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# **MINIMIZING WASTE MAXIMIZING RECYCLING**

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Environmentally Sound Economic Development

# MINIMIZING WASTE MAXIMIZING RECYCLING

Prepared for:

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## INSTITUTE FOR LOCAL SELF-RELIANCE

The Institute for Local Self-Reliance (ILSR) is a nonprofit research and educational organization that provides technical assistance and information to government, citizen organizations, and industry. Since 1974, ILSR has researched the technical feasibility and commercial viability of environmentally sound, state-of-the-art technologies with a view to strengthening local economies. ILSR works to involve citizens, government, and private enterprise in the development of a comprehensive materials policy oriented towards efficiency, recycling, and maximum utilization of renewable energy sources.

This document is one in a series of manuals prepared for the National Capital Area Project. The five manuals listed below are available from the Institute for Local Self-Reliance's (ILSR's) National Office:

*Recycling Economic Development through Scrap-Based Manufacturing*

*Minimizing Waste, Maximizing Recycling*

*Creating Local Recycling Markets*

*Expanding Scrap-Based Manufacturing through the Community Joint-Venture Process*

*Preparing a Business Plan for a Small-Scale Recycling-Related Venture*

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## INTRODUCTION

The linkages between recycling and local economic development are increasingly becoming accepted and understood. Building a national scrap-based manufacturing industry is key to realizing the economic benefits of recycling. To do this, we must first ensure efficient, cost-effective recovery of materials from our waste stream. This booklet identifies steps that contribute to high levels of waste reduction and materials recovery. It is not intended as a "how-to" manual to guide decision-makers through implementation steps. Rather it focuses on what initiatives decision-makers need to consider in order to maximize waste reduction and highlights communities that have already undertaken such strategies.

### INITIATIVES TO MAXIMIZE WASTE REDUCTION

- √ Implement waste prevention strategies.
- √ Target a wide range of materials for recovery.
- √ Offer convenient service (curbside and drop-off collection).
- √ Employ collection and processing techniques that facilitate resident participation as well as yield high-quality materials.
- √ Establish strong economic incentives.
- √ Collect source-separated yard waste for composting.
- √ Encourage backyard composting.
- √ Extend programs to the commercial and institutional sectors.

Source: Institute for Local Self-Reliance, 1994.

Market development is clearly essential if collected and processed materials are actually to be utilized. The companion manuals—*Creating Local Recycling Markets* and *Expanding Scrap-Based Manufacturing through the Community Joint-Venture Process*—focus on how communities can develop and expand markets for recyclable materials.

## WASTE PREVENTION STRATEGIES

Preventing waste generation saves money in waste hauling, disposal, and recycling fees; conserves valuable landfill space; and reduces energy and resource use as well as pollution. While recycling diverts waste from disposal, waste prevention (also known as source reduction) reduces the amount and/or toxicity of material entering the waste stream.

When waste collection service is publicly provided, local government can benefit from direct cost savings. Even where municipal trash and recyclables collection is the exception rather than the rule—as is the case in many parts of central Virginia—local government can help educate homeowners of the potential benefits and savings to them. For instance, one study found that tomatoes wrapped in packaging cost 24 percent more than those sold without packaging.<sup>1</sup>

Preventing the generation of waste means reducing the use or consumption of materials. To do this, we need to:

- substitute reusable and durable materials and products for single-use and disposable ones at all levels of use (manufacturing, packaging, transportation, retail, household);
- use fewer resources per product in manufacturing and packaging; and
- use fewer resources to perform everyday functions at the household, institutional, and commercial levels.

All of us have an important role to play in reducing materials use or consumption (citizens, institutions, businesses, and manufacturers). There has been a recent groundswell of activity on the part of individual product manufacturers, businesses, and institutions to reduce their waste through purchasing decisions, product redesign, substitution of reusable products for disposables, and the elimination of unnecessary materials. (See sidebar, page 3.) These efforts exemplify the tremendous potential for source reduction and the savings that can be realized through more efficient use of materials.

While local communities frequently lack control over decisions regarding product design and manufacture, state governments can wield considerable influence over these decisions. Local governments can also do much to prevent waste.

#### **STEP 1 – HELP CITIZENS, BUSINESSES, AND INSTITUTIONS REDUCE THEIR WASTES**

Source reduction education can target children through in-school curricula, consumers through

supermarket shelf labeling and informational brochures, and businesses through waste audits and other technical assistance. These programs can be undertaken at both the state and local levels. The impact of educating consumers through “precycling” campaigns can be significant. A pilot program in Berlin, Germany, showed that household waste was reduced by 21 percent through consumer education alone.<sup>2</sup>

Information disclosure at the point of purchase, including shelf and product labeling, encourages consumers to select products that advance source reduction and recycling goals. Some states, such as Rhode Island and New York, have implemented labeling programs to identify and promote products that are reusable, recyclable, and/or made from secondary materials. Similar projects could be undertaken at the local level.

Educational outreach can play an important role in reducing the number of specific items discarded every year. Consider tires as one example: car owners and operators could be informed that simple tire maintenance such as proper inflation, maintenance, and frequent inspection for road damage is a source reduction strategy that could cut in half the number of discarded tires. Ratings compiled by the Center for Auto Safety show the longest lasting ordinary tire at 80,000 miles and the longest lasting high performance tires at 68,000 miles. The average American car owner, however, gets just 35,000 to 40,000 miles of use from a tire.<sup>3</sup>



## GOVERNMENT AND INSTITUTIONS TAKE ACTION TO PREVENT WASTE AT THE SOURCE

**Berkeley, California:** In 1989, Berkeley was the first U.S. city to start an intensive "precycling" program, which encourages residents to purchase products packaged in recyclable materials, to avoid purchase of disposable products and products in multiple layers of packaging, and to buy in bulk. Residents are also encouraged to reuse and repair products. Drawing on information provided by local environmental and recycling groups, the Berkeley Department of Public Works promotes the precycling concept through fliers and newspaper advertisements. The city also encourages local merchants and restaurants to offer discounts to customers who bring their own containers and who use reusable napkins and silverware.

**Portland, Oregon:** The Bess Kaiser and Kaiser Sunnyside Medical Centers in Portland, Oregon, have mandated the use of cloth diapers in an effort to reduce solid waste. Sixty of the 64 hospitals in the Seattle region now use cloth rather than disposable diapers in maternity and pediatric wards.

**Itasca County, Minnesota:** The county courthouse and 16 road and bridge department garages reduced the amount of trash generated last year by about 10 percent. The county cleaned and reused the 60 stainless steel air filters in the furnaces and air filtration systems in its garages and the courthouse, and replaced disposable drinking cups with reusable ones. The switch to reusable furnace and air filters saved the county over \$4,700 per year and has reduced its waste by 1,040 pounds per year. The courthouse also substituted cloth roll towels for the paper towels in its restrooms. This avoided the landfill disposal of 30.24 cubic yards of waste and saved \$971. Employees at the county courthouse reduced junk mail by sending preprinted postcards to the generators asking to be removed from mailing lists. Mailing 1,000 postcards cost \$173. In the Itasca County zoning office and human resources office, the junk mail dropped from 8 pounds per week prior to the mailing to 1.5 pounds per week afterwards. The county also photocopied on both sides of the paper and bound scratch pads from papers used on only one side.

**Champaign, Illinois:** A local environmental organization, the Central States Education Center in Champaign, Illinois, designed a series of labels for local supermarkets that identify "least-waste packaging" and recyclable products. The Center held an educational conference on national waste reduction activities, and has established model schools, restaurants, copy shops, and newspapers in the area. In the CSEC's Model Schools, students are encouraged to minimize the amount of packaging in their lunch boxes. One Illinois school reports that, as a result of these efforts, average lunchroom garbage decreased by one-third, from 60 to 40 pounds per day. Many children now bring their lunch in reusable rather than disposable containers.

**Monroe, Wisconsin:** The town actively encourages local businesses and institutions to reduce waste generation. Through educational outreach alone, the Monroe Area Recycling Committee convinced area schools to switch from disposable polystyrene foam trays to reusable plastic trays. One elementary school estimates that this switch has reduced by 75 percent the volume of trash generated on an average day.

**Alt-Erlaa, Austria:** To promote waste avoidance, Alt-Erlaa in Vienna, Austria, carried out a novel education project—Ideas Instead of Waste—which has reduced total waste volumes by 7 percent. To raise public awareness, 25 volunteers were trained and became teachers, spreading the word on how to reduce waste. The campaign focused on promoting refillables and environmentally friendly products.

Sources: Institute for Local Self-Reliance, 1994; "Precycle: Do it Right from the Start," City of Newark Recycling; Susan Okie, "The Disposable Society's 16-Billion Diaper Question," *Washington Post*, January 8, 1990; Anne Magnuson, "What Has Happened to Waste Reduction," *American City and County*, April 1991; "Itasca County Prevents Waste and Saves Money," *Reusable News*, U.S. Environmental Protection Agency, EPA/530-N-92-001, Spring 1992, page 4; Central States Education Center, *Waste Reduction and the Model Community*, Champaign, Illinois, 1989, page 3; Becky Stanfield, "Towards a Model Community," *Model Community Update*, Central States Education Center, Champaign, Illinois, September 1991; "Small Steps in the Right Direction," *Warmer Bulletin*, August 1992, page 8.

