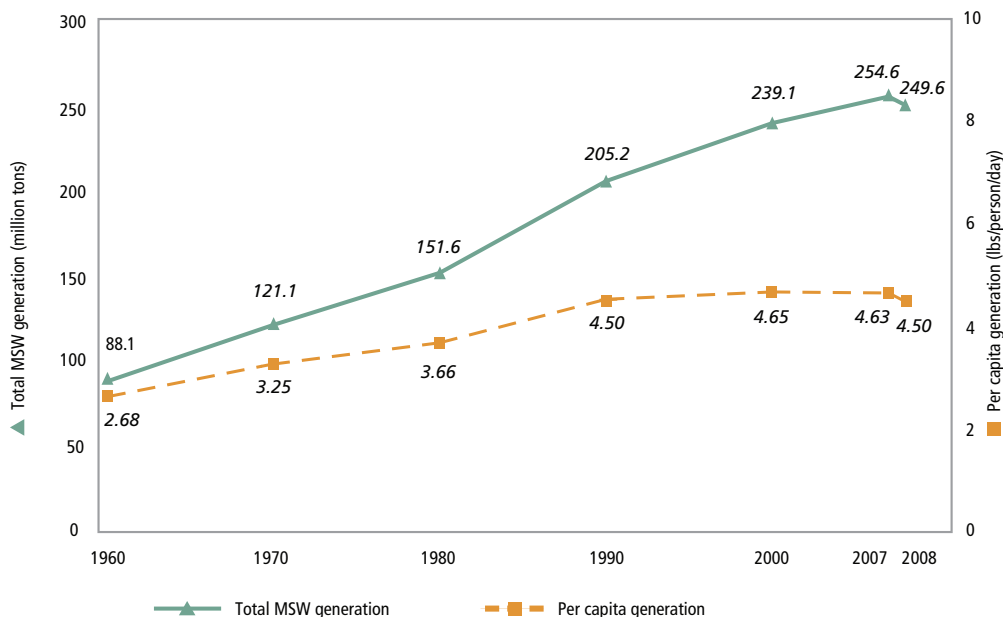


Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2008

The U.S. Environmental Protection Agency (EPA) has collected and reported data on the generation and disposal of waste in the United States for more than 30 years. We use this information to measure the success of waste reduction and recycling programs across the country. These facts and figures are current through calendar year 2008.

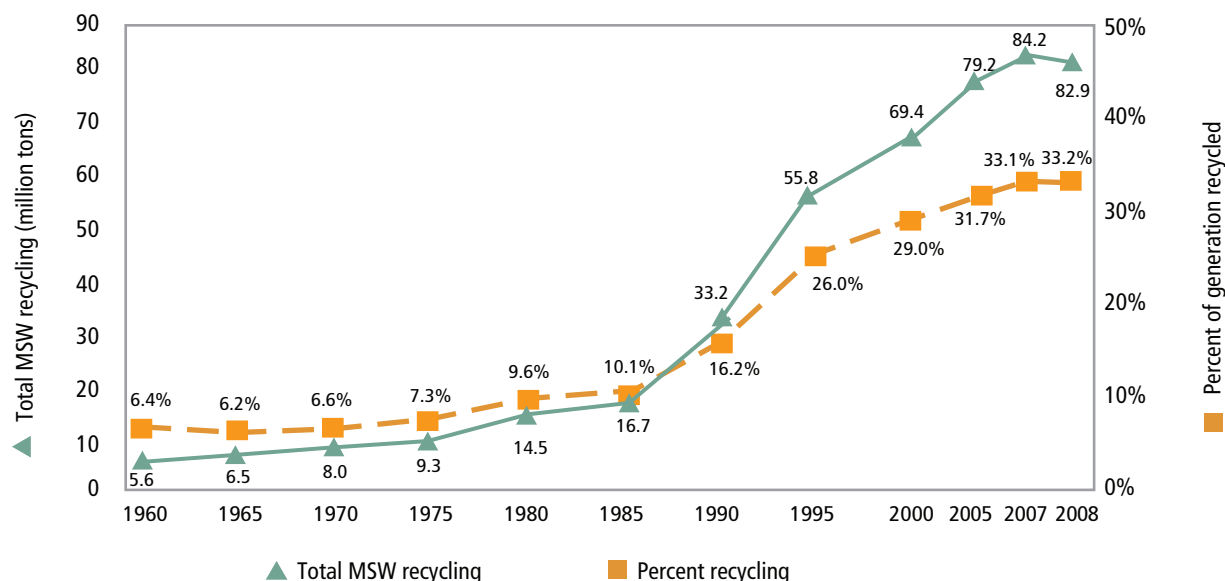
In 2008, Americans generated about 250 million tons of trash and recycled and composted 83 million tons of this material, equivalent to a 33.2 percent recycling rate* (see Figure 1 and Figure 2). On average, we recycled and composted 1.5 pounds of our individual waste generation of 4.5 pounds per person per day.

