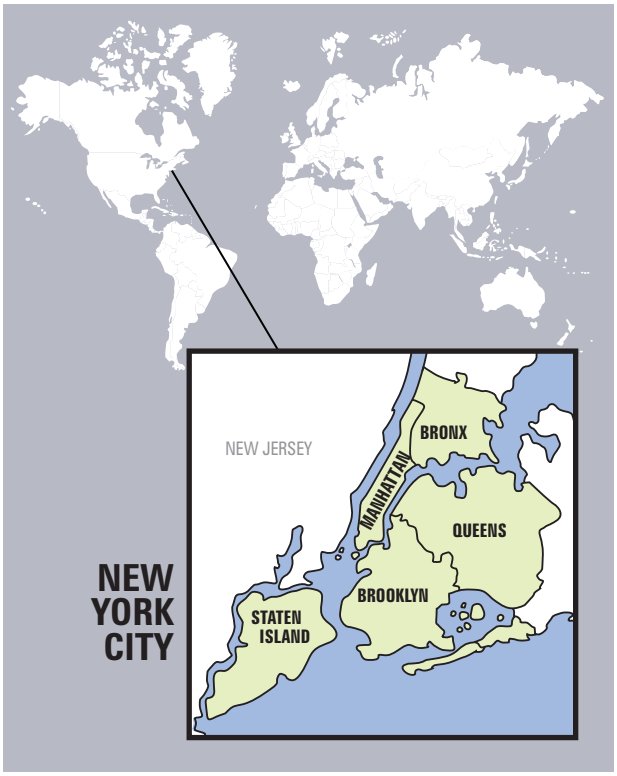
Chapter 1
RECYCLING ECONOMICS

New York City's economy is linked in complex ways to regional, national, and global networks of production, trade, and consumption (Graphic 1-1). By and large, NYC's economy follows the rules and tendencies of the U.S. economy as a whole, which itself has unique characteristics among advanced industrial nations.

In contrast to countries in Europe, Canada, and Australia, the U.S. government at all levels tends to refrain more from intervention in the private marketplace. There is a strong belief in the U.S. that the private sector can and should deliver as many services as possible. In fact, privatization of what were traditionally public works and services has been a growing trend in U.S. municipalities since the 1980s. Despite our many land-use regulations, approaches to urban planning in the U.S. tend to be driven much more by entrepreneurial investment and the laws of supply and demand than in other Western nations.[1] Not surprisingly, this economic climate affects the way cities recycle.

Graphic 1-1
NYC in Global Context



The Recycling Market

Although recycling has wide-ranging social and environmental benefits, it is important to understand that market exchange—over and above citizen participation or government support—is what makes it possible in the United States. Without businesses interested in buying recycled materials (Photo 1-1, page 18), residential recycling programs would soon grind to a halt, no matter how well-organized or popular they might be. And while it is true that community recycling emerged in the 1960s and 1970s as a grass-roots movement based on moral concern for the environment, by the 1980s it had become evident that, as one journalist put it, recycling:

> involves much more than the curbside collections of newspapers, bottles, and cans that are becoming a familiar feature of life in much of urban and suburban America. While necessary and critical, that is only the first step, one that becomes futile unless the materials can also be reprocessed, sold and recast into new products.[2]

Photo 1-1

Pictures of some processed NYC recyclables (clockwise from top left): paper, metal, plastic, and glass

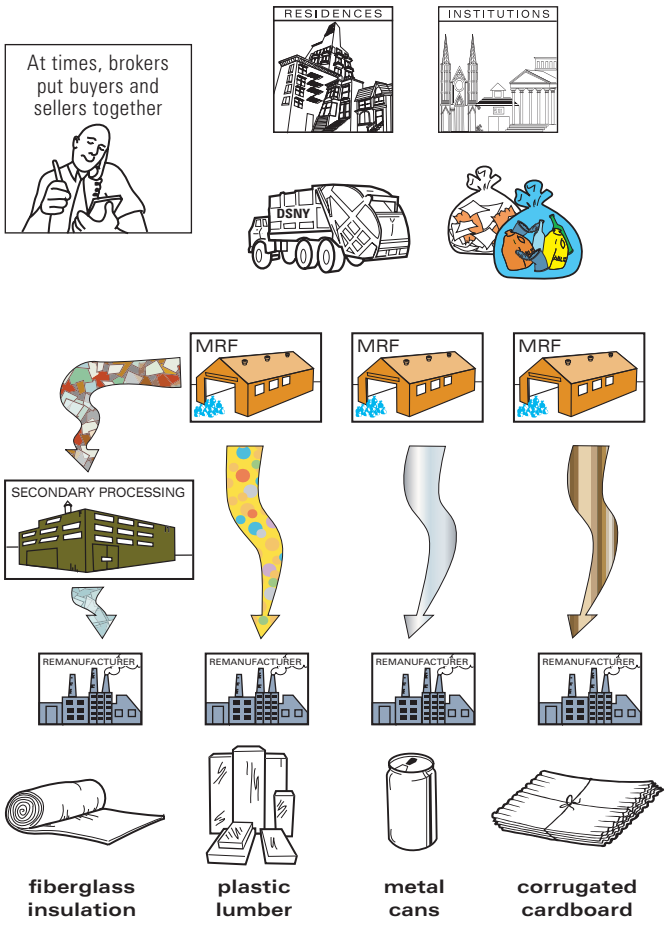
For this reason, it is useful to think about recycling in market terms. Municipalities, or carters who collect recyclables, are the "sellers" in this market. Buyers include:

- **Brokers** who specialize in buying, holding, and selling recycled materials to manufacturers or processors
- **Intermediate or "secondary" processors** who "clean up" recyclables and resell them at a profit to manufacturers
- **Manufacturers** who use recycled inputs in production

This meeting of seller supply and buyer demand—interacting over time through the mechanism of exchange—creates the recycling market (Figure 1-1). In this regard, recycling markets are like markets for anything else. Just what is sold in these markets? In the United States as elsewhere, established markets exist for certain components of residential municipal solid waste (Table 1-1, page 20).

The term "established markets" means that there is a sizeable group of potential buyers and sellers of a given commodity, who exchange it consistently. The term does not cover the many additional end uses of secondary materials for which markets are not well developed. These include substances for which recycling technologies exist, but which rarely can be operated at a profit—at least today. While public subsidy or unusual local economic conditions can sustain recycling of such materials at certain times and places, there are far fewer incentives for recycling companies to become engaged in processing them. Currently, common materials fitting this description include those listed in Table 1-2 (page 20).

Figure 1-1
Buyers and Sellers in the Market for Municipal Recyclables



Residences and public institutions receive recycling collection service from municipalities.

⇩

Municipalities (or the private carters that contract with them) collect recyclables to **sell** to firms that operate materials-recovery facilities (MRFs). (*See note below on Positive and Negative Prices.*)

⇩

Firms operating materials-recovery facilities **buy** recyclables, preparing (sorting, cleaning, and baling) the materials for **sale** at a higher price. This first stage of processing recyclables is called *primary processing*.

⇩

Sometimes other firms **buy** partially sorted recyclables for further (secondary) processing. This is often the case with glass.

⇩

Either way, sorted glass, plastic, metal, and paper is ultimately sold to remanufacturers who make goods with recycled content.

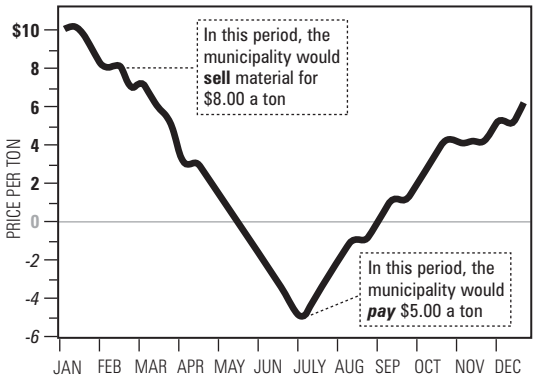
⇩

These are some examples of the products made from residential recyclables. **These products (with the exception of metal) are often of lower grade than the products made from commercial recyclables.**

Positive and Negative Prices

Ideally, municipalities sell recyclables, and processors (MRFs) buy recyclables. Yet when the market value of certain commodities falls to zero, MRFs are not willing to buy these materials.

Under free market conditions, zero-value commodities would simply be disposed of as refuse. But municipalities with recycling laws or mandates can't just do this—they are required to recycle specific materials, no matter what. In such cases, municipalities "sell" these materials for a negative price; in other words, they pay processing firms to take them.



If municipalities are paying, then why is it customary in recycling contracts to use the term "negative price"? There are two reasons. First, different materials in commingled recycling may have positive and negative prices. In that case, the overall per-ton price that municipalities sell recyclables for is the sum of the individual prices for the commingled mix. Second, negative prices fluctuate. Keeping the terminology of prices, rather than talking about paying for service, leaves open the chance for prices to rise to positive numbers when market conditions improve.