Citizens, businesses, and institutions frequently need information and guidance to successfully develop source reduction measures. Technical assistance programs that include an information clearinghouse, model source reduction programs, and waste audits are vitally needed.

Government agencies could fill this need, letting people know what works and what does not. Citizens, businesses, and institutions could turn to a government database of waste prevention initiatives and their operating experiences.

A related strategy would be for local government to identify, develop, or otherwise support model source reduction programs and share their successes with those who would benefit the most from them. This could be done via electronic means, on internet, via newsletters, or via conferences at the state or local level.

Local governments could also facilitate waste audits by either providing handbooks to generators on how to conduct waste audits or actually having city staff or consultants conduct these. Waste audits look at how and what types of wastes are generated. With this information in hand, auditors or waste generators can then design specific source reduction measures.

## **STEP 2 – CONSIDER IMPLEMENTATION OF VOLUME- OR WEIGHT-BASED REFUSE COLLECTION FEES**

Volume-based refuse collection fees (through per-can or per-bag fees) are a direct economic incentive for

waste generators to reduce their refuse as much as possible and recycle what's left. Volume-based fees, which embrace the "polluter pays" principle, are needed to link waste generation behavior to the costs of waste collection and disposal. Currently, waste disposal fees are often hidden in property taxes.

There are two basic types of volume-based refuse systems. In one, residents are charged a per-bag fee and must purchase special bags or tags to place on bags. In the second, residents choose among refuse containers with varying capacities, and pay substantially more to set out the larger ones.

Weight-based billing systems can provide fair and flexible billing incentives. The City of Farmington is trying to develop a weight-based rate system in which its existing side loading trucks are retrofitted with scales and computers to monitor the weight of garbage containers from each residence on the collection route. The information would be stored in a computer for quarterly billing. The estimated cost of the equipment is \$8,000 to \$11,000 per truck and \$4,000 to \$6,000 per office/mainframe computer.<sup>4</sup>

Seattle has also tested residential weight-based refuse collection rates in order to determine if significant technical, labor, time, legal, or cost barriers to such a system exist. Results of the pilot were favorable and showed that weight-based rates could be a practical option within the next few years, especially with the advent of more sophisticated garbage weight metering systems. In Seattle, the

### VOLUME-BASED REFUSE COLLECTION FEES HELP REDUCE WASTE AND SPUR RECYCLING

Volume-based refuse collection fee systems were first introduced in California (Richmond and Berkeley started up in the 1920's); then in Washington State (Olympia in 1954, Tacoma in the 1970s, and Seattle in 1981). Since then, variable refuse rates have been implemented in 200 cities around the nation, including rural communities (such as Bowdoinham, Maine, and La Crescent, Minnesota), suburbs (such as Perkasio, Pennsylvania, and West Linn, Oregon), and urban areas (such as Portland, Oregon, and San Francisco).

Perkasio, West Linn, and Seattle have successful volume-based collection fee systems; each recovers at least 40 percent of its residential waste stream. In Seattle, the average number of cans used by single-family customers per week decreased from 3.5 to 1.4 between 1981 and 1988.

Loveland, Colorado, has had impressive results with its volume-based bag program. To give residents an incentive to recycle in its pilot recycling program, Loveland changed the flat fee structure for refuse collection (\$5.75 per month) to a much lower flat monthly collection fee (\$3.40) plus a per-bag fee (40¢ for a 13-gallon bag of refuse, 75¢ for a 30-gallon bag). The monthly household curbside recycling participation rate is now over 90 percent, and 54 percent of the waste stream is reportedly being recycled and composted. Trash set-outs in the pilot neighborhoods have been reduced by nearly 62 percent. Total disposal costs per household have been reduced an average of 8 percent.

Sources: Institute for Local Self-Reliance, 1994; Lisa Skumatz, "Garbage By the Pound: The Potential of Weight-Based Rates," *Resource Recycling*, July 1991; Lisa Skumatz, Synergic Resources Corporation, Seattle, Washington, personal communication, March 1992; Lisa Skumatz, *Volume-Based Rates in Solid Waste: Seattle's Experience*, Seattle Solid Waste Utility, Seattle, Washington, February 1989; City of Loveland, Colorado, *Solid Waste Management Plan*, May 1992, page 2.

average number of pounds of garbage per household decreased by 15 percent over the three-month trial period.<sup>5</sup>

Illegal dumping or burning of refuse is a possible adverse effect of variable refuse rates. This has rarely presented an ongoing problem, however, since communities have found a variety of ways to stop illegal dumping. In 1987, after experiencing increased illegal dumping during a period of rapidly rising user fee rates, Seattle introduced a pre-paid sticker to handle additional waste generation, and hired inspectors to monitor complaints from customers and contractors.<sup>6</sup> In Perkasio, where there were four reports of illegal dumping in 1988, the offenders' names were reported in the local newspaper. Illegal

dumping was not reported as a problem in 1989.<sup>7</sup>

Houston County, Minnesota, addresses the problem by charging offenders \$0.68 per pound of illegally dumped materials. In order to prevent commercial dumpsters receiving illegal waste, the City of Farmington has provided a dumpster locking service for commercial establishments. On request, the City places a lock mechanism on dumpsters that releases only when the dumpster is professionally emptied.<sup>8</sup>

In order to address the drawback of penalizing low-income families, some communities have adopted low-cost "lifeline rates" that allow a minimum disposal volume for low-income

residents or provide discounted rates for low-income residents.<sup>9</sup> Certification and administration difficulties have kept other communities from offering these options. At least one community has met this challenge by arranging to have free bags distributed along with welfare checks.<sup>10</sup>

The RCRA hotline (800-424-9346) provides detailed information on setting up a volume-based collection fee program.<sup>11</sup>

### TURNING WASTE INTO GOLD

In Sonoma County, California, Garbage Reincarnation, a local nonprofit organization, operates two "recycling/reuse/resale" depots at the landfill and transfer station, under contract with the County. Residents and businesses may stop at the depots and drop off any salvageable items, including appliances, bicycle parts, books, tires, wine bottles, batteries, and building materials. Items are either repaired or set out "as is" in the yard. Repair shops regularly buy appliances, television sets, lawn mowers, and bicycles. Flea market vendors buy bulky items to repair for resale. Homeowners and contractors purchase used building materials. A mattress refurbishing company buys, sterilizes, and recovers used mattresses. Recovered paint is given away free to residents. According to Garbage Reincarnation, start-up costs for a salvage/reuse business are minimal, and on-site sales start the first day. In 1990, Sonoma County salvaged 1,483 tons of residential items, equivalent to 8 percent of all residential materials recycled and 1 percent of all residential waste generated that year.

Urban Ore is a for-profit materials salvage business, which operates two drop-off sites in Berkeley, California. Nearly 90 percent of the materials Urban Ore recovers and resells is dropped off by residents and local businesses; the remainder is recovered from the city's transfer station. The city supports this recovery operation by publicizing it and leasing Urban Ore land and buildings.

Urban Ore recovers more than 5,000 tons of materials every year, about 20 percent of which is household goods, including electronics equipment, clothing, and kitchen appliances. The other 80 percent is comprised of building materials, including cabinets, furniture, doors, windows, and white goods. The company recovers an estimated 50 percent of the reusable items discarded in Berkeley each year.

Besides diverting salvageable items, Urban Ore contributes financially to the community. While Urban Ore's gross operating and maintenance costs total about \$130 per ton, its revenue totals about \$135 per ton. Its Discard Management Center pays the city of Berkeley 10 percent of its gross monthly income, over \$9,000 for the right to occupy city property and salvage from the transfer station floor, and \$28,000 in license fees. In addition, Urban Ore pays local residents and businesses about \$100,000 each year for their reusable goods, and \$328,000 in wages to its 16 employees. The company also generates more than \$48,000 in sales taxes, and \$40,000 in payroll taxes and state and local license fees.

Urban Ore's capital costs total approximately \$211,900 (1990 dollars), less than \$15,000 per ton-per-day recovered, far below those of many intermediate processing centers.

Another model salvage operation is The ReStore, a facility in Montpelier, Vermont, operated by Restore Resource Unlimited. The ReStore is both a retail outlet for clean industrial scrap and a work space for repairing products that would otherwise be discarded. The ReStore's projects include collecting and refurbishing toys and furniture, helping to organize furniture swaps, and coordinating training courses to encourage greater development of repair skills within the Vermont community.

Sources: Institute for Local Self-Reliance, 1994; EarthRight Institute, "Swap Spot," *Chicken Little Chronicle*, White River Junction, Vermont, August/September 1990, page 2.

### STEP 3 – ESTABLISH OR ENCOURAGE SALVAGE/REUSE OPERATIONS

Reusing materials in-house at the residential or commercial level prevents these discards from entering the municipal waste stream and therefore saves a community the cost of collection or processing. Appliances, other equipment, books, building materials, clothes, tires, kitchen utensils, and furniture all are examples of materials that can be salvaged and/or reused. Product reuse can be increased by establishing salvage/reuse operations to which citizens can bring their reusable discards. Community-scale reuse operations generally cost very little for collection (since most materials are dropped off) and little for processing. Such operations also can raise revenue, with private repair and reuse operations netting considerable profits as well as providing jobs for the local community. Communities can actively promote private salvage/reuse operations through written listings and other types of publicity.

