

Future of Recycling

Is a zero-waste society achievable?

Three-quarters of all Americans recycle at home, making recycling one of the nation's most popular environmental activities. Skeptics argue that recycling does little to help the environment and often costs more than burying waste in landfills, but rising energy prices and concerns about climate change are strengthening the supporters' case. Making new goods from scrap metal, glass or paper uses less energy and generates fewer greenhouse gases than extracting and processing virgin materials. Today the U.S. recycles more than 30 percent of its municipal solid waste, and advocates say that figure could be much higher. Diverting more waste from landfills, however, will involve finding ways to handle new materials such as food scraps. Meanwhile, a growing stream of junked computers, televisions and other electronic trash — much of it containing toxic materials — is forcing manufacturers to take responsibility for disposing of their products.



Four million old cell phones are recycled yearly at ReCellular, in Dexter, Mich. Used TVs, computers, cell phones and other "e-waste" contain many toxic materials and are the fastest-growing segment of the U.S. municipal solid-waste stream.

INSIDE THIS REPORT

| | |
|-------------------------|------|
| THE ISSUES | 1035 |
| BACKGROUND | 1044 |
| CHRONOLOGY | 1045 |
| CURRENT SITUATION | 1049 |
| AT ISSUE | 1051 |
| OUTLOOK | 1052 |
| BIBLIOGRAPHY | 1056 |
| THE NEXT STEP | 1057 |

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THE ISSUES

- 1035 • Is there a waste-disposal crisis in the United States?
• Do product bans reduce waste?
• Should producers be responsible for disposing of used products?

BACKGROUND

- 1044 **'Throwaway Society'**
Increased consumption has created more trash.
- 1047 **Confronting Waste**
Government involvement began in the 1960s.
- 1047 **Domestic Debate**
Critics say recycling has more costs than benefits.

CURRENT SITUATION

- 1049 **Federal Action?**
Advocates want more education programs and market involvement.
- 1050 **Slimmer Packages**
Manufacturers are designing lighter and more eco-friendly packaging.

OUTLOOK

- 1052 **Zero-Waste Visions**
Many U.S. and foreign cities share Wal-Mart's goal.

SIDEBARS AND GRAPHICS

- 1036 **One-Third of Solid Waste Is Paper**
About one-fourth is yard trimmings and food scraps combined.

- 1037 **Recycled Content Often Saves Energy**
But using virgin resources to make newsprint and glass consumes less energy.

- 1038 **Almost All Car Batteries Are Recycled**
Percentages are much lower for everyday household products.

- 1039 **Half of All Trash Is Discarded**
Only one-third is recycled.

- 1040 **Nation Recycles 82 Million Tons Annually**
Over a 15-fold increase since 1960.

- 1042 **San Francisco Pioneers in Food Recycling**
City to collect 75 percent of all waste by 2010.

- 1045 **Chronology**
Key events since 1948.

- 1046 **Recycling Focuses on Two Types of Plastic**
Market for other types is less developed.

- 1047 **Did You Know?**
Facts about recycling.

- 1051 **At Issue**
Is generating energy from waste good for the environment?

FOR FURTHER RESEARCH

- 1055 **For More Information**
Organizations to contact.

- 1056 **Bibliography**
Selected sources used.

- 1057 **The Next Step**
Additional articles.

- 1059 **Citing CQ Researcher**
Sample bibliography formats.

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Future of Recycling

BY JENNIFER WEEKS

THE ISSUES

Back in the early days of recycling, critics argued that recycling not only cost more than dumping waste in a landfill but also used more energy than it saved.

Tell that to the enterprising thieves cruising the streets of New York City nowadays. With scrap material prices rising, New York has an unusual recycling problem: Thieves are stealing metal, bundled paper and other recyclables from curbside bins and selling them on underground markets. The improbable “green” crime wave prompted Mayor Michael Bloomberg to sign a bill in October raising the penalty for using a vehicle to steal curbside materials from \$100 to \$2,000.¹

Few New Yorkers would have predicted that old glass and plastic could become so valuable back in 2002, when the city stopped recycling them to save money during a budget crisis. But as costs rose to send these items to landfills, and neighborhoods opposed building new incinerators, the city made a new commitment to recycling.

“With landfill and incineration disposal costs rising steeply and their current reliability in question, it is important that [New York City] move beyond its traditional reliance on dump-and-burn solutions,” Comptroller William Thompson, Jr. warned in an October 2004 report.²

New York City’s waste problem is especially challenging because the city closed its vast Fresh Kills landfill on Staten Island (the world’s largest) in 2001 after local politicians sued to shut



AP Photo/Seth Wenig

New York City sanitation workers collect paper for recycling ahead of roving scrap scavengers. Almost half of the 250 million tons of household trash generated by Americans annually is diverted to other uses. About a third is recovered for recycling or composting, and 13 percent is burned to generate electricity.

it down, and trucking waste to out-of-state landfills is costly.

Americans have debated the benefits and costs of recycling for several decades.³ Although U.S. recycling rates have climbed steadily since the 1970s, advocates say that the nation can do more. At the same time, technologies for producing energy from trash offer new options for managing solid waste.

Americans generate about 250 million tons of municipal solid waste (MSW), or household trash, annually. This amount has nearly tripled since 1960, but the rate of growth has slowed in recent years. In 1960 nearly all MSW was dumped into landfills, but in 2006 almost half was diverted to other uses. More than 32 percent was recovered for recycling or compost-

ing (breaking down organic materials such as food and paper into a soil-like mixture that can be used as fertilizer). Another 13 percent was incinerated in waste-to-energy (WTE) plants — facilities equipped with advanced pollution controls that burn garbage under controlled conditions to generate electricity.⁴ (See chart, p. 1040.)

State and local governments, which are responsible for solid waste disposal, typically support recycling as a way to reduce littering and disposal costs. Environmentalists endorse recycling because it conserves natural resources and reduces environmental impacts from logging and mining. And because manufacturing products from scrap instead of virgin materials often requires less energy, recycling saves fuel and reduces greenhouse gas (GHG) emissions that contribute to global climate change.⁵ (See graph, p. 1037.)

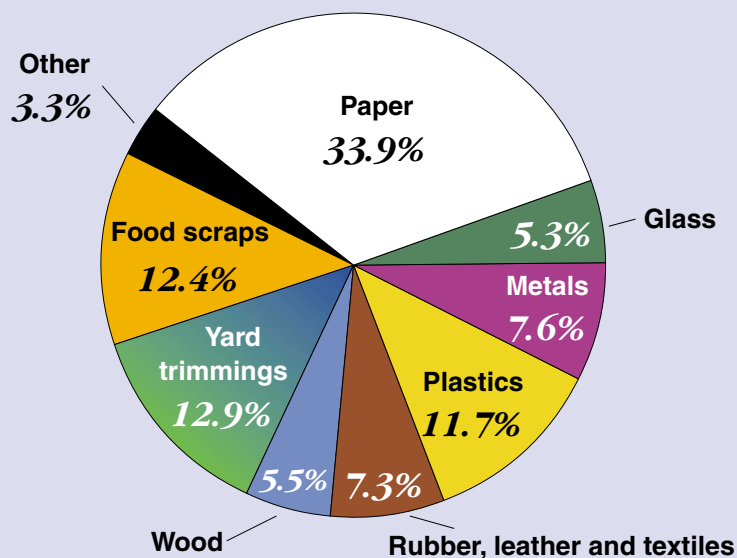
Recycling also combats global climate change directly by reducing generation of methane, a powerful greenhouse gas produced when organic waste decays in landfills.

“People understand recycling — it’s the most widely practiced environmental activity in the U.S.,” says Allen Herzkowitz, a senior scientist with the Natural Resources Defense Council (NRDC). “Recycling is ecologically superior to using virgin materials. When you make aluminum from recycled cans instead of bauxite ore, you save 95 percent of the energy.” Relying on virgin resources also threatens biodiversity, Herzkowitz contends. “Earth is losing an acre of tropical forest every second, and the paper industry is the top world cause of deforestation,” he says.

One-Third of Solid Waste Is Paper

Paper accounted for 34 percent of the 251 million tons of U.S. municipal solid waste in 2006. Yard trimmings and food scraps together were 25 percent of the total.

U.S. Municipal Solid Waste, by Material, 2006



** Figures do not total 100 due to rounding.*

Source: "Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2006," Environmental Protection Agency

Municipal recycling is part of a larger scrap-recycling industry that also processes materials from industrial and other sources, such as automobiles, appliances and construction and demolition wastes. This sector generates an estimated \$65 billion in revenues annually and employs some 50,000 people. In 2006 U.S. scrap recyclers exported \$15.7 billion worth of materials to 143 countries.⁶

"With the developing world taking off economically, demand for resources is picking up, and this trend is not going to subside. There just aren't enough raw materials out there at decent prices for manufacturers to get what they want," says Jeffrey Morris, a principal with Sound Resource Management Group, a consulting firm in Washington state. "Energy is scarce,

too, and it takes energy to process materials into products. Disposal isn't a good use of these resources, which is why China is buying them as fast as it can."

Skeptics say that materials in municipal waste have low value and are expensive to reuse or recycle. Daniel K. Benjamin, an economics professor at Clemson University in South Carolina, argues that mandatory recycling programs "force people to squander valuable resources in a quixotic quest to save what they would sensibly discard." In Benjamin's view, society is better off letting low-income scavengers cull valuable materials from trash. "[R]ecycling household discards is the business of the poor, but only until they have improved their lot enough to pass it

on to those who would follow in their footsteps," he writes.⁷

Nearly 60 percent of U.S. household discards are organic materials that can be readily composted or recycled (food scraps, yard trimmings, paper and paperboard). Other products pose harder challenges. Only two of the six major types of commercial plastic resins have well-developed recycling markets. (See sidebar, p. 1046.) And unlike glass, plastic typically cannot be processed directly back into its original form, so recycling often means "downcycling" it into a lesser-quality product — for example, shredding plastic beverage bottles to make fiber for fleece garments.

Another concern is e-waste — used electronic goods like televisions, computers and cell phones, which contain many toxic materials. The United Nations Environment Programme estimates that 20-50 million metric tons of e-waste are generated worldwide every year.⁸ E-waste currently accounts for about 2 percent of U.S. municipal solid waste, but it is the fastest-growing segment of the municipal waste stream. According to the Environmental Protection Agency (EPA), only 15 to 20 percent of the roughly 2 million tons of U.S. electronics discarded in 2005 were recycled, with most of the remainder going to landfills.⁹

The short life cycle of electronic products is contributing to the prevalence of e-waste. "Invariably, after you buy the newest electronic widget, you dump the old one," observes Canadian writer Giles Slade.¹⁰ Government standards can also make products obsolete. Notably, U.S. television broadcasters are scheduled to shift from analog to digital technology in early 2009, a step that could prompt consumers to scrap millions of older televisions.¹¹

Waste managers and environmentalists worry that e-waste will be crushed in landfills and release contaminants, polluting ground water and threatening human health. Cathode ray tubes

in televisions and computer monitors contain several pounds of lead, which can cause brain and nerve damage. Computers also contain heavy metals such as copper, zinc, cadmium, beryllium and arsenic that are hazardous in small quantities. Liquid-crystal displays in laptops, flat-panel televisions and other digital equipment contain mercury, another strong neurotoxin.¹² Electronics recycling is a fast-growing industry because the metallic components are valuable, but many operations — especially in developing countries — provide little or no protection for workers or the environment.