Table 1-1
Developed Markets for Secondary Materials

Recyclable material	*Virgin source*	*Developed end uses for recycled material*	*Minor, less developed end uses for recycled material*
PAPER			
Corrugated cardboard 	ground wood pulp	paperboard, linerboard	
Mixed paper 	ground wood pulp	paperboard, linerboard, tissue	insulation, animal bedding
Newspaper 	ground wood pulp	recycled newsprint	board mills, insulation, animal bedding
Office paper 	chemically pulped wood fiber, ground wood fiber	tissue paper, printing and writing paper, paperboard packaging	
METAL			
Aluminum cans/foil 	bauxtite ore	aluminum beverage containers	
Bulk metal 	iron, steel, copper	metal mills, auto industry	
Steel cans 	tinplate steel	steel mills	
PLASTIC			
HDPE bottles 	petroleum derivatives	HDPE bottles	drainage pipe, film, pallets, plastic lumber
PET bottles 	petroleum derivatives	polyester fibers (carpet, clothing)	bottles, strapping
GLASS			
Glass containers 	sand, limestone, soda ash	glass containers	fiberglass, abrasives, aggregate, filler

Note: Established markets for primarily commercial recyclables such as concrete and asphalt are not listed here.

Table 1-2
Undeveloped Markets for Secondary Materials
(MSW components for which weak, unreliable markets exist in some places at some times)

	Virgin source	*End uses*
Food/yard 	organics	finished compost
Milk/aseptic cartons 	paper, polyethylene, aluminum foil	paper, tissue
Non-HDPE or PET plastics 	petroleum derivatives	plastic lumber
Textiles 	cotton, wool, synthetic fibers	bedding and fiberfill
Tires 	rubber, carbon, steel	tire derived fuel, ground rubber

Recycled Materials Prices

Municipalities, recycled-input manufacturers, processors, and brokers constantly monitor, and make decisions based on what is called "secondary materials" commodity pricing.[3] Several trade publications specialize in tracking prices for secondary materials—conducting daily research among the vast network of buyers and sellers in the U.S. and internationally who are engaged in trade (Graphic 1-2). They are standard reference for those in the business, including the City of New York.[4]

Charts 1-1 through 1-4 (pages 21–23) graph the changes in prices for recycled commodities marketed in the New York region over time. While certain materials—white office paper, aluminum cans/foil, natural HDPE plastics, and clear glass—command high prices, other

Graphic 1-2
Published Commodity Prices

Prices for secondary materials can be found in various trade publications.

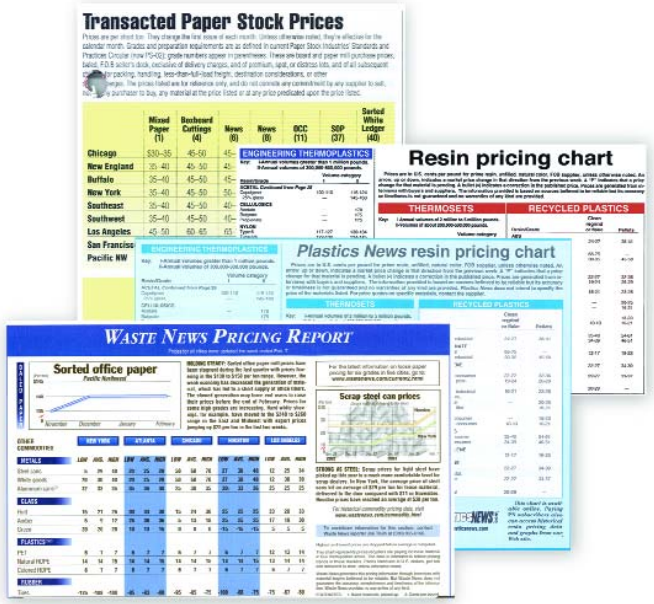
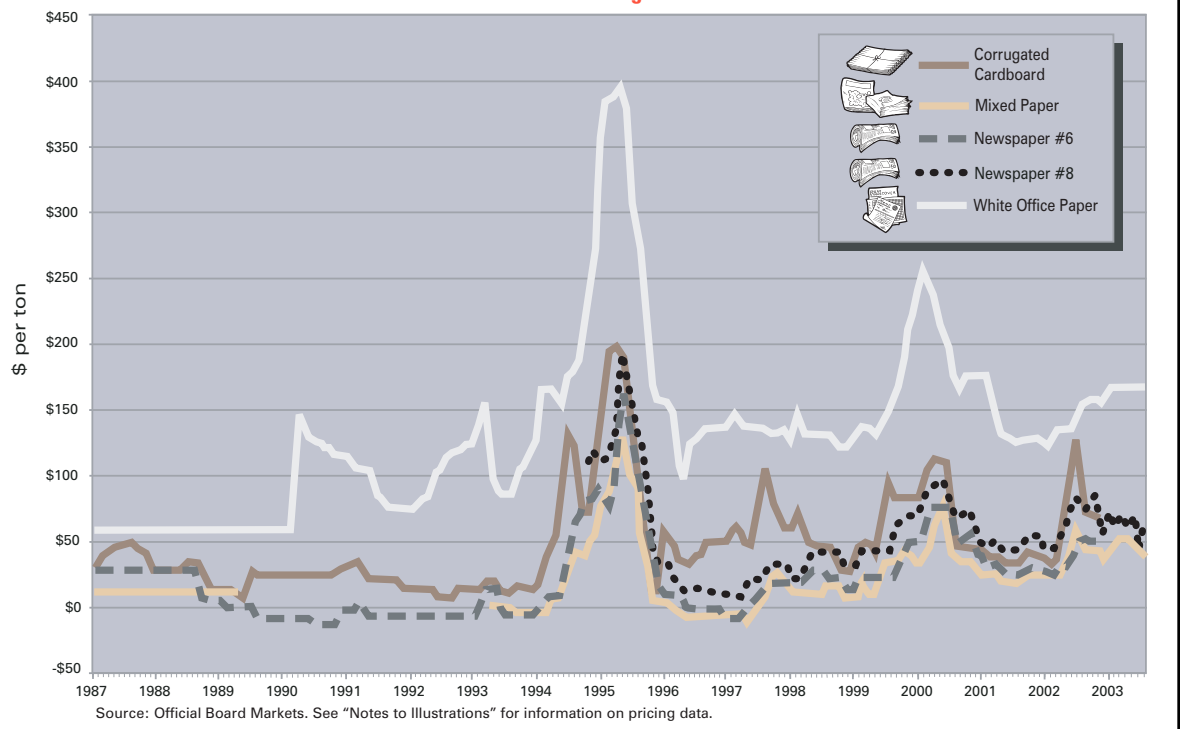
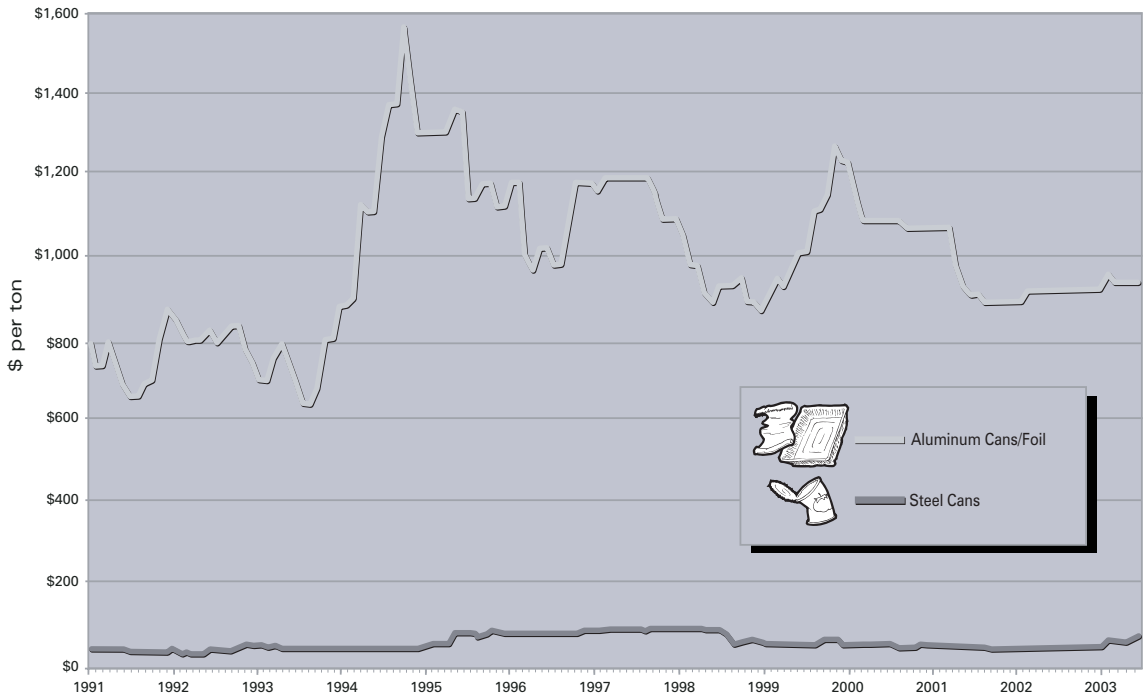