Although local solid waste managers have given considerable attention to startup of curbside recycling programs, they have given little attention to salvage and reuse as a serious waste reduction strategy. Several communities run salvage operations at public disposal sites where materials are either dropped off already sorted or attendants must sort through the refuse. However, most of these operations are recovering minimal amounts of the waste stream.

### THE LOADING DOCK PROVIDES MEMBERS WITH LOW-COST SUPPLY OF REUSED MATERIALS AND OTHER BENEFITS

Although it originated as a low-income home improvement program, The Loading Dock located in Baltimore, Maryland, has proven to be a very successful salvage and reuse operation. Established in 1984, this non-profit organization has developed working relationships with manufacturers, building suppliers, and distributors to collect outdated and overstocked items that would normally be discarded, including lumber, paint, insulation, cabinets, doors, floor covering, and major appliances. The operations currently occupy 21,000 square feet of warehouse space.

The Loading Dock provides a service to both its customers and its suppliers. Nonprofit and religious organizations, property owners of low-income housing, and low-income individuals can purchase building supplies from The Loading Dock for approximately one-third the retail price for comparable items. Retailers and building supply businesses benefit from tax deductions and avoided disposal fees for the items donated. Since the program began, over 21,000 tons of reusable materials have been recycled.

The program has expanded to include paint recycling and a "landfill rescue project," whereby reusable building supplies are collected monthly at several county landfills. The Loading Dock also purchases non-donated, high-demand items such as weatherization materials, white paint, and painting supplies to offer its members a lower per-item price than retail.

In addition to providing a low-cost source of materials, The Loading Dock benefits its members in several ways. Through monthly workshops and newsletters, The Loading Dock educates its members on topics such as home repair, weatherization, and lead assessment and abatement. The indirect benefits in terms of money saved on materials and training allow members to accomplish more with their limited resources.

Hope Cucina, the former Executive Director, is coordinating an informal national network to help groups in other communities establish a similar material collection and supply organization and to share related resources. Over 300 groups have expressed interest.

Source: Institute for Local Self-Reliance, 1994.

A number of programs stand out as models. These include The Loading Dock in Baltimore; Garbage Reincarnation in Sonoma County, California; Urban Ore in Berkeley, California; the Surplus Exchange in Kansas City, Missouri; and the Materials for the Arts project in New York City. (See sidebars, pages 6 and 7.)

Local solid waste planners can either establish salvage/reuse operations or encourage salvage and reuse by:<sup>12</sup>

- requiring salvaging at transfer stations and landfills and making more materials subject to recovery;
- developing contracts for salvage and reuse operations;
- providing salvage contractors with agreements that are as long-term as those made for other disposal services;
- sponsoring and organizing programs such as regional waste exchanges and "drop and swaps;"<sup>13</sup>
- adding reusable items to curbside collection programs;<sup>14</sup> and
- including "reusable goods" in municipal or county solid waste management plans and as a category in studies of local solid waste streams.

#### **STEP 4 – PROMOTE BACKYARD COMPOSTING, GRASSCYCLING CAMPAIGNS, AND VERMICOMPOSTING**

Yard debris and food waste comprise at least one-quarter of municipal solid waste.<sup>15</sup> Much of this organic material is generated by individual households and can be

recovered successfully and inexpensively at the point of generation. Through backyard composting and vermicomposting (composting with worms), residents can convert organic waste into a high-quality soil amendment suitable for house plants, seedling transplants, and general garden use. Grasscycling programs encourage homeowners to leave grass clippings on the lawn.

Leaving grass clippings on a mowed lawn can actually improve the moisture retention ability of soil and act as a natural fertilizer, reducing the need for commercial fertilizers. A number of cities have implemented "grasscycling" or "Don't Bag It" programs. According to the Rodale Institute Center's research, residents with a half-acre of lawn could save \$693 per year in garbage fees (based on \$2 per bag collection and disposal fees) by using mulching mowers rather than disposing of grass clippings.<sup>16</sup>

While backyard composting, vermicomposting, and grasscycling do not represent true source reduction, these strategies prevent waste by avoiding the collection and handling of materials. Seattle estimates that it saves \$20 in avoided yard waste collection and tipping fees for each ton of material composted in residents' backyards.

Communities can support backyard composting, vermicomposting, and grasscycling programs by:

- distributing composting bins;
- providing technical assistance to homeowners;

## BACKYARD COMPOSTING STRATEGIES

**Distributing composting bins:** Seattle plans to distribute 70,000 composting bins over a seven-year period. In Ontario, Canada, more than 116,000 backyard composting bins are being used in 44 communities, aided in part by \$3 million Canadian dollars in financial assistance provided by the provincial government. King County, Washington, provides residents with bins at a subsidized rate of \$8.75 each.

**Providing technical assistance to homeowners:** King County offers technical assistance through the Master Recycler/Composter Program, the Nursery Composting Demonstration Program, and a recycling and composting information telephone line. The Professional Lawn Care Association of America has published a guide to promoting grasscycling, *Grasscycling: Today's Turf, Tomorrow's Earth*. The San Francisco Recycling Programs (SFRP) developed a home composting program in 1988 with the San Francisco League of Urban Gardeners (SLUG). During the summer of 1990, SLUG began vermicomposting workshops. Participants pay \$35 for instruction, a worm bin, and worms. SFRP also offers multilingual workshops in backyard composting. In 1990 the City estimated that residents were composting 4,414 tons of food waste—7 percent of residential food waste generated that year—and 2,164 tons of yard waste at home. The Capital Regional District of Victoria, British Columbia, has distributed 200 vermicomposting bins for residential use. Recipients were required to attend a one-hour training workshop.

**Implementing volume-based yard waste collection fees:** A number of communities with successful backyard composting programs, such as West Linn, Oregon, and Seattle and King County, Washington, also have variable refuse rates. The City of West Linn, Oregon, for example, estimates that 15 to 20 percent of all yard debris generated in 1990 was composted in residents' yards. These communities partially attribute their success with backyard composting to their yard waste collection fee structure.

**Banning grass clippings from curbside pickup:** As of April 1993, Dallas residents are no longer allowed to put their grass clippings at the curbside for pickup. They can leave the clippings on their lawns, use composting bins, or take them to one of four composting sites operated by the city. Indianapolis is now considering a ban on collecting yard waste in garbage and the promotion of on-site composting. The Texas Agricultural Extension publishes a community action plan called *Don't Bag It*. Montgomery County, Ohio, adapted the Texas program and saved \$600,000 in disposal costs in the first year with a modest \$30,000 investment in promotional materials. Greenfield, Wisconsin's "Don't Bag It" campaign encouraging its 8,000 residents to leave their grass clippings on their lawns, prevented an estimated 101 tons of grass clippings from being collected and landfilled. As a result, the town cut its hauling costs by 17 percent. According to Recycling Coordinator Keven Klopp, these savings have allowed Greenfield to add a separate yard waste collection and composting program at no extra cost.

Sources: Institute for Local Self-Reliance, 1994; Carl Woestendiek and Susan Smith, "Implementing a Backyard Composting Program," *BioCycle*, December 1990, page 70; Anne Scheinberg and Donna Smoler, "European Food Waste Collection and Composting Programs," *Resource Recycling*, December 1990, pages 76-77; "Passaic County Will Work to 'Clip' the Problem of Dealing with Grass," *Beyond the Curb*, Association of New Jersey Recyclers, January 1991, page 3; "Gearing Up for Spring's Grass Clipping Madness," *The NYSAR3 Network*, New York State Association for Reduction, Reuse and Recycling, Albany, New York, March-April 1992, page 5; "Home Composting," *Resource Recycling*, May 1994, page 18; "Dallas, Texas: Grass Will Be Greener," *BioCycle*, May 1993, page 20; "Big City Recycling News," *Resource Recovery*, May 1994, page 15; and "Greenfield, Wisconsin, 'Don't Bag It' Campaign Clips 101 Tons from Grass Collection," *BioCycle*, March 1993, page 22.

- implementing volume-based yard waste collection fees;
- banning the set-out of yard waste mixed with garbage at curbside; and
- banning grass clippings from curbside pickup.

#### **STEP 5 – PROCURE REUSABLE PRODUCTS AND NON-RESOURCE-INTENSIVE PRODUCTS**

Both state and local governments can establish programs to procure reusable products or products that are not resource-intensive. While every state in the Union has some type of government procurement program to purchase recycled-content products, little organized activity has been shown at the state level to procure reusable products or products made with minimal materials. As with recycled-content procurement programs, state procurement programs to help reduce the waste stream can be models for local governments, institutions, and businesses.

In 1990 the Connecticut Department of Administrative Services issued a plan to eliminate disposable and single-use products at the state government level.<sup>17</sup> A number of products procured by state agencies, from office supplies and housekeeping products to food service items and industrial and automotive products, were targeted for substitution. For instance, contracts for new typewriter ribbons were replaced with multi-strike ones, which last six to ten times longer. The state also moved to eliminate statewide contracts for disposable food service

products by replacing these with reusable products.

