handle San Francisco refuse, top-loaded into trailers, and trucked 65 miles to Norcal’s Jepsen Prairie organics-composting facility in Vacaville, California (Photo 3-6). The

Photo 3-5

Paper, metal, glass, and plastic are sorted, separated, and baled at San Francisco’s “Recycle Central” MRF.



Photo 3-6

Norcal’s outdoor composting facility is sited outside the City of San Francisco, in the rural town of Vacaville.



residuals, which consist of yard waste, discarded food, soiled paper, waxed cardboard, and animal bedding, were processed in an Ag-bag in-vessel composter, followed by outdoor windrow curing and a final screen.

Diversion

San Francisco takes a much broader approach to evaluating its diversion accomplishments than does New York City. San Francisco’s official recycling rates and tonnages—in the sense of those routinely reported to the public, referenced in the media, and assessed by the State of California—encompass commercial, industrial, and residential sources. Figures on diversion, costs, and waste flows are not normally published by generator type, but are instead evaluated for the City’s entire, privately serviced, waste-management system as a whole. The State of California holds municipalities to a 50-percent-diversion mandate, with fines of \$10,000 a day for noncompliance. At the same time, it allows many forms of commercial and industrial diversion, including C&D recycling, asphalt recovery, containers redeemed under the state’s deposit program, and commercial composting of food waste, to count towards the 50 percent goal.

Diversion Measurement in California and New York— Vastly Different Methodologies

The diversion rate for all municipalities in California is *indirectly measured*. While California municipalities directly measure and report amount of refuse *disposed*, they do not directly measure the amount of waste recycled or otherwise diverted from disposal. Instead, the California Integrated Waste Management Board estimates each jurisdiction’s waste generation tonnage using results of a statewide waste characterization conducted in 1999, which is adjusted annually to reflect inflation, taxable sales, employment, and population shifts in that jurisdiction. Diversion is then calculated from this estimate by subtracting the tonnage of waste disposed.

California Diversion Rate:

$$\frac{\text{estimated tonnage of total waste} - \text{directly measured tons of refuse}}{\text{estimated tonnage of total waste}}$$

Any tonnages estimated to have been generated, but not directly measured as disposed, are assumed to have been recycled, composted, reused, or even prevented. Municipalities are not required to report the composition of diverted materials, nor to break down diverted tonnages by their particular method of diversion.¹⁴

In contrast, the diversion rate in New York City is *directly measured*. Every DSNY recycling or refuse delivery truck passes over a scale, which records the weight of that truck’s load on that delivery, minus the weight of the truck itself. This allows DSNY to calculate the total tonnages of recycling and refuse daily, weekly, monthly, and annually. The diversion rate at any time is tonnage of DSNY-collected recycling divided by the tonnage of DSNY-collected recycling plus refuse (total DSNY waste).

NYC Diversion Rate:

$$\frac{\text{directly measured tons of DSNY-collected recycling}}{\text{directly measured tons of DSNY-collected total waste (recycling + refuse)}}$$

The City's most recently published diversion data is for 2001, when 46 percent of the San Francisco combined waste stream was recycled. City officials announced that attaining this goal was a "huge increase for one year and puts us in the position to reach 50 percent, certainly by the end of 2003."¹¹ Much of the City's success, the officials pointed out, was attributable to food waste composting from restaurants and markets, as well as "a major increase in recycling construction and demolition debris."¹² In fact, out of San Francisco's annual combined waste stream of 1.7 million tons, of which 825,000 tons were diverted from disposal in 2001, a total of 584,000 tons, or *more than half the diversion*, consisted of materials other than paper, metal, glass, plastic, or organics—such as C&D material, clean fill, tires, and wood.¹³



Residential Diversion

San Francisco does not publish data on residential recycling tonnages separately from overall tonnages for residential, commercial, and industrial waste combined; but it does report a residential-only diversion rate of 38 percent.¹⁵ An article published in 2000 in *BioCycle* stated that before the introduction of organics collection, residential diversion was 20 percent, or around 60,000 tons of recycled paper, metal, glass, and plastic per year.¹⁶ This means that a full 18 percent of diversion now comes from materials other than metal, glass, plastic, and paper—such as yard waste, construction and demolition debris, textiles, furniture, tires, and bulk.¹⁷

As previously described, residential recycling is organized under a program called "Fantastic Three," in which residents are provided with a green cart (for food scraps, soiled paper, and yard waste), a blue cart (for commingled paper, metal, glass, and plastics), and a black bin (for refuse) (Photo 3-7). The program, which is currently available to most of the city's households, is expected to be fully implemented citywide by 2005 at the latest.

Surveys show that the Fantastic Three program has been enthusiastically embraced by residents of single-family homes and small complexes.¹⁸ In larger, multi-unit buildings, however, green-waste recycling has met with less of a response (Photo 3-8). Recycling and composting are completely voluntary in San Francisco. While residents of buildings containing five units or less are automatically provided with green-waste containers, under the Fantastic Three program:

...larger buildings (usually with six or more units) that do not have individual billing or trash and recycling service receive larger centralized black and blue bins to share, similar to their current citywide service. These large multiunit buildings do not get a green cart for compostables unless they requested one and identify a resident who will be responsible for the bin.¹⁹

While it is estimated that close to 90 percent of apartments participate in traditional recycling, the Department of the Environment observed in February of 2002 that “few apartment buildings have joined the composting collection program so far. More outreach for them is needed and is likely to occur after the initial program roll out is completed.”²⁰ According to the Department, “the biggest challenge for residents has been the number or size of containers for their small spaces, as houses often are connected to each other and garages are often small or nonexistent. Residents are encouraged and helped to find ways to fit the carts somewhere and/or share green or even blue carts with multifamily neighbors.”²¹

Photo 3-8

There is less participation in green-waste collection by larger multi-unit buildings in San Francisco than by smaller residences, due to lack of storage space and the problems that come with composting food waste in tight spaces.



Disposal

Despite its diversion accomplishments, San Francisco still disposes of some 270,000 tons of residential and 600,000 tons of commercial refuse each year.²² As in New York, this refuse is exported by truck beyond city limits by private firms. Waste haulers deliver all refuse to one transfer station in San Francisco run by the Sanitary Fill Company, which is also owned by Norcal. Almost 90 percent of this refuse is transferred to the Altamont landfill 62 miles away in Alameda County, with the balance going to other regional landfills and a small fraction to waste-to-energy incineration. As of 2000, there were around 8 million tons of capacity left, which was projected as sufficient through 2008 with 40 percent diversion, 2011 if the city were able to raise diversion to an overall 60 percent (again counting all forms of diversion, including fill, millings, and C&D).²³

Program Costs

According to San Francisco’s Department of the Environment, the city does not evaluate the annual costs and benefits of recycling as part of the budget review process.²⁴ Officials there note that both state law and a general public consensus consider sustainability to be an undisputed requirement for local environmental policy.²⁵ This consensus, along with the fact that Norcal handles the day-to-day financial management of recycling, creates no imperative to publicly track system costs for waste management or revenues from the sale of recyclables.²⁶ Per ton costs for recycling and refuse collection, transport, and disposition, according to the Department of the Environment, remain “in the brain of the recycling manager.”²⁷ Very roughly, however, officials there estimate overall costs at \$200 per ton for refuse, and \$150 per ton for recycling, with the difference explained by recycling revenues.²⁸

Norcal retains all revenues from the sale of recyclables. The costs of collection, transport to Norcal’s transfer station, and ultimate disposition (at a variety of landfills, WTE facilities, MRFs, and composting facilities in surrounding counties) are coordinated by Norcal at the corporate level.

Processing and Marketing Recyclables in New York City

Norcal, in fact, enjoys contracts with many California municipalities for collection, recycling, composting, and disposal services, and owns and operates 23 waste facilities statewide. In addition to handling San Francisco's residential waste, it also contracts privately with most commercial generators in the city (Photo 3-9). This extensive presence provides Norcal with economies of scale, as well as latitude and flexibility to shift resources, staff, and investment among its many subsidiaries. In addition, Norcal benefits from the city's contractual arrangements with the Altamont landfill, which is currently owned by another large waste firm, Waste Management.

In sum, user fees pay for the combined costs of collection, transport, and disposition of refuse, recycling, and compost in San Francisco. These services, from collection to disposition, are carried out by one private firm with an extensive network of subsidiaries and contracts with many generators statewide. For the most part, data on waste flows and costs are not publicly reported except in the broadest of terms. All of this means that comparison of the economics of recycling between San Francisco and New York is extremely difficult.

One possible way to approach the question of cost comparison is to look at the fees households pay to Norcal. Aside from a small amount of state and city funding for special projects, residential-waste management is funded directly by citizens, through their accounts with Sunset or Golden Gate, which are paid just like an electric or water utility bill. Most households pay a single monthly fee of \$16.49 for refuse and recycling collection (and in Fantastic Three areas, organics collection), with a minority paying less or more depending on their rate of refuse generation.²⁹ With around 320,000 households, this translates to a yearly expenditure of around \$65 million for residential-waste management, which means around \$207 per ton for collection, transport and disposition of refuse, recycling, and composting *combined*, given the size of the current

Photo 3-9

The same private firm that collects all of San Francisco's residential waste under a pay-as-you-throw system also collects most commercial waste in the city as well.



residential waste stream. This would roughly coincide with the San Francisco Department of the Environment's estimate of \$150 for recycling/composting and \$200 for refuse, per ton.

However, the fees paid by residents do not entirely cover the costs of residential-waste management. While the rates households pay in San Francisco are slightly lower than average for the surrounding region, and are, in fact, regulated by the Refuse Collection and Disposal Rate Board, San Francisco *commercial* rates are unregulated and are far higher than the norm (approximately \$114.86 per cubic yard of waste). A spokesman for Norcal stated that the sizeable profits from these commercial waste contracts, "help pay for a broad recycling program and for driving trash to the Altamont dump. They also help keep homeowners' rates down. The residents of San Francisco benefit because large downtown businesses pay a larger fee."³⁰ Thus the \$207 figure probably understates the true cost of residential-waste management, although it is not possible to estimate to what extent.

Markets

Regardless of the true per ton costs of recycling, composting, and refuse management, what San Franciscans pay will remain fixed for the next several years under the Board's agreement with Norcal. No matter how favorable or disastrous the market for paper, metal, glass, or plastic may turn out to be, fees will not increase or decrease according to market conditions. Norcal will instead retain all recycling and composting revenues in exchange for running the city's overall waste-management program, as well as shouldering the risk of a volatile market.