Chart 1-1
Recycled Paper Prices
New York Region



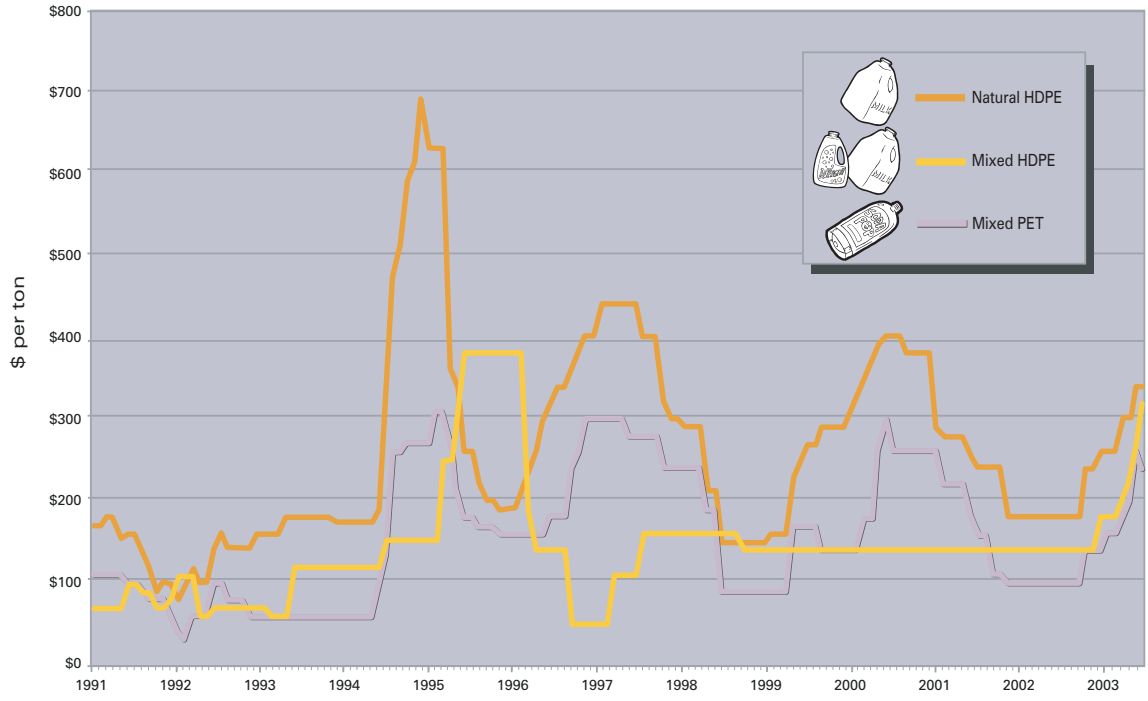
Source: Official Board Markets. See "Notes to Illustrations" for information on pricing data.

Chart 1-2
Recycled Metal Prices
New York Region

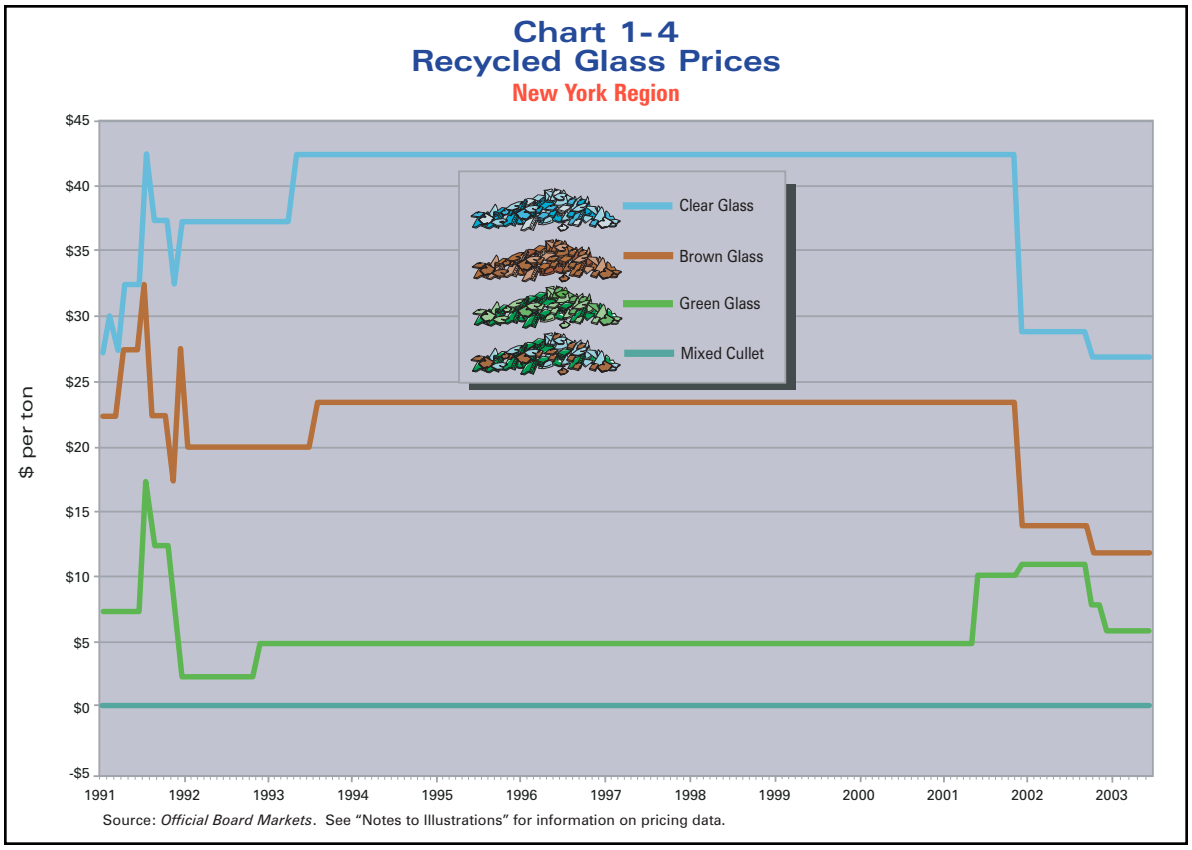


Source: *Recycling Manager*. See "Notes to Illustrations" for information on pricing data.

Chart 1-3
Recycled HDPE and PET Plastic Prices
New York Region



Source: *Recycling Manager*. See "Notes to Illustrations" for information on pricing data.



materials normally collected in municipal recycling programs—mixed paper, steel cans, and mixed glass—are worth much less. With the exception of glass, all the commodities represented in the charts show a great deal of market volatility.

Why are these markets so volatile? And why are some materials so much more valuable than others? The answers lie in the fact that after recyclables are collected, they enter a highly competitive materials economy that starts locally, and very quickly goes global.

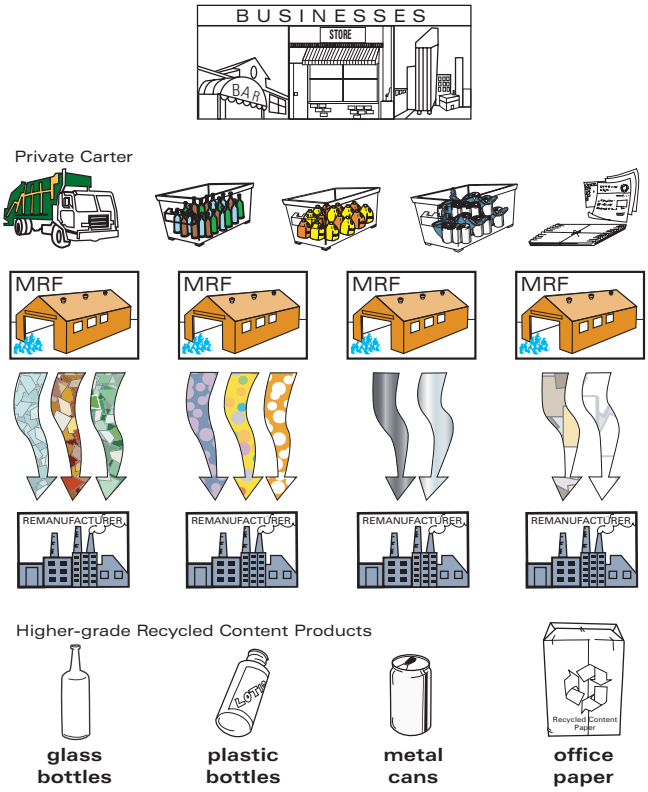
Competition Between Various Buyers and Sellers

Charts 1-1 through1-4 show prices for post-consumer recyclables—but even these volatile prices don't reflect the extent of price instability among recyclables culled from different sources of municipal solid waste (MSW). This instability reflects the fact that within the secondary recyclables market, competition is occurring all the time, among a variety of buyers and sellers.

Commercial vs. Residential Recyclables

The term MSW refers to waste generated in human settlements—rather than by industry, agriculture, or other large-scale production operations. Residents account for a little over half of all MSW. The balance is generated by commercial sources, such as offices, restaurants, and other businesses. Recycling from these municipal commercial sources also enters a city's recycling economy (Figure 1-2, page 24).

Figure 1-2
Buyers and Sellers in the Market for Commercial Recyclables



Commercial Recycling comes from **businesses**, including bars, restaurants, stores, and offices. These sources **sell** recyclables to the private carters who collect their waste. Sale takes place either directly or by receiving a reduced fee for refuse hauling.

⇩

Private carters in turn **sell** commercial recyclables to **materials recovery facilities** (MRFs). Sometimes, these same MRFs buy municipal recyclables. Other times, they specialize in processing materials from commercial sources only.

⇩

Because commercial recycling is typically "cleaner" (more homogeneous) than municipal recycling, it has a competitive edge. Color-sorted glass, for example, may not need secondary processing.

⇩

Processed commercial recyclables are sold to **manufacturers** of recycled-content products. Some of these manufacturers buy only commercial recycling; others buy both residential and commercial.

⇩

Processed commercial recyclables are typically used to make higher grade products than processed municipal recyclables.