At least one institution's purchasing policy may serve as a model for government. The Chancellor's Recycling Task Force at the University of Colorado recommends purchasing furniture made from durable, recyclable materials, and allows the University to pay up to ten percent more for these products.<sup>18</sup>

#### **STEP 6 – ESTABLISH SOURCE REDUCTION FUNDS**

States and local governments can make available grants and loans to stimulate source reduction efforts in the private and public sectors. Numerous states have financing programs to encourage recycling enterprises; similar financing programs could be developed to spur waste prevention. Incentives could be used to (1) spur the development of certain types of businesses that decrease waste generation as a result of the goods or services they offer (cloth diaper services, repair shops, bottle washing operations); and (2) reduce the waste generation of existing businesses and organizations. Grants are especially useful for support of feasibility studies; whereas loans can help with project implementation. Grants do not always lead to sustainable projects, as project funding may not be available after the grant funding runs out. Program administrators should prioritize projects according to their potential impact on reducing the waste stream, and might require grant applicants to demonstrate how the project will be funded in the long-term.<sup>19</sup>



## **STEP 7 – REQUIRE RECYCLABLE OR REUSABLE PACKAGING**

Requiring packaging to be minimized and either reusable or recyclable can help reduce the volume as well as the toxicity of the waste stream. Such requirements could shift the responsibility for managing packaging waste away from local governments to those who produce and use packaging. Packaging requirements can be implemented at the state and local levels.

In the United States, virtually no serious government initiatives are in place to reduce the volume of packaging, although several initiatives at the state level are being considered. Two exceptions are: (1) Oregon's recycling law that requires rigid plastic containers sold in the state in 1995 to contain 25 percent recycled content or have a 10 percent reduction of package-to-product ratio from 1991;<sup>20</sup> and (2) Minneapolis' 1989 Environmentally Acceptable Packaging Ordinance, which bans food packaging that is not reusable at least five times, cannot be recycled by being collected in a municipally approved program, or is not degradable (with the exception of degradable plastics).<sup>21</sup> St. Paul and four suburbs in the Twin Cities area have passed similar ordinances, which have led to increased plastics recycling. Working with the plastics industry, Minneapolis has developed municipal collection of all types of rigid plastics. In St. Paul, which recycles only PET and HDPE plastics, the possibility of banning other plastics still exists.<sup>22</sup>

Refillable containers can also avoid the generation of significant quantities

of municipal solid waste.<sup>23</sup> Although ten states have bottle bills (representing 30 percent of the U.S. population), few policies exist that encourage the use of refillable bottles, let alone require their use. The refillable bottle market share has dropped in the United States to 11 percent from 87 percent in 1964.<sup>24</sup>

In the mid-1970's, Prince Edward Island, Canada, mandated that all packaged beer be sold in refillable bottles; in 1984 the mandate was extended to all packaged soft drinks, and to wine coolers in 1989.<sup>25</sup> U.S. communities may be able to pass similar laws.

While deposit legislation can and does facilitate the use of refillable containers, other initiatives can also do so. Economic incentives proved successful at UCLA. As an alternative to throw-away beverage containers, UCLA's Recycling Program offered students a refillable 20-ounce thermal mug for \$1.99 and a 20 percent discount on dispensed beverages with its use. During the first six weeks of the program, all 10,000 original mugs were sold out and over 1,500 advance orders were received. For the first three months of the program, hot refills in the mugs saved 6,100 polystyrene cups, and cold refills saved more than 17,580 paper cups.<sup>26</sup>

## **STEP 8 – NEGOTIATE AGREEMENTS WITH INDUSTRY TO REDUCE PACKAGING AND ELIMINATE WASTES**

Rather than regulating industry, some states and countries are relying on voluntary reduction goals or guidelines and negotiated agreements with industry to reduce packaging. For voluntary guidelines to be effective, however, the threat of legislative requirements may be needed.

The Coalition of Northeast Governors' (CONEG) efforts to get major industries to voluntarily reduce packaging are beginning to pay off. As part of its Challenge to Industry program, CONEG challenged chief executive officers of participating industries to set numerical reduction goals for their packaging, using the guidelines established by CONEG in its 1989 Preferred Packaging Guidelines. Of the 200 companies that CONEG originally challenged, 29 accepted. After one year, several companies reduced their use of the following materials through lightweighting and product redesign: steel, by approximately 23 percent; glass, up to 75 percent; and plastic, as much as 50 percent. In one case, reducing the size of corrugated boxes reduced corrugated cardboard use by 83 percent.<sup>27</sup>

## **STEP 9 – BAN WASTEFUL PRODUCTS**

Banning products that cannot be reused or recycled may prompt manufacturers to redesign their products. Bans are targeted at a specific material or product that is viewed as an undue burden on the waste stream. While some product bans have been instituted at the local level, others may

go into effect if recycling rates are not met.

Some communities, such as Berkeley, California; Newark, New Jersey; and Portland, Oregon, have passed local ordinances to ban use and/or sale of certain types of materials. In some cases, product bans lead to the substitution of one disposable material for another, and thus do not decrease the overall volume or weight of the waste stream. In other cases, however, nonrecyclable products are replaced with recyclable or reusable materials. For example, the City of Newark has worked with local retailers and cafeterias to switch from plastic to reusable utensils, plates, cups, and carry-out containers.

## **COMPREHENSIVE SOURCE-SEPARATION COMPOSTING PROGRAMS**

Yard trimmings are a fairly homogeneous component of the waste stream that can be composted in residents' yards, at community composting sites, or in regional facilities. Food waste, another significant portion of the waste stream, also can be composted in residents' backyards or composted on a community level. Mature compost serves as a soil amendment or mulch, improving the physical, chemical, and biological properties of soil. In communities with source-separation yard debris composting programs, the supply of and demand for compost are usually well-balanced. In some cases, demand exceeds supply. Year-round,

curbside collection of all types of yard waste, and recovery of landscapers' waste for composting, are critical in order to reach high materials recovery levels.

Communities that source-separate yard waste and compost more than 11 percent of their municipal solid waste typically provide frequent and convenient collection, target a wide range of organic materials, serve a high percentage of households, and offer incentives to encourage composting.<sup>28</sup>

#### **STEP 1 – IMPLEMENT A HOME COMPOSTING PROGRAM**

See pages 8 and 9.

#### **STEP 2 – IDENTIFY EXISTING COMPOSTING SITES AND/OR ESTABLISH LOCAL COMPOSTING SITES**

For communities that want to operate their own local facilities, capital costs per ton per day composted are relatively inexpensive. Composting costs, like processing costs for recyclables, are highly influenced by the technology utilized, the amount of material composted, and the number and wages of employees. A variety of composting techniques exist. Low-technology systems require little maintenance and are generally inexpensive. However, materials take longer to compost and a lack of adequate oxygen in the compost pile can result in unpleasant odors. In medium-level systems, yard debris is composted in windrows (elongated piles), which are turned a minimum of four times per year to control oxygen levels and temperature and to hasten decomposition. An end

product, suitable for landscaping and gardening purposes, is complete in less than one year, and often in four to eight months. In higher-technology composting systems, windrows are turned frequently (e.g., once per week), internal windrow temperatures are monitored daily, and nutrients and/or water are added as needed. Higher-technology systems can handle more material per year than lower-technology systems on the same amount of land because the compost process is completed more rapidly.

Communities can avoid or minimize their composting costs by relying on county or private facilities that charge minimal or no tipping fees. Advantages include avoiding capital costs for equipment and being relieved of operating and marketing responsibilities. On the other hand, communities may have to incur additional transportation costs and will have little control over the types of materials accepted. In response to the Virginia General Assembly's landfill ban for yard waste, the Central Virginia Waste Management Authority (CVWMA) has contracted with three local composting facilities to handle residential yard trimmings. CVWMA pays a low per-ton tipping fee, and it has decreased transportation costs by distributing the organic material among the three facilities. Berkeley and Seattle use private composting facilities, where they have to pay per ton tipping fees.

### **STEP 3 – ESTABLISH YARD TRIMMING DROP-OFF SITES**

Drop-off collection of yard debris can be practical and cost-effective. In rural and small communities, particularly those where residents self-haul refuse, drop-off programs have recovered significant amounts of yard waste. In communities that provide curbside refuse collection, curbside yard waste collection is needed to divert large-volume materials (such as fall leaves), but drop-off programs can play a crucial role in capturing additional organic waste off-season. Drop-off sites may also provide the only opportunity for private businesses such as landscapers to divert their yard trimmings from disposal. Communities can provide residents and private haulers maximum incentive to deliver their yard debris to drop-off sites by locating these at disposal facilities and accepting source-separated yard waste free of charge or at a reduced tipping fee. Volume-based refuse rates can also encourage residents to use drop-off sites.

### **STEP 4 – DESIGN AND BEGIN CURBSIDE COLLECTION OF YARD TRIMMINGS AND FOOD WASTE**

Important considerations for designing and beginning curbside collection of yard trimmings and food waste include types of materials to target, frequency of pickup, and set-out and collection method.