High fossil fuel prices in recent years have raised interest in alternative fuels, including energy generated from waste.¹³ WTE plants are one way to turn garbage into power; in addition, many large landfills capture their methane emissions, clean the gas to remove impurities and burn it to generate electricity. As of 2006 the U.S. had 3,134 megawatts of generating capacity from landfill gas and WTE plants, the equivalent of five or six medium-sized coal-fired power plants.¹⁴

More landfill methane projects are on the drawing boards, but no new WTE plants have been built in the United States for a decade, although several plants are expanding. Today's WTE plants have advanced pollution controls and produce much lower emissions than older waste incinerators. WTE advocates say that electricity from waste combustion should receive the same legal benefits and subsidies as other renewable fuels, but many environmental advocates oppose classifying WTE as "green" power. (See "At Issue," p. 1049.)

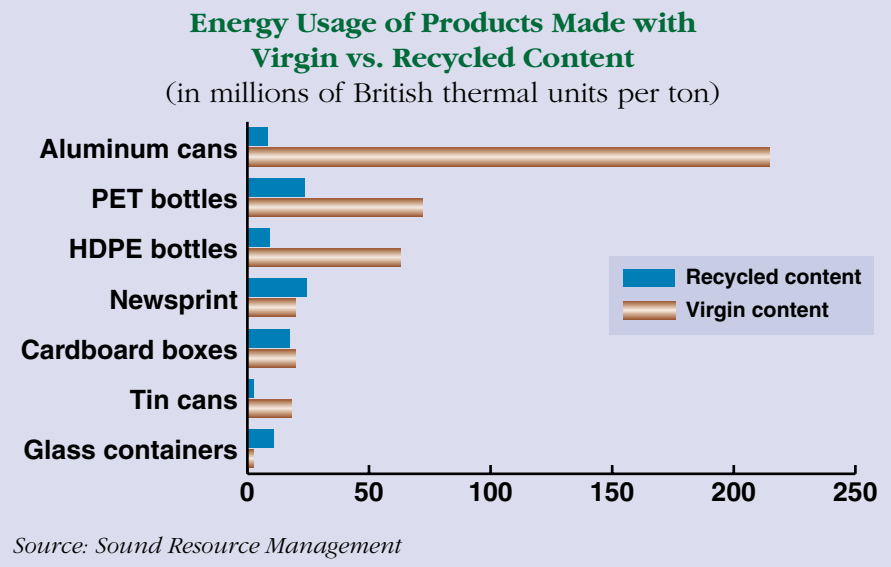
As regulators, businesses and advocacy groups look for ways to manage America's trash, here are some of the issues they are debating:

Is there a waste disposal crisis in the United States?

Since the first Earth Day celebration in 1970, many recycling advo-

Recycled Content Often Saves Energy

Manufacturing products with recycled material requires far less energy than making the same products with virgin content. Aluminum cans, for example, require about 10 BTUs if they are made with recycled material vs. 225 BTUs with virgin materials. Some other products, however, such as newsprint and glass containers, use less energy when made from virgin resources.



cates have warned that the nation faces disaster if Americans keep recycling only a fraction of the solid wastes they produce. In the past, some observers worried the United States could run out of landfill space. Today most recycling supporters acknowledge it is possible to bury all of our trash, but they say landfills pose lasting environmental risks and that some wastes are too toxic to bury or burn. And some regions lack disposal space or systems for managing trash.

In 2006 there were 1,754 municipal landfills operating in the United States.¹⁵ The number has declined sharply in the past several decades, but their average size has increased as site owners seek to achieve economies of scale. According to recent industry estimates, the United States has 20-50 years of landfill disposal capacity, although some states have as little as five years' worth.¹⁶ A 2004 survey by

BioCycle magazine identified 30 states that were adding landfill capacity.¹⁷

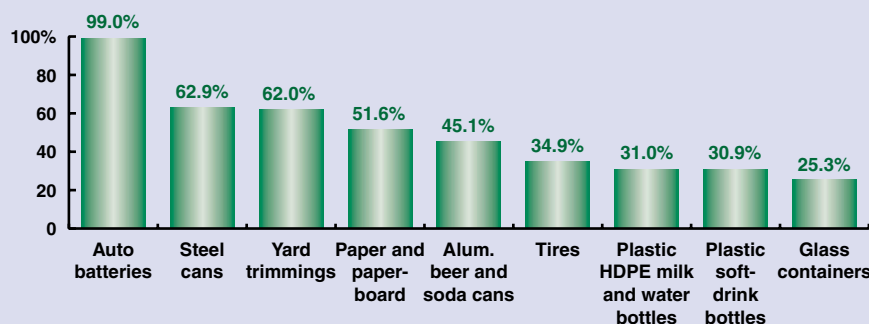
Some observers argue that the world has plenty of room for its trash. In his 2001 bestseller *The Skeptical Environmentalist*, Danish political scientist Bjorn Lomborg projected that all of the garbage generated in the United States in the 21st century would fit into a landfill measuring 18 miles on each side and 10 stories high. "Garbage is something we can deal with. It is a management problem," Lomborg asserted.¹⁸

But many environmental and community groups say that even state-of-the-art landfills are not an acceptable way to manage trash. As waste breaks down in landfills it produces landfill gas, a mix of methane, carbon dioxide and small amounts of other substances that can cause odors or health risks.¹⁹ Landfills also produce leachate, a liquid runoff that can be toxic, when

Almost All Car Batteries Are Recycled

Virtually all of the nation's old automotive batteries are recycled, as required by most state laws. Recycling rates for household products such as paper and aluminum cans are significantly lower.

Recycling Rates of Selected Items, 2006



Source: "Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2006," Environmental Protection Agency

water leaks in and picks up contaminants from garbage.

Current standards require landfill operators to install liners to contain leachate, and to capture and treat gas at large landfills. But neither system is foolproof. "Most professionals acknowledge that no one knows how long modern liners will actually function," says Sego Jackson, principal solid waste management planner for Snohomish County in northwest Washington state. EPA's guidelines for estimating landfill air emissions assume that on average, collection systems will capture about 75 percent of the landfill gas.²⁰

"We still do have a solid-waste management crisis. The issue isn't landfill capacity, it's the long-term impact of landfills on public health," says Brenda Platt, co-director of the Institute for Local Self-Reliance, a nonprofit community development group in Washington, D.C. "We know all landfill liners will eventually leak, so we're just postponing the impact of our consumption."

Waste managers want to improve technologies for managing trash but say that the system is working. "Solid

waste management is a local issue, so it's hard to generalize that the U.S. is facing a crisis," says Brent Dieleman, manager of the technical division for the Solid Waste Association of North America (SWANA), which includes industry and government agencies. "There are local crises because of landfill space shortages and high disposal prices. But when people raise this issue, often they're really saying that we generate more garbage than we did in the past, and that's not true."

In the 1970s and '80s, U.S. MSW generation rates rose by 30 percent or more each decade. The rate leveled off considerably in the 1990s as the concept of source reduction (preventing waste from ever entering the waste stream) started to influence business practices. For example, many manufacturers found ways to use less material in packaging as a cost-cutting measure. Beverage companies reduced the weight of two-liter plastic bottles by 25 percent between 1977 and 2000, and made steel beverage cans 40 percent lighter between 1970 and 2000.²¹ And producers increased the lives of some

products, such as tires, so fewer were thrown away over time.

These trends gradually moderated the rate at which Americans produced trash. Total municipal waste generation increased by about 16 percent between 1990 and 2000, and from 2000 through 2006 trash output increased by only 5.4 percent. The national per-capita generation rate actually fell slightly, from 4.64 pounds per day in 2000 to 4.60 pounds in 2006 (total garbage quantities rose because population increased).²² "We're not producing substantially more waste now than we have in the past, so for the most part we can handle it effectively," says Dieleman.

But for public officials in areas with high waste disposal costs the issue is urgent. The nationwide average "tipping fee" for disposing of trash at a landfill rose from \$8.20 per ton in 1985 to \$34.29 in 2004, and prices are much higher where space is scarce. Northeast state tipping fees averaged \$70.53 per ton in 2004; in contrast, fees in Southern and Western states were roughly \$25 per ton.²³

And siting new landfills can be challenging. "We have room, but landfilling is not what citizens want to do with open space. When you ask consumers about landfills, no one wants to live near them or drive by them," says Kate Krebs, executive director of the National Recycling Coalition.

In one recent instance, when proposals for six large landfills in eastern North Carolina became public in 2006, the state legislature passed a one-year moratorium on new landfills by votes of 50-0 in the Senate and 99-11 in the House. Later, North Carolina placed a surcharge on all trash sent to landfills and tightened environmental standards for new facilities.²⁴ States are forbidden from discriminating against out-of-state waste shipments under a 1978 U.S. Supreme Court ruling, which held that such policies violated the Constitution's Commerce Clause, but some

have used strategies such as surcharges and special waste-management districts to regulate imported waste.²⁵

Many areas with growing populations are having trouble keeping up with rising waste generation. California has an aggressive solid waste program that already recycles, reuses and composts 54 percent of household garbage, but the state's population is projected to rise from 36 million today to 60 million by 2050. "We're looking at that and we're thinking, 'Wow, that's going to be a lot of trash,'" acknowledged Jon Myers, public affairs director for the California Integrated Waste Management Board.²⁶

Growth and development in many Western states are worsening a long-standing problem: illegal waste dumping on public lands. The Interior Department's Bureau of Land Management reported more than 6,000 illegal dump sites strewn with household waste, car parts, appliances and other trash between 2000 and 2006. Cleaning up those dumps could cost several thousand dollars apiece if they contain hazardous materials or require laboratory testing.²⁷ Illegal dumping is especially common in areas that do not have enough trained personnel and facilities for managing solid waste.

Even everyday consumer items such as automobile tires can create hazards if they are not managed safely. Between 1983 and 1985 two separate fires at a tire pile in Everett, Wash., burned more than 1 million tires, leaving five acres of ash that contained carcinogenic residues and required a multi-million-dollar cleanup.²⁸ "A lot has been done to address tire piles, but they still exist in Snohomish County and around Washington today. They're very expensive to clean up, and the public still doesn't have many good options for dealing with unwanted tires," says Jackson.