Commercial recycling is typically collected by private companies (carters), who have contracts with businesses to haul away their waste. In New York City, regulations require businesses to make arrangements with carters for the recovery of designated paper materials, and, in the case of food and beverage establishments, certain kinds of metal, glass, and plastic.[5]

The carters in turn sell these commercial materials to processors, manufacturers, and brokers—often the same ones that accept a municipality's residential recycling. But since businesses tend to generate cleaner and more homogeneous recycling than households, processors frequently prefer to receive material coming from commercial sources. Whether they are bars turning over inventories of bottled beer, offices generating scrap paper, or grocery stores discarding boxes—commercial establishments by their very nature generate higher quality recyclables more consistently than do residents (Photo 1-2). For this reason, the commercial stream of recyclables is more desirable to processors and they will pay more for commercial material. In this competitive scenario, municipalities, which specialize in collecting residential recyclables, lose out.

This in turn can lead to competition among processors located within the same area, who sell their sorted, baled materials to manufacturers on a local market. For instance, if a decorative-tile factory seeks green glass to make its product, and looks around for a local supply source, it may choose to buy recycled glass from a processor that only takes bottles from bars and restaurants, rather than an MRF that handles commingled residential materials (Photo 1-3).

Photo 1-2

Hundreds of commercial carters (top left) provide recycling collection service to thousands of New York City businesses each day. Businesses typically generate cleaner streams of recyclables, as shown in an office building's paper recycling (mostly boxes and white paper—top right) and its commingled container recycling (nearly all water bottles—bottom left). In contrast, residential streams contain a greater mix of materials. Bottom right photo shows residential paper recycling at one of DSNY's processors.

Photo 1-3

Sorted green bottles from a local bar (left). The quality of commercial glass contrasts sharply with what residential glass (right) looks like after it is separated at an MRF from commingled metal, glass, and plastic recyclables.

Another source of competition for processed recyclables is the industrial scrap that manufacturers generate (Photo 1-4). This leftover paper, metal, and plastic from the production process is almost always higher in quality than processed recyclables, and so is often preferred by manufacturers—even over post-consumer commercial recycling.

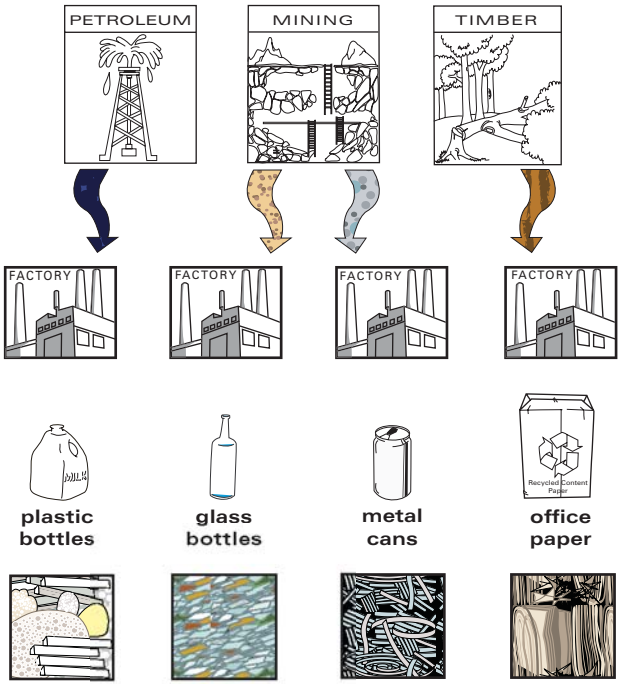
Secondary vs. Primary Materials

Depending on what is being manufactured, sellers of secondary materials also compete with the wide array of businesses engaged in production using virgin materials (Figure 1-3). Virgin prices fluctuate according to the availability of mined, harvested, or extracted resources that are traded globally every day. While they are typically more expensive than secondary materials on a ton-for-ton basis, their superior quality may make them more economical to use. And there are even cases where virgin prices fall to, or below, secondary prices—as surprising as that may sound.

Photo 1-4

Because of its higher quality, manufacturers prefer to use industrial metal and plastic scrap (shown in these pictures) as inputs for their production processes, rather than processed recyclables.

Figure 1-3
Primary Materials Industry as Sources of Competition for Recycling Markets



Most consumer products are made from virgin materials that originally came from **raw materials industries**, such as petroleum, mining, and timber. Petroleum byproducts are used to manufacture plastics. Mining supplies the silica sand to create glass and the metal ore to produce metal products. The pulp to make paper comes from the timber industry.

⇩

Once raw materials are processed, they are **sold to primary (or virgin) manufacturers** who produce products that may be different from, similar to, or the same as products manufactured with recycled content.

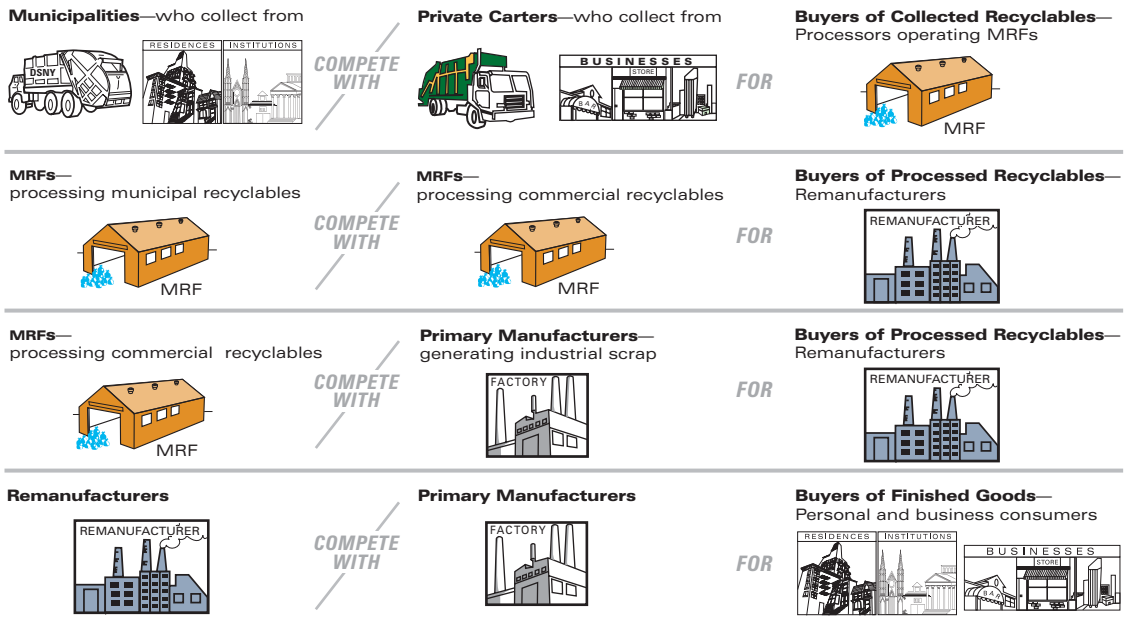
⇩

Virgin products sold to consumers often compete with recycled-content products.

⇩

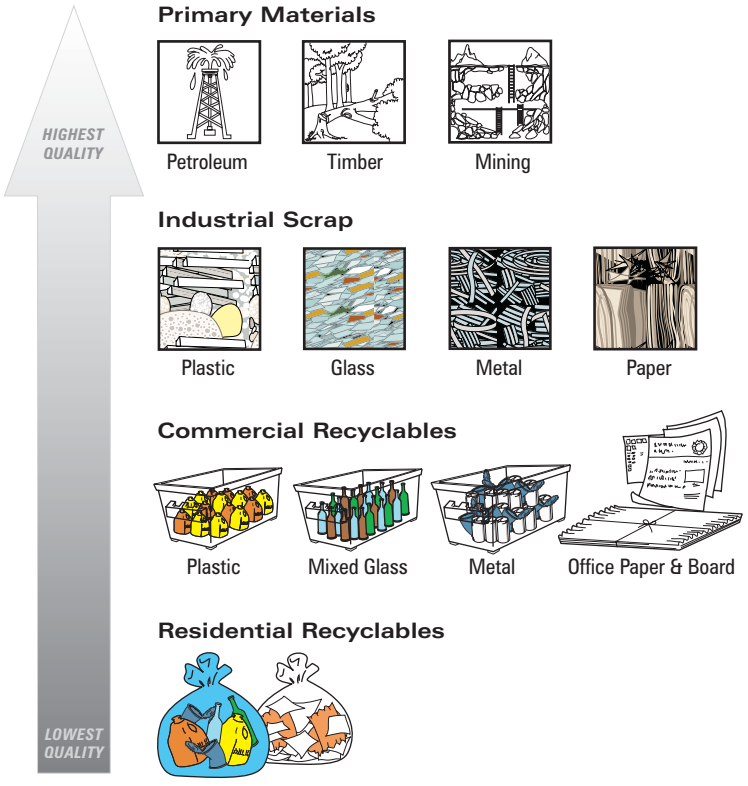
Primary manufacturers also **sell** "industrial scrap," the left-over plastic, glass, metal, and paper from the production process. Industrial scrap is almost always higher in quality than commercial recyclables, and far superior in purity than residential recyclables.

Figure 1-4
Summary of Competition Among Buyers and Sellers



Figures 1-4 and 1-5 summarize how the various buyers and sellers in the recycling market place compete with one another. Due to the lower quality of residential recyclables (compared to commercial recyclables, industrial scrap, or virgin materials), municipalities are in the weakest position. In other words, the recycling that people set out at home, and which the Sanitation Department collects, has a very tough time getting a good price on the market, given the other recyclable materials available for sale. This makes running a residential recycling program more costly, and less stable, than managing a commercial/industrial recycling operation.