The frequency of yard debris pickup affects the level of participation and consequently the level of composting. Setting out yard trimmings for composting needs to be as convenient

for residents as setting out their refuse. Weekly year-round curbside collection of organic waste for composting has proven effective in reaching high recovery rates. Communities collecting more types of organic waste for recovery generally have higher composting levels. In addition to the obvious fall leaf collection, cities should give consideration to collecting grass clippings (if they're not banned from curbside pickup), brush, wood waste, and Christmas trees. Food discards can also be targeted for curbside collection to elevate recovery levels. The City of Quebec operated a pilot 30-household food waste collection program. In the first nine months of 1992, 432 metric tons of materials were collected and composted. Expansion of the program is contingent on the processor's ability to site a larger facility to handle greater volumes.<sup>29</sup> In Toronto, a pilot wet waste collection program offered by Metropolitan Toronto services 1,500 households on a weekly basis. The bagged food scraps and garden materials are collected with yard debris and composted using an in-vessel system.<sup>30</sup>

To collect yard debris and trimmings, communities often utilize existing public works equipment such as front-end loaders, refuse packers, and dump trucks. Packer trucks have the advantage of compacting materials, reducing the frequency of unloading. Some communities purchase new equipment such as vacuum leaf loaders. The loaders can either be hooked up to existing packer or dump trucks, or can be purchased as a self-contained truck or vacuum loader unit.

Collection methods vary depending on the type and amount of yard materials targeted. During the fall months of heavy leaf generation, many communities collect leaves loose, using front-end loaders or vacuum attachments, to relieve residents of the task of bagging leaves.

In parts of Europe and Canada, communities have implemented a new type of materials recovery system known as "wet/dry" collection. These systems typically achieve high materials recovery rates of 60 percent. A 10-week wet/dry pilot study conducted in Kokoma, Indiana, for example, recovered 82 percent of all

### THE CANADIAN VANGUARD: WET/DRY COLLECTION SYSTEMS

A pilot 100-household wet/dry program in ten urban communities in the East Prince Region of Canada's Prince Edward Island resulted in 62.8 percent of residential waste being diverted from disposal (46.6 percent composted and 16.2 percent recycled). The pilot ran from November 1992 through the end of April 1993. Each household was asked to separate their waste into three streams: (1) newsprint with nonglossy inserts, phone books, corrugated cardboard, glass bottles and jars, metal food and beverage cans, and soft, clean plastic bags commingled into blue bags; (2) food waste (including meat, bones, fish, and dairy products), nonrecyclable paper, boxboard, yard trimmings, sawdust, wood shavings, paper vacuum cleaner bags and contents, animal or human hair, and wood ash in green Compostainer carts; and (3) remaining waste into black wheeled carts.

The pilot was expanded to serve 220 households on June 15, 1993. This second phase is achieving a 67.5 percent diversion rate. It is scheduled to run until May 1994. Fifteen communities, with a total population of 27,500, have chosen to participate in the full-scale program, which is already being implemented.

The Municipality of the District of Lunenburg and the towns of Bridgewater, Lunenburg and Mahone Bay, Nova Scotia, with a total population of 38,000, have been working cooperatively to manage their municipal solid waste. The municipalities have set a goal of 75 percent diversion of their wastes through source-separated organic and mixed waste composting, recycling, and waste reduction. A 1,000 household wet/dry recycling pilot project was initiated in September 1992, with a second phase continuing until February 1993. Residents in the pilot areas were asked to place newspapers, glass containers, PET bottles, aluminum and steel food and beverage cans, and LDPE plastic grocery bags commingled into blue plastic bags. Household food waste (excluding meat, fish, bones, pet litter, diapers, and feminine products) and yard trimmings were separated and placed into an aerated wheeled cart, the Compostainer. Residents were provided with a minivan in which to place and then transfer their food scraps to the cart. During the first phase of the project, recyclables sorted and processed for end market represented 7 percent of the waste stream. Organics collected and composted represented 23 percent of the waste stream. Total diversion was 30 percent.

The municipalities are now proceeding with implementation of a full-scale system. The approved solid waste system consists of a materials processing facility, a composting plant for source-separated organics and mixed waste and a dry landfill for residue. Materials will be separated into four streams: (1) glass, steel, aluminum and PET containers into blue plastic bags; (2) paper fibers (newspaper, magazines, glossy paper, corrugated cardboard) in standard plastic grocery bags; (3) food waste (all types including meat, fish, and bones), soiled and wet paper products and boxboard, and yard trimmings in aerated carts, and (4) refuse in standard garbage bags. A total of 10,018 Compostainer carts will be purchased for the collection of organics.

Sources: Institute for Local Self-Reliance, 1994; Glenda Gies, "Prince Edward Island to Open Source Separated Facility," *BioCycle*, May 1994, pages 68-69; Glenda Gies, "Going Full-Scale with Source Separation," *BioCycle*, May 1994, pages 66-70.

waste generated. Residents in the 70 participating households were extremely surprised to discover the small quantity of material needing to be disposed in the refuse bag destined for the landfill.

In wet/dry systems, residents set out all of their refuse and recyclable and compostable components into two or three containers for collection. In the two-stream method, residents place all wet wastes, including food scraps, yard trimmings, and soiled paper, in one container; and all dry waste, including recyclable components, in a second container. Wet and dry fractions are collected in one dual-compartmentalized vehicle. Recyclables are separated from the dry fraction at a processing center; inorganics are screened out of the wet fraction at a composting facility; and the remaining material is composted. Residual materials from the wet and dry fractions (which came to less than 40 percent of total materials in the pilot studies conducted in Guelph, Ontario, and Kokoma, Indiana) are landfilled. In the three-stream system, residents separate organic yard and food waste into one bin, dry recyclables into a second, and residual materials into a third. Materials are collected in two separate vehicles; generally, organic materials and refuse are co-collected in one vehicle (but remain segregated), and commingled recyclables are collected in a second vehicle. Wet waste is composted; recyclables are removed from the dry waste; and the refuse is landfilled.

#### **STEP 5 – IMPLEMENT LEGISLATIVE MANDATES AND ECONOMIC INCENTIVES TO SPUR COMPOSTING**

Requiring residents to participate in source-separation yard debris collection programs and requiring haulers to collect source-separated yard debris from their customers can spur composting levels. Yard debris disposal bans spur the implementation of yard debris collection and composting programs. Volume-based refuse rates are direct economic incentives for putting out source-separated yard debris at curbside.

#### **STEP 6 – ENCOURAGE BUSINESSES, INSTITUTIONS, AND LANDSCAPERS TO COMPOST**

In some communities, yard materials generated by businesses, institutions, and professional landscapers constitute a substantial portion of total yard debris generated. By allowing private haulers to deliver their yard materials to drop-off sites for free or at reduced fees, communities can attract haulers to composting sites and greatly increase composting levels.

In addition to yard materials, some businesses and institutions generate significant amounts of food waste, which is increasingly targeted for recovery. One hundred classrooms in Durham, North Carolina, for example, are participating in a school vermicomposting project.<sup>31</sup> Resource Conservation Services, a subsidiary of BFI, recently opened the Capital District Compost Facility in Colonie, New York, the state's first large-scale food waste composting effort. The

facility is slated to compost between 350 and 500 tons of waste each week from area supermarkets, restaurants, schools, fast-food chains, food processors, and hospitals.<sup>32</sup> The Albany Medical Center is one establishment separating food waste (about one-third of the hospital's waste) for composting with yard waste at the Colonie site. Food waste is put through a grinder and sorted in separate containers in the kitchen. It is dumped each day into a 12-cubic-yard roll-off container. Daniel Seip, Hospital Environmental Health and Safety Supervisor, plans to acquire compactors for food waste.<sup>33</sup> The Center sends ten tons per week of food wastes, packaging materials, paper towels, and nonrecyclable office paper to the site for composting.<sup>34</sup>

## IMPROVING RECYCLING LEVELS

This section identifies critical steps that need to be taken in order to achieve high recycling levels. (Composting programs, which also are critical to reaching high levels of materials recovery, are discussed in the previous section.)

### STEP 1 – TARGET A WIDE RANGE OF MATERIALS FOR RECOVERY

When implementing a recycling program, an important first step is to determine which materials to target for collection and how such materials will be collected and prepared for market. These steps are interrelated. Available markets and processing capabilities will determine which

### ST. PAUL ADDS TEXTILES AND HOUSEHOLD GOODS TO CURBSIDE COLLECTION

St. Paul has been collecting textiles and household goods from 9,000 households in a pilot program since July 1992. When the program expands to citywide collection in July 1994 (when approximately 86,000 single-family households will be served), it is expected to divert more than 12 percent of the city's municipal solid waste. Textiles accepted include all types of used clothing, unwearable textiles, leather, and scrap cloth. In order to be collected, household goods will have to meet the following criteria: working or functional; nonbreakable; of good enough quality to give to a friend; and be able to fit in a standard garbage bag. Textiles and household goods are collected twice a month by contracted collection vehicles. Goodwill Industries, Inc., the program's exclusive market for materials, sorts, grades, and sends the material to other end users. It retains all revenues from sales. The city's contract with Goodwill contains a clause about a voucher system that allows other charitable organizations in town to get materials from Goodwill free of charge if Goodwill is cutting into their waste stream.

Sources: Institute for Local Self-Reliance, 1994; Kathleen M. White, "St. Paul's Recycling Rate Rises with Textile, Household Recycling," *Recycling Times*, March 22, 1994, page 7.

materials in the waste stream to collect. Targeted materials and market specifications will influence how recyclables should be collected and processed.

Communities with the highest recycling levels generally target a large number of materials for recovery, particularly those materials that constitute a significant percentage of the waste stream, such as waste paper and construction and demolition materials. Of course, identifying outlets for targeted materials has been

critical for the success of these programs.