It is reasonable to assume that Norcal, like any private firm, is amenable to such arrangements because there are profits to be made. And there are, in fact, several factors that make recycling and composting revenue potential strong in San Francisco's particular region.

Prices for recycled commodities have been consistently higher on the West Coast than elsewhere for over a decade. This is due to the proximity of West Coast ports to Asian markets, which are major buyers of recycled materials. (See discussion of how regional factors influence recycling markets in Chapter 1.)

In addition, California's strict recycled-content requirements, which make it mandatory for many products manufactured in the state to be made of 20- to 30-percent recycled materials, create an unusually strong market for metal, plastics, and even glass. (See section on *Recycled-content Requirements* in Chapter 1 for more information.) California's extensive wineries are large buyers of green glass, which further strengthens markets for these materials. Even mixed cullet finds a profitable outlet, as fiberglass manufacturers in the state have to abide by recycled-content requirements.

Furthermore, MRFs have a constant "market" for deposit-bearing beverage containers, as the State of California pays both public and private facilities for such bottles and cans *on a per-ton basis* that corresponds to the deposit value (1 to 5 cents) and not market value. MRFs can therefore count on a stable revenue source for a good portion of their materials.

What Can NYC Learn from San Francisco?

San Francisco is often cited as a waste-management model for other cities, including New York, to follow. The foregoing discussion highlights some important differences between the two cities, including the method of diversion rate calculation and the relationship of residential to commercial recycling in evaluation of municipal recycling success. When such differences are accounted for, it would appear that as of 2001, San Francisco's

residential diversion rate for *paper, metal, glass, and plastics only* was around 14 percent.³¹ Most of its diversion, in other words, comes from commercial sources, or from composting and C&D/bulk recovery.

If changes to NYC's Local Law 19 were implemented to allow the Department of Sanitation to include C&D, fill, asphalt, and other such forms of diversion towards meeting its tonnage mandates, it would be fair to compare the recycling rate here to San Francisco's published 46 percent. The New York public, however, has demonstrated a decided preference for limiting official diversion measurement to that from residential recycling of paper, metal, glass, plastic, and through composting.³²

With the continued expansion of the Fantastic Three program, San Francisco's residential rate may continue to climb, due largely to increased diversion of organics. This raises the question of how feasible a separate organics collection program would be in NYC. San Francisco's experience with multi-unit buildings suggests that organics collection may not hold the same degree of promise for large buildings that it does for smaller structures. This is, in fact, consistent with the experiences of large European cities. Curbside organics collection for in-vessel composting is common practices in the Netherlands and Germany, but is not practicable in large apartment buildings due to problems of contamination, space constraints, and odor/vermin concerns.³³

The disappointing results of New York City's experiments with organics collection, which took place in 1992–1993 in Park Slope, Brooklyn and Starrett City, Queens, have been well documented in DSNY publications.³⁴ When considering whether a Fantastic Three program would be suitable for NYC, there are some hard questions about the feasibility and fairness of such a system. A full 64 percent of NYC's housing is in structures with more than five units. Would it be fair to offer (or require) separate organics collection among low-density housing in New York, and not in multi-unit apartment buildings? If separate organics collection were offered to *all* residents, who would be held accountable for the failure or success of the endeavor in apartment buildings—building owners, superintendents, or residents? And finally, even if collection hurdles could be overcome, is there a composting facility in proximity to New York City that would be permitted to accept some or all of the roughly 650,000 tons per year of yard, food, and soiled paper residuals generated in New York City?

In addition to these matters, a comparison of San Francisco's waste-management system to New York's raises a number of larger questions about service provision. The most obvious is the question of privatization. San Francisco has a long historical precedent of private management of residential waste. It has also succeeded, through its Rate Board and its contractual arrangements, in preventing Norcal from exerting monopoly control over the pricing of waste management. The long history of private collection (scavenging) in the city, and the consequent local structures for overseeing this industry, have resulted in the case of San Francisco in a close, nonadversarial relationship between the city and Norcal. Is full privatization needed to enable innovations such as the Fantastic Three program? If so, is full privatization an option for New York City? Given the complexity of Norcal's operations, and the fact that user fees from commercial and residential sources throughout California fund an extraordinarily complex network of private waste-management functions, there are no simple answers to these questions.

It is also likely that San Francisco's use of single-stream recycling collection (i.e., paper commingled with MGP), dual-bin trucks for recycling and garbage, and single-person crews substantially decreases collection costs there. Should NYC consider moving to a single-stream system? The question of the feasibility of such technology and labor arrangements in New York is, once again, not a simple matter given the vastness of territory, increased density, and differing transfer, processing, and disposal infrastructure available to us here. But the case of San Francisco does give us food for thought.

The Case of Los Angeles

If the California city of San Francisco is New York's counterpart in terms of housing density, predominance of apartment buildings, and low amounts of yard waste, then Los Angeles is its closest cousin in the sheer size of its population and waste stream. While Los Angeles's 3.8 million persons total a little less than half that of New York's population, it nevertheless ranks second after NYC in population rankings for U.S. cities (Photo 3-10). Its combined waste stream of almost 9.6 million tons annually³⁵ is second only to New York's combined total of 16.4 million tons. As *Waste Age* observes:

Los Angeles waste market is among the world's largest. The city Sanitation Bureau's residential trash collection program ranks as one of the largest city-run programs of its type, serving 720,000 single-family households. According to Waste News's 2001 Largest Landfills ranking, four landfills in the L.A. metro area rank among the 10 largest disposal sites in the country, including the largest, the Puente Hills landfill, which took in 4.1 million tons of solid waste in 2000.³⁶

Los Angeles and New York City also share another feature: a long-standing municipal workforce devoted to curbside collection of residential refuse, recycling, and yard waste. Los Angeles's Bureau of Sanitation, a division of the Department of Public Works, was formed in the early twentieth century to respond to the pressing need for timely collection and disposal of municipal waste that came with a burgeoning population.

Housing Stock and Provision of Service

Yet despite the opportunities and special challenges NYC and Los Angeles share, there are a number of crucial differences between the two megacities. The first concerns housing stock and population density. Los Angeles is notable for its decentralized layout, with no single downtown and many neighborhoods connected via roadways in a sprawling, settlement pattern. Though Los Angeles has half the population, its total land area is larger than NYC, around 470 square miles in comparison to our roughly 300. A major difference in population density follows. While nearly 26,000 New Yorkers cram into each square mile, L.A. residents have far more elbow room,

Photo 3-10

Among U.S. cities, Los Angeles is second only to New York City in population and the size of its waste stream.



Processing and Marketing Recyclables in New York City

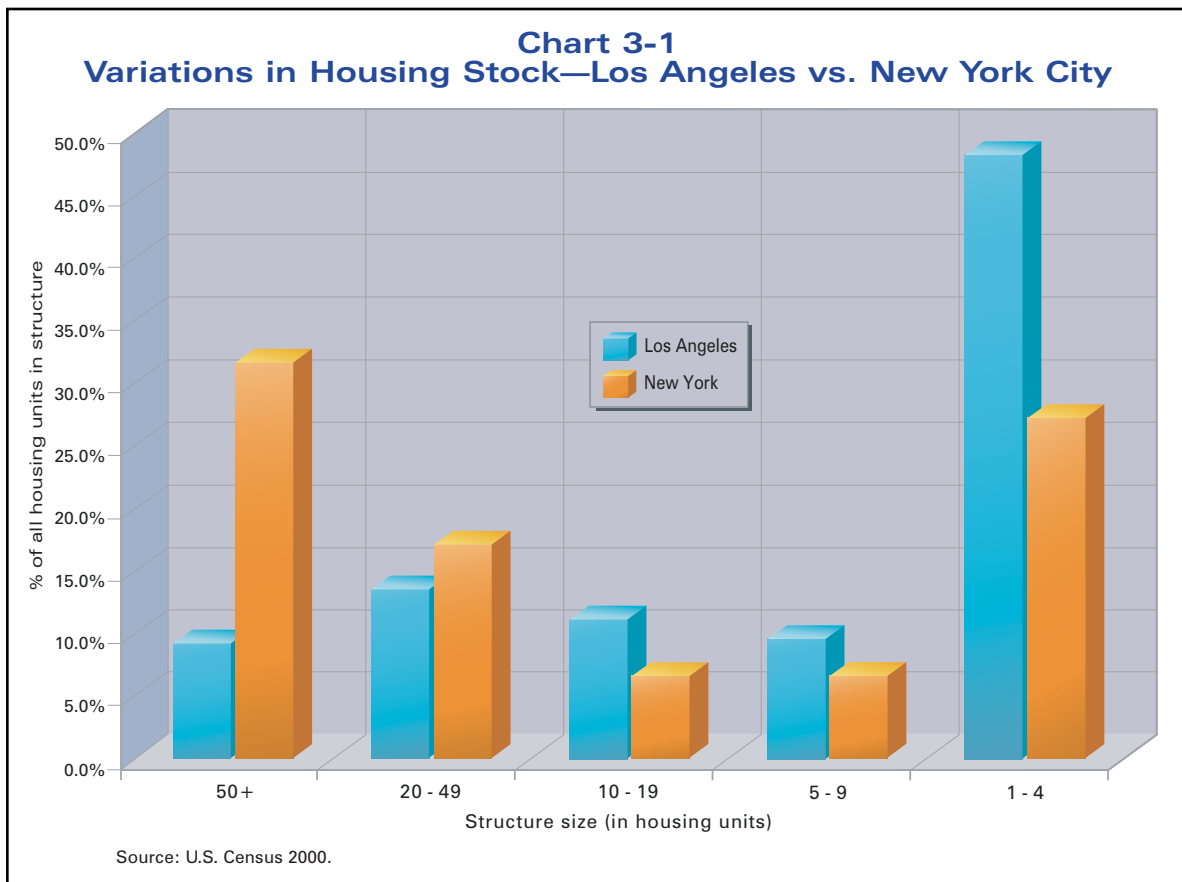
with only 7,900 people on average residing in the same area. Not surprisingly, Los Angeles's distribution of housing among single-, two-, and multi-unit dwellings is quite different from New York's, as shown in Chart 3-1. High-rise apartment buildings are relatively uncommon in the "Big Orange" (Photo 3-11).