Figure 1-5
Quality of Recyclables
in terms of cleanliness, consistency, and suitability for use as an input to production



How Recycling Competes with Disposal

Competition exists not only among recycled and virgin commodity processors and manufacturers, but also from a strong, third rival: waste disposal (Photo 1-5).

If recyclables are commodities which are **sold**, while disposal of refuse at landfills and incinerators costs **money**, then how can it be that recycling competes with disposal? Recycling competes with disposal under two scenarios:

1. On the Municipal Level: Competition via the Local Law

Local laws determine what is "recycling" and what is "refuse" for each municipality. These laws reflect an understanding of the total costs for recycling as the sum of program administration, collection, transport, and processing, plus the sale price for recyclables. Total costs for refuse include program administration, collection, transport, and disposal.

Photo 1-5

Despite the strength of recycling programs, in 2000 around 70 percent of MSW was disposed of in landfills or incinerators.[6]

Total Costs, Per Ton

Recycling	*Refuse*
–Administration	–Administration
–Collection	–Collection
–Transport	–Transport
–Processing	–Disposal
+Revenues from Sale of Recyclables	
TOTAL	TOTAL

Because of economies of scale, collection and transport of refuse usually cost less per ton than collection of recyclables. Administration for recycling programs (due to education and outreach expenses) usually costs more. On the other hand, the sale price for valuable commodities is a revenue, not a cost. This is clearly preferable to the cost of disposing of valuable commodities.

Nonetheless, disposal may still be less expensive than recycling *in total.* This is especially true when commodities have a *negative sale price* (see Figure 1-1), which means that municipalities must pay to have them recycled. For this reason, local recycling laws typically designate materials with positive sale prices, or the potential for positive sale prices, as recyclable.

When disposal costs are low, there is more incentive for laws to count low-value materials as refuse than recycling. Of course, municipalities may still choose to designate low-value materials for environmental reasons, but in those cases it is understood that a greater taxpayer expense will be involved. In this way, recycling and disposal compete economically when local recycling laws are considered and implemented.

2. On the Commercial Level: Competition via the Free Market

Some localities (like New York) also require commercial recycling of high-value commodities via local laws. Many others do not. In purely free-market situations, businesses, or the hauling firms they contract with, will calculate total costs for collection and transport, and weigh them against the sale price of materials for recycling, or the cost of landfilling. In these situations, what ends up as refuse and what is recycled may

change as market conditions change. Here, recycling and disposal are competing economically as part of normal business decisions, with businesses constantly seeking to minimize total waste-management costs.

Consolidation of the Waste-Management Industry

In the United States, a highly consolidated waste disposal-industry competes with recycling for materials and profits—but this competition is far from the free and equal sort envisioned by Adam Smith in his *Wealth of Nations.*[7] A vast number of small recycling businesses—including independent MRFs, recycled commodities brokers, foreign importers, and recycled-content manufacturers confront a waste-management industry dominated by two, large, multinational corporations (Figure 1-6).

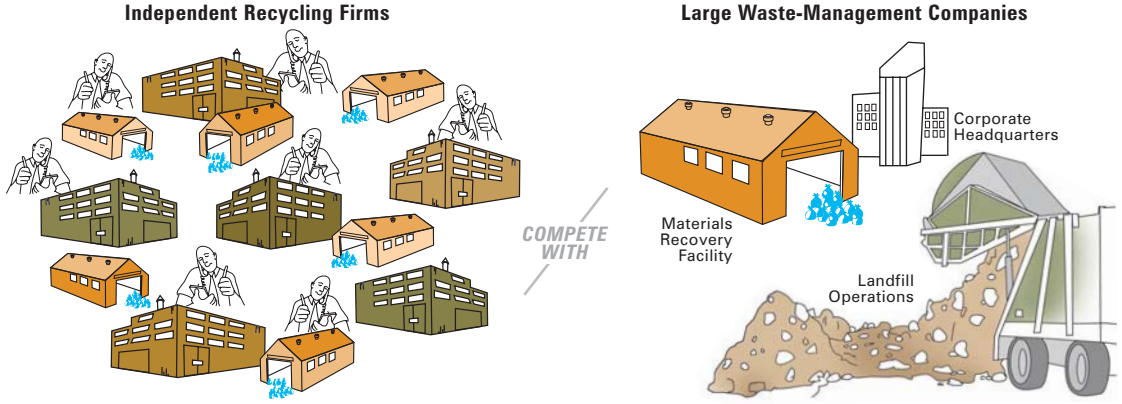
These multinational "waste giants" own numerous landfills across the county, have extremely well-developed transportation networks, and hold disposal contracts with many municipalities. Moreover, they occupy an interesting dual position. On one hand, they clearly consider recycling as a competitor to disposal; on the other, many of these same companies provide recycling services as part of their overall waste management contracts. As reported by Dow Jones:

> Recycling has been a modest money-losing venture for publicly traded solid waste companies such as Waste Management and Allied Waste industries. It is a relatively small part of the companies' revenue (less than 6%)…but it's a significant service because municipalities demand it. Low prices for recycled commodities, however, have hurt companies' bottom lines for the last several quarters.[8]

Another investor news source explains this paradox even more bluntly:

> Although publicly traded waste companies derive a very small portion of their revenues from it, recycling is primarily seen as a competitive threat because it steals volumes away from landfills, their most promising assets. Therefore, we view any declines in recycling as bullish for these stocks.[9]

Figure 1-6
Competition Between Recycling and Waste Disposal



- Intense competition among **many independent recycling firms** stimulates technological development in the area of materials recovery.
- Recycling generates profit for these firms, but disposal of residue is pure cost.
- Recycling is therefore maximized, and disposal minimized.
- **The overall result is *more* and better recycling.**

- The large size and small number of **consolidated waste-management corporations** means less competitive pressure for technological development in the area of materials recovery.
- Both recycling and disposal generate profit for the same parent company, so materials are sent to the less expensive option, which is usually landfilling.
- **The result is *less* recycling, and more disposal.**

A June 2001 article in the industry journal *MSW Management* discussed the implications of such competition between recycling and landfilling, observing that:

> …if consolidators [i.e., large waste management companies] control all of the MRFs in a region, they have the opportunity to increase prices [for processing] above market rates, making recycling look less attractive than it would with true competition.…Do the facts on the ground bear this out? In the last decade, the consolidators' involvement in MRF processing on a weight-adjusted basis has grown from a third to more than half….
>
> [One such company] replies that it serves the needs of its customers and, if its customers want recycling, that is what the company will happily provide. There is an element of truth in this, and that ought to be acknowledged. But what that defense misses is the key difference between continuing the programs that now exist and expanding them to the next level….In much of the U.S., local recycling programs are beginning to report slow deterioration in their recovery fractions.…There's little incentive for recyclers of any stripe to diverge into new programs.[10]

World Markets

Despite the fierce competition and volatility in secondary materials markets, the trade in materials that were once "somebody's" waste is thriving. One of the reasons for this is the fact that one country's discards are another's resource. In fact, the United States is one of the world's largest exporters of recycled materials. Where does it all go?

Canada is a large and steady importer of U.S. newsprint, but Asia makes up the most dynamic and arguably the most important foreign market for U.S. recycled materials overall. China, Japan, South Korea, and Taiwan are low on forest resources, and consequently depend on wastepaper imports for production. At the same time, these countries are rapidly modernizing, and possess a great deal of pent-up demand for materials as their production systems mature.

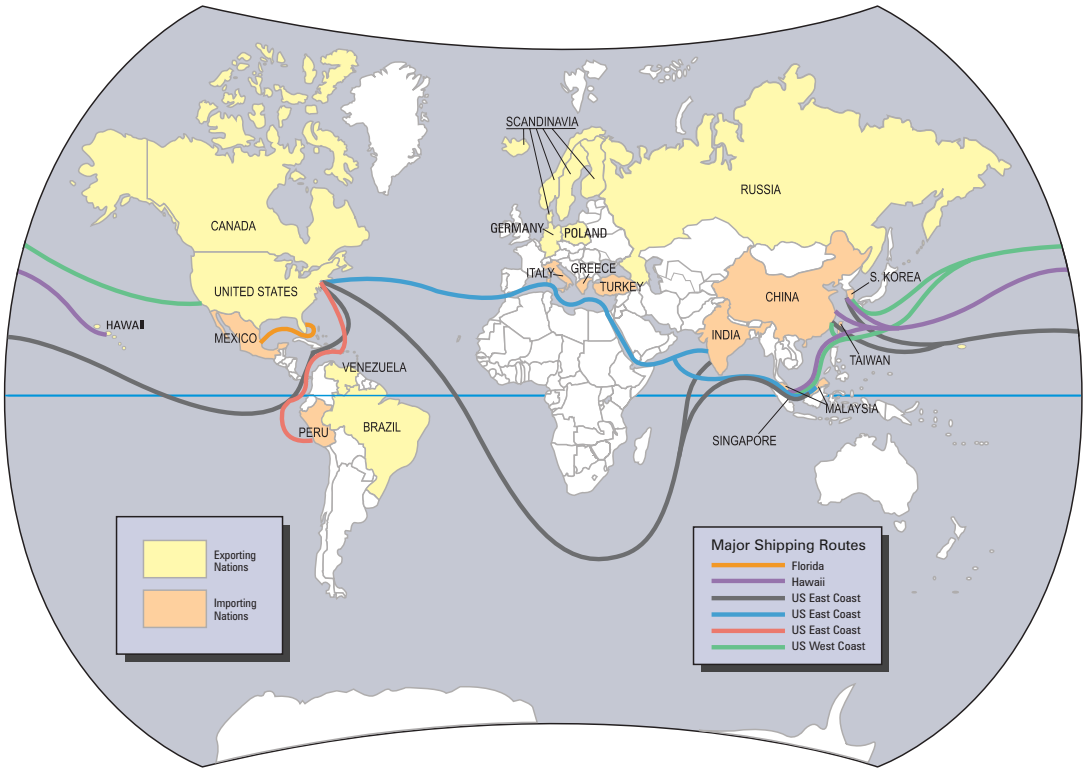
Developing countries in Asia have lower labor and operating costs for processing waste materials, different manufacturing-quality standards, and sometimes looser environmental regulations than do Western industrialized nations. U.S. discards, therefore, represent an essential resource for such economies. In fact, the California Integrated Waste Management Board (CIWMB) observes that "the most important force driving the value of many secondary foreign markets is their importance as primary sources of feedstocks for industrial operations."[11]