San Francisco and Seattle are recovering about one quarter of their residential waste stream through waste paper recycling alone. Both recover a wide range of paper grades, including newspaper, magazines, advertising mail, and corrugated cardboard. A number of communities have found that adding mixed paper to materials collected at curbside dramatically increases total curbside amounts. While targeting mixed paper for recycling is critical for maximizing recovery rates, collectors and processors need to design their programs with specific end users and their specifications in mind. Paper mills producing boxboard typically accept the widest range of paper grades, while paper mills producing printing and writing paper may accept only white office paper.

Targeting each and every recoverable component of the waste stream with a market or potential market—from used oil to food waste and textiles—helps raise recovery levels. No material with a market should be overlooked. Palm Beach County, Florida, is expanding its recycling program to include kraft bags, aluminum foil and pie plates, corrugated cardboard, and milk and juice cartons.<sup>35</sup> A number of communities around the country are adding “innovative” materials to curbside programs—textiles, household batteries, milk and juice cartons, aseptic packages, frozen food boxes, steel aerosol cans, steel paint cans, and reusable items. Pittsburgh was the first major city to add empty steel paint cans and aerosol cans to its

curbside recycling collection program.<sup>36</sup>

Food waste is one significant component of the waste stream that has untapped recovery potential. Food waste can be used as livestock feed, composted into a high-quality soil amendment, or manufactured into such products as perfumes and soaps.

## **STEP 2 – IDENTIFY OUTLETS FOR COLLECTED MATERIALS**

One of the most difficult yet fundamentally important tasks is finding an outlet for material collected for recycling. Identifying markets, securing agreements with materials brokers and end users, and meeting buyer specifications are all part of this task. Recycling collection programs only can be as successful as a recycling marketing program. Consequently market analysis will be both a planning and ongoing activity. Many communities rely on private processors to find end users. Others undertake this legwork themselves. Municipal recycling coordinators and private processors are finding different end uses for the same material and using a variety of strategies to keep materials moving to those who can manufacture new products from them.

Cities can play an important role in helping local haulers and private businesses locate markets for commercial recyclables. Some cities facilitate commercial/institutional sector recycling by accepting privately generated materials at public facilities. Private haulers in Providence, Rhode Island, have reported some difficulty marketing commercially generated



recyclables. The state of Rhode Island allows private haulers to use the state processing facility as a market of last resort; however, it charges the private sector a tipping equivalent to the tipping fee at the State landfill.

*Creating Local Recycling Markets* (ILSR) provides guidelines for stimulating end markets for collected recyclables.

### **STEP 3 – PROVIDE CONVENIENT COLLECTION SERVICE**

In order to maximize the amount of material collected, cities need to design recycling programs that will result in high participation rates. This means providing convenient collection services. Residents are more likely to participate in a recycling program if doing so is as convenient as disposing of their refuse. Businesses and institutions also need convenient recycling services. The initiatives below have proven effective in increasing program participation.

### **Provide Weekly Curbside Collection of Recyclables if Weekly Curbside Collection of Refuse is Provided**

In communities that have switched from monthly to weekly collection, participation rates have increased. When participation increases, the amount of materials collected tends to increase. When Berkeley, California, switched from monthly to weekly curbside collection during 1988 and 1989, curbside tonnage more than doubled. Newark switched from biweekly to weekly collection of recyclables in October 1991. Twenty percent more material was recovered in November 1991 than in November 1990.

### **Offer Service to All Households**

The more households that receive curbside collection of recyclables, the more residential materials a community will recover.

### **Promote Multi-Unit Recycling**

In urban areas, servicing multi-unit buildings is critical for reaching high materials recovery levels. The

### **PORTLAND, OREGON, TARGETS APARTMENTS**

Portland, Oregon, is currently working to expand the delivery of recycling collection services to multi-unit households. Refuse haulers in the city are required to collect recyclables from only one- to four-unit buildings. As a result, approximately one-quarter of all households in the city receive no recycling collection. The City has contracted with Portland State University (PSU) to set up recycling collection systems in selected multi-unit buildings. At least 330 buildings had been supplied with recycling systems. The City provides technical assistance and supplies recycling containers (such as 90-gallon carts), which PSU delivers to the site. The hauler selected by the building collects and markets the materials. (Buildings are not charged an additional fee for the collection of recyclables.) Many buildings have set up central recycling depots in parking lots, while others instruct residents to bring individual bins to the curbside. The City budgeted \$162,000, equivalent to \$27 per multi-unit household, to set up recycling systems at 170 buildings containing a total of approximately 6,000 apartment units in 1992.

Source: Institute for Local Self-Reliance, 1994.

### THE IMPORTANCE OF CONTAINERS: ST. CHARLES' LESSON

St. Charles, Illinois' initial multi-family recycling efforts, which consisted of supplying 14-gallon recycling bins in 32 apartment complexes, were unsuccessful. To increase participation, the City made several changes in 1992. It placed dumpsters or totes in the refuse areas of the top 11 complexes. It launched an educational program tailored to multi-family residents. It provided residents with special plastic recycling bags that were the size and shape of a paper grocery bag, were washable, had cloth handles, and could hang on a doorknob or stand upright.

Within six months of implementing the new program, 10 percent of the waste generated by the complexes was being recycled. The City's recycling coordinator attributes the success of multi-family building recycling to the new bags.

Sources: Institute for Local Self-Reliance, 1994; "Improving Multifamily Recycling with Bags," *BioCycle*, July 1994, page 20.

following strategies are being employed around the country to promote recycling in multi-unit buildings:

- mandate that multi-unit buildings recycle designated materials;
- provide collection service or require private haulers to provide this service;
- offer haulers economic incentives to collect recyclables;
- provide buildings with recycling containers and other equipment;
- offer buildings technical assistance, including waste audits;
- encourage building owners and managers to take an active role in planning and promoting the program;
- encourage buildings to establish recycling systems that closely parallel existing refuse collection systems.

### Utilize Set-Out and Collection Methods that Encourage Participation and Yield Marketable Materials

A variety of curbside collection systems are available for recyclable materials. Each collection and processing system has advantages and disadvantages. Sorting materials in the household or on the collection route minimizes the amount of sorting that must be performed at a processing center, and frequently results in lower overall breakage and reject rates, increasing the net amount of material marketed. Sorting materials at a processing center may increase program participation and speed collection, but often requires construction of a more capital-intensive facility, which may be difficult for a community to finance.

Set-out and collection systems affect overall recovery materials. Processing facilities that accept segregated materials report low residue rates of 0 to 4 percent by weight, while those that accept commingled materials often rely on mechanized sorting and report higher residue rates of 1 to 16 percent. To

increase the value of recyclables collected, Seattle required its recycling hauler, who services the south end of the city (which previously utilized a fully commingled system), to color-sort glass en route; paper contaminated with broken glass was becoming increasingly difficult to market. Rumpke Recycling, the contractor for Westerville, Ohio, separates glass en route, enabling compaction of the other recyclables. In Milwaukee, divided packer collection vehicles use different compaction levels for paper and commingled containers. This maximizes tonnages per truck and minimizes glass breakage.<sup>37</sup> Sorting materials at the household level or on the truck can increase the net tonnage of material marketed.

#### **Provide Adequate Containers for Residential Recyclables**

Providing suitable containers to households for storage and set-out of recyclable materials may increase participation and recycling levels. Storage containers serve several purposes: (1) they publicize a recycling program and remind individuals to source-separate material, thereby increasing program participation; (2) they assist drivers' identification of recyclable materials and loading of materials onto vehicles; and (3) they may increase the amount of material residents set out per collection day by providing a convenient and attractive place to store materials.

Container size may influence recycling levels. Small containers may limit the amount of material recovered. A container must not only be large enough to accommodate

current levels of material, but must also accommodate substantial program growth.

Providing bins to residents free of charge will increase participation.

#### **Establish Recycling Drop-Off Sites**

While curbside collection generally is a more effective way to maximize the amount of recyclable materials collected, drop-off collection can augment curbside and serve as the primary method of recyclables collection in communities in which residents self-haul refuse. Seattle, for example, recovers recyclable and compostable materials through hundreds of private drop-off sites (in addition to its curbside program) and two public drop-off centers, one each at the City's two transfer stations. Philadelphia has implemented a "block corner" recycling program to service those households not provided with curbside collection.

#### **Stimulate Recycling in the Commercial and Institutional Sectors**

Commercial and institutional waste recovery helps communities meet high recycling goals. Communities, particularly large cities, can encourage commercial recycling through legislative mandates, technical assistance, and recycling planning requirements, and by allowing private haulers to deliver materials to public processing centers.

#### **STEP 4 – MANDATE PARTICIPATION IN RECYCLING PROGRAMS**

Mandatory citizen participation in recycling programs increases participation rates, and, in turn,

recycling levels. Requiring businesses to recycle also is important. By mandating that businesses and institutions recycle, communities encourage the establishment of a private sector recycling infrastructure.

#### **STEP 5 – ESTABLISH ECONOMIC INCENTIVES**

Economic incentives such as high tipping fees at disposal sites, low or no tipping fees at recycling or composting facilities, volume-based refuse collection rates, and contest awards, can and do increase participation in recycling programs and reduce overall waste generation rates. Prestigious awards can spur businesses and institutions to recycle. Awards provide businesses with free advertising and can be a valuable public relations tool.