A second major difference concerns the division of municipal and private responsibility for waste management. The Los Angeles Bureau of Sanitation services buildings with three units or less. Buildings with four units and up must instead contract for private hauling, and draw from the same pool of private waste firms that service Los Angeles's commercial- and industrial-waste generators. Very few of these buildings recycle at all.³⁷

Yet despite this departure from the New York model, the divide between public and private service is still in some respects similar to our own municipal/commercial distinction. For one segment of waste generators, the city is actively involved not just in designing and administering refuse removal and recycling programs, but also for implementing them. At the same time, many private hauling companies compete to provide services to apartment buildings and businesses. The situation is much the same in New York for the commercial vs. the residential sector. Here, DSNY is responsible for *all* NYC households; there, Los Angeles's Bureau of Sanitation provides service to a little over half of them.

Measuring Diversion, California Style

Another crucial difference between the two cities concerns the evaluation of recycling success in terms of tonnage and diversion. Like San Francisco, Los Angeles reports its official diversion rate as the sum total of all recycling, composting, and other forms of materials recovery and waste prevention for the commercial,



industrial, and residential sectors combined. This enabled them to claim an impressive, 60-percent overall diversion rate as of 2000.³⁸

Los Angeles's combined waste stream from commercial, industrial, and residential generators is 9.7 million tons per year, out of which a total of 5.3 million tons were diverted in 2000. Around 2.3 million tons of this diversion consisted of materials other than paper, metal, glass, plastic, or organics—namely C&D material, clean fill, asphalt millings, harbor dredge spoils, and other heavy inerts.³⁹ This tonnage, if counted alone, would constitute 23 percent diversion for the city as a whole. Organics, predominantly yard waste, constituted another 11 percentage points, with traditional recyclables bringing in the balance of 21 percent.⁴⁰

Unlike San Francisco, Los Angeles tracks diversion from buildings with three or fewer units. In 2003, the Bureau of Sanitation, serving 740,000 households, diverted 231,456 tons of recycling and composting combined, which translated to a diversion rate of 39 percent from this subsection of the residential population⁴¹ (Photo 3-12).

Collection

Los Angeles's residential collection system has been fully automated since 1998. In that same year, the residential recycling program switched from a dual-stream system like New York's to a single-stream arrangement. Under the new program, residents of homes with three units or fewer are issued three, separately colored carts designed to work with the city's fleet

Photo 3-11

This view of Los Angeles shows high-rise office buildings, but few apartment buildings of more than a few stories. This housing stock is typical of the entire city.



Photo 3-12

Residents of L.A. housing with three units or less recycled 468,000 tons of yard waste in the year ending June 2002, but only 6,495 in the year ending June 2003, according to *Waste News's* "Municipal Recycling Survey."⁴²



of 510 automated single-bin trucks.⁴³ They are instructed to place commingled paper and metal, as well as glass and plastic bottles and jugs, in a 90-gallon blue cart; yard waste in a 90-gallon green cart; and remaining refuse, including food organics, in a 60-gallon black cart⁴⁴ (Photo 3-13).

Collection of most waste under this program is funded out of general taxes. However, Los Angeles's system incorporates a pay-as-you-throw element—residents are charged a fee of \$5 on their monthly water bills if they set out more than 60 gallons of refuse. Alternately, they may buy additional capacity tags for \$2.50 to affix to extra refuse bags. Similar provisions apply for excess yard trimmings and horse-manure collection. Extra recycling bins are available free of charge.

To accommodate automated collection, residents are also required to place carts at least three feet apart from each other or any other object at curbside on collection day. Three single-compartment trucks, one for each stream, come by weekly (all on the same day) to lift, tip, and replace empty carts using an automated grabber. At most stops, drivers never need to dismount the truck.

The implementation of automated collection for residential refuse, recycling, and composting has had major impacts. The first is increased productivity and cost savings. The city writes that the use of "fully automated trucks in a significant part of its operation...allowed it to significantly reduce its labor requirements and reduce operating costs."⁴⁵ Most notable was the reduction in crew size from two to one, and the improved speed of collection. Los Angeles's Bureau of Sanitation reports that as a result of automation, the city has reduced its collection staff and equipment by 25 percent.⁴⁶ Recycling routes have lengthened from 400 to 800 homes, and the collection rate has risen to 145 containers per hour.

With these changes have come a number of operational improvements. In 2000, the Los Angeles Bureau of Sanitation wrote that "until three years ago, the Division experienced overtime overruns, reduced 'on route

Photo 3-13

In Los Angeles, residents of buildings of three units or fewer use a three-bin system similar to San Francisco's Fantastic Three, although food waste is not collected in the green bin—only yard waste.



Photo 3-14

An L.A. Department of Public Works truck uses automation to collect recyclables from bins placed at curbside.



time' due to delays in morning dispatch and vehicle breakdowns, limited technology support operations, labor and management tension, low employee morale and a significant number of drivers who did not meet the previously agreed upon work standard for household refuse." They went on to explain that "over the last three years [the collections division] has undergone major changes in its operation, which resulted in improved operations and financial performance." Management has "reduced end of shift overtime by 36 percent since 1997," while "'on route time' increased to a full eight hour day." Efficiencies have been gained by several new technologies. Autocoach® and Routesmart® tracking software, combined with two-way radios, provide supervisors with minute-by-minute detailed information about work productivity on the street. A new automated timekeeping/dispatching system has been implemented, reducing absenteeism. And workers' compensation claims have fallen because automation places less physical stress on drivers.⁴⁷

Many of these changes were facilitated by a joint labor/management committee of the Los Angeles Bureau's Solid Resources Collection Division formed in the mid-1990s to "encourage management and labor to collaborate on finding new solutions to a variety of critical issues facing the Bureau [of Sanitation],"⁴⁸ with the overall goal of improving operating procedures and lowering bottom-line costs. Since the 1998 changes were implemented, the committee's work has continued. Members have conducted research on waste management in major municipalities throughout the U.S., and have made visits to several of them to learn about improving diversion and cutting costs.⁴⁹

The Bureau considers the move to automation and the implementation of the three-cart system among all residences (of three units or less) a tremendous success, writing that:

Los Angeles residents took well to the new single-stream recycling program. Along with positive responses at community group presentations, an early survey revealed a customer approval rating of 92 percent. Additionally, the collection day set-out rate soared from 30 percent with the [two] 16 gallon yellow bins [one for paper, one for commingled metal, glass and plastic] to more than 80 percent with the 90 gallon blue containers. Participation by tonnage increased 150 percent.⁵⁰

Contamination

The convenience of single-stream recycling in roomy carts has, according to the Bureau, been key to the positive reception of the program. In addition, the use of 90-gallon containers has reduced scavenging because the "larger container increases the time scavengers need to pull out specific commodities."⁵¹ As in New York, scavenging of valuable materials from recycling has been an ongoing problem for L.A.⁵²

At the same time, the implementation of single-stream recycling has caused contamination rates to rise from an estimated 10 percent, when residents source-separated recycling into two streams, to 25 percent, with "about a quarter of what's thrown in the recycling bins...either not recyclable or not recycled by the city."⁵³ In a *Waste Age* article profiling Los Angeles's program, a recycling program manager observed that a "handful of residents... 'maliciously' contaminate the recycling stream...the problem is, that in a city the size of Los Angeles, a 'handful' easily can mean 10,000 residents and a significant negative impact on the quality of the recycling stream."⁵⁴ The city's research, he stated, suggests that malicious contamination takes place to avoid paying fees for extra refuse containers, since residents must pay for extra-capacity tags if they occasionally set out more than 60 gallons of refuse, and must rent extra black carts for \$10 per month and extra green carts for \$5 per month if their waste generation consistently exceeds the amount allotted (extra blue carts are free).

To combat this problem, L.A. has hosted several forums on contamination to which representatives of other California municipalities and private waste-industry representatives have been invited. The local official organizing these forums hopes that “with our diverse population...what we learn here in L.A. about contamination in a large-scale single stream recycling program can benefit other municipalities nationwide should they choose to go to single-stream collection.”⁵⁵

The city also plans to address what it calls “innocent” contamination (i.e., recycling refuse materials that are believed in good faith to be recyclable, but which are not) with several updated forms of public education. These include many of the same approaches that we use in NYC: a customer service guide mailed to all residents; truck signs; outreach materials for annual distribution to schools, civic associations, and other groups; and TV, radio, and print ads. The Bureau has also introduced “random task force checks of neighborhood containers and truck load audits at MRFs to track contamination and accumulate data to help the city determine what factors affect contamination levels (e.g. language barriers, extra-capacity fees, etc.).”⁵⁶

In 2000, the Bureau of Sanitation viewed education, not enforcement, as key to controlling contamination “because patrolling 450 square miles can be costly and not necessarily effective. The city is hopeful that resident reeducation will reduce malicious contamination by informing the contaminators what the economic...and environmental detriments are to the city’s recycling program.”⁵⁷

In February 2004, however, the Department of Public Works announced that any recycling containers “contaminated with materials that should not be deposited in these bins” would be left at curbside, with a tag informing the resident of the problem and asking them to call the Bureau of Sanitation’s hotline for information on how to correct it. The move was undertaken because, according to Bureau of Sanitation Assistant Director Enrique Zaldivar, “Residents not properly using their green and blue containers is becoming a major problem.... Contamination undermines our efforts to recycle and divert refuse from precious landfill space.”⁵⁸

Multifamily Housing—Not Recycling

It should be recalled that the Los Angeles’s recycling program does not apply to nearly 40,000 multifamily complexes with four or more units in the city, which are home to around 600,000 households. In 1995, the last year in which data was compiled separately for this fraction of the privately serviced waste stream, multifamily residents disposed of 500,000 tons of refuse, the large fractions of which consisted of residual paper, mixed paper, and newspaper. According to city officials, “the sprawl of L.A. and the number of different languages make targeting [multifamily] waste a daunting task. Recycling participation amongst multi-family complexes seems to be limited because of increased cost from private haulers and lack of space for recycling containers in units and in the disposal area. The city has addressed this issue in new construction after 1992, but older buildings still remain an issue.”⁵⁹ In reality, few multifamily buildings recycle at all.⁶⁰

In 1997, the Bureau conducted a pilot study in which 214 blue containers were delivered to 71 multifamily complexes and tested over a period of months. The experiment yielded low participation and very small tonnages. As a result, “The diverted cost per ton was very high due to capital and labor costs.”⁶¹ The Bureau again attributed this result to the “transient nature of many apartment dwellers, many languages spoken in the city, resistance of apartment owners and managers, due to lack of space.”⁶²

As of July 2002, the city imposed a fee on private firms that service apartment buildings that amounts to 10 percent of what they charge their customers for refuse disposal. Haulers are not, however, charged for

collection and disposition of recycling at MRFs if they get customers to source-separate recyclables, or conduct post-collection separation themselves.⁶³ In January 2004, the city announced a new \$6 million recycling pilot project to encourage apartment building recycling, funded from this 10 percent surcharge. This voluntary program will begin by targeting 100,000 of L.A.'s roughly 600,000 multifamily units. The city will contract with five private haulers to collect recyclables and implement public education. The pilot program is expected to have a diversion rate of 15 percent.⁶⁴

According to L.A. statistics, apartment dwellers generated 21 percent of all of L.A.'s disposed waste in 2003, showing that this segment of the population contributes significantly to L.A.'s overall waste stream.⁶⁵ Yet until very recently, residents of multi-unit housing simply did not recycle at all. This fact highlights the difference between Los Angeles and New York—where multifamily recycling has been part of the program from the outset.