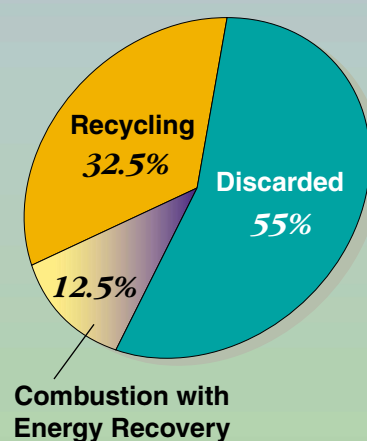
Do product bans reduce waste?

Plastic bags, once a convenience that shoppers took for granted, have be-

Most Trash Is Discarded

Fifty-five percent of all municipal solid waste was discarded in 2006. Only about one-third was recycled. One-eighth was combusted with energy recovery.

Management of Municipal Solid Waste, 2006



Source: "Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2006," Environmental Protection Agency

come a prime environmental target. About 100 billion bags are sold to retailers worldwide every year, and only 1-3 percent are recycled. Plastic bags and films make up about 4.5 percent of the waste in landfills, where they can take centuries to break down.²⁹ They blow around easily outdoors, where they tangle in tree branches, block drains and choke animals and birds that accidentally ingest them. Ubiquitous as litter, plastic bags are known derisively as "the national flower" in South Africa, "white pollution" in China and "witches' knickers" in Ireland.

Plastic bags are made of several types of polyethylene (#2 and #4 resins). Only about 1 percent of bags used in

the U.S. each year are recycled. Most curbside recycling programs do not collect them because they clog sorting machinery. In response to growing concerns about litter and environmental impacts, at least 18 countries have adopted or considered taxes, consumer-education campaigns, usage-reduction targets or outright bans on plastic bags in the past five years.³⁰

San Francisco banned plastic shopping bags at large grocery and drug stores in 2007, and other cities have debated similar measures, including Annapolis, Boston and Austin. In November 2007 a bill was introduced in New Jersey to ban the bags at large retail stores statewide.³¹

Proponents argue that banning hard-to-recycle and environmentally harmful products will force users to find more benign substitutes. "[M]erely emphasizing greater recycling of plastic bags is an inadequate response; rather, we must fundamentally alter policy to significantly reduce our use and consumption of plastic bags," argues Ramey Ko, a member of the Bag the Bags Coalition in Austin, Texas. As Ko acknowledges, even in environmentally conscious Austin many people choose plastic bags over alternatives such as paper bags or reusable tote bags.³²

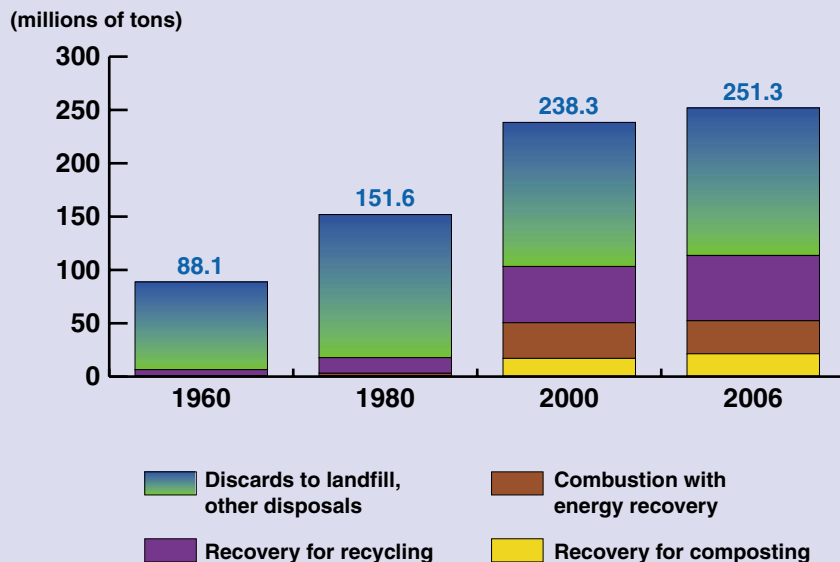
Bag manufacturers say the best way to deal with plastic bag litter is to boost support for recycling. The industry is working with grocery stores to increase at-store collection and train employees not to double-bag purchases in plastic. Producers also note that technology improvements have made bags much lighter: grocery sacks were 2.3 mils (thousandths of an inch thick) in 1976, but are 0.7 mils thick today. Because plastic bags are so light, they require less fuel to transport than paper grocery bags. They also consume about four times less energy to produce and require only about 10 percent as much energy to recycle.³³

"From a litter standpoint, plastic bags are very aggravating, so it's under-

Nation Recycles 82 Million Tons Annually

The amount of solid waste in the United States has nearly tripled in the past half-century, to 251 million tons. During the same period, the amount of waste recycled — including composting — increased more than 15-fold, to 82 million tons.

Management of Municipal Solid Waste, 1960-2006



Source: "Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2006," Environmental Protection Agency

standable that people are focusing on them," says the NRC's Krebs. "But there's very strong end-use demand for them from companies that use them as feedstock for plastic decking, and the industry is working hard to get users to recycle them."

Other plastic goods have attracted similar treatment. Roughly 100 cities, mostly in California, have banned takeout food containers made of polystyrene foam (known as Styrofoam, a trademarked brand) over the past 20 years, seeking to promote biodegradable alternatives such as paper cups.³⁴ Polystyrene can be recycled but has a low scrap value because it is lightweight and bulky, so collecting and transporting enough material for recycling is expensive, and food containers must be cleaned before pro-

cessing. Like other disposable plastic products, it is a major component of litter and breaks down very slowly.

As with plastic bags, producers say that polystyrene containers cause less environmental harm than alternatives, such as plastic-coated paper cups.

Many food retailers also object to container bans. "It places the burden on restaurants when we should be focusing attention on the people who are throwing away the containers," said Lara Diaz Dunbar of the California Restaurant Association in March 2007, when legislation banning non-recyclable food containers by 2012 was introduced in the state legislature.³⁵

Instead of banning hard-to-recycle products altogether, many states and communities forbid landfilling them. Numerous states bar wastes including yard

trimmings, tires, used motor oil, various types of batteries, appliances and oil-based paint from landfills.³⁶ These rules force sources to recycle the materials or find other uses for them and help to reduce waste generation over time. "Disposal bans that put responsibility for recycling on producers create a direct incentive not to make that item," says Snohomish County's Jackson.

For example, in 2006 Massachusetts banned sending construction and demolition wastes such as asphalt, brick, wood and metal to landfills in order to extend state landfill capacity. "The state targeted aggregates [crushed stone, sand and gravel], metal and wood because recycling markets could accept at least 75 percent of the calculated waste stream with no problem," says Amy Bauman, founder of greenGoat, a Boston consulting firm that works with the building industry to reduce and recycle wastes. "Otherwise a ban might lead to illegal dumping, which doesn't help anyone."

In Bauman's view, the ban has benefited Massachusetts builders by giving them a new incentive to reduce waste and take advantage of markets for recyclables. "The industry was already recycling aggregates and metal, so wood was the only controversial issue," she says. "The ban reinforces the growing popularity of green building."

Dieleman of SWANA emphasizes that disposal bans only work as part of a broader waste reduction and recycling strategy. "Before you ban landfilling wastes, you need to establish alternative ways to regulate, collect and process them that will achieve the overall goal," he points out. "Otherwise, you're imposing an unfunded mandate on waste managers."

Some cities are working with producers instead. In July 2007 Los Angeles partnered with plastic bag manufacturer, grocers and environmental groups to launch a pilot plastic bag recycling program in the wake of a new state law requiring grocery and retail

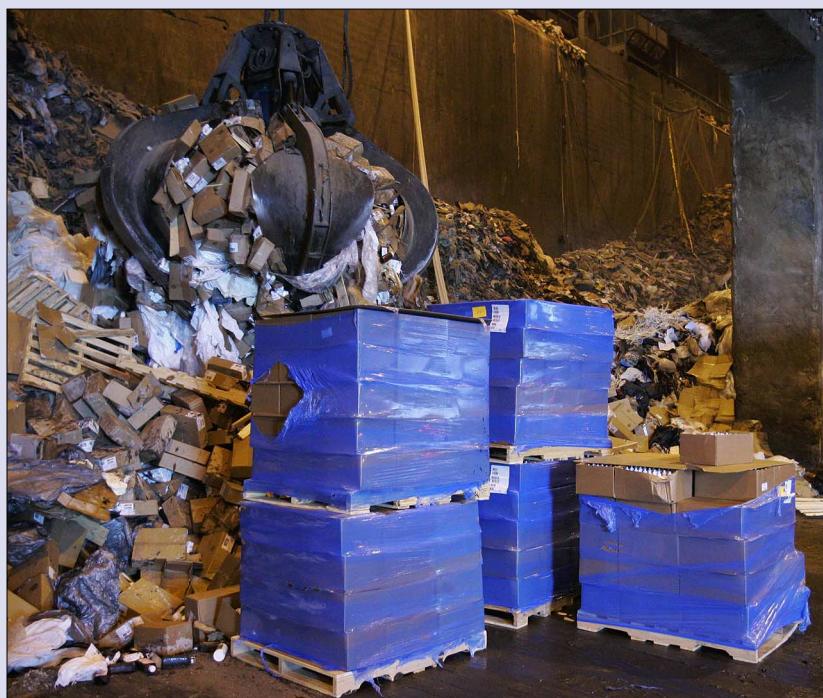
stores to offer in-store bag collection. City agencies are publicizing the program in designated “high-trash areas” and offering collection bins, pickup services, promotional materials and media support to stores that participate.³⁷

Taxes and fees can also promote sustainable choices. Ireland cut plastic shopping bag use by 90 percent after it placed a 15 Euro-cent tax on the bags in 2002. In 2007 the tax was raised to 22 cents per bag after its initial impact began to erode.³⁸ And a “green bag” movement in which stores offer inexpensive, reusable polypropylene tote bags as an alternative to paper or plastic, is spreading from Europe and Australia to the United States. “Hardly anyone pays for a shopping bag in those countries,” says Jackson. “They’ve all got their own.”

Should producers be responsible for disposing of used products?

Few Americans think of their homes as hazardous waste storage sites, but according to EPA the cans of old house paint sitting in millions of basements nationwide are household hazardous waste. Modern paints may contain a variety of toxic solvents and pigments, and some older house paints contain lead (added to make the finish last longer) or mercury (used to prevent mildew).