#### **STEP 6 – UNDERTAKE COMPREHENSIVE EDUCATIONAL AND PROMOTIONAL PROGRAMS**

Educational and promotional outreach may be critical in obtaining high participation rates, especially in urban areas. Cities can use any of the following to motivate citizens and businesses to recycle: recycling information sheets, newsletters, posters, and utility bill inserts, and recycling ads in the print and broadcast media. Some communities promote recycling and composting through in-person education, which can be particularly effective. The Recycling Association of Central Virginia has taken this initiative by educating local businesses about national "Buy Recycled" programs. The nonprofit, volunteer organization has

encouraged 30 businesses to enroll in the National Office Paper Recycling Project and/or the Buy Recycled Business Alliance. To educate businesses on how to set up successful recycling programs, the Association has conducted recycling seminars and sponsored tours to showcase existing programs.

Block leader or block captain programs actively promote recycling through neighbor-to-neighbor communication. Boulder, Colorado, successfully initiated a block leader program in 1980. Designed by a psychology professor at the University of Colorado, Boulder's block leader program currently is run by Eco-Cycle, a community-based recycling company. During the first year of the program, a study revealed that participation rates in the neighborhoods with block leaders were more than double those without such programs. Boulder currently spends \$30,000 annually on materials and labor to coordinate its block leader program. Communities as widespread and diverse as Minneapolis, Minnesota; Seattle, Washington; and Austin, Texas, have replicated the block leader program.

Similar in design are the Master Recycler/Composter programs, through which volunteers are trained to educate friends, neighbors, and co-workers about home composting, source reduction, and recycling. King County, Washington, conducts three two-month training sessions each year. Participants agree to contribute 40 hours each to community outreach initiatives. Capital expenditures for the program include \$10,000 for training manuals and curricula, \$6,000

for outreach tools, and \$10,000 for the construction of two demonstration sites. The county spends \$15,000 on training and equipment for each training session.

Education programs directed at school-age children play a vital role in the long-term success of a recycling program. Many communities use formal or informal recycling curricula to teach recycling concepts. The Ecology Center in Berkeley, California, developed "the Recyclones," cartoon characters that reinforce recycling concepts. Newark, New Jersey, created the Recycling Rangers to encourage students to spread the word about recycling to their parents. To generate enthusiasm for recycling, several communities conduct recycling poster contests, which use either a recycling theme or recycled materials.

Demographic factors play an important role in determining the amount of money a community must spend on recycling educational programs, and the types of programs implemented. Cities with transient populations and diverse ethnic groups face the greatest challenges in securing broad participation, and typically must spend more money on recycling education. Smaller communities, on the other hand, can rely on volunteer efforts and word of mouth to ensure participation in recycling programs.

Educational outreach has played an important role in elevating recycling rates in urban areas. Providence, Rhode Island, for example, increased participation in its curbside recycling program in the south side of the City (which has a large multilingual population) from 30 percent at the

startup of the program to 60 percent one year later, using foreign language brochures and other materials. Newark, New Jersey, hired a local minority public relations firm to initiate a promotional campaign. Newark translates most mailings and bulletins into Spanish and Portuguese to reach its minority communities. Jersey City, New Jersey, distributes recycling information pamphlets in Arabic, Hindi, Spanish, and Korean. San Francisco informs its Latino residents about its recycling program via Spanish-language radio and television stations. San Francisco also offers backyard composting workshops in Spanish and Cantonese.

## **MINIMIZING RECYCLING AND COMPOSTING COSTS**

Whatever program design a city selects, there are ways to make recycling and composting more successful and cost-effective. Communities can reduce their overall materials recovery costs by negotiating favorable conditions in contract arrangements, maximizing the public's participation and the amount of tonnage recovered, reducing traveling distance and time to materials recovery processing centers or markets, utilizing collection vehicles with appropriate capacity and routing to avoid frequent unloading, and integrating recycling and composting into existing solid waste management systems. These and other strategies are discussed below.

## **CONTRACTED PROGRAMS**

The following strategies have proven effective in contracted situations.

### **Step 1 – Make Use of Competitive Bids**

Cities can ensure lower contract fees through competitive bidding. Seattle, Philadelphia, and Newark are among those using competitive bid structures.

### **Step 2 – Include Locally-Based Nonprofit Organizations in the Bidding Process**

Because nonprofit groups do not operate with a profit margin, communities that contract with such groups may incur lower costs than they would with for-profit companies. In addition, nonprofit organizations typically provide services that extend beyond collection and processing. For example, many engage in extensive recycling and source reduction education programs. One obstacle, however, to contracting with nonprofit groups is the possibility that they may not be able to comply with standard contracting requirements (such as bid and performance bonds—that ensure contract execution and compliance, and certificates of insurance). The contracting entity may or may not have the legal flexibility to waive any of these contracting formalities in the negotiation of a service contract.

### **Step 3 – Revenue Sharing**

Cities can reduce the net costs of materials recovery by writing revenue-sharing agreements into recycling contracts. Montgomery County, Maryland, receives some revenues

from the sale of materials even though it contracts with a private firm to operate and maintain its processing facility. The private operator receives 25 percent of gross revenue, the County receives the rest. Also, as an incentive to use local markets, the operators are responsible for 25 percent of the cost of transporting processed materials to market. A similar arrangement between Broward County, Florida, and its processing facility operator translated to a \$20 per ton net return for commingled material in 1994.<sup>38</sup>

Cities can not only lower recycling costs through revenue-sharing agreements, but they also can help ensure profitable or break-even contract arrangements for private haulers in light of highly variable market conditions. Seattle's recycling contract stipulates that the City will share all market risk with its contractors. If prices for recyclables rise above predetermined levels, the City will receive all of the extra revenue in the form of reduced per ton payments. If prices fall, the city will cover all of the loss through higher per ton payments.

### **Step 4 – Retain Flexibility to Reduce Refuse Costs in Refuse Contracts**

Cities can retain the flexibility to shift resources between materials recovery programs and refuse collection through proper negotiating of refuse and recycling contracts. The flexibility that Naperville, Illinois, retained in its five-year refuse collection contract allowed it in 1990 to eliminate one of its two weekly refuse collection days, and instead provide weekly collection of refuse, recyclables,

and yard waste. In 1991 the city paid 20 percent less to collect and dispose of its refuse. By contracting with the same hauler for refuse and recyclables collection, cities can facilitate the sharing of infrastructure, equipment, and other resources between these two functions.

### **REDUCING COSTS IN PUBLICLY-RUN PROGRAMS**

#### **Step 1 – Maximize Participation and Tonnage Recovered**

Communities that maximize the amount of material collected often have low per-ton recycling and composting costs. Because a truck must travel the same route length regardless of how many residents participate in the program, the more participants and the more recyclables collected, the more efficient the journey will be. Additional costs incurred in collecting and processing recyclables and yard waste above and beyond traditional waste collection will be offset by reduced costs of managing solid waste destined for disposal.

#### **Step 2 – Minimize Unloading Frequency and Distance to Processing Facilities**

The number of times collection trucks must unload per day, as well as the truck's routing, type, and carrying capacity, and the distance it must travel to processing centers or transfer stations all impact curbside collection efficiency. The distance to processing centers and the number of times trucks must unload may have the most substantial impact on collection costs. Traveling time costs a city

money in labor expenses, fuel fees, and truck maintenance. In contrast to driving a collection route to pick up materials, traveling to unload materials is unproductive time and can be considered an add-on cost.

Reducing the number of times vehicles must unload also can increase collection efficiency, thus reducing costs. Factors affecting unloading frequency include the capacity of collection vehicles, the density of materials collected, and whether or not materials can be compacted en route. Some communities are using compactor trucks to collect recyclables, especially waste paper. As a result, truck tonnage capacity increases. Since plastic wastes are low-density materials, collecting them can reduce efficiency. To meet this challenge, several communities such as Monroe, Wisconsin, and areas of Portland, Oregon, are using plastics compactors on their collection vehicles.

#### **Step 3 – Implement Comprehensive Yard Waste Composting**

Yard trimmings are more homogeneous than other types of recoverable materials. Because yard trimmings can be compacted and collected in one vehicle, yard waste collection systems can be very efficient. In addition, cities can avoid investing in equipment for collecting yard trimmings by using existing collection vehicles.

Composting costs, like processing costs for recyclables, are influenced by the technology utilized, the amount of material composted by the facility, and the number and wages of employees. Many communities are avoiding composting costs by relying on county

or private facilities that charge minimal or no tipping fees. For those that are composting their yard waste at local facilities, operating costs range from \$2 per ton to close to \$100 per ton, with most costs in the \$15 to \$30 per ton range. Capital costs per ton-per-day composted are relatively inexpensive, ranging from virtually zero (in cases where cities are relying on existing equipment like front-end loaders to turn windrows) to \$55,000 (high-tech systems with windrow turners and screening equipment).

In addition, communities can substantially reduce both collection and processing costs by promoting backyard composting of organic materials and leaving grass clippings on lawns.

#### **Step 4 – Send Materials to Outside Processing & Composting Facilities**

Cities can avoid and/or reduce capital and operating costs by sending recyclables and yard trimmings to processing sites owned by county or state agencies, or by private firms. (Regional facilities benefit from economies of scale, and the overall operating expenses of such facilities are frequently cheaper on a per-ton basis than those of municipally-scaled ones. In many instances, total capital costs of regional operations are higher.) While municipalities typically pay low or no tipping fees to use such operations, drawbacks include additional transportation costs, little control over the types of materials accepted, and little control over where materials are marketed.