And within Los Angeles's real estate industry there continues to be reluctance to implement apartment building programs, and resistance to making apartment recycling mandatory:

Los Angeles County requires private haulers to offer recycling if an apartment complex requests it, but few complexes do. Complexes say it's too expensive and there's no room for containers. Few owners want to pay the extra service fee.⁶⁶

According to another official involved in apartment recycling:

"There's a convenience factor lacking in apartment buildings," said Mark Alpers, vice president and director of Environmental Science Associates' solid-waste group, which runs apartment recycling programs in San Francisco, San Jose, and Santa Ana, and will start recycling at complexes in Los Angeles.

⁶⁷

Processing

Like New York, Los Angeles relies on the private sector to accept and manage the recyclables and refuse its collects (Photo 3-15). The Bureau of Sanitation currently contracts with six private, single-stream, materials-recovery facilities located throughout the city.⁶⁸ Each MRF is owned and operated by a different, local firm unaffiliated with national or international waste corporations.⁶⁹ These firms are doing well financially. Observes one *Waste News* journalist, "the city is fortunate to have an abundance of MRFs in the area that have a large pool of labor to put on the sorting lines. Recyclables also tend to fetch better prices on the West Coast, especially in overseas markets."⁷⁰

Despite this capacity, the city's 2000 Solid Resources Infrastructure Strategy Facilities Plan, prepared by the Los Angeles Bureau of Sanitation's Board of Public Works, has argued that Los Angeles should construct its own mixed-

Photo 3-15

Workers at an L.A. MRF sort commingled paper, metal, glass, and plastic.



waste-processing MRF.⁷¹ Noting that “inert” landfills tend to turn away commercial C&D mixed with organics (which places burdens on residential landfills), as well as the low recycling participation and diversion rate in multi-unit dwellings, this Plan states that:

Although opportunities exist for residents and businesses to recycle, many are unable to provide source separation because of location, size, or other impediments. To increase the recycling rate in the City, the Bureau believes that the City should promote and support the development of Material Recovery Facilities which can accept mixed loads of construction and demolition debris, office and commercial bin waste, and potentially mixed residential waste.⁷²

The Bureau believes that mixed-waste processing is particularly needed for “apartment complexes with large trash bins,”⁷³ and plans to conduct some pilot program testing of this recycling method in the near future.

Disposal

In 2000, Los Angeles voted to purchase two landfills in nearby Los Angeles counties for a total of \$41 million each. These “mega-fill” sites (Mesquite Mine in Imperial County and El Sobrante, Riverside County) will supplement the existing network of landfills in other areas around Los Angeles, as well as in Arizona, that are needed to manage the city’s massive refuse stream.⁷⁴

Some of the existing capacity, however, is due to close. Much residential refuse is disposed of at the Bradley landfill (owned and operated by Waste Management, Inc.), which has only one to two more years of life. While other sites expect to be open for some time, Los Angeles expects to need additional disposal capacity of around 1,000 tons per day by 2004.⁷⁵ As a consequence, the city is looking into the option of developing “a transfer station in the central Los Angeles area that will allow access to desert rail-haul disposal facilities.⁷⁶ It is also looking anew at using waste-to-energy capacity near the city, observing that its current small contract with the Long Beach Incinerator for 100 tons per day of residential refuse yields a “potential tip fee savings of \$160,000 per year.”⁷⁷

Costs

In their 1998 survey of recycling programs in other municipalities, the Los Angeles Bureau of Sanitation Solid Resources Collection Division’s joint labor/management committee noted the difficulty of identifying and comparing refuse and recycling costs across jurisdictions, writing that:

A detailed analysis of the funding structure of each participating agency is beyond the scope of this study...regional economic variations would not permit credible comparisons. Disposal costs, which vary regionally, significantly influence total costs. Some agency resources come primarily from their City’s general fund, while others rely only on enterprise funds....Some agencies [use] cost data based upon 1988 data, while in other cases...information is more current....Most importantly, there is no template guaranteeing that the financial information from the agencies is collected and/or computed in the same manner as to permit credible comparisons.⁷⁸

The same realities, of course, limit the extent to which we can compare New York City’s costs to Los Angeles (or any other city). The city reports residential collection costs of \$10.71 per household, per month (\$1.72 for recycling, \$3.24 for yard trimmings, and \$5.75 for refuse), but does not calculate costs on a per-ton basis.⁷⁹ The cost of recycling collection is no doubt influenced by the choice of single rather than dual stream and the use of automated trucks. Transport costs are also mitigated by the fact that each Sanitation district has its own MRF.

At the same time, the implementation of single-stream recycling has driven processing fees up 20 percent to as much as \$75 per ton, in contrast to landfill tipping which is \$20 per ton.⁸⁰ In 1997, in anticipation of the program changes, the city re-bid MRF contracts, establishing a floor price of \$5 to \$10 per ton for single-stream recyclables. This agreement includes a tiered revenue-sharing arrangement tied to market prices. Revenues to the city are augmented by its redemption of deposit containers separated at the MRF, for which the state pays. This benefit, along with strong markets for paper, plastic, and most especially, green waste and composting, enable the city to generate significant revenues. In 2003, officials reported \$2.4 million coming in from these operations.⁸¹

Los Angeles, San Francisco, and New York: Interesting Comparisons

Los Angeles's experience with recycling provides crucial insight into the challenges facing megacities like New York that must move millions of tons of waste up and out of their jurisdictions each year. The massive tonnages of refuse, recycling, and (in the case of L.A.) yard waste that are daily collected, transferred, and hauled beyond city limits drive an immense waste-management economy that surrounds each megalopolis.

It is important to note that although Los Angeles is in the same state as San Francisco, and therefore has the same state-level regulations (the California bottle bill, recycled-content requirements), and similar regional market advantages, it handles its recycling in some ways more like New York City than San Francisco. In San Francisco, collection is entirely privatized, while Los Angeles follows a public service model. San Francisco collects residential food organics; Los Angeles does not. And Los Angeles faces a contamination problem that does not seem to be an issue in San Francisco. These particular characteristics suggest that megacities face different challenges than cities that are merely "big" (Photo 3-16).

Photo 3-16

The United Nations defines a megacity as having a population in its greater metropolitan area of 10 million or more. L.A. and NYC are the only megacities in the United States. Others include Mexico City, Beijing, Bombay, London, and Tokyo. There are currently 20 megacities worldwide, 15 of which are in the developing world.



But both Los Angeles and San Francisco treat larger, multi-unit buildings differently from the rest of the housing stock—which makes them very different from New York. This difference has implications for comparing New York’s residential diversion rate to that of San Francisco or Los Angeles. San Francisco does not track its multi-unit–building diversion rate, but the fact that such buildings generally do not separate organics suggests that multi-unit diversion is lower than the diversion overall. And in Los Angeles, multifamily diversion is not assessed because it forms part of overall commercial diversion, but it is also known qualitatively to be low.⁸² These commonalities highlight the importance of being careful when we compare these cities to New York, the capital of the high-rise.

At the same time, it should not be overlooked that both Los Angeles and San Francisco are enabled by California state law to take a “whole systems” approach to assessing diversion success, counting all forms of material recovery (including reuse of C&D debris and other inerts, and estimates of business waste prevention) towards an overall diversion rate for the commercial, industrial, and residential sectors combined—and using a method that does not directly measure recycled tonnages.⁸³

The whole system’s focus, whether it be in a context of complete private sector provision (San Francisco) or a mix of public and private involvement (Los Angeles) reduces pressure on the residential sector for waste-reduction performance. For better or worse, it enables a very different determination of success. New York, in contrast, is circumscribed in what it can and cannot count as diversion.⁸⁴ It also calculates its diversion rate based on tonnage data that is directly measured daily. Unfortunately, this fact has been routinely overlooked when critics have compared New York to San Francisco, Los Angeles, and other cities.⁸⁵

What Can New York Learn from Los Angeles?

The fact that both L.A. and NYC experience diversion and contamination problems (and San Francisco does not) suggests that these issues are to be expected when the population is immense. As one Los Angeles recycling official observed, the impact of “just a few” irresponsible citizens can be great when residents number in the millions.⁸⁶ The challenges of transience—especially since both L.A. and NYC are immigration centers—as well as language barriers are compounded when the city must educate a huge and constantly changing populace.

The Los Angeles experience also shows that reducing crew size, automating collection, and moving to a single-stream recycling system can result in major cost savings. As one Superintendent at the Bureau of Sanitation observed, “automated collection is the only way we can do recycling at all.”⁸⁷ While single stream may present more challenges for MRFs, the strong markets for recyclables on the West Coast and the large number of competing recyclables processors make this method worth it (Photo 3-17). It is notable that such a significant alteration in work rules was accomplished under the planning guidance of a coalition of labor and management.⁸⁸

Photo 3-17

Like San Francisco and Seattle, L.A. enjoys access to Asian markets for recyclables and exports much of its processed residential material abroad.



Finally, it is interesting to compare processing capacity for residential recyclables in the two cities. In both Los Angeles and New York City, a municipal agency is responsible for waste contracts with private MRFs that process commingled materials. Materials are then sold on the open market. Los Angeles's MRFs have, until now, resisted consolidation by larger waste-management corporations. The mix of labor and market conditions in Los Angeles may explain why they have managed to turn a profit processing mixed, somewhat contaminated, residential materials, as well as the fact that they have not sought to join the wave of industry consolidation that characterizes waste management today.