The United States' role as a major exporter of recycled materials has been essential to the growth of the recycling industry in this country, and has been crucial in the establishment of regional and national markets at home. However, our dependence on export to sustain robust markets has its downside as well. The U.S. must compete as an exporter with Europe, whose high levels of affluence, strong environmental regulations, and well-established municipal recycling programs make it a formidable opponent—especially among markets on the east coast (Figure 1-7).

As a result, the U.S. recycled-materials markets ride highs and lows that are closely related to economic conditions in other countries and our nation's overall balance of foreign trade. Factors such as currency exchange rates, commodity stockpiling by foreign buyers, and the availability of technology lead to periods in which the U.S. finds it more or less difficult to export its surplus recycled materials to other countries.

Figure 1-7
Markets for U.S. Exports of Recyclables

East and west coasts of the United States compete with Canada, as well as with exporting nations in northern Europe and South America, for markets in Asia, southern Europe, and Latin America.



One interesting variable affecting overseas trade in recycled materials is the availability of cargo-shipping containers at any given time (Photo 1-6). When the U.S. economy is strong, there are more imports of goods from abroad. Exporting recycled materials becomes very cost-effective if these same containers can be used to send recovered materials back. When the U.S. economy slows down, shortages of these containers lead to an oversupply of recycled materials at home. Prices for these materials then fall.

Unlike most commodities, the supply of residential recyclables cannot be controlled in response to fluctuations in demand—people put their paper, metal, glass, and plastic out every day, no matter what the economy is doing. Slower economic periods mean "downtime" for factories, due to reduced demand for finished products. When this happens, the whole manufacturing system backs up. Recycled materials accumulate in stockpiles, which results in lower prices when the economy gets going again.

Photo 1-6

In good economic times, there are stockpiles of cargo-shipping containers due to the import of goods from abroad. Exporting recycled materials becomes very cost-effective if these same containers can be used to export recovered recyclables.

Regional Factors

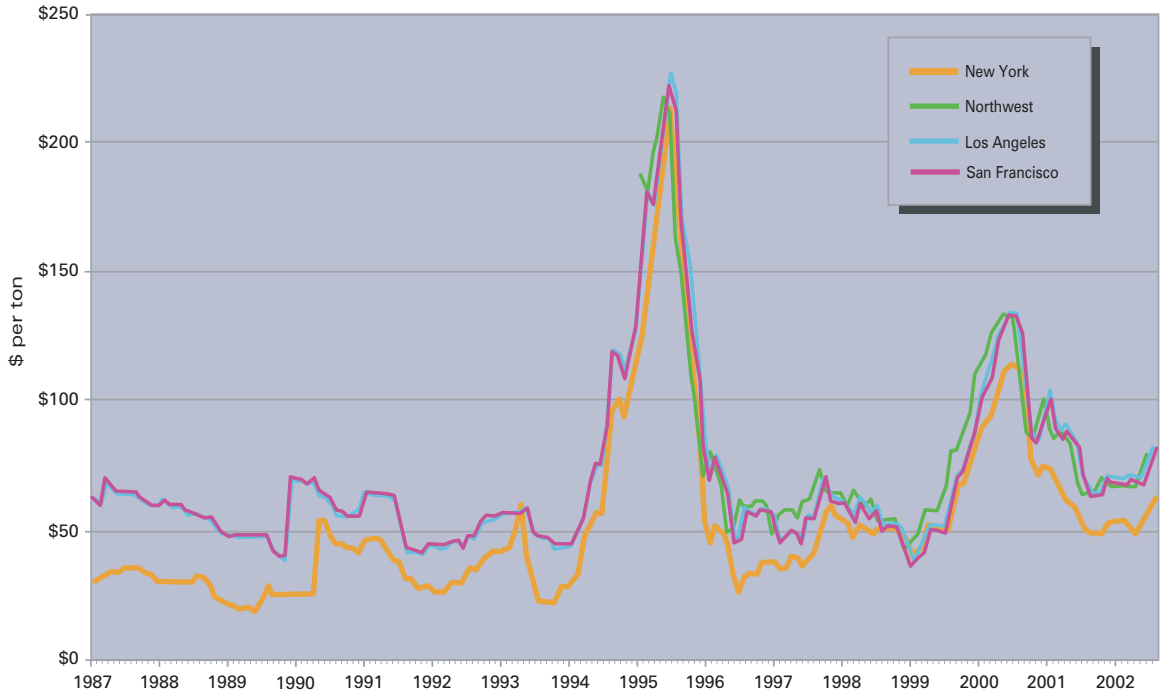
Although states throughout the U.S. have equal access to land-based trade in recycled materials with Canada, west coast states—notably California, Oregon, and Washington, benefit from access to ports heavily engaged in Asian trade (Figure 1-7). East coast states, whose natural market is Europe, lack this advantage due to northern Europe's status as a recycled-material exporter, not importer.

Charts 1-5 and 1-6 show differences in market prices over time for paper and MGP respectively for the New York region compared with west coast regions. While New York follows the same price fluctuations as the west coast, prices for recycled materials in the New York region are consistently lower.

Less densely developed areas of the U.S. (the west, midwest, and south) also compete with the congested regions of the northeast in terms of transportation and storage costs, giving them an advantage over the northeast. In fact, northeastern prices for paper, green glass, and HDPE have consistently come in lower than other regions for the past twenty years.

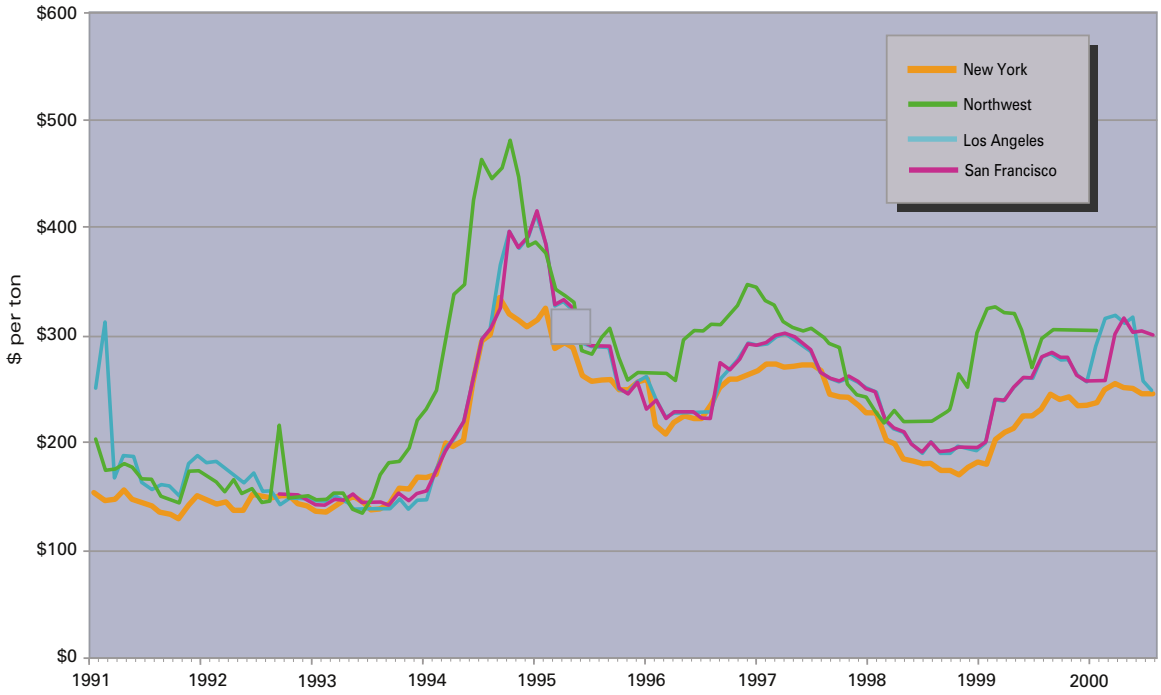
State-level legislation, particularly recycled-content requirements, also contributes to regional market differences. State-sponsored, recycled-content requirements, which force producers of certain products in a state to utilize recycled materials in their production processes, builds demand for secondary materials locally. California is one of nine states to impose minimum recycled-content requirements for manufacturers of certain kinds of plastic, glass, or paper products. Its large size and particularly comprehensive laws, combined with the advantage it enjoys from access to Asian exports, make markets in this state remarkably robust.

