

Solid Waste Infrastructure

Section 14

In 2006, the United States generated 251 million tons of municipal solid waste, 32.5 percent of which—82 million tons—was recycled. Approximately 12.5 percent of the total—31 million tons of municipal solid waste—was incinerated to generate energy at waste combustion facilities that year. The remaining 55 percent—138 million tons—was discarded in landfills, according to the Environmental Protection Agency (EPA).¹

Our trash is made up of things we use and then throw away. By weight, the largest categories are containers and packaging (31.7 percent); nondurable goods such as newspapers, office papers, and clothing (25.5 percent); and durable goods (16.0 percent). Municipal solid waste includes waste generated by schools, businesses, and hospitals. It does not include industrial, hazardous, or construction waste.

The recycled share of such waste has doubled since 1990.³

Although the number of U.S. landfills has decreased dramatically, from more than 6,300 in 1990 to 1,700 in 2006, the average size of such landfills has increased, ensuring “sufficient” landfill capac-

ity at the national level but also creating some local limitations.⁴

A landfill shortage has been averted primarily because ever larger fractions of solid waste have been recycled or used for the generation of energy. Indeed, the total volume of solid waste going to landfills actually declined from 142.3 million tons

in 1990 to 138.2 million tons in 2006.

Bruce J. Parker, chief executive officer of the National Solid Waste Management Association, says that the nation has 19 years’ worth of landfill capacity. He agrees, however, that there are regional variations in that capacity—a problem often remedied by shipping waste

across state lines.⁵

Immigration’s Impact

Of all the problems associated with rapid population growth, waste disposal may be the most visible. Today, our cities generate nearly three times as much solid waste as they did in 1960.⁶ The number of active landfills is down, not because they are no longer needed, but because many of them were polluting or simply full.

Solid Waste by the Numbers

251 million tons of municipal solid waste generated in the U.S. (2006)
 4.6 pounds per person per day of solid waste (2006)
 32.5 percent of solid waste recycled (2006)
 1,700 landfills in the U.S. (2006)
 22.5 percent increase in solid waste generation, 1990-2006
 73.0 percent reduction in number of landfills, 1990-2006
 42 million tons of solid waste transported across state lines for disposal (2006)

Solid Waste Management Spending (a)
 \$12.1 billion (2004) (\$40 per capita)

2050 projections (b):
 \$17.9 billion : at current immigration trends
 \$15.5 billion: at 50-percent reduction in immigration
 \$12.1 billion: at zero population growth

Notes:

a. Solid waste collection and disposal spending by state and local governments in 2004.

b. Projections assume per-capita spending stays at 2004 levels and U.S. population grows as per the Pew Research Center’s February 2008 forecast.²

Sources: American Society of Civil Engineers, Environmental Protection Agency, Statistical Abstract of the U.S. (2008).

Some cities have unsuccessfully tried to unload the waste on third-world countries. Since the passage of the North American Free Trade Agreement (NAFTA), waste generated by U.S. production facilities in Mexico has been dumped in landfills in Texas and other southern states. Major eastern cities have been negotiating with rural counties as far away as New Mexico and Texas to accept the stuff.

“The nation is on a solid waste treadmill.”⁷

In 2006, the average American generated 4.6 pounds of solid waste per day—1,680 pounds per year. Immigrants probably do not generate more trash per capita than U.S. natives. They are responsible for a disproportionate share of U.S. population growth, however. An astounding 82 percent of population growth between 2005 and the year 2050 will be due to immigrants arriving after 2005 and their U.S-born children.⁸

The potential impact of immigration on solid waste generation is easily estimated using population projections and per-capita waste figures:

If current rates of legal and illegal immigration persist, U.S. population will reach 438.2 million in 2050, and municipal solid waste generation will be 46 percent above its 2006 level.

The projected increase in solid waste over the 2006 to 2050 period—116.5 million tons—equals the total solid waste generation in 1970.

be more than 25 percent below levels currently estimated for 2050.

These are conservative estimates. They assume, for example, that per-capita waste generation remains its current level of 1,680 pounds per person per year. Per-capita amounts have increased 72 percent since 1960.

More important, the waste totals are based on the EPA’s estimates of municipal waste collections. The EPA reported in 1988 that municipal waste accounts for only 20 percent of all waste generated. The other 80 percent of the waste stream includes industrial waste, construction and demolition debris, agricultural waste, municipal sludge from, say, wastewater treatment plants, and other debris that may be deposited in municipal landfills but is not considered municipal solid waste.

The 5-to-1 ratio implies that 1.3 billion tons of waste is generated annually.

At \$100 per ton (EPA’s estimate of waste disposal costs), we estimate total waste disposal costs at \$130 billion in 2006.

Landfill Problems

Basically, a landfill is a depression in the ground into which wastes are put. Ideally, they are carefully engineered and monitored so as to keep the garbage dry and contained. The aim is to avoid any leakage into the surrounding water or air.

The best landfills are lined with state-of-the-art plastic bottom liners .10 of an inch thick. The liner effectively creates a bathtub in the ground. If the bottom liner fails, liquefied garbage will migrate directly into the environment.

In fact, all landfills eventually fail. Plastic is not inert. As chemicals and gases flow along plastic liners and pipes, they become brittle, swell, and eventually break down.

“...82 percent of surveyed landfill cells had leaks, while 41 percent had a leak area of more than 1 square feet,” according to Leak Protection Ser-

Solid Waste Generation Under Different Immigration Scenarios, 2050			
Year	Solid waste generation (millions of tons)	U.S. population (millions)	Solid waste generation per capita (pounds)
2006 — actual	251.3	299.4	1,680
2050 — projections			
Current immigration trends	367.8	438.2	1,680
50-reduction in immigration	318.7	379.7	1,680
Zero immigration	269.6	321.2	1,680

A 50-percent reduction in immigration would reduce solid waste by nearly 50 million tons, or 13 percent, below amounts projected for 2050 under current immigration trends.

If immigration were halted entirely, the U.S. population would increase by only 22 million between 2005 and 2050. Solid waste generation would

vices, Inc. (LLSI) website, March 15, 2000.⁹

Detecting leaks is not easy. Monitoring wells are supposed to be located in spots most likely to detect contamination from landfills. But because landfills are usually located near large bodies of water, such as rivers, lakes, and bays that may be contaminated from non-landfill sources, it is often impossible for the monitors to determine whether the landfill itself is secure.

The health effects of leaking landfills are well documented. A recent paper shows an association between proximity to such sites and increased incidence of hospitalization for diabetes. Elevated birth defect and cancer rates have been noted in neighborhoods close to defective landfills.¹⁰

Another study identifies airborne chemicals as problematic:

Many of the typical landfill gases.... may present an odor problem that can cause adverse health effects such as mucous membrane irritation, respiratory irritation, nausea, and stress. If an individual has a pre-existing health condition (e.g., allergies, respiratory illness), these additional health impacts can be significant.¹¹

Clean Energy from Dirty Garbage

Landfills produce significant amounts of methane gas, which must be vented or collected. Most captured methane is burned off — but more than 100 landfills use the gas to generate power.¹²

After methane gas is drawn out of the landfill, it is placed in a pipeline and sent to the generator facility. One such facility is located at NASA's Goddard Space Flight Center in Greenbelt, Maryland. Barry Green, the center's energy manager, describes the process:¹³

The gas comes from the Sandy Hill landfill about 5 miles away. It comes under ground in a 10-inch pipe and then it pipes it to the power plant here. It comes above ground and goes to two of our five boilers inside the power plant. From there we use that gas to heat water to make steam, and we send that steam

through an underground network that heats about 31 buildings.

Methane is the second-most important greenhouse gas after carbon dioxide. It is responsible for about 15 percent of the global warming that has occurred over the last 150 years. Methane burned for fuel is not released to the atmosphere, thereby reducing greenhouse gas emissions.

Transporting Solid Waste

More than 42 million tons of municipal solid waste crossed state lines for disposal in 2005, an 8 percent increase over 2003 shipments. Such shipments have grown 147 percent over the past decade, and now account for more than 25 percent of all municipal solid waste disposed of at landfills or in energy generation facilities.¹⁴

According to the Congressional Research Service report, at least 11 states each export more than 1 million tons of waste annually and at least 11 states accept that amount. New York and New Jersey are the largest exporters of municipal solid waste, while Pennsylvania is the largest importer, accepting 9.6 million tons in 2005. An infrastructure problem—namely, the absence of rail service at Pennsylvania landfills—contributed to a 2.7 million ton drop in that state's waste imports between 2001 and 2005, making Pennsylvania the only major importer to experience such a decline in recent years, the report noted.

Interstate waste shipments represent an especially efficient use of solid waste infrastructure. It enables underutilized landfills to process waste turned away from facilities operating above capacity. For years the solid waste industry had to fight the NIMBY reflex, manifested by attempts to ban such commerce through federal or state legislation. But no significant bans are currently under consideration, according to the American Society of Civil Engineers (ASCE).

ASCE's 2005 Report Card conferred a grade of C+ on the infrastructure for handling America's solid waste—the best score earned in any in infrastructure category. ■

Endnotes

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