The EPA regulates hazardous waste disposal under the Resource Conservation and Recovery Act (RCRA), but households and small businesses that generate minimal quantities of waste are essentially exempt from RCRA requirements. Instead, municipal waste programs are responsible for safe disposal of household hazardous wastes. Communities may collect paint and other hazardous materials year-round, accept them on special collection days or refer residents to drop-off centers elsewhere. People who live far from collection centers have few options. Some agencies suggest mixing old paint with kitty litter or sawdust to thicken



AP Photo/Michael Conroy



AP Photo/Janet Hosterter

Remnants of a ‘Throwaway Society’

Pharmaceutical products await incineration at the Covanta Energy Corp. in Indianapolis (top). Last year the facility burned some 6.5 million pounds of pills from pharmacies and drug manufacturers around the country. Electronic equipment to be recycled is warehoused at The Computer Service Center in Blaine, Minn. (bottom). A half-dozen states, including Minnesota, ban computer monitors, televisions and other e-waste in landfills because of their toxic content.

San Francisco Pioneers in Recycling Food Scraps

City to collect 75 percent of all waste by 2010.

About 60 percent of U.S. municipal solid waste is food scraps, soiled paper, yard trimmings and other compostable materials. Homeowners and municipal landscapers typically bag yard waste separately from other garbage, so it is easy to collect. Some 62 percent of U.S. yard waste was composted in 2006. But few jurisdictions collect food scraps, which are usually mixed into household garbage and require special handling to manage odors and avoid attracting rats and other pests.

San Francisco is the first large U.S. city to collect and compost food scraps as a waste-diversion strategy. Food and other compostable materials like soiled paper and waxed cardboard make up about 20 percent of San Francisco's solid waste (the city is highly urbanized and has few yards, so it produces little yard waste). Sunset Scavenger and Golden Gate Disposal, the city's two waste-hauling companies, have collected food waste from restaurants and other commercial customers since 1996 and from residences since 2000. Thanks partly to this program San Francisco was diverting 63 percent of its waste by 2005 and is aiming for a 75 percent diversion rate by 2010.¹

Some 40 percent of San Francisco's population does not speak English, so the food-diversion process is designed to be simple and user-friendly. Curbside collection of household waste uses a color-coded system called the "Fantastic Three": organic wastes go into green wheeled collection carts, other recyclables like glass and plastic into blue carts and trash into black

carts. Businesses, which also use a color-coded collection system, receive a 25 percent discount on their trash pickup costs for separating food waste. Hauling companies provide multilingual training and posters to help employees learn the system.

As of 2007, San Francisco haulers were collecting over 300 tons of organic wastes every day from some 2,100 businesses and 75,000 homes.² Trucks take the materials from a downtown processing center to two composting facilities about an hour away. There the waste is ground, mixed and stored for several months until natural decomposition processes turn it into compost. The resulting blends, including a mix called Four Course Compost that is approved for use on organic soils, are sent to local vineyards, small farms and landscaping suppliers. San Francisco also holds a yearly free compost giveaway for residents.

Rather than viewing the food collection program as a burden, restaurants praise it. "It's increased the morale in the kitchens," said Jonathan Cook, operations supervisor at the Metreon, a San Francisco entertainment complex with eight restaurants. "People feel they're not throwing things out, they're doing something good for the environment while they're working." Separating food scraps saves Metreon restaurants \$1,600 per month in waste hauling fees.³

Growers also praise the end product, which costs no more than traditional compost. Linda Hale, vineyard supervisor for

it, pouring half-inch layers of paint into a cardboard box lined with plastic (letting each layer harden before adding more), and then throwing away the box.³⁹

In contrast, residents of British Columbia, Canada, can call a hotline for directions to more than 100 depots across the province that accept leftover house paint.⁴⁰ The centers are run by Product Care, an industry-funded nonprofit association that also collects flammable liquids, pesticides and gasoline.⁴¹ Under provincial regulations, companies that make, sell and distribute these products must provide environmentally safe ways for users to dispose of leftovers — a philosophy known as extended producer responsibility.

Producer responsibility requirements are common in Canada and the European Union, but the concept has been applied less often in the United States. Examples include deposit/return systems for beverage bottles and voluntary producer initiatives to recycle items that are landfilled in large quantities, such as carpet, or that contain hazardous materials, such as home thermostats equipped with mercury switches. Most states have laws requiring car-battery retailers to take back used batteries for recycling. Many service stations and chains like Jiffy Lube and Auto Zone also take back and recycle used motor oil, antifreeze and tires.

Concerns about the growing volume of electronic goods entering the munic-

ipal waste stream are spurring a grassroots push for producer responsibility laws focused on e-waste. "We think corporations should be required to take back their e-waste, and should be barred from exporting it," says Silicon Valley Toxics Coalition campaign Director Lauren Ornelas. "They also should have to reduce and eventually eliminate the toxic chemicals that they use now."

Today most e-waste recycling takes place in developing countries, where labor costs are lower and environmental standards are less stringent than those in the United States. Press reports indicate that a large share of global e-waste is exported illegally in violation of the Basel Convention, a pact that bans international shipment of hazardous

the Madrone Vineyard Management Group in Sonoma County, calls Four Course Compost “really rich, and just fabulous stuff.” The diversity of ingredients collected from restaurants gives the compost a rich nutrient content, says David Di Loreto, owner of Di Loreto Cellars in Camron Park, Calif.: “They have developed a consistent, high quality, well-composted product, which all of our field trials and use have shown very beneficial and environmentally clean and friendly.”⁴

Other cities are starting to follow San Francisco’s lead. Seattle has banned paper and cardboard from non-recyclable garbage and allows residents to mix food scraps with yard waste, which is collected for composting. Starting in 2009 the city will require food-scrap recycling.⁵ Meanwhile, nearly 200 businesses in Portland, Ore., and another 33 companies at Portland’s airport are participating in a city program that collects commercial food waste and soiled paper for composting.⁶



Food scraps go into a compost container at The Slanted Door restaurant in San Francisco, which began collecting and composting residential and commercial food wastes in 1996.

AP Photo/Jeff Chiu

“Food and green wastes are the new recycling frontier,” says Kate Krebs, executive director of the National Recycling Coalition. “The biggest opportunities we have within the municipal stream are all compostable materials like food, yard trimmings, wood scraps, paper and cardboard. This trend is going to spread east because it makes so much sense to turn food waste into nutrients in a non-chemical way.”

¹ Jeremy Bates, “City Surges Toward 75 Percent Waste Diversion,” *San Francisco Observer Online*, May 17, 2005.

² Norcal Waste Systems, “New Annex Becomes Green Central in S.F.,” March 22, 2007.

³ Elizabeth Davies, “Four-Course Compost Completes the Food Chain,” *Independent* (London), Nov. 5, 2004.

⁴ Tina Caputo, “Restaurant Scraps Find New Life in Northern California Vineyards,” *Wines & Vines*, February 2004.

⁵ J. Michael Kennedy, “Seattle’s Recycling Success Is Being Measured in Scraps,” *The New York Times*, Oct. 10, 2007.

⁶ Portland Composts!, www.portlandonline.com/osd.

wastes without consent from receiving states.⁴² The convention has been ratified by 170 countries, including most European nations, but not the United States.

The Silicon Valley coalition and the nonprofit Basel Action Network estimated in 2002 that 50-80 percent of the roughly 13 million computers recycled in the United States that year were exported to Asia.⁴³ In 2005 significant amounts of e-waste were also beginning to flow to Africa, and a case study in Nigeria found that most secondhand electronics were either refurbished or thrown directly into unregulated dumps.⁴⁴

Many Asian e-waste processors do little more than smash up electronics to recycle them and harvest valuable

materials. Environmental samples collected by Greenpeace in 2005 at e-waste recycling facilities in Guiyu, China, and New Delhi, India, contained high levels of toxic metals including lead, cadmium, copper, antimony and mercury, as well as PCBs and PBDEs — persistent, toxic manmade chemicals that are widely used in plastic and electronic products as insulators and flame retardants.⁴⁵ Exposure to PCBs can damage victims’ skin and liver as well as their hormonal and immune systems and increase cancer risks.⁴⁶ PBDEs have caused harmful thyroid and liver effects in animal studies, and EPA has classified one type as a possible human carcinogen.⁴⁷

A 2007 study by researchers from Hong Kong found elevated levels of

dioxins and furans (persistent toxic chemicals that are by-products of many industrial processes), in surface soils and waste combustion residues in Guiyu. “[T]he crude processing of e-waste has become one of the main contributors of [these chemicals] to the global environment,” the authors concluded.⁴⁸

Since 2003 California, Connecticut, Maine, Maryland, Minnesota, North Carolina, Oregon, Texas and Washington have passed laws that require certain electronic products to be recycled and set up systems to pay for it. Arkansas, Massachusetts, New Hampshire, and Rhode Island have banned landfilling or incinerating e-waste.⁴⁹ Most state recycling laws require manufacturers to pay for collecting and recycling their

products. California uses an alternate system under which retailers collect a \$6-\$10 advance recycling fee from buyers at the time of purchase. The fees go into a fund to cover recycling costs without involving producers.

Under pressure from advocacy groups and consumers, some companies have started providing takeback services. Dell Computer offers free recycling for its own products at any time and for other brands when customers buy a Dell replacement. Other companies, including Hewlett-Packard, Apple and Toshiba will take back certain products, often with a service charge. Among television manufacturers, only Sony will recycle its products for free.⁵⁰

Some waste managers observe that no toxic leaks from landfilled e-waste have been documented and say that risks from e-waste have been exaggerated. "Of course, we should eliminate the use of toxic materials whenever possible, and we should also learn how to best collect and process electronic materials for recycling. However, we should not ban e-waste disposal unless we have sound data that support such a ban. Public-sector budgets can't afford new recycling mandates," argues Chaz Miller, state programs director for the Environmental Industry Associations, a trade group for the solid waste management industry.⁵¹

Other experts point out that although producer responsibility requirements in Europe have helped to reduce waste and increase recycling, it is not clear that they are the most effective way to achieve these goals, or that they are spurring manufacturers to make their goods more eco-friendly.⁵² "The main arguments for takeback in Europe were to reduce costs for local governments and to encourage producers to redesign products," says Margaret Walls, an economist with the think tank Resources for the Future. "But no programs actually work that way because they're all collective — companies hire contractors to manage takeback. No producer takes

The Top 10 Items to Recycle

These items make up significant shares of the municipal solid waste stream and are readily recyclable in most areas of the United States:

1. Aluminum
2. PET plastic bottles
3. Newspaper
4. Corrugated cardboard
5. Steel cans
6. HDPE plastic bottles
7. Glass containers
8. Magazines
9. Mixed paper
10. Computers

Source: National Recycling Coalition; for a map showing places to recycle, visit www.nrc-recycle.org/localresources.aspx

back its own merchandise from consumers, so signals to redesign products are very muted."