Chart 1-5
Comparison of Paper Prices in New York Region to West Coast Regions
Average of Mixed Paper, Newspaper #6, Newspaper #8, Corrugated Cardboard, and White Office Paper



Source: *Official Board Markets*. See "Notes to Illustrations" for information on pricing data.

Chart 1-6
Comparison of MGP Prices in New York Region to West Coast Regions
Average of Steel Cans, Aluminum Cans, Natural HDPE, Mixed HDPE, Mixed PET, Clear Glass, Green Glass, and Brown Glass



Source: *Recycling Manager*. See "Notes to Illustrations" for information on pricing data.

Other government initiatives—including deposit legislation, environmentally preferable purchasing, and economic development policies—are widely held to be beneficial in strengthening recycling markets and recycling rates. These, as well as other government initiatives, are discussed in more detail in the next section.

Government Intervention into Markets

In the United States, government intervention into free-market activity usually must be justified. Even if the opposition of affected businesses can be overcome, it is politically unwise for government to intervene unless there is a real and demonstrated social need that unregulated markets are clearly failing to meet. In the case of recycling, this need is—stated broadly—environmental and public health protection, as well as the avoidance of the cost and nuisance of refuse disposal.

A host of federal and state laws, including the federal Resource Conservation and Recovery Act (RCRA), set guidelines for waste transport and disposal, controlling their environmental impacts. These landmark laws, enacted in the 1970s and early 1980s, represent the most direct form of government intervention into waste management. Since they were put into place, landfill and other disposal costs have increased dramatically, giving recycling an edge. In fact, the early success of recycling can be attributed to the sudden jump in landfill fees brought on by strict environmental controls like RCRA and its state-level equivalents.

Government intervention since then has taken a different form, however. Federal, state, and local governments have endeavored to strengthen recycled-materials markets through a number of legislative mechanisms that

aim to increase the flow of recycled materials through the marketplace and/or spur demand for such materials. These include:

- Recycling mandates
- Container deposits (Bottle Bills)
- Government procurement mandates
- Recycled-content requirements

Each of these legislative actions is designed to make recycling more competitive in the materials economy. On this topic, there is a great deal of literature in the field of environmental planning and management that describes *how* such policies are supposed to work, presents case studies of successful implementation, and demonstrates how the recycling sector has, as these policies have been implemented over the 1990s, grown prodigiously.[12] There is, however, much less in the way of evaluation of such policies' overall impact on prices or markets, especially against larger economic forces that create volatility. There is not much research on the role of scale in policy implementation either. Programs enacted at the state level, for instance, may generate secondary effects that interfere with the success of municipal recycling programs. A full discussion of these issues as they pertain to each policy initiative follows.

Recycling Mandates and Goals

At the federal, state, and local level, the use of recycling mandates or goals is widespread. In 2000, President Clinton issued a nationwide recycling goal of 25 percent[13] which, by many accounts, appears to have been attained on average.[14] Most states set mandatory or voluntary recycling rates (as shown in Table AI-1 in Appendix I), as do many counties and localities. New York City, for instance, imposed what was in effect a 25 percent recycling mandate in 1989 at the inception of its curbside program.

The obvious purpose of recycling mandates or goals is to set priorities for public agencies, and hold them accountable for implementing successful programs. Mandates and goals set benchmarks against which agency performance can be evaluated, and if necessary, improved. In a few states, producers of certain products also fall under mandates. The state of California, for instance, requires manufacturers of plastic and glass containers and newsprint to maintain certain recycling rates statewide for their products or face additional regulatory burdens.

The point of recycling mandates and goals is to increase diversion of materials from disposal. For municipalities, greater rates of recycling improve collection productivity, as trucks need to drive shorter distances before they fill up. By increasing the recycling rate, states and municipalities also hope to save money by avoiding disposal costs and generating revenues from the sale of what is collected. If increased supply actually stimulates demand, this may eventually lead to a growth in local or statewide processing capacity and recycled-manufacturing industries.

This is, at least, how it is supposed to work. But as real market conditions in the U.S. have shown, increases in supply often depress prices. When this occurs, revenues to municipalities fall and disposal becomes a more cost-competitive alternative. In the long-run, "hanging in there" with sustained, high recycling rates does indeed lead to development of processing capacity. This puts cities in a good position for an eventual rebound in markets. The question is then how long municipalities can afford to wait out such periods. Doing so requires a strong commitment at the local and state level to maintaining funding for municipal programs even when they "appear" to be losing money.

Container Deposits (Bottle Bills)

Eleven states—California, Connecticut, Hawaii, Iowa, Maine, Maryland, Massachusetts, Michigan, New York, Oregon, and Vermont—currently sponsor legislation that requires beverage container manufacturers and/or distributors to charge a deposit on the bottles and cans they sell (Photo 1-7). Residents pay a surcharge to retailers at the point of purchase, redeemable by returning intact empties. Distributors are in turn required to collect and transport empty containers, taking responsibility for them from there. Bottle Bills are highly efficient and impose few costs on public agencies. Combined, they account for between 5 and 15 percent of total materials recovery in the states they cover.[15]

As opposed to curbside collection, Bottle Bill redemption yields a relatively clean and well-sorted stream of aluminum cans and PET bottles, as well as color-sorted glass containers that drastically reduces processing costs and improves the marketability of what is recovered (Photo 1-8). For this reason, they are hailed as one of recycling's great success stories.

Most states, including New York, allow distributors to keep unredeemed deposits. Amounts can be sizeable and represent a windfall for producers. California's deposit system stands in stark contrast to other examples in this regard. There, the state government, and not the retailers, administers redemption and retains unclaimed deposits, which are used to fund local waste-management programs. Revenues lost from curbside aluminum recycling are thus redistributed, while the State directs redeemed containers towards recycling.

Government Procurement Mandates

In the United States, consumers—whether individuals or businesses—can only be encouraged, not required, to alter their purchasing decisions. A variety of economic incentives, including taxes and subsidies that are passed on to the consumer, use the price mechanism to steer purchasing in one way or another. But the state cannot command private consumers to buy more or less of a good. This would interfere with the freedoms of choice and expression that are the cornerstones of American democracy.

Photo 1-7

These soda bottles are redeemable in New York and Connecticut for five cents each.

Photo 1-8

Bottles and cans are sorted and compacted during the redemption process. The result is a far cleaner stream than curbside collection.

The government sector, in contrast, represents one area in which large-scale purchasing *can* be directly affected by public policy. The EPA's Comprehensive Procurement Guidelines, imposed in 1995 and strengthened several times since then, are designed to orient the vast purchasing power of federal agencies towards recycled products. While neither the EPA nor other federal agencies are authorized to enforce these guidelines, some provisions exist for its evaluation and oversight when the EPA conducts federal facility inspections.

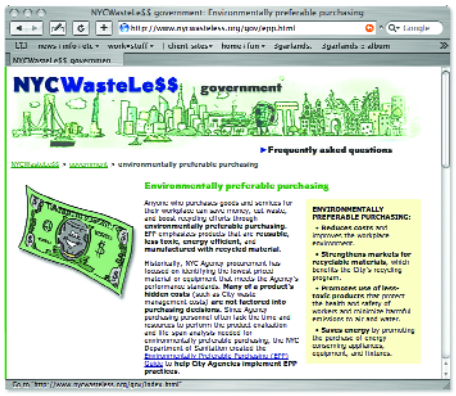
Many states and localities impose their own environmentally preferable procurement policies. Typically, they require government agencies to purchase recycled-content, low-energy, or other environmentally preferable goods—provided the products meet certain standards and agency performance is not undermined. The purpose of procurement mandates and guidelines is to stimulate demand for recycled materials both directly—through the market mechanism of purchasing—and indirectly by encouraging new recycled-content manufacturers.

What are the impacts of such policies? Few if any evaluations of the direct relation between government purchasing practices and market prices exist. It is likely that the recycled office paper industry—for which substantial capacity already exists and which represents a major budget item for public agencies—has benefitted from such programs. For other markets, it is simply too early to evaluate the impact, and it remains possible that government purchases—while potentially vast in scope—are still too small to affect markets in the face of global and domestic forces.

NYC Local Law 19: Purchase of Recycled Products

Chapter 3 of Local Law 19, originally enacted in 1989, is also known as the New York City Recycling Law. The law establishes the *"policy of the city to promote the recovery of materials from the New York City solid waste stream for the purpose of recycling such materials and returning them to the economy."* Subchapter 5 addresses the City Purchase of Recycled Products.

DSNY promotes this aspect of Local Law 19, as well as encouraging other forms of Environmentally Preferable Purchasing, on its NYCWasteLe$$ website: www.nycwasteless.org.



At the municipal level, instituting environmentally preferable procurement policies may (or may not) save agencies money, but may also provide a powerful symbolic support for the local recycling effort and recycling in general. At the same time, such policies are not likely to affect the success or failure of that municipality's recycling program without comprehensive coordination of production and consumption at a local and even regional level. In other words, there has to be a robust infrastructure of plants able to use a municipality's recycled inputs, and then to produce goods that the municipality's government can actually use. Such a "closed loop" urban vision is immensely appealing but has yet to be realized in any large-scale, sustained manner in the United States. What is far more likely, and what has indeed occurred, is that municipal recyclables enter a much larger and complex market that spans domestic and international markets.

Recycled-content Requirements

One method that has been successfully used to close the loop at the state level is recycled-content manufacturing laws. Such arrangements typically require or encourage producers of a certain good to use a set

minimum percentage of recycled feedstock in products made, distributed, and in some cases just sold, in that state. Table 1-3 summarizes the states (or district) that currently have recycled-content laws and the products that these laws cover.