Nonetheless, Los Angeles's interest in building some public MRFs and transfer stations suggests that it seeks to maintain leverage in its relationship with the private sector. A memo from the Bureau of Sanitation Director to the Los Angeles Mayor in 2001 makes clear the benefits of balancing private sector capacity with city-owned infrastructure:

The City does not own infrastructure facilities such as transfer stations and material recovery facilities, which support the Bureau's core business of providing waste management services to 720,000 households. The City is thus subject to changes in pricing and ownership of the large private waste companies that do own the infrastructure facilities which the City currently uses. Acquiring City-controlled facilities will provide more control over future price increases and more options for managing the materials the City collects at the curbside.⁸⁹

The Case of Chicago

The city of Chicago has much in common with New York, and provides an interesting contrast to the California programs examined above (Photo 3-18). Chicago ranks third in the nation both for population size (2.3 million) and density (12,252 persons per square mile). While only 40 percent of its residences contain five or more units (as compared to 63 percent in NYC), its housing stock is as old as our own. Both here and there, the

Photo 3-18

Although it is not a megacity, Chicago's large population, housing density and age, and industrial history make it comparable in many ways to New York.



majority of homes and apartment buildings were built before 1960, when residential recycling first made its appearance on the national scene.

Chicago's combined residential and commercial waste stream is 5.2 million tons per year.⁹⁰ Like NYC and L.A., responsibility for managing this waste is divided between the public and private sector. Chicago's Department of Streets and Sanitation (DSS) handles collection of refuse, recycling, and yard waste from the city's 740,000 households in buildings of four or fewer units, and runs a separate collection program for the roughly 40,000 units of public housing. Its Department of Environment oversees education, planning, and marketing for recycling and composting. Commercial waste is handled by the private sector. Chicago's total residential stream totals around 3.1 million tons per year, out of which 22.3 percent was recycled in 2003.⁹¹

However, Chicago's municipal programs do not cover apartment complexes of five or more units. They too must arrange service with private haulers. Chicago's 1994 Workplace and Residential Recycling Ordinance requires property managers and building owners to implement a recycling plan specific to their property. Unless they qualify for a waiver, apartment houses are required to source separate at least three recyclables of their own choosing. They also have the option of substituting one separation with two source-reduction measures.⁹²

With the exception of the fact that apartment houses are served by private hauling firms, Chicago's commercial-waste-management system is very much like New York City's. Businesses are serviced by a mix of independent and national carting companies. As in NYC, waste haulers in Chicago are required to report data to the city on both the types and amounts of materials collected for recycling on a semi-annual basis. Failure to report risks loss of license.

The Blue Bag Program

What makes Chicago's residential recycling distinctive is its one-stop collection method, the "Blue Bag" system. This program, initiated in 1995, enables residents to source-separate their waste into three streams. Refuse goes into black bags; commingled paper, metal, glass, and plastic into blue bags; and yard waste into separate blue bags. Everything must then be placed in one or more 96-gallon carts at curbside.

All three separations are collected *in the same truck* (Photo 3-19) and delivered to a mixed-waste Materials Recovery Facility, sometimes known as a "dirty MRF," for extensive sorting. At the end of the recovery process, the MRF yields processed streams of paper, metal, glass, plastic, and organics—all of which go to beneficial use—as well as refuse, which is transported to a landfill. Costs are funded entirely through general taxes.

In 2001, Chicago's Department of Environment Commissioner stated that "We've now got a mature program that's really performing well."⁹³ According to the agency, diversion under the program reached 26.8 percent in 2000, although in 2001 it dropped to below 25 percent for the first time in four years.⁹⁴ It is notable that these rates were achieved despite rather modest participation levels. Periodic alley surveys had determined that "approximately 33 percent of residents that are eligible to use their blue bag program actually participate in it."⁹⁵ Unlike in NYC, Chicago's program is not mandatory; residents may place recyclables in blue or black bags as they wish. Many choose not to source-separate.

Recycling in the city's public housing projects is handled somewhat differently. Echoing the conventional wisdom about the diversion-income connection, Chicago planners have observed that "not unlike other large cities, Chicago's diverse population presents challenges when it comes to getting residents of different

socioeconomic backgrounds to recycle.”⁹⁶ But while studies in New York and Los Angeles have explained lower diversion in lower income areas by looking at the baseline composition of the waste stream, Chicago takes a different view:

...officials knew the standard blue bag program would not work for this [the public housing] sector of the population for two reasons: the out-of-pocket expense required to purchase the blue bags, and the fact that most public housing units are in high-rise buildings, which are not conducive to blue bag collection.⁹⁷

At the time the Blue Bag program was introduced, it was felt that the barriers of high density and low income were too high to surmount among the public housing population. Consequently, Chicago never implemented the Blue Bag system in its 40,000 or so housing authority units. Instead, it contracted with a nonprofit group called The Resource Center to institute a different arrangement. Each day, the Center sends buy-back trucks to housing project sites. Residents exchange paper, metal, glass, and plastic recyclables for vouchers, which can later be redeemed for cash. Recyclables are bought at the going market rate, calculated by weight. Collected materials are taken directly to one of the two MRFs owned by Waste Management to be processed and marketed with Blue Bag materials. In 1999, this program paid out roughly \$140,000 to residents. It also provided local employment, since buy back vehicles were staffed by neighborhood residents.

Chicago's MRFs

In light of the Blue Bag program's modest level of participation, Chicago's residential diversion rate of around 25 percent is impressive. This rate exceeds the 20 percent attained in New York City before the temporary suspension of glass and plastic collection from the curbside program—even though New York's participation rate was then around 80 to 90 percent.⁹⁸ But a closer look at Chicago's mixed-waste-processing system (as well as its method of calculating diversion) explains how such lackluster participation was able to translate to respectable diversion.

Photo 3-19

Top photo: Unlike most other U.S. cities, Chicago residents place blue bags full of recycling in the same bin with refuse. Bottom photo: A worker from Chicago's Department of Streets and Sanitation loads a blue bag into a packer truck that also collects refuse. Note the automated lifters that are used for large, curbside bins.



Processing and Marketing Recyclables in New York City

As a recent article in *Waste Age* reported, “the long-term success of Chicago’s blue bag program is crucial because the city invested much up front capital and resources....It spent millions...to construct four custom-designed sorting centers that handle both residential solid waste and recyclables from the blue-bag program.”⁹⁹ Today, the city uses these MRFs—two of which are city-owned and two of which are owned by Waste Management, Inc. (WMI)—to handle all residential waste from the Blue Bag program. WMI operates all four facilities. Under its contract, the city offers WMI incentives for increased diversion, and levies penalties if diversion falls below a certain level.¹⁰⁰

Three-person city crews collect blue and black bags at curbside weekly using single-compartment, rear-loading, semi-automated packer trucks. Crews consist of one driver and two additional workers, who either load manually, or use automated lifters to assist in emptying curbside bins into the hopper. Trucks then transport and deliver all material—including blue and black bags—to one of four MRFs, each of which is located within city limits. Upon delivery, blue bags of commingled recycling are retrieved and sent to a recycling sort line, where they are mechanically debagged. Commingled containers are separated using a mix of standard manual and automated sorting methods (magnets and eddy currents). Glass bottles that remain intact are color-sorted by hand.¹⁰¹ Manual sorting also removes #1 and #2 plastic containers, as well as the blue bags themselves which are also recycled (Photo 3-20).

Photo 3-20

Trucks carrying bags of recyclables and refuse unload at one of Chicago’s four Materials Recycling and Recovery Facilities. Blue bags carrying recyclables are sent to a separate sort line, where materials are mechanically and manually sorted.



The refuse stream is fed into a separate sort line, where pickers remove wood, certain bulk plastics (mainly buckets), and bulk metal—as well as designated recyclables that were not placed in blue bags. The remaining discards are sent through a magnet/eddy-current process to retrieve residual metals. After this, material passes over a two-inch screen that separates out an organic-rich fraction of fines. What remains after screening is sent to any number of area landfills in surrounding counties.

Processed paper, metal, and plastic is sold to a wide array of processors and manufacturers with whom WMI has relationships. Glass—much of which is broken mixed cullet—is shipped to a second “glass MRF” run by WMI, where it is optically sorted by color. Meanwhile, blue-bagged yard waste is sent to a separate manual sort to remove contaminants, and is then blended with screened material from refuse. This mixture is sent to compost facilities and other end-use sites outside the city (Photo 3-21).



The combined use of co-collection and a dirty-MRF system cuts down on problems of contamination, low participation, and low capture that can occur when recyclables are collected and processed separately from refuse. That said, even with post-collection sorting of refuse to retrieve recyclables and organics, roughly 75 percent of what is collected is still landfilled.

Program Costs

In 2001, Chicago’s residential collection budget was \$157 million.¹⁰² While per ton collection costs are not published, it is clear that the consolidation of recycling and refuse collection has yielded economies—even with crews of three working truck shifts. As officials from the city’s DSS have observed, “one of the reasons city officials decided to implement the blue bag program was to avoid the costs of a separate fleet of collection vehicles and separate sorting centers for recyclables. Commingled collection allows us to bring recycled materials to our sorting centers without additional crews or trucks and, subsequently, without additional vehicle emissions.”¹⁰³

In the mid-1990s, the city paid WMI \$60 million to build the four MRFs, only two of which it still owns, since the construction agreement gave WMI title to the remaining two. This up-front expenditure has enabled the city to negotiate quite favorable processing and disposal fees for residential waste. It pays WMI \$22 per ton to accept its recycling, and \$44 per ton for refuse handling (including landfill disposal).¹⁰⁴ WMI in turn retains all revenues from the sale of recycled commodities and organics. As an incentive to keep the diversion rate at or above 25 percent, the city’s contract provisions cap disposal payments at 75 percent of the annual total-waste tonnage. WMI must also pay penalties if diversion falls below 25 percent.