Takeback programs also are expensive and can be complicated to administer, Walls notes. "Systems that require consumers to pay a deposit fee up front when they buy an item and refund it to them when they're done with it [often retaining part of the deposit to pay for recycling] are more cost-effective, and the rebate offers an incentive to bring things back," she says. Deposit-refund systems have worked well for beverage containers in the United States: 65-95 percent of these items are recycled in the 11 "bottle bill" states, compared to 30 percent on average in other states.⁵³ Some states also use deposit-refund systems to promote recycling of lead-acid car batteries. ■

BACKGROUND

'The Throwaway Society'

Humans have recycled since ancient times, especially prior to the Industrial Revolution, when labor was cheaper than most finished goods. Through the late 19th century, many American families sewed quilts out of worn clothing, fed table scraps to their animals and made soap from wood ashes and animal fat.

As industry expanded during the 1800s, factories needed increasing quantities of rags (used to make paper), ropes, rubber, scrap metal and other inputs. Scrap recycling expanded from an activity practiced mainly at home and in small craft shops into a commercial industry. By the 1890s large U.S. cities such as New York and Philadelphia had hundreds of scrap and junk dealers, some of whom shipped goods throughout the United States and across the Atlantic to Europe. Thousands of immigrants earned their first American wages collecting, processing and peddling scrap materials.⁵⁴

At the same time, public health experts recognized that garbage could spread disease, and local governments came to see trash disposal as a civic responsibility. New York City, with its notoriously crowded and dirty tenements, was the locus for many waste-management innovations. It built the first U.S. trash incinerator on Governor's Island in New York Harbor in 1885, created the first public garbage-collection system in 1895 and set up the first U.S. trash sorting plant for recycling in 1899. Other cities followed suit: A survey conducted by MIT in 1902 found that more than 120 American cities provided regular residential waste collection.⁵⁵

Continued on p. 1046

Chronology

1945-1960

Postwar boom makes disposable products more widely available, increasing waste generation. Marketing promotes culture of mass consumption.

1948

Fresh Kills landfill, which will become the world's largest city dump, opens in Staten Island, N.Y.

1954

Industrial designer Brooks Stevens calls "planned obsolescence" the goal of marketing.

1955

Life magazine labels America a "throw-away society."

1960s-1970s

Emerging environmental movement warns about hazardous wastes and argues that Americans generate too much trash.

1960

Americans recycle about 6 percent of the more than 82 million tons of municipal solid waste they generate.

1965

Solid Waste Disposal Act provides funds for research, demonstrations.

1970

The first Earth Day raises awareness of the growing waste problem and recycling. . . . Congress establishes Environmental Protection Agency. . . . Resource Recovery Act shifts focus of federal waste-management activities from disposal to recycling, resource recovery and converting waste to energy. . . . College student Gary Anderson designs the "chasing arrows" recycling symbol.

1971

Oregon enacts first U.S. "bottle bill" on beer and soft-drink containers.

1976

Resource Conservation and Recovery Act (RCRA) creates first federal permit program for hazardous-waste disposal and sets standards for "sanitary landfills" and waste incinerators.

1980s

Perceived waste-disposal crisis spurs public and government support for recycling.

1984

Amended RCRA sets environmental-protection standards for landfills and requires all facilities not meeting these standards to close by 1993.

1987

Mobro 4000 garbage barge receives widespread media coverage as it sails from Long Island to the Caribbean looking for a disposal site, sparking public fears the U.S. is running out of landfill space.

1988

Society of the Plastics Industry develops coding system sorting plastics into six categories. . . . Hypodermic needles and medical waste wash up on East Coast beaches.

1990

U.S. waste generation rises to 205 million tons, of which 14 percent is recycled, 14 percent is burned for energy and 2 percent is composted. . . . Pressure from consumers and environmentalists leads McDonald's restaurants to stop selling food in Styrofoam "clamshell" packages. . . . Congress amends Clean Air Act to tighten emission standards for solid-waste incinerators.

1990s-2000s

Ups and downs in scrap markets trigger debate over the economic value of recycling. Increasing energy prices and concerns about climate change prompt companies to explore ways of turning waste into energy.

1994

EPA launches outreach program to reduce landfill methane emissions, promote landfill gas energy projects.

1996

San Francisco launches pilot program to collect and compost food waste. . . . U.S. achieves 25 percent recycling rate.

2002

Mayor Michael Bloomberg, R-N.Y., suspends glass and plastic recycling in response to major budget deficits.

2004

Suspension of recycling fails to generate major savings, and New York City resumes recycling, sets a goal of diverting 70 percent of municipal waste from landfills by 2015.

2005

Nation produces 245 million tons of municipal solid waste; 23 percent is recycled, 8 percent is composted and 13 percent is burned for energy.

2006

Dell Computer institutes free recycling for all of its hardware without requiring a replacement purchase.

2007

San Francisco bans plastic shopping bags at large grocery and drug stores. . . . Five states pass e-waste recycling laws. . . . Eighteen nations ban or regulate plastic bags.

Recycling Focuses on Two Types of Plastic

Market for other types is less developed.

Plastics have become essential in packaging as well as products from clothing to furniture. In 1988 the Society of the Plastics Industry introduced seven codes identifying the basic types of plastic resin. These numbers, which were intended to make recycling easier, appear inside the small "chasing arrows" triangle imprinted on the bottoms of plastic jars and bottles.

But this imprint does not guarantee that plastic items will be recycled. Recyclers focus mainly on #1 and #2 narrow-neck containers, such as beverage bottles, because there are more commercialized applications for these resins. (Wide-mouth containers such as yogurt tubs and baby wipe boxes are often rejected, even if they are made from #2 plastic, because they have a different melting point from bottles, so the containers cannot be processed together.) Fewer jurisdictions collect plastics #3 through #7 because markets for these materials are less developed.

| Resin | Products made with virgin material | Products made with recycled content |
|--|---|--|
| #1 Polyethylene Terephthalate (PET/PETE) | Plastic beverage and grocery bottles; food jars; film wrap; microwaveable food trays; textiles; carpet | Fiber for carpet, clothing, and comforter fill; food and beverage containers; film; strapping |
| #2 High Density Polyethylene (HDPE) | Milk, water, juice, shampoo, and detergent bottles; grocery bags; shipping containers; extruded pipe; plastic wood composites; wire covering | Bottles for non-food items such as shampoo and cleaning supplies; plastic lumber; pipe; floor tiles; buckets, crates, recycling bins, and other containers |
| #3 Polyvinyl Chloride (PVC) | Many types of rigid and flexible packaging; shrink wrap; pipe; siding; window frames; fencing; medical tubing; carpet backing | Pipe; decking; fencing; paneling; gutters; flooring; garden hose; packaging |
| #4 Low Density Polyethylene (LDPE) | Bags for dry cleaning, newspapers, produce, and household trash; shrink wrap; coatings for beverage containers; toys, squeezable bottles; moldings, adhesives, and sealants | Floor tiles; paneling, furniture; compost bins and trash cans |
| #5 Polypropylene (PP) | Yogurt, margarine, and deli food tubs; medicine bottles; appliances, carpeting, and other durable consumer products | Automobile parts; garden equipment |
| #6 Polystyrene (PS) | Takeout food containers and disposable utensils; Styrofoam "peanuts" and other types of foam packaging; building insulation; medical products; toys | Thermal insulation; foam packaging; plastic moldings |
| #7 Other (resins other than #1-6 or a multi-layer combination of several of these resins) | Large reusable water bottles; packaging materials bottles; plastic lumber | Bottles; plastic lumber |

Source: American Chemistry Council, Plastics Division

Continued from p. 1044

Through World War I, as immigration swelled the U.S. population and incomes rose, Americans generated growing quantities of trash. New York City residents threw out four pounds per person per day between 1900 and 1920, mostly ashes from coal and wood heating.⁵⁶ But consumers also were buying more single-use disposable products such as razors, facial tissue and sanitary napkins, which producers touted as more modern and hygienic than traditional homemade versions. Using these items eroded the thrift ethic, making it more socially acceptable to throw things away.⁵⁷

The Great Depression forced many Americans back into recycling household items and composting food scraps out of economic necessity. When the United States entered World War II, government officials touted recycling as a civic duty. Millions of families collected used metal, rags, paper, string and household fats (a source of glycerin for explosives) for scrap drives to support war production. President Franklin D. Roosevelt exhorted radio listeners in 1942 to join a used-rubber collection drive that brought in 400 tons of material, including girdles, pet toys and rubber bands.⁵⁸

The pendulum swung back toward consumption in the postwar boom years as consumers spent their rising wages on new homes, cars and appliances. To encourage repeat purchases, manufacturers updated products regularly. Some deliberately shortened the design lives of popular items like radios, a practice known as planned obsolescence or "death-dating."⁵⁹ In 1955 *Life* magazine dubbed the United States "The Throwaway Society."

Although people were buying more packaged goods, they also were using less coal and wood for heating and burning more oil, which did not leave ashes behind. As a result Americans generated only 2.68 pounds of solid waste per person per day in 1960 — the same amount or less than in the 1930s and '40s.⁶⁰

Most of the refuse was dumped into “sanitary landfills” that compacted alternating layers of garbage and dirt in trenches, a technique pioneered by the U.S. Army Corps of Engineers during World War II and widely adopted by American cities. But as consumers scooped up televisions, hula hoops and other “must-have” items, the municipal waste stream expanded and junkyards — increasingly filled with manufactured products and packaging — spread across the nation.

Confronting Waste

Converging worries about municipal and hazardous wastes pushed the federal government into the waste management arena in the 1960s. In 1965 Congress passed the Highway Beautification Act, championed by Lady Bird Johnson, which regulated junkyards and billboards along major highways. Congress also adopted the Solid Waste Disposal Act, which authorized federal research and demonstration projects of waste-disposal practices and provided aid to states to create waste management plans. Five years later the Resource Recovery Act expanded the focus to recovering energy and materials from solid waste and required the newly formed Environmental Protection Agency to report annually on ways of promoting recycling and reducing solid-waste generation.

States and towns also took up the issue. In 1971, over opposition from the beverage industry, Oregon passed the nation's first “bottle bill” requiring refundable deposits on beer and soft-drink containers. Next-door-neighbor Washington state quickly jumped on the recycling bandwagon, opening the first U.S. buy-back center for newspapers, beer bottles and aluminum cans in 1972. By the mid-1970s several communities, including Madison, Wis., and University City, Mo., had established curbside recycling collection.⁶¹

With the 1976 Resource Conservation and Recovery Act (RCRA), Congress cre-

Did You Know?

- *Recycling 82 million tons of solid waste saved the energy equivalent of 10 billion gallons of gasoline in 2006.*
- *Recycling a ton of mixed paper saves the energy equivalent of 185 gallons of gasoline.*
- *Recycling a ton of aluminum cans saves the energy equivalent of 1,655 gallons of gasoline.*
- *Approximately 31.4 million tons of materials were combusted for energy recovery in 2006.*
- *There were 8,660 curbside recycling programs in U.S. communities in 2006.*

Source: “Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2006,” Environmental Protection Agency

ated a national waste management policy framework. Many of the law's provisions focused on hazardous wastes, but Subtitle D urged states to develop comprehensive programs for managing non-hazardous wastes, including MSW and other materials such as batteries, construction debris and medical waste. The law established criteria for municipal landfills and incinerators and banned open dumping of solid waste.