Table 1-3
Recycled-Content Laws

State/District	*Product*	*Content*	*Goal Date*
Arizona	newsprint	20%	2000
California	fiberglass insulation	30%	1995
	plastic trash bags	30%	1995
	rigid plastic packaging containers	25%	1995
	glass containers	35%	1996
	newsprint	20%	2000
Connecticut	newsprint	45%	1999
	telephone books	35%	2001
Illinois	newsprint	28%	1993
Maryland	newsprint	35%	2003–4
	telephone directories	35%	2003–4
Missouri	newsprint	50%	2000
Oregon	rigid-plastic packaging containers	25%	1995
	telephone books	25%	1995
	glass containers	50%	2002
	newsprint	7.5%	1995
Washington, D.C.	high-grade paper	50%	1994
	tissue	5–40%	1994
	unbleached packaging	5–35%	1994
	newsprint	40%	1998
Wisconsin	rigid-plastic packaging containers	10%	1995
	newsprint	40%	2003

Source: Grassroots Recycling Network. *Wasting and Recycling in the United States 2000* (ISLR: Washington, D.C., 2000).

Mandatory recycled-content provisions are most prevalent in the case of newsprint. The states of Arizona, California, Connecticut, the District of Columbia, Illinois, Oregon, Maryland, Missouri, and Wisconsin have goals or requirements for newsprint production that range between 7.5 to 50 percent.

Less common are regulations targeting plastic, glass, and other materials. The states of Oregon, Wisconsin, and California mandate minimum-recycled content in rigid-plastic packaging containers (RPPCs). Typically these laws target beverage and non-food vessels, exempting products containing substances regulated by the Food and Drug Administration. Wisconsin's law requires a 10-percent-recycled content in such packaging, although it allows the counting of pre-consumer scrap toward this requirement. In Oregon, if the annual, state recycling rate for RPPCs falls below 25 percent, individual manufacturers must demonstrate this level of recycled post-consumer content in their products. Alternately, they may show that their product is consistently reused a minimum of five times, or that it is by itself recycled at a rate that exceeds 25 percent.

A similar, but more comprehensive, law applies in California, which a recent review of recycled-content mandates dubbed as having "the most complicated RPPC law and…the only state to have taken enforcement action."[16] The California Integrated Waste Management Board (CIWMB) monitors and enforces content regulations using a combination of periodic waste-characterization data, manufacturer reporting requirements, and sales-data analysis. The laws apply to all "product manufacturers" in the state, including distributors and importers. According to the CIWMB: "A company must comply…if it manufactures, distributes, or imports a product that is packaged in an RPPC and is sold or offered for sale in CA, and if its company name is on the container label."[17]

Like Oregon, if the CIWMB determines that the statewide recycling rate for RPPCs is above 25 percent, all companies are deemed in compliance—with the exception of PET rigid containers, which must reach a recycling rate of 55 percent. Otherwise, manufacturers must show at least a 25-percent post-consumer content or five-plus times refill use. California also offers the option of light weighting products by 10 percent in place of content requirements.

California is also unique in the nation in applying similar requirements for glass product manufacture. The CIWMB writes that, "The demand for cullet in California is driven primarily by the production rates of California's glass food and beverage container and fiberglass manufacturing industries and the State's minimum content requirements for (glass) food and beverage containers and fiberglass."[18] By law, fiberglass producers have to use at least 30 percent post-consumer cullet for insulation made or sold in California, and manufacturers of glass food and drink containers must use at least 35 percent. The state applies similar content requirements to plastic trash bags as well.

California stands alone in its integration of recycled-content requirements with state agency procurement mandates. The state's Public Contract code requires all product suppliers to certify the recycled content of products offered or sold to the government. The State Agency Buy Recycled mandate in turn requires agencies to purchase recycled-content products representing at least 50 percent of dollars spent on products within ten product categories. These include printing and writing products, paper products, compost, glass products, lubricating oils, paint, solvents, tires, tire-derived products, steel products, and plastic products (including toner cartridges, diskettes, carpet, office products, hoses, and other uses besides containers). This linking of recycled-content mandates with government procurement requirements represents a rare case of a geographically "closed loop" materials economy, albeit at the level of the state and not the municipality.

In California, as elsewhere, manufacturers have in some cases attempted to evade the law by altering container and product characteristics so as to be excluded from regulation (for example, switching from rigid to flexible containers), and have also complained about the impact of content requirements on product quality. An alternative typically preferred by industry is the *voluntary* recycled-content agreement, which may be facilitated at the state level or nationwide within a certain industry or corporation. An example of a state-organized voluntary approach can be seen in New York, where a 1989 accord among the top eleven newsprint producers in the state led to increases in post-consumer recycled content in this product, and has, according to the NYS DEC, resulted in significant investment in recycled newsprint de-inking capacity nationwide.[19] It should be noted, however, that there are still no recycled-newsprint mills located in New York State. As is often the case in the absence of mandates, the economic opportunities afforded are at a national, rather than a state or local, scale.

A number of major manufacturers have made voluntary commitments to manufacture their products using post-consumer recycled content. The Coca-Cola company, for instance, pledged in 1990 to aim for a 25-percent recycled content for its bottles produced in North America, although as of yet it has attained only 7.5 percent.[20] Trade associations representing fiberglass, container, and other product industries frequently announce voluntary recycled-content goals. And where markets are strong and the economics are right, it would appear that the growth of municipal recycling has enabled private industry to voluntarily meet such goals. For example, the American Forest and Paper Association reports that:

> The forest and paper products industry is committed to recycling and has made it a goal to recover 50% of all paper used in the U.S. With the help of millions of Americans who recycle, our industry is quickly approaching this goal. Since the early 1990's companies have invested an estimated $10 billion in new recycling capacity in order to meet the demands for the increased use of recovered fiber. It is estimated that 83% of U.S. paper makers use recovered fiber to manufacture new paper products.[21]

Local Economic Development

Recycling mandates, container deposits (Bottle Bills), agency procurement mandates, and recycled-content requirements are mechanisms for direct government intervention into the recycling market. Each uses laws or goals to alter the balance of supply and demand of recycled materials that prevails at any time. The result, it is hoped, will in the short run be better prices for recyclable materials and supply conditions favorable to industrial development. In the long run, the point of such initiatives is overall growth of recycling industries nationwide.

Local economic development initiatives (Graphic 1-3, page 40) operate on the same general principle, but endeavor to keep the tax revenues, jobs, and positive spillover effects from recycling industries rooted to the municipality, the region, the county, or the state. By and large, they involve programs that reduce the costs associated with starting and operating a private recycling business. These include:

- Tax incentives—the suspension or reduction of property and other local/state taxes
- Grants-in-aid, usually directed to certain expenditures
- Reductions in electricity costs, labor agreements, and real property costs through a third party, with whom the government brokers an agreement

- Technical and bureaucratic assistance with permitting, research and development, and other tasks

- Low-interest and/or tax-free loans

- City contracts that relinquish revenue from sale of municipally collected recyclables to processors, as well as guaranteed minimum-amount provisions that assure processors of a monthly tonnage of recyclables

Graphic 1-3

The New York City Economic Development Corporation and the Empire State Development Corporation are among the agencies that participate in local economic development in New York City.

In some cases, government programs seek to "close the loop"—to facilitate situations in which "locally-generated recyclables are collected, processed in local or regional plants, sold to local remanufacturers, and the end-products are purchased by local private or municipal consumers."[22] This approach sometimes works for businesses targeting deconstruction materials, used clothing, and other reuse items—albeit in very small tonnages. Usually, however, when local economic development assistance is tied to remanufacturing, it ends up assisting businesses that take in feedstock from outside the locality, and who frequently market their end products outside city limits as well. While such projects create jobs and taxes, they do not usually offer outlets for municipal recyclables, which have to seek wider markets throughout the country, and the world.

Chapter Conclusion: Applied Economics

Understanding New York City's position in the larger materials economy is essential to solid-waste–management planning. Given our present political system, it is crucial to recognize that market forces drive recycling in the United States. Citizen and government initiatives have to work around these forces—which themselves reflect the ups and downs of the economy at large.

Market prices fluctuate a great deal, presenting challenges to business and governments alike. The causes of such fluctuation are complex. Supply of and demand for recycled materials and the finished goods made from them ebbs and flows globally, nationally, regionally, and locally. Fluctuating prices reflect constant shifts in who will buy what, and what they will manufacture. In this framework, residential recycling must compete at three distinct levels. A city's residential recyclables compete with its commercial waste for local buyers. Firms manufacturing products from recycled inputs compete both with each other and with virgin producers. Recycling as a waste-management option furthermore competes with refuse disposal, both locally and regionally.

Although it may sound obvious, it is important to keep in mind that New York City is simultaneously within New York State, the greater New York area encompassing New Jersey and Connecticut, on the eastern seaboard, and in the U.S. It is also a player in a globalized economy. The City must adhere to the laws of New York State

and ultimately the federal government. At times, it also benefits from federal and State programs. But economically, trade in recycled materials around the city ignores official borders, moving across state lines and even overseas (Photo 1-9).

In the next chapter, the history of the City's recycling program shows the relevance of this economic background. Like the firms engaged in processing, brokering, or manufacturing with recyclables, New York City has had to grapple with a turbulent, competitive market in materials that spans the globe.

Photo 1-9

An ocean-going vessel at one of New York City's recycling processors prepares to ship scrap metal to overseas markets.