#### **Step 5 – Integrate Materials Recovery into Solid Waste Systems**

When implementing materials recovery programs, cities generally incur additional capital and operating expenses. These additional costs can be offset by the reduced costs of managing solid waste destined for disposal. While some additional expenses cannot be avoided, communities can reduce such costs by shifting staff and equipment away from refuse collection and into materials recovery. Recycling and composting programs serve as substitutes for refuse collection and disposal systems, not additional programs. Berlin Township, New Jersey, which boasts one of the highest recovery rates in the nation, uses the same staff and much of the same equipment for refuse and recycling activities. When Takoma Park, Maryland, started its curbside program, it reorganized its Sanitation Division in order to avoid hiring additional employees to collect recyclables. The city reduced the number of trucks collecting refuse and converted one of its three-person refuse collection crews to a recycling crew. After reaching a 36 percent residential recovery rate in 1990, Takoma Park further reduced its refuse collection infrastructure in 1991 and split sanitation crews evenly between recycling and refuse collection.

Many communities have avoided new equipment purchases by using pre-existing or shared equipment. Equipment used for collecting refuse or other public works functions can be used for collection of recyclables and



yard trimmings and, in some cases, for processing these materials.

Co-collection systems, in which refuse and source-separated recyclables are collected simultaneously using the same vehicles, present another way to more fully integrate recycling into solid waste management. Loveland, Colorado, projects that its citywide co-collection program will cost \$79 a ton—well below the costs estimated for separate trash and recycling collection systems.

## CONCLUSIONS

Unlike incineration or landfilling, recycling must be approached as a system. Conventional waste management strategies allow everyone to dump everything into a single container; the waste is then compacted and either sent to a landfill or to an incinerator. Recycling and waste reduction programs must use a comprehensive approach, combining public education, careful attention to the mechanics of collection, and market development for each material. This approach to solid waste management can reap the benefits of lower costs, job creation, and new enterprise development.

Cities facing economic recession and ever-tightening budgets may be tempted to cut back on their recycling programs. Such cutbacks may save money in the short run, but they will cost money in the long run. Unless a community is located near high-capacity, low-cost landfills, waste reduction, recycling, and composting are the cost-effective strategy. The per-

ton costs of start-up and pilot programs may be higher than those of conventional solid waste management alternatives. But as the programs expand, the costs will come down. Still, even where landfills are relatively cheap, prudent recycling, waste reduction and composting efforts can be cost-effective. Certainly, high-capacity, low-cost landfills and community commitments to the three R's (Reduce, Reuse, Recycle) are not mutually exclusive. Even when landfills are under private control, investments to save their capacity for the future will help keep the private operators more competitive on price and service levels.

Communities around the country have experienced a dramatic learning curve in the last few years, learning how to pick up and process more materials more efficiently, and how to identify new markets for these materials.

## GLOSSARY

### **aseptic package**

A carton made of paper and coated with plastic used primarily as a container for juice.

### **backyard composting**

The controlled biodegradation of leaves, grass clippings, and/or other yard trimmings on the site where they are generated (typically residents' backyards).

### **bottle bill**

A generic term for container deposit legislation.

### **boxboard**

Paperboard used in the manufacture of cartons and rigid boxes.

### **co-collection system**

The collection of mixed waste and source-separated recyclables with one vehicle in one trip.

### **commercial recyclable**

Recyclable generated by the commercial and institutional sectors. The commercial sector includes theaters, retail establishments, hotels, and restaurants. The institutional sector includes hospitals, schools, and government offices.

### **commingled recyclables**

Several recyclable materials mixed together. Typically refers to glass, metal, and plastic containers placed together in a single container.

### **composting**

The microbial degradation of organic

matter into a soil amendment, fertilizer, and/or mulch.

### **curbside recycling**

The generic term for scheduled recycling collection service to households. Some curbside recycling collection programs collect from alleys.

### **disposable**

A product that is designed to be used once and then thrown away.

### **drop and swaps**

A salvage and reuse operation where one can bring unwanted materials and exchange them for materials which have some value to the exchanger.

### **drop-off collection**

The collection of recyclables at a site where citizens can deliver separated secondary materials, such as newspapers, glass containers, and metal cans.

### **durable**

Lasting in spite of use.

### **end user**

Mills and other industrial facilities where secondary materials are converted into new materials. Paper mills, steel mills, and glass container production plants are examples of end users.

### **feedstock**

Raw material input into a process.

### **grasscycling**

Leaving grass clippings on a lawn after it has been mowed.

### **HDPE**

High-density polyethylene, a plastic polymer. Examples of products made

from HDPE include milk jugs, detergent bottles, certain kinds of grocery sacks, and garbage containers.

**ILSR**

Institute for Local Self-Reliance.

**in-vessel system**

A containerized or enclosed system.

**industrial scrap**

Waste generated by industries during the manufacturing process.

**kraft bag**

A bag consisting of a comparatively coarse, strong paper made primarily from wood pulp produced by the sulfate process. Paper grocery bags are usually kraft bags.

**LDPE**

Low-density polyethylene. LDPE is used for both rigid containers and plastic film applications.

**least-waste packaging**

A method of product packaging that minimizes the amount of waste created by the packaging material.

**lightweighting**

A method employed by manufacturers to reduce the amount of materials consumed per product produced.

**master recycler/composter program**

A program through which volunteers are trained to train others how to home compost, prevent waste, and recycle.

**materials broker**

A middle person who first purchases collected recyclables and then sells or otherwise directs the recyclables to end users.

**materials recovery**

The recycling and composting of discarded materials.

**materials recovery processing center**

A facility that separates and/or processes recyclable materials and sells or otherwise directs them to other processors or end users.

**mixed paper**

A bulk grade of waste paper made up of papers from various sources. Generally regarded as a low grade.

**municipal solid waste**

Includes residential, commercial, and institutional nonhazardous solid wastes.

**package-to-product ratio**

The ratio of packaging weight to the weight of the actual product.

**PET**

Polyethylene terephthalate, a plastic polymer, used to manufacture plastic soft drink and other rigid containers.

**polystyrene (PP)**

A plastic polymer commonly known as styrofoam. PP is used in flexible and rigid packaging, film, and textiles.

**precycling**

Preventing waste generation (first coined by the Berkeley source reduction educational campaign).

**recovery**

The process in which a material is either saved from loss or restored to usefulness.

**recyclable**

When commonly used, refers to the technical ability of a material to be reused in manufacture. A more precise definition incorporates requirements that a recycling collection, processing, and market system be in place and economically functioning in order for a material to be considered recyclable. Using this definition, many materials are technically capable of being recycled but are not considered recyclable due to the lack of a viable recovery system.

**recycling**

Commonly, the use of secondary materials in the production of new items. Recycling by definition often includes materials reuse. In this booklet, we make a distinction between recycling and composting. Here, recycling refers to recovering discarded products and packaging materials for reuse and/or processing into new products; it does not generally include composting.

**regional waste exchange**

A salvage and reuse operation where one can bring unwanted materials and exchange them for materials which have some value to the exchanger.

**reusable**

Capable of being used again or repeatedly.

**scrap-based manufacturing**

Production of new products using recycled feedstock.

**secondary material**

Recyclable materials, such as waste paper and scrap metals.

**solid waste**

Waste materials produced by residents, businesses, institutions, and industry, not including liquids, hazardous wastes, and other non-solid materials.

**source reduction**

Any action that avoids the creation of waste by reducing waste at the source, including redesigning products or packaging so that less material is used; making voluntary or imposed behavioral changes in the use of materials; or increasing the durability or reusability of materials.

**source-separation**

Separation by the waste generator of materials designated for some form of materials recovery or special handling.

**tipping fee**

The charge assessed for unloading solid waste at a disposal or transfer site.

**transfer station**

A centralized facility where solid waste is transferred from collection trucks to other trucks (usually larger in carrying capacity), which then deliver the waste to disposal sites such as landfills or waste incinerators.

**vacuum leaf loaders**

Collection vehicles with vacuum attachments used to collect leaves, mostly in the fall season.

**vermicomposting**

The use of worms to digest raw or stabilized organic waste.

**volume-based refuse collection fee**

Refuse or garbage collection fees that are based on the volume of waste

generated. The more waste generated, the higher the fees. Fees are typically based on the number and size of trash cans or trash bags.

**waste audit**

A survey that analyzes the volume, weight, toxicity, and/or composition of a selected waste stream.

**waste reduction**

Decreasing the amount of waste disposed through waste prevention, recycling, and composting.

**wet waste**

Organic waste such as food scraps and yard trimmings.

**wet/dry collection**

Materials collection system in which organics such as food scraps and yard trimmings are segregated from conventional recyclables such as paper, plastic, metal, and glass. Both streams are collected for recovery.

**windrow**

A piled row used to compost organic material.

## NOTES

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  15. Yard debris comprises on average 18 percent of the nation's municipal waste stream, while food waste comprises an additional 7 percent. U.S. EPA, *Characterization of Municipal Solid Waste in the United States: 1992 Update*, Office of Solid Waste, July 1992, page 2-2.
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