Many states and communities embraced recycling as a way to reduce litter and disposal costs, particularly on the East and West coasts where landfill tipping fees were relatively high. These efforts received a boost in 1987, when the *Mobro 4000* garbage barge sailed up and down the East Coast seeking a place to dump a load of trash from Long Island. When operators in other states re-

jected the barge — which did not have a disposal permit — out of fear that it was carrying hazardous waste, news stories wrongly reported that the United States was running out of space for its trash. After six months the barge owner was finally allowed to send the garbage to a Brooklyn incinerator.

By 1988 some 1,050 communities offered curbside pickup for recycling, a figure that would double to 2,711 in 1990 and double again to 5,404 in 1992.⁶² Nine states had followed Oregon's lead and passed bottle bills. In 1989 California adopted a goal of diverting 50 percent of its solid waste from landfills and waste-to-energy plants by the year 2000.⁶³

Like other commodities, recycled materials were subject to price swings influenced by market conditions, government policies and investor actions. Rapidly expanding community recycling programs produced a flood of materials in the early 1990s, driving U.S. prices down from an average of \$50-\$60 per ton in the late 1980s to around \$33 per ton in 1993. Then in 1994 and '95, prices abruptly spiked as high as \$200 per ton before falling back to around \$50 by 1996.

These wild swings roiled the recycling industry: Many companies that had invested when prices were high quickly went bankrupt. Some critics blamed state and federal mandates requiring use of recycled paper for the spike. However, other assessments concluded the episode was an unusual confluence of events in a developing industry and that such dramatic swings were less likely to recur as global recycling capacity expanded and producers signed more long-term contracts.⁶⁴

Domestic Debate

Grating markets for recycled materials prompted critics to argue that environmentalists had oversold recycling and that it produced more costs than benefits. A 1996 *New York*



AP Photo/Eric Risberg



AP Photo/Kalamazoo Gazette/Mark Bugnaski

From Vineyards to Greenhouses

High-grade compost made from restaurant and household food scraps is delivered to the Saintsbury winery in Napa, Calif. (top). Pipes collect methane gas from a solid-waste landfill in Watervliet, Mich. (bottom). Some of the gas is burned in furnaces to heat neighboring greenhouses. Environmentalists say recycling combats global climate change directly by reducing the generation of methane, a powerful greenhouse gas produced when organic waste decays in landfills.

Times Magazine cover story proclaimed, “Recycling is Garbage,” calling it a waste of time and resources that disrupted markets.⁶⁵ Others supported recycling to a point but dis-

agreed that the United States could achieve a “zero-waste” society as some advocates urged.

“We already recycle the items that make the most environmental and eco-

nomic sense,” argued former EPA Assistant Administrator J. Winston Porter in 1997. During his tenure at EPA a decade earlier, the agency had established a national goal of diverting 25 percent of municipal waste for recycling. “As we force ourselves to go after less valuable wastes in more difficult locations — say, hotdog wrappers at ballparks or leftover napkins at the airport — the costs will skyrocket. Recovered items will be trucked greater distances, or more resources will be used to clean and process dirty recyclables.”⁶⁶

Recycling skeptics also pointed out that new controls were reducing the environmental impacts of landfills and waste-to-energy plants. Many small landfills and dumps had closed since 1991, when EPA began requiring municipal landfills to install liners, leachate-collection systems and groundwater monitoring. Integrated waste-management companies — a growing force in all facets of the industry, from trash collection to recycling and disposal — had opened new, larger landfills in their place.⁶⁷ In 1995 EPA required advanced pollution controls at municipal incinerators and waste-to-energy plants.⁶⁸ A year later the agency directed large landfills to collect landfill gas emissions and burn them, either directly at the site or in engines or boilers to generate energy.⁶⁹

Recycling supporters contended that the new requirements still produced serious air and water pollution and that properly designed collection programs were cost-competitive with incinerators and landfills. They also charged that critics understated energy and environmental benefits from recycling.⁷⁰ By 2000 the United States was diverting more than 29 percent of municipal solid waste for recycling and composting, and rapid economic growth in Asia was creating new markets for both new and used paper, plastics and metals. Thanks in large part to rising Asian demand, average prices for recycled materials rose

steadily from the late 1990s through 2007.⁷¹ In 2006 the United States shipped \$6.7 billion worth of scrap materials to China, some 42 percent of its total scrap exports worldwide.⁷²

Even with demand growing, diversion rates for various materials remained uneven. By 2005 the United States was recovering 50 percent (by weight) of paper products in municipal solid waste and 35-72 percent of major metals, but less than 6 percent of plastics. The situation was similar for organic wastes, which accounted for one-fourth of waste generation, about half from yard trimmings (of which almost 62 percent were composted) and half from food wastes (less than 3 percent composted).⁷³

Some areas with advanced recycling programs began to tackle new and neglected classes of waste. Starting in 1996 San Francisco developed a system for collecting and composting residential and commercial food wastes. (See sidebar, p. 1042.) And as environmentalists and regulators grew increasingly alarmed about electronic waste, states began to ban e-waste from landfills and debate whether producers or consumers should pay to recycle it. ■

CURRENT SITUATION

Federal Action?

Growing concern about e-waste disposal and climate change

may stimulate national action to boost recycling rates. Although states and communities manage most recycling programs, advocates say the federal government should do more to help create markets and educate the public about recycling's benefits.

Several studies by the Government Accountability Office (GAO) have called for more federal support for recycling. In 2005 the agency recommended that EPA should take the lead in developing national legislation to encourage and finance e-waste recycling. But EPA responded that the problem was "fundamentally a business and eco-

vey of recycling program managers and other experts, the report identified three major federal actions that could increase recycling rates:

- more public education;
- passage of a national bottle bill; and
- support for producer takeback programs focusing on toxic or hard-to-recycle products.⁷⁵

Facing a patchwork of state e-waste laws, the Electronic Industries Association (EIA) called in 2007 for Congress to pass national legislation regulating computer and television recycling. EIA's proposal would set

up two systems: TV recycling would initially be paid for by fees assessed on buyers of new TVs, until a large number of "legacy" TV sets (televisions sold in the past by companies no longer in business) had been recovered, while computer makers would collect and recycle information-technology equipment at no cost to consumers.⁷⁶

"This is an issue crying out for a national solution," said EIA interim president and CEO Matt

Flanigan. "Congress can do right by the environment, consumers and the electronics industry by adopting a national recycling plan."⁷⁷ Several members of Congress have formed a working group on e-waste, and Rep. Mike Thompson, D-Calif., has introduced legislation (H.R. 233) that would assess fees of up to \$10 on computer purchases to fund recycling grants.

Congress may also consider a bill (H.R. 4238) introduced by Rep. Edward M. Markey, D-Mass., to place a five-cent national deposit on bottled water, iced tea, sport drink and carbonated beverage containers. Other legislators have advocated national bottle bills in



The Fresh Kills landfill — the world's largest — on Staten Island, was closed in 2001 adding to New York City's trash-disposal problems. While in operation, the 3,000-acre dump took in 14,000 tons of trash and released 2,650 tons of methane gas per day.

Liaison/Stephen Ferry

nomic issue, rather than an environmental issue," and that it would be inappropriate for the agency to choose how to fund e-waste recycling when manufacturers did not agree on the best approach.⁷⁴

Another GAO study in 2006 pointed out that EPA worked with businesses and government agencies to promote recycling but did not have data or performance measures. Nor, GAO reported, was the Commerce Department carrying out its responsibility under the Resource Conservation and Recovery Act to help develop new markets for recycled materials in the United States. Based on a sur-

the past, but Markey, who chairs the House Select Committee on Energy Independence and Global Warming, described his bill as a way to save energy and reduce greenhouse gas (GHG) emissions. "If all of the 58 billion aluminum cans that are thrown away every year in the United States were recycled, it would cut the emissions of heat-trapping carbon pollution by nearly 6 million tons — the equivalent of the pollution from more than 1 million cars," Markey said.

Some bottle-bill states, including California, and Oregon, have broadened their coverage to include popular products like bottled water. But it can be hard to expand state laws, according to Jeffrey Morris at the Sound Resource Management Group, because beverage manufacturers and grocers lobby hard against such measures. "National legislation would make a big difference, especially on plastic bottles and items that people consume away from home, so they don't go into curbside bins," says Morris. Many retailers dislike handling returned bottles because they take up space, but the process can be structured in other ways. For example, California accepts bottles and cans at more than 2,100 state-certified bottle and can redemption centers.

Beyond these waste categories, some advocates say U.S. energy and

climate-change policy should reward recycling for reducing overall energy use. One option, says the National Recycling Coalition's Krebs, would be awarding tradable credits to companies and agencies for increasing the quantity of materials they collect and



Environmental activist Wen Bo, here at a recycling center in Beijing, heads up China operations for the U.S.-based group Pacific Environment. China buys about 42 percent of all U.S. scrap, but environmentalists say many Asian recyclers use unsafe practices. Environmental samples collected by Greenpeace in 2005 at e-waste recycling facilities in Guiyu, China, contained high levels of toxic metals and chemicals.

recycle. "Recycling helps to sequester carbon, and we hope that Congress will include it in a multi-pronged assault on global warming," says Krebs.

Slimmer Packages

Under pressure to reduce their environmental footprints, many consumer product manufacturers are reducing waste by redesigning packages to make them even lighter and use less material. In doing so, they also are cutting production, shipping and disposal costs. Some companies are using recycled materials or designing readily recycled packages.

As part of a broad push to make its operations greener, mega-retailer Wal-Mart has set a long-term goal of producing zero waste from its stores by reducing waste generation and recycling more materials. As a first step, the company is working to reduce solid-waste generation at its U.S. stores 25 percent below 2005 levels by October 2008.

Wal-Mart has sent scorecards to its network of more than 60,000 suppliers to rate the environmental soundness of their packaging materials and will start factoring the results into its purchasing decisions in 2008. "Our aim is to reach a day when there are no dumpsters behind our stores and [Sam's] Clubs, and no landfills containing Wal-Mart throwaways," the company said.⁷⁸

This strategy is good business, says NRDC senior scientist Hershkowitz. "Wal-Mart doesn't want to incur

the ecological liabilities and costs of disposing of so much packaging, so that's why they're saying that all the

Continued on p. 1052

At Issue:

Is generating energy from waste good for the environment?



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how can communities best manage post-recyclable garbage? How can a newly carbon-conscious America reduce greenhouse gas emissions? Which homegrown energy source can help promote energy independence and reduce fossil fuel consumption? Waste-to-energy is the answer to these questions, and many others just like them.

Americans generate more than 300 million tons of garbage each year. About one-third of it gets recycled, about 8 percent goes to waste-to-energy plants and more than 160 million tons is landfilled. Modern waste-to-energy plants generate clean, renewable energy through the combustion of household trash that would otherwise be landfilled. All waste-to-energy facilities comply with extremely stringent federal and state requirements. After a thorough examination of waste-to-energy facilities, the U.S. Environmental Protection Agency concluded that waste-to-energy facilities produce electricity "with less environmental impact than almost any other source of electricity."

Use of waste-to-energy has been shown to be an important component of successful solid-waste management programs. IWSA and its members vigorously encourage and support community programs to reduce, reuse and recycle waste. The EPA and many states, as well as the European Union, have established a solid-waste management hierarchy, showing that, after the 3Rs (Reduce, Reuse, Recycle) direct recovery of energy from waste through waste-to-energy is preferable to landfill disposal. Far from competing with recycling, waste-to-energy is compatible with recycling. In fact, recycling rates of communities that utilize waste-to-energy plants are nearly 20 percent greater than the national average.

Not surprisingly, European nations that enjoy the highest recycling rates emphasize the use of waste-to-energy to process what cannot be recycled. For example, Germany and Denmark, with recycling rates of more than 60 percent, employ waste-to-energy for the remainder of their combustible waste.

Waste-to-energy plants are also valuable contributors in the fight against global warming. EPA studies show that American waste-to-energy plants prevent the release of nearly 30 million tons of carbon dioxide equivalents per year. The U.S. Conference of Mayors and the Global Roundtable on Climate Change have both recognized waste-to-energy as a tool to fight global warming.

Increased use of waste-to-energy will promote energy independence and reduce greenhouse gas emissions through the generation of clean, renewable energy. It's an important component of America's energy and solid-waste policies.



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the incinerator industry falsely promotes waste incineration as safe and clean, and as a source of renewable energy. Yet, incineration is not "waste to energy," it is a waste of energy. Here are four key reasons to say no to incineration and in its stead favor waste prevention, reuse, recycling and composting:

Incinerators Waste Energy and Resources — Recycling saves three to five times the amount of energy as burning the same materials. For example, when a ton of office paper is burned for its heating value, it generates about 8,200 mega joules. But when this same ton is recycled, it saves about 35,200 mega joules. For every ton of material burned, many more tons of raw materials must be processed to make new products to take its place. More trees cut down to make paper. More ore mined for metal production. More petroleum processed into plastics. Incineration encourages a one-way flow of materials on a finite planet. It makes the task of conserving resources and reducing waste more difficult, not easier.

Incinerators Pollute — All incinerators release pollutants, including acid gases, particulate matter, carbon monoxide, nitrogen oxides, metals, dioxins and furans and at least 190 volatile organic compounds. Many are persistent, bioaccumulative and toxic. A U.N. report indicated that waste incinerators contribute 69 percent of the dioxin in the global environment. The better the air-pollution control, the more toxic the ash. An alarming new trend is the increase in efforts to use and disperse incinerator ash in commercial products. Moreover, waste prevention and recycling can reduce greenhouse gases and pollution much more effectively than burning trash to displace coal.

Incinerators Are Costly — Facilities cost hundreds of millions of dollars to build and operate — far higher than recycling and composting. (Recycling also sustains 10 times more jobs than incineration on a per-ton basis.) Indeed, many existing incinerators have become white elephants for their communities. Some jurisdictions have raised property taxes to subsidize their incinerators. In New Jersey, counties that built incinerators accumulated \$1.35 billion in debt. Voters had to approve a multimillion-dollar state bailout.

Burning Encourage Wasting and Limit Recycling — Incinerators rely on minimum guaranteed waste flows, often called "put-or-pay" contracts. As a result, facility operators regularly burn readily recyclable materials rather than pay extra fees for tonnage shortfalls. Incinerators perpetuate the throw-away society and impede sustainable production and consumption.

Continued from p. 1050

packages they sell have to be recyclable or contain reduced amount of waste," he says. Other companies are also "greening" their packages by reducing material content or using more recycled and recyclable inputs, including Proctor & Gamble (toothpaste packages), Coca-Cola (Dasani water bottles), Estée Lauder (makeup tubes), Kraft (beverage bottles), and Johnson & Johnson (Aveeno moisturizer bottles and tubes).⁷⁹

Technical advances are making it possible to incorporate more recycled materials in packaging. Seventh Generation, a Vermont-based company that makes environmentally safe household products, has developed HDPE (#2 plastic) bottles with 50 percent recycled content, rigid containers that are 80-90 percent recycled and trash bags made from 65-100 percent recycled content.

The economics of recycling are challenging, says Reed Doyle, Seventh Generation's director of advanced innovation. "Recycling is expensive in the U.S. because we have stringent environmental regulations, so the profit margins for recyclers are low," says Doyle. "But sustainable packaging is a huge movement. The whole consumer products industry is doing this because it has to do it to stay in business."

Many recycling advocates agree that China's voracious demand for scrap materials is a mixed blessing for re-

cycling in the United States. "China's growth has helped grow the paper-recycling infrastructure in the United States, Japan and the European Union," says Doyle. "The better and smarter we get at collecting this stuff, the more of their supply we'll be able to produce."

Better still, say some, would be to process scrap at home. "I doubt that overseas recyclers follow the same environmental standards that we use here, so I'm skeptical that there's an



Plastic bags — known as "the national flower" in South Africa and "white pollution" in China — are a global problem. About 100 billion bags are sold to retailers worldwide every year. Plastic bags and films make up about 4.5 percent of the waste in landfills, where they can take centuries to break down. At least 18 countries have adopted or considered taxes, consumer-education campaigns, usage-reduction targets or outright bans on plastic bags in the past five years.

Ocean Conservancy

overall environmental benefit in sending material abroad," says Boston consultant Bauman. "And if we had a manufacturing base big enough to accept all of that post-consumer scrap, it would ultimately drive down production costs and make these manufacturers healthier. But you can't ignore the reality of overseas opportunities." ■

OUTLOOK

Zero-Waste Visions

Although U.S. solid-waste generation continues to inch upward, some 30 U.S. cities and counties, plus dozens of others worldwide, share Wal-Mart's long-range goal of achieving zero waste.⁸⁰ They view waste as a resource that can be used in more productive ways than landfilling or incinerating it.

"It's a planning strategy, like a zero-defect policy for manufacturers," says Platt at the Institute for Self Reliance. "The goal isn't literally to eliminate every shred of waste, but it does say that we won't set an artificial cap on recycling by saying that our goal is 25 or 35 percent and then stopping there. We want to get to an efficient society in which all materials, products and packaging can be recovered and recycled at the end of their lives."

Snohomish County's Jackson echoes this perspective. "Unless you look toward zero waste, you're completely off the path to true sustainability," he says. "You may not get to zero, but you should be able to get very close, and the small residual should not contain harmful elements."

Architect William McDonough and chemist Michael Braungart sketched a paradigm for a zero-waste society in their 2002 best-seller *Cradle to Cradle*,

which called for shifting from “cradle-to-grave” industrial production — make something, use it, throw it away — to a waste-free society in which objects are designed to be reused. “Products can be composed either of materials that biodegrade and become food for biological cycles, or of technical materials that stay in closed-loop technical cycles, in which they continually circulate as valuable nutrients for industry,” the authors wrote.⁸¹

Some waste professionals see this vision as utopian. Dieleman of the Solid Waste Association of North America says that managing 65 percent of America’s municipal waste through source reduction, recycling, composting and energy recovery projects is an ambitious but realistic goal. “Zero-waste ambitions and aggressive recycling targets aren’t bad, but at this point we can’t recycle 100% of our waste, and we aren’t likely to be able to do that any time,” he says.

Zero-waste goals can make sense in certain settings, says the National Recycling Coalition’s Krebs. “We’re seeing the idea come up quite a bit in the private sector, and we applaud that. It also makes sense in venues like sporting arenas and national parks, where you can control who comes in, who leaves and how concessionaires run their businesses. In those contexts you can set up systems to capture wastes and hit a high target,” Krebs says. “It’s trickier when you get out into communities with homes, schools, playgrounds and other elements that aren’t as tightly controlled.”

Current debates about nuisance items like plastic shopping bags and disposable water bottles suggest that Americans are becoming more concerned about trash and waste. Another trend that echoes the idea of using fewer goods is the growth of so-called product-service systems, in which customers buy a product or service instead of an object. For example, Zipcar is a car-sharing company whose members

pay for occasional use of cars from a company fleet.⁸² Interface, a Georgia-based carpet manufacturer, offers a carpet leasing program under which it will supply, install, and replace flooring for a monthly fee (recycling used carpet).⁸³ Some products, such as photocopying machines, are more commonly leased than purchased.

According to theorists like McDonough and Braungart, product-service systems combined with extended producer-responsibility requirements will create a system in which manufacturers want to design their goods for eventual disassembly and recycling. Under such a system consumers would not have to feel guilty about upgrading to new models, because they would return durable goods to manufacturers, who in turn would have access to a constant stream of high-quality materials for new production.

“We’re moving forward now from a very primitive perspective on recycling and materials management into a more modern era,” says Jackson in Snohomish County. “It’s inevitable from a climate change, resource and energy perspective. The transition will be bumpy for a while, but it’s going to happen.” ■

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Fishbein, Bette K., “Waste in the Wireless World: The Challenge of Cell Phones,” *INFORM*, 2002.

Fishbein examines the growing world cell phone market, environmental impacts of cell phone components and options to promote cell phone recycling.

U.S. Department of Commerce, “Technology Administration, Recycling Technology Products: An Overview of E-waste Policy Issues,” July 2006.

Comments at a government-sponsored roundtable provide an overview of stakeholder positions and concerns about possible national e-waste recycling legislation.

The Next Step:

Additional Articles from Current Periodicals

China

"Chinese Computer Company Is Ranked Top for Green Policies," *Agence France-Presse*, April 3, 2007.

Lenovo, a Chinese computer manufacturer, is the world's best electronics maker for recycling waste and dealing with toxic content, according to Greenpeace.

Casey, Michael, "Study Says China's Paper Recycling Industry Is Helping to Save Forests Worldwide," *The Associated Press*, July 13, 2007.

China provides a strong market for wastepaper that mostly comes from the United States and Europe, thereby saving forests in the process.

Fitzpatrick, Liam, "Awash in Trash," *Time International*, Oct. 9, 2006, p. 42.

As China gets richer and consumes more, it produces unprecedented quantities of solid waste.

Gross, Daniel, "Putting Out the Trash," *Newsweek International*, Sept. 17, 2007.

As U.S. imports from China soar, American exports — including recyclables — to China are quietly rising at a more rapid pace.

Johnson, Tim, "Scavengers of Old, Toxic Computers," *The Philadelphia Inquirer*, April 8, 2006, p. D1.

China is sprawling with computer "slaughterhouses" whose runoff includes toxic acids and metals.

Kleba, Heather, "Building Bridges in China," *Governing*, April 2006, p. 63.

Rapid industrialization and decreasing raw materials have made China the largest market for recyclables.

E-waste

"E-waste Recycling Polluting Overseas," *Chicago Tribune*, Nov. 19, 2007, p. C5.

Activists estimate that between 50 to 80 percent of electronics collected for recycling in the United States ends up overseas.

"How Green Is Your Apple?" *The Economist*, Aug. 26, 2006.

There is a wide variation in how technology firms are helping their consumers dispose of obsolete products, according to Greenpeace.

"Recycle Computers," editorial, *Charlotte Observer*, June 11, 2006, p. 22A.

A Senate bill encouraging the recycling of electronic equipment would reduce the need for costly landfills and create jobs to recover and recycle components.

Bosire, Bogonko, " 'E-waste' from Western Hand-Me-Downs Threatens Poor Countries: UN," *Agence France-Presse*, Nov. 27, 2006.

The United Nations has called for the protection of poor countries from potentially deadly used electronics coming from rich nations.

Cole, Wendy, "Talking E-trash," *Time*, May 15, 2006, p. A14.

The number of electronics-recycling firms has nearly doubled to about 900 over the past three years.

Harrison, Crayton, "Old PCs Less of a Pain to Recycle," *Dallas Morning News*, Oct. 8, 2006, p. 1D.

Environmental groups have begun rating recycling contractors based on their disposal practices, giving consumers more information on where to send old electronics.

Kessler, Michelle, "Pricey Electronics Recycling Makes Strides, But Expense Holds it Back," *USA Today*, April 21, 2006, p. 4B.

Many electronics manufacturers have resisted comprehensive recycling programs because of their costs.

Moran, Susan, "Panning E-waste for Gold," *The New York Times*, May 17, 2006, p. G8.

Hewlett-Packard's recycling centers have extracted precious metals from e-waste, such as gold, silver and palladium.

Velasquez-Manoff, Moises, "How Do You Make Electronics Easier to Recycle?" *The Christian Science Monitor*, March 8, 2007, p. 13.

Discarded electronics are one of the fastest-growing segments of municipal waste, piling up three times faster than other types of garbage.

Zimmerman, Martin, " 'E-waste' Recyclers at Your Disposal," *Los Angeles Times*, Feb. 11, 2007, p. C1.

The e-waste recycling sector is experiencing growth thanks to consumers' penchant for replacing outdated electronics.

Food Composting

Bloom, Jonathan, "Colleges Should Recycle Food," *The Philadelphia Inquirer*, March 16, 2007, p. B2.

Pennsylvania universities, many of which are separating food scraps from regular trash, provide hope for reducing the state's municipal solid waste.

Brubaker, Harold, "A Blooming Success Out of Table Scraps," *The Philadelphia Inquirer*, March 16, 2007, p. C1.

A Pennsylvania business recycles the kitchen waste from hotels into compost for farms and gardens.

Kennedy, J. Michael, "Seattle's Recycling Success Is Being Measured in Scraps," *The New York Times*, Oct. 10, 2007, p. A14.

Recycling of food scraps will be mandatory in Seattle by 2009, but for now residents of single family homes are allowed to mix the scraps with yard waste, which is then composted.

Laws and Regulations

"Recycling Becomes Mandatory," *The Washington Post*, July 12, 2007, p. VA3.

Mixed paper and cardboard recycling is now mandatory in Fairfax, Virginia, after a measure adopted by the county's board of supervisors.

Brown, Jennifer, "State Hopes Law Spurs Creativity in Recycling," *Denver Post*, July 5, 2007, p. B1.

Colorado lawmakers are hoping to inspire entrepreneurial recycling ideas by raising fees on trash dumping and tire recycling.

Catsimatidis, John A., "Canning the Bottle Bill," *The New York Times*, July 9, 2006, p. A11.

A New York bill that would have increased the number of bottles and cans that could be returned to grocery stores for redemption was rejected by the state Senate.

DeMillo, Andrew, "Ark. Lawmaker Hopes to Encourage Recycling of Plastic Foam," *The Associated Press*, Dec. 4, 2007.

Democratic Arkansas state Rep. Kathy Webb unsuccessfully pushed a bill that would have required landfills to offer polystyrene recycling.

Ellement, Franci Richardson, "Recycling Up as Towns Use a Carrot and a Stick," *Boston Globe*, Aug. 9, 2007, p. Reg1.

Many towns in Massachusetts are threatening to fine residents if they fail to follow recycling guidelines — and it's been working.

Hu, Winnie, "Newly Approved Trash Plan Puts Emphasis on Recycling," *The New York Times*, July 21, 2006, p. B3.

New York residents will be expected to do more recycling and composting under a newly approved trash plan initially presented by Mayor Michael Bloomberg.

Lee, Mike, "New Formula Stirs Trash Talk," *San Diego Union-Tribune*, March 16, 2006, p. B1.

San Diego business leaders say garbage officials should drop plans for mandatory recycling programs that affect companies and construction sites.

Marshall, Matt, "Tossing E-waste Is Not So Easy," *San Jose Mercury News* (California), May 8, 2006, p. 1.

Fragmented systems for collecting and recycling e-waste are too confusing for consumers, according to several environmentalists.

Mulero, Eugene, "Arizona's Recycling Efforts Fall Short," *The Arizona Republic*, Sept. 7, 2006, p. 1.

Recycling rates have leveled off across Arizona, putting the state in danger of not meeting target goals set forth by the Environmental Protection Agency.

Sherman, Lola, "Waste Not: List of Untrashable Gadgets to Recycle Grows," *San Diego Union-Tribune*, Feb. 16, 2006, p. B6.

San Diego city officials and private waste companies are informing residents that they can no longer throw away batteries, cell phones and many other things into the trash.

Plastics

Jewell, Mark, "Makers of Emerging Plant-Based Plastics Hope to Carve Larger Market Niche," *The Associated Press*, Oct. 22, 2007.

Plastics made from corn and other plants are being touted as green alternatives to conventional petroleum-based plastics.

Oko, Dan, "The Doggie Bag Dilemma," *Mother Jones*, November-December 2006, p. 84.

The Green Restaurant Association is working with fast-food restaurants to use eco-friendly plastics that can be molded into silverware and trays.

Pratt, Mark, "Massachusetts Museum Educates, Promotes the Plastics Industry," *The Associated Press*, May 11, 2006.

The National Plastics Center and Museum in Leominster, Mass. — once the center of the plastics industry — educates visitors on the development of biodegradable plastics and the recycling process.

Show, Christine, "Got Plastic to Get Rid Of?" *Orlando Sentinel*, July 15, 2007, p. J1.

Volusia County in Florida is expanding the types of plastics residents can recycle, including those used in ketchup bottles, CD cases and yogurt cups.

Watson, Tom, "Where Can We Put All Those Plastics?" *Seattle Times*, June 2, 2007, p. I11.

All plastics are technically recyclable, but in reality plastics recycling has many limitations.

Product Bans

Clanton, Brett, "Bag Makers Defend Plastic," *Houston Chronicle*, Dec. 2, 2007, p. 1.

The plastic bag industry is challenging proposals in several cities that limit the use of plastic bags in supermarkets and other stores.

Clayton, Mark, "Bye-Bye, Incandescent Bulb?" *The Christian Science Monitor*, Feb. 28, 2007, p. 1.

A California legislator has proposed a ban on incandescent bulbs amid concerns over global warming, but major manufacturers are promoting bulb-recycling programs and a reduction in the bulbs' mercury content.

Goodyear, Charlie, "S.F. First City to Ban Plastic Shopping Bags," *The San Francisco Chronicle*, March 28, 2007, p. A1.

San Francisco city officials have approved a ban on non-biodegradable plastic bags at supermarkets and pharmacies, hoping retailers will eventually use plastic bags made from starches.

Lee, Mike, "Plastic Pileup," *San Diego Union-Tribune*, May 3, 2006, p. A1.

Even though they are recyclable, plastic bags are banned from curbside collection in California for several reasons.

Rosenblatt, Susannah, "L.A. County Supervisors Consider Banning Polystyrene Food Containers," *Los Angeles Times*, May 23, 2007, p. B4.

Los Angeles officials have agreed to consider banning plastic foam food containers from restaurants and stores because they contribute to pollution, but an industry representative says the real problem is a lack of recycling programs.

Responsibilities of Producers

"Deleting Computer Waste," editorial, *The Christian Science Monitor*, Aug. 21, 2006, p. 8.

The European Union's Waste Electrical and Electronic Equipment directive makes producers responsible for recycling customers' computers free of charge.

Chea, Terence, "The Big Reboot: What to Do With Old PCs?" *Chicago Tribune*, March 12, 2007, p. C5.

Hewlett-Packard and Dell are earning praise from environmentalists for using eco-friendly computers and recycling their products after consumers discard them.

Slagle, Matt, "Coalition Urges TV Makers to Offer Free Recycling Programs to Make Disposal Safer," *The Associated Press*, Nov. 15, 2007.

The Electronics TakeBack Coalition says television manufacturers need to make it easier for Americans to safely dispose of aging TV sets.

Zezima, Katie, "Makers Start Bearing the Cost of Recycling TV's in Maine," *The New York Times*, Jan. 19, 2006, p. C20.

Maine has become the first state requiring manufacturers to pay the full cost of recycling computer monitors and old televisions.

Waste Disposal

"Focus on Recycling, Not Private Landfills," editorial, *St. Petersburg Times*, Jan. 24, 2007, p. 2.

A Florida county is considering a private-sector solution to address the growing trash pile, but opponents say officials should focus more on improving recycling programs.

"Taking Out the Trash," editorial, *The New York Times*, Dec. 11, 2005, p. LI19.

Long Island does not have enough landfills to accommodate all of its garbage.

Cauchon, Dennis, "Cities Trying to Rejuvenate Recycling Efforts," *USA Today*, Oct. 27, 2006, p. 4A.

The economics of recycling — it costs less to dump in a landfill than to recycle — has been a continuous threat to recycling programs.

Covarrubias, Amanda, "Californians Recycle Half Their Trash," *Los Angeles Times*, Aug. 25, 2006, p. B1.

State officials in California said the state has achieved its goal of reducing landfill waste by 50 percent thanks to diligent recycling programs over the past 16 years.

Rainey, Richard, "Renew, Rebuild . . . Recycle?" *Times-Picayune (New Orleans)*, April 16, 2007, p. 1.

Many city governments in the New Orleans area are finding it too costly to bring back curbside recycling programs affected by Hurricane Katrina.

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