WMI is not, however, contractually bound to actually recycle the segregated material. For two months during the winter of 1997, for example, all collected mixed paper and corrugated cardboard were landfilled, due to lack of markets, compounded by heavy rates of contamination. While the city withheld payment on its

contracts and WMI paid \$1.1 million to landfill 28,275 extra tons, this option was still more cost-effective than recycling during that period. The state of Illinois has unusually low landfill tipping fees, making disposal there a constant competitor to recycling.¹⁰⁵

Nonetheless, since inception of the Blue Bag program, collection costs have dropped \$5 million per year. At the same time, handling and processing costs have consistently increased.¹⁰⁶ Officials note that the increase has not been caused by shortfalls in recycling revenues, but instead reflects the realities of processing mixed waste.¹⁰⁷ Although recycling mixed with refuse is more efficient to collect in one truck, it takes much more labor and time to sort.

Public Opinion

Despite the simplicity of Blue Bag recycling and the 25-percent diversion it yields, the program is not without its critics. Citizens have, over the years, objected to the contamination that co-collection brings about. The city has responded that these and other concerns have been addressed by reducing the compaction rate in the trucks to cut down on breakage.¹⁰⁸

In addition, some of the program's detractors allege that having to purchase blue bags in addition to black ones makes participation inconvenient, and acts as an incentive to instead just throw everything into one bag of garbage. In their view, it is not only public housing residents who are deterred by the expense and bother of two sets of bags. Some citizens have also expressed distrust of the entire recycling process because they witness refuse and recycling tossed into the same truck. The much-publicized incident of the landfilling of Chicago's paper in 1997 has reinforced these suspicions.¹⁰⁹

Another controversy has arisen over the large tonnage of organics that are counted in the diversion rate each year. As the city explains:

In the Sorting Centers, once the Blue Bags containing yard waste are separated during the Primary Sort, they move to a separate area where sorters remove contaminants, any trash or recyclables that are not yard waste. Small bits of organic matter are recovered from the general trash too by a process called "screening." This material is composted. Much of Chicago's yard waste is sent to a farm and used as a "compost amendment" adding nutrients to the soil in the fields.¹¹⁰

In Kankakee County, where this farm is sited, a scandal arose in the late 1990s when "the rancid smells and high truck traffic generated vigorous local opposition."¹¹¹ As a result, land application of Chicago organics at this site stopped, but the continued use of compost from the Blue Bag program as landfill cover has also drawn public criticism.¹¹²

What Can NYC Learn from Chicago?

Like New York City, Chicago reports its "official" diversion rate as its residential rate. In 2003, this rate was 22.3 percent, a figure comparable to New York's before the temporary suspension of glass and plastic. Different from New York is the current administration's long-term plan for waste management. Mayor Richard Daley has explicitly advocated an "environmental agenda toward the goal of sustainable development."¹¹³ His legislative approach to the environment is focused on actively pursuing change at the state and federal level.¹¹⁴ Policies his office advocates include: federal procurement of recycled products; federal encouragement of source reduction as a "cost saving technique for business"; national recycled/minimum-content standards to "characterize what

can be sold as recycled”; a national Bottle Bill; the listing of used oil as nonhazardous and promotion of reuse and recycling; federal guidelines for disposal of used tires; the reduction of subsidies for virgin materials; and federal incentives for buy-back of light bulbs.¹¹⁵

The case of Chicago suggests that taking a whole-systems approach to assessing diversion success is feasible even in a city very much like New York in history, politics, and culture. Whether fact or myth, old, industrial cities like New York, Chicago, Boston, and Philadelphia have the reputation of being less “environmental” than their newer cousins on the West Coast. Yet in Chicago, sustainability is an explicit goal on the city agenda.

In addition, Chicago’s eight years of experience with co-collection and mixed-waste processing provides good information about the benefits and pitfalls of such a system. Unlike Los Angeles, and San Francisco’s three-cart, automated-collection system, the Blue Bag method could be easily implemented in New York, as it would require no major changes to trucks, crews, or curbside practices.

At the same time, Chicago’s experience tells us that such a program cannot work without immense mixed-MRF capacity. It is notable that the city did not rely on the private sector to come forth with the complicated and massive processing services it needed—it recruited and paid one large firm to build and operate its own system. Given the lack of such mixed-MRF capacity around New York, NYC would need to undertake a similar capital project of more than double the size to even consider co-collection.

Chicago currently pays significantly less than New York for processing and disposal, while its collection costs are roughly comparable to ours. On the other hand, WMI retains all revenues from the sale of recyclables—including paper. The contamination of paper and the low cost of Midwest landfilling in comparison to the Northeast, make paper a less profitable proposition. WMI no doubt does not reap the same revenues from its paper that NYC’s processors do, and sometimes finds disposing of it cheaper than recycling at any price. Nonetheless, Chicago has chosen to forego a potential source of funds from the operation of facilities that it paid to have built. This throws lower processing and disposal costs into a different light. And given the fact that the same large corporation that owns two of the city-funded MRFs, and operates all four, is rapidly consolidating independent waste businesses in the Chicago area, it is not unreasonable to expect that costs will continue to rise with the next contract negotiations.

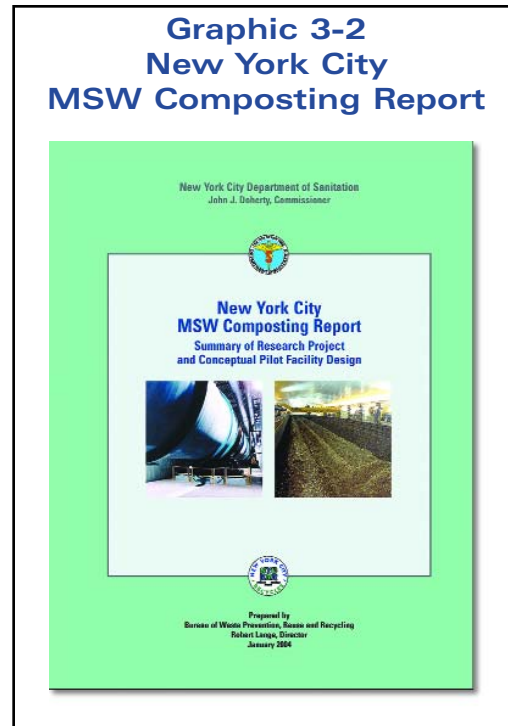
Chicago’s experience also points to the crucial role that organics diversion would have to play in making any Blue Bag program capable of diverting a substantial amount. Yard waste makes up around 20 percent of Chicago’s residential waste stream (recall that 23 percent of its housing is single-family, *detached*, as compared to around 8 percent in NYC). Nevertheless, to maintain a 25-percent diversion rate, WMI augments the yard-waste stream with organic fines from refuse. It is notable that this blend, which for a period was shipped to outlying counties in Illinois for land application, goes through only minimal processing and curing beforehand.¹¹⁶

If organics are needed to make up the lion’s share of diversion under a Blue Bag program, then mixed-waste *composting*—which is a different process from mixed-waste processing—seems a better alternative to a dirty MRF. Mixed-waste composting uses advanced technology to process much of the refuse stream, including food, yard trimmings, and paper, under anaerobic and aerobic conditions that promote rapid, yet complete, decomposition. Its output is a hygienic, odor-free compost that can be used, without concern, for landscaping and other horticultural purposes. What is left after the mixed-waste–composting process are certain recyclables—plastics, metal, and large-fragment glass—as well as a small amount of non-recyclable, inorganic materials.

The NYC Department of Sanitation explored municipal solid-waste-composting technology in its report, *New York City MSW Composting Report: Summary of Research Project and Conceptual Pilot Facility Design* (Graphic 3-2). This report explores the state of MSW composting, examines the quality of compost produced from this technology, and presents a proposal for how to test MSW composting in New York City.

The Case of Seattle

No comparative study of recycling in U.S. municipalities would be complete without looking at Seattle, a city long considered as the vanguard of recycling in the United States. Seattle is considerably smaller and less dense than NYC, with a population of a little over half a million citizens, a quarter million households, and around 6,700 persons per square mile. Like most cities, it has far fewer multi-unit buildings than New York. Only 37 percent of its units are in buildings of 5 or more units, including 20 percent in complexes of 20 apartments or more (Photo 3-22).



Diversion

In the 2003 Municipal Recycling Survey published in *Waste News* in February of 2004, Seattle reported an overall diversion rate of 38 percent for residential and commercial recycling and composting combined. The city also keeps extensive statistics on residential diversion, which was 43 percent for the year 2003 for curbside programs.¹¹⁷

Out of curbside residential diversion, 30 percent was accounted for by recycling of paper, metal, glass, and plastic, and another 13 percent came from yard-waste composting. Curbside diversion included both single-

Photo 3-22

Seattle is considered at the forefront of municipal recycling in the United States.



and multifamily housing.¹¹⁸ While the city's published reports don't track multifamily diversion rates specifically, they do show an average of 327 pounds of recycling generated per year, per participating unit.¹¹⁹ This is considerably less than the 812 pounds per year of recyclables (not including yard waste) that households in buildings of four units or less set out for curbside collection, but units in larger complexes may also generate less refuse.¹²⁰ Thus, the multifamily recycling rate is probably lower than 30 percent for paper, metal, glass, and plastic under the city's curbside program.

Service Provision

Single-family houses and buildings with two to four units generate about 54 percent of residential waste, while apartment complexes put out another 20 percent.¹²¹ The remaining 26 percent is hauled to transfer/recycling stations by residents themselves. Residents of single-, two-, and three-family housing choosing curbside service pay variable rates for weekly refuse waste-hauling, but receive biweekly recycling collection free of charge. Those who opt to self-haul their waste to one of the city's several transfer stations pay more modest fees for tipping trash and yard waste, and can drop off recycling there for free.

Residents subscribing to curbside, alley, or backyard collection pay monthly rates for trash collection that range from \$10 for a 12-gallon "microcan" to \$67 for backyard pickup of a 96-gallon cart. For an extra \$4.25 per month, they can also arrange biweekly collection of leaves, clippings, and other yard materials. They must either choose this option or haul yard waste to transfer points themselves, since Seattle has a local ban on landfilling yard waste. Recycling, on the other hand, is voluntary, although residents are prohibited from disposing of tires (which must be taken to a drop-off center) and bulk items (for which there is a \$20 collection fee) in their trash. Taken together, the yard and recycling arrangements provide strong financial incentives for residents to divert waste from refuse. This is especially true in the 60 percent of the city's housing in buildings that are four units or less, because in these cases individual "customers" pay for collection directly.