Figure 1. MSW Generation Rates, 1960 to 2008



* The previously published 2007 recycling rate, 33.4 percent, was revised to 33.1 percent in this year's report, based on updated data (see Figure 2).

Figure 2. MSW Recycling Rates, 1960 to 2008



Trends in Municipal Solid Waste in 2008

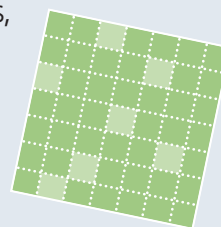
Our trash, or municipal solid waste (MSW), is made up of the things we commonly use and then throw away. These materials range from packaging, food scraps, and grass clippings, to old sofas, computers, tires, and refrigerators. MSW does not include industrial, hazardous, or construction waste.

In 2008, Americans recovered about 61 million tons (excluding composting) through recycling. Composting recovered 22.1 million tons of waste. We combusted about 32 million tons for energy recovery (about 13 percent). Subtracting out what we recycled and composted, we combusted (with energy recovery) or discarded 3 pounds per person per day.

In 2008, office-type paper recovery rose to about 71 percent (4.3 million tons), and about 65 percent of yard trimmings were recovered (see Figure 3). Metals were recycled at a rate of almost 35 percent (see Table 1). By recycling more than 7 million tons of metals (which includes aluminum, steel, and mixed metals), we eliminated greenhouse gas (GHG) emissions totaling close to 25 million metric tons of carbon dioxide equivalent (MMTCO₂E). This is equivalent to removing more than 4.5 million cars from the road for one year.*

About 135 million tons of MSW (54 percent) was discarded in landfills in 2008 (see Figure 4).

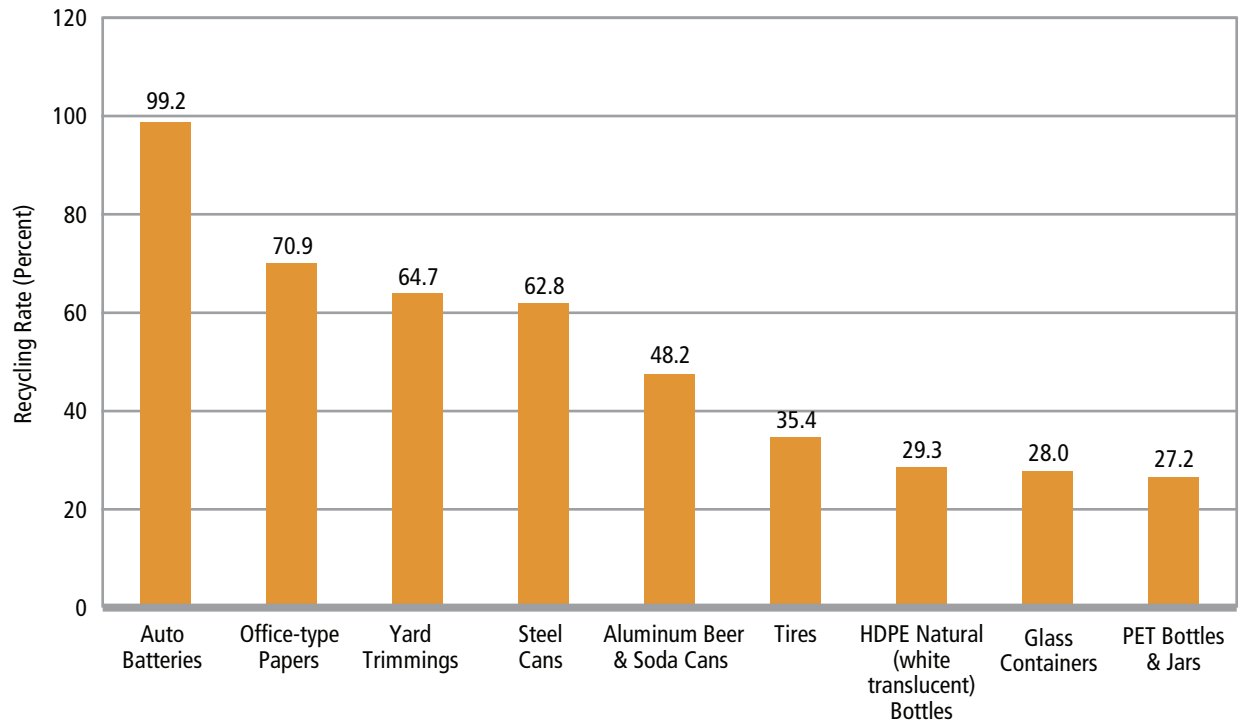
Over the last few decades, the generation, recycling, composting, and disposal of MSW have changed substantially. While solid



waste generation has increased, from 3.66 to 4.50 pounds per person per day between 1980 and 2008, the recycling rate has also increased—from less than 10 percent of MSW generated in 1980 to over 33 percent in 2008. Disposal of waste to a landfill has decreased from 89 percent of the amount generated in 1980 to 54 percent of MSW in 2008.

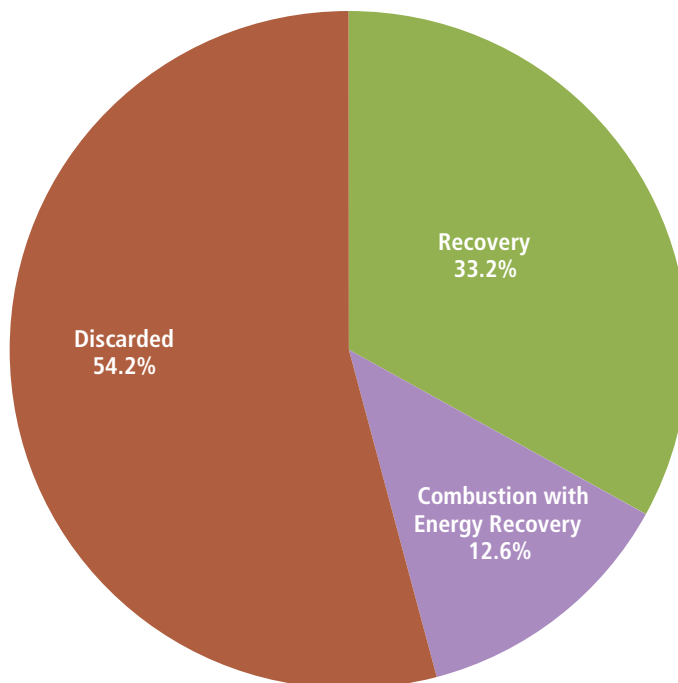
* All benefit calculations in this fact sheet are derived from EPA's WASTE Reduction Model (WARM). Please see www.epa.gov/warm

Figure 3. Recycling Rates of Selected Products, 2008*



*Does not include combustion (with energy recovery).

Figure 4. Management of MSW in the United States, 2008



Sources of MSW

We estimated residential waste (including waste from apartment houses) to be 55 to 65 percent of total MSW generation. Waste from commercial and institutional locations, such as schools, hospitals, and businesses, amounted to 35 to 45 percent.

Nationally, we recycled and composted 83 million tons of municipal solid waste. This provides an annual benefit of 182 million metric tons of carbon dioxide equivalent emissions reduced, comparable to the annual GHG emissions from more than 33 million passenger vehicles.

Analyzing MSW

We analyze waste by material, such as paper and paperboard, yard trimmings, food scraps, and plastics, and by major product categories, which include durable goods (such as furniture), nondurable goods (such as paper or clothing), containers and packaging (such as milk cartons and plastic wrap), and other materials (such as food scraps).

Materials in MSW

Total MSW generation in 2008 was 250 million tons. Organic materials continue to be the largest component of MSW. Paper and paperboard account for 31 percent, with yard trimmings and food scraps accounting for 26 percent. Plastics comprise 12 percent; metals make up 8 percent; and rubber, leather, and textiles account for almost 8 percent. Wood follows at around 7