Billing for refuse and yard-waste collection is coordinated through Seattle's Public Utilities (SPU) department, which contracts with two private waste-haulers, each of whom has exclusive rights to service a section of the city. These same firms offer refuse and recycling collection to apartment buildings, although the decision about whether or not to recycle in these cases is left up to each building manager. In order to encourage apartment recycling, SPU's contracts include financial incentives for the two firms to maintain recycling in between 70 and 80 percent of the nearly 5,500 apartment buildings in Seattle. It also runs the "Friend of Recycling" program, which offers training sessions for volunteer tenant coordinators, along with a \$100 annual rebate on trash bills to the building management if a tenant agrees to coordinate recycling on site.

This approach, according to SPU, has increased participation among multifamily dwellings over the past three years (Photo 3-23). SPU officials note that "transient populations as well as space downtown and older buildings are

Photo 3-23

Seattle's housing stock consists of small apartment buildings and houses in a low-density arrangement. High-rise apartment buildings are relatively uncommon.



problematic,” for recycling.¹²² These buildings figure among the 20 percent not participating in recycling at all. In addition, if a building consistently contaminates recyclables, firms have the option to terminate recycling service. This, according to SPU, has occurred in “between 50 and 100 buildings.”¹²³ Excluding the “bad apples” among Seattle’s apartments is quite effective, leading staff member Hans Van Dusen to conclude that “that multifamily participation is not the highest in the country, but the program’s low levels of contamination are among the best, albeit higher than single family.”¹²⁴ He notes that “haulers and city contract managers have had and will continue to have the option of pulling service at a building where contamination levels cannot be corrected. These buildings go back to the pool of nonrecycling targets.”¹²⁵ Van Dusen estimates a 4 percent contamination level for apartments that recycle, and a 2 percent contamination level for the city’s residents overall.¹²⁶

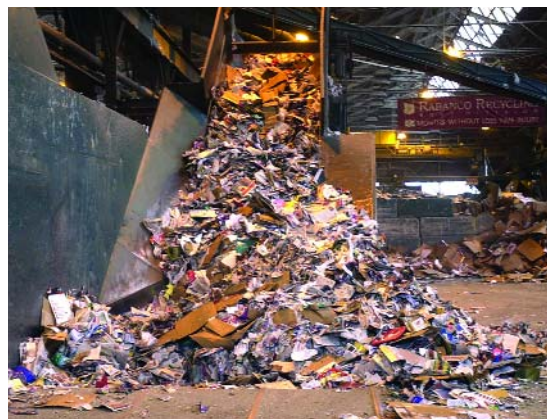
Collection and Processing

SPU regulates rates, subsidizes recycling collection, requires its contractors to collect yard waste and recycling separately from refuse, and specifies the MRF these haulers will use. However, it leaves design of source-separation arrangements and collection methods up to the individual firms. When contracts were re-bid in 1999, they were awarded to two haulers (WMI and Allied), each of which won the exclusive right to service a section of the city. Both chose single-person, semi-automated trucks to collect two streams of recycling consisting of: (1) commingled paper, metal, and plastic; and (2) separated glass. WMI selected a dual-bin rear loader that would compact both streams separately; while Allied opted for a single-bin compactor for the commingled materials, with a separate box for glass mounted between the truck cab and the 20-cubic-yard hopper in back. Fully automated trucks were deemed unworkable in the many narrow alleys and hilly sections of the city.¹²⁷

The decision to keep glass separate was made as a result of experiences earlier in the decade with glass contamination of paper fibers. The firms serving the city under the previous contract, which lasted from 1989–1999, had required three source separations (paper, metal/plastic, and glass). Several experiments with single-stream collection during that time led to complaints from paper mills about glass and problems with the marketability of the end product. While the new contracts have retained the separated-glass provision, SPU anticipates that the city will move to a full single-stream system in the near future, because of improved processing technologies. The MRF serving the city, Rabanco (now owned by Allied), is currently undergoing modernization to handle commingled paper and glass (Photo 3-24).

Photo 3-24

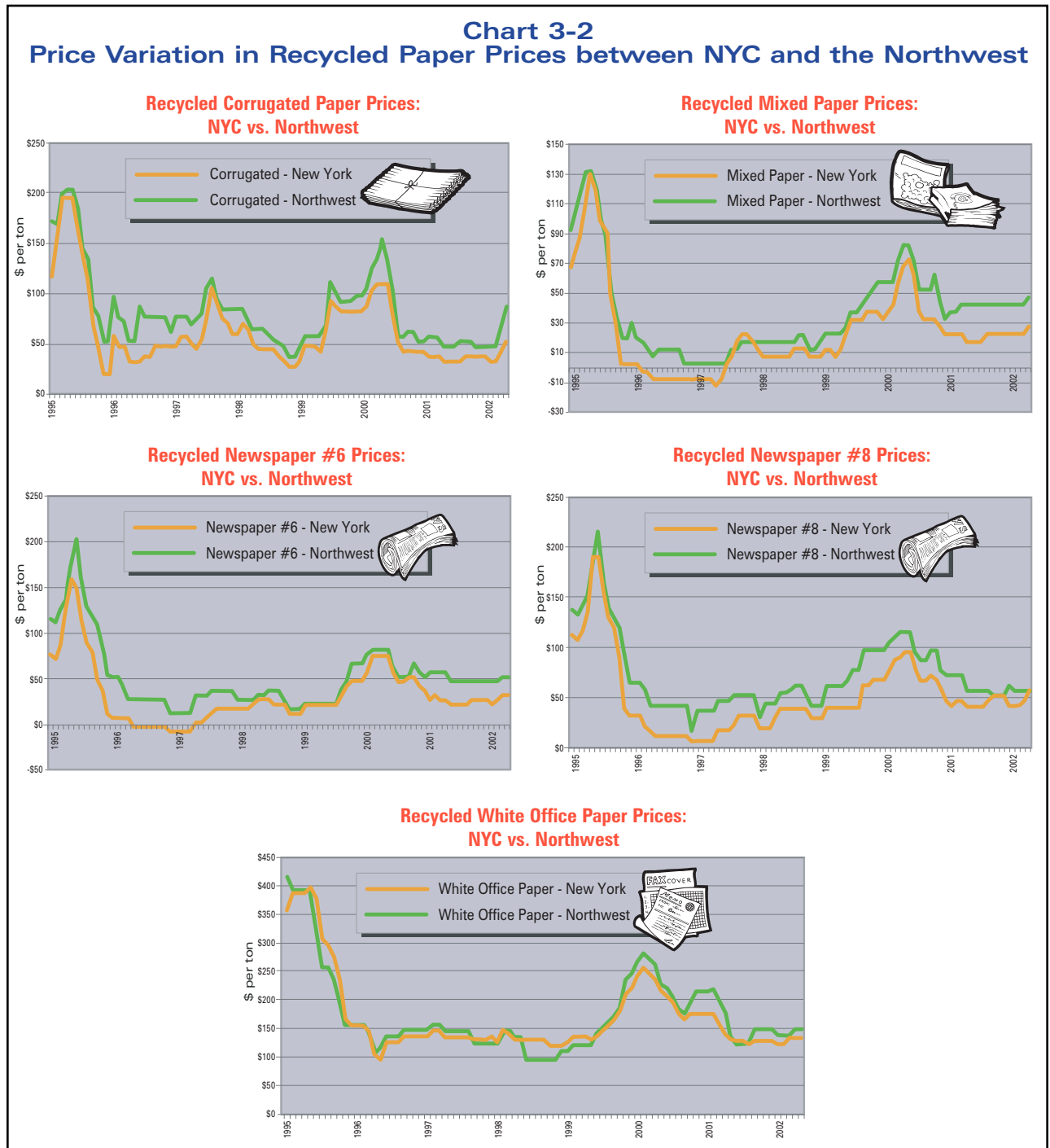
Haulers under contract with Seattle Public Utilities use single-person, semi-automated trucks to collect recyclables. The Rabanco MRF shown here (now owned by Allied) is undergoing modernization to handle commingled paper and glass.



Moreover, WMI operates a single-stream MRF in Seattle for commercial and out-of-town residential recycling, and is constructing another large, single-stream MRF in the surrounding King County. In Van Dusen's opinion, reticence on the part of mills to accept paper co-collected with glass is unfounded, given today's technology.¹²⁸

Markets

As shown in Chart 3-2, paper markets are stronger in the Pacific Northwest than in the East. This strength reflects the region's well-developed paper industry, as well as its trade linkages with Asia, which buys 25



percent of Seattle's recycled paper alone (Photo 3-25).

Roughly half of Seattle's HDPE and PET go to export markets in Asia as well, and the high demand for glass in nearby California (due to that state's recycled-content requirements) create a steady outlet for this material.¹²⁹ Much of the separately collected glass is taken from the MRF to a glass-beneficiation facility, where it is optically color-sorted. Clear, green, and amber glass typically finds ready buyers to the south, although SPU staff report that

when glass markets are weak, its contractors may forego optical sorting and sell all glass locally as mixed cullet for a minimal price. The State of Washington, moreover, has no bottle bill. This increases the fraction of aluminum in the recycling, which—according to SPU economist Jennifer Bagby—accounts for 25 percent of recycling revenue, even though it represents only 2 percent of the recycling collected.¹³⁰ (In comparison, aluminum represents only 0.6 percent of New York City's waste stream.¹³¹ Seattle also collects other plastic resins (numbers 3-5, but not polystyrene), but reports that regional infrastructure and markets for them are limited.¹³²

Photo 3-25

As with cities in California, Seattle's location on the West Coast makes it a prime exporter of materials to Asia and the Pacific Rim.



Program Costs

Much of the revenue needed to fund Seattle's programs comes from its subscription accounts. State, county, and municipal grants round out the waste-management budget. SPU in turn pays the two firms that collect and process garbage, recycling, and yard waste; and contracts with a third (WastebyRail) to export waste to landfills within and outside the state. Depending on market conditions, the total cost of recycling may be greater or less than the costs of refuse collection, tipping, transfer, and landfilling. For instance:

In 1993, the savings from the recycling program totaled \$98.50 per ton. This amount can be broken into four components. The first is the avoided costs of collection...the savings from not having to collect the material was \$32 per ton. Additional savings are attributable to not having to transfer or transport the material. Finally...there were savings in 1993 from disposal of \$44 per ton. The costs of the recycling program in 1993 included a \$93 per ton payment to the contractors who collect the material plus \$2 per ton for administration and public information costs incurred by the City. Thus, in 1993, the costs were \$3.50 per ton less than the benefits.¹³³

By 1994, strong markets had driven the cost per ton of recycling to \$77, making it approximately \$15 less costly per ton than refuse collection. This annual variation in recycling costs comes from the structure of Seattle's contracts with its processors. SPU pays WMI and Allied a per-ton fee for recycling collection, which (as of the year 2000), averaged around \$64. Another \$19 per ton goes to Allied to cover processing at the MRF.¹³⁴ The city shares the risk for market variation in commodity prices by reimbursing the contractors if prices fall below a set level and reducing payment by the amount prices rise above that same level.¹³⁵ As a

consequence, over the past 12 years the cost per ton for recycling has ranged from a low of around \$20 per ton during the bull market of 1995, to a high of \$100 per ton in 2002.

The City of Seattle protects itself from extreme market volatility through a clause in each contract specifying that, “if the market price indicator for any material falls below \$0, the city may at any time direct the Contractor to deliver the material to a city transfer station or other location within the city rather than pay the additional differential below \$0.”¹³⁶ In other words, the city retains the right to landfill or otherwise recycle the materials if markets are very poor. Moreover, the contracts make special allowances for potential problems arising with glass, stating that if the “glass beneficiation plant will not accept all, or a portion of one of the above colors, that color, or a portion of color, will be calculated at \$0 value.”¹³⁷ This addresses the fact that in the absence of markets for color-sorted glass that cover the cost of optical sorting, mixed cullet usually commands no positive price.

What Can NYC Learn from Seattle?

The City of Seattle rightly earned its reputation as a national recycling leader because of its early and continued commitment to recycling and other forms of waste reduction—and its achievement of measurable results. As one SPU report noted in 1999, “Seattle’s program became a byword among cities, a success story acclaimed worldwide...Why? Because Seattle increased recycling from 28 percent its wastes in 1988 to 44 percent in 1995.”¹³⁸ While this diversion rate fell short of the city’s initial goal of 60-percent waste reduction by 1998, it was nevertheless high among programs in the mid-1990s.¹³⁹

Other elements of Seattle’s waste-reduction programs, such as its monthly “recycling newsletter” (sent to all curbside collection subscribers), its detailed program evaluations, its food-waste–composting programs at local markets, and its backyard-composting initiatives, earned the city recognition as well. But it is important to keep in mind that the city’s own literature shows that, by and large, its “traditional” curbside programs for recycling and yard waste account for its reported diversion rate of 43 percent, 30 percent of which was curbside recycling.¹⁴⁰ Here we find ourselves again at the observation made so many times in the course of this report—that when we compare New York to other cities for residential diversion of paper, metal, glass, and plastic, what were seemingly huge differences turn out to be much more modest.

This suggests that what New York has to learn from Seattle is not how to increase the diversion rate or how to conduct public education, but how to recycle more cost-effectively. In this regard, a great deal depends on how provision of recyclables collection, processing, and marketing is structured. SPU’s contractual arrangements with private haulers have enabled it to pass on costs to customers in the form of rates that are affordable, and maximize diversion. At the same time, Seattle has intervened in the private market at key points to guide the system in a direction that is not just economically efficient, but also environmentally and socially sound.

While privatized, Seattle’s system is anything but *laissez faire*. SPU heavily regulates the residential hauling industry, telling it where it can collect, what it must collect and process, and how much it can charge. In the case of yard waste, economic incentives for diversion have been reinforced by the command-and-control legislation of the landfill ban. The city has retained ownership of two recycling and disposal stations. This reins in potential abuses of a purely free-market arrangement by offering lower income residents the less-expensive option of self-haul, as well as retaining an element of competition from the public sector. In addition, the city supplements funding from subscriptions with municipal, county, and state grants, which mitigates the cost-competitiveness of disposal over recycling when markets are weak. At the same time, it structures revenue-sharing such that it is protected from serious market downturns, limiting its risk exposure.

Despite this heavy regulation, the fact that Allied and WMI have agreed to such conditions suggests that it is reasonable for them to expect at least modest profits over the duration of a 10-year contract. Here the strong markets of the Pacific Northwest are no doubt key, as is the fact that both hold exclusive franchises for collection of refuse and recycling. Thus, these large companies may be able to spread costs and earnings across operations, making processing and marketing a more profitable venture than if they only accepted the materials collected by someone else.

Does Seattle's success with this arrangement mean that NYC should follow its lead (or the lead of San Francisco, with a similar system)? Both cities have a long precedent of private collection. For decades, residents have paid directly for waste-hauling, as commercial enterprises do here. The transition from the publicly provided sanitation arrangement that has existed in New York since the 19th century would no doubt be painful, difficult, and would impact lower income residents the most. But over and above these challenges, NYC would have to think about how to structure its relationship with one, two, or even three very large companies such that it retained control over its own waste-management system. The case of Seattle shows this very clearly.

Chapter Conclusion: Applied Comparison

This comparative exercise reveals several key findings. The first is that the organization, funding, and split of public to private responsibility for collection, processing, and disposal varies widely from city to city, even among cities subject to the same state laws (Los Angeles and San Francisco, for example—see Table AVI-3 in Appendix VI). The costs of running a recycling program may form part of the overall waste-management budget and be funded out of local taxes. At the other extreme, costs may be covered by direct fees paid by consumers of waste-hauling. There is no general rule as to how commercial and residential streams break down in terms of service provision or any other attribute. Similarly, what is the direct responsibility of government, what falls under municipal contract to an outsourced provider, and what is a private matter between waste hauler and generator-consumer, differs in each city.

A second point is that despite the widespread variations, all large cities contract with one or more large, private firms that *process and market recyclables*. It is notable that in all cases the reach of these corporations goes beyond the locality. Regardless of how programs are funded, municipal recyclables end up being privately sorted at MRFs and then entering a regional, national, and even global market. While cities may encourage local businesses that use recycled materials, recycling takes place on scale beyond the city itself. And in three out of the four cases, the same firm contracted to handle recycling also managed refuse disposal. With the exception of San Francisco, the cities' recyclables processing contracts are with one or both of the two "waste giants." In sum, among these and in fact all U.S. cities, recycling is part of a large, global waste-management industry.

Third, this analysis shows that comparing recycling costs (and revenues) among cities is not just extremely difficult—it is ultimately not useful. So many factors go into program funding, allocation of costs, structuring of payment and revenue provisions in contracts, that line-item budget comparisons make little sense. Furthermore, regional factors—including the wage and tax rate, the strength of markets, the cost of landfilling, the public vs. private ownership of processing and disposal facilities—vary greatly, yet their contribution to costs is difficult to quantify. Thus, there is no where to simply "look up" what it costs to recycle or to dispose of refuse in any particular city, nor is it prudent to evaluate a city's recycling costs using anything but that city's own information.

The interaction of geographic and state policy factors has a great deal to do with the revenues municipalities can expect from the sale of recyclables. But the effect of revenue potential on program economics is not straightforward. There are many types of contractual arrangements between municipalities and recycling processors. Among them, revenue sharing between the two parties is by no means the norm. Many private processors retain all revenues *and* charge processing fees. Others give municipalities a certain percentage, often tied to the strength of the market overall. In each case, the processing fee may be different because the processor is shouldering varying degrees of risk and reward. In none of the cases we reviewed did municipalities opt to skip the middleman and sell materials processed at their own MRF directly on the open market, although such cases do occur in smaller jurisdictions from time to time. Under these arrangements, the municipality's relationship to the recycled-materials market—and its revenues or losses—would take yet a different form.

The comparison of New York to its large cousins also shows that single-stream recycling, in which most or all recyclables are collected and processed together, is an emerging trend among large cities. Especially when paired with automated-collection systems that reduce crew size and increase collection speed, single-stream approaches appear key to making collection economics work, and this goes for cities that use municipal collection crews, as well as for those who contract out to private haulers. At the same time, the case of L.A. shows that single-stream processing can bring with it serious problems of contamination, which undermines marketability of processed materials. On the West Coast, the strength of markets and the available technology nevertheless make this approach work. It is far from clear, however, that the method is transferable to the East Coast context.

Although public education was not the focus of this comparison, research showed that the mechanisms a city uses for public education do not vary greatly from place to place—although who pays for them does. Cities like San Francisco and Seattle, in which residents pay direct fees for service, require contractors to foot some or all of the public education bill. County and state monies, furthermore, supplement public education budgets in most areas, making it very difficult to get a handle on variations in per capita spending. But a comparative examination shows the main vehicles for public education—speakers, school visits, mailings, billboards, TV spots, print advertisements, compost bin sales, and the like—are used across the board. Appendix IV details some of the incidental findings about comparative public education programs that were compiled during the research for this report. It argues that the lack of correlation between public education spending and diversion rate invites reconsideration of the conventional wisdom that public education frequency, forms, and/or spending is the primary determinant of the efficiency and effectiveness of a recycling program.¹⁴¹ Certainly no recycling program can work without public education. But that does not mean that variations in diversion, costs, or other features of recycling among cities can be explained by different approaches to public education.

Finally, it should be clear that when the question of “what other cities are doing to make recycling work” comes up, it is not enough simply to turn to the official statistics at hand, or seek out success stories. These sources can be important starting points. Yet for a comparison of recycling programs to be of any use, comparisons must include much wider and more painstaking examination of a variety of factors. At a minimum, it is essential to establish comparability of municipalities in terms of population size, density, per capita waste generation, and housing stock. It is also important to pay attention to how a jurisdiction calculates its diversion rate. To comply with California's reporting requirements, for instance, Los Angeles calculates its diversion rate based on collected tonnages (including inerts, asphalt reuse, and C&D debris), processors' survey data, California Redemption Value data, C&D and yard trimmings survey data, generator surveys of source reduction, and alternative daily cover tonnages reported by survey of Los Angeles and Ventura County Landfills. This method is much broader and admits far more to diversion estimates than does New York City's method.

Processing and Marketing Recyclables in New York City

When diversion rates from other cities are reported in the media or in policy documents, they are commonly compared to NYC's diversion rate as we calculate it. For example, one *Newsweek* article that ran shortly after the temporary suspension of glass and plastic recycling in NYC invited readers to consider that "the City recycles only 18 percent of its trash, as compared to Los Angeles's 44 percent, Chicago's 47 percent and Seattle and Minneapolis, which recycle a whopping 60 percent of their trash."¹⁴² Such comparisons are neither accurate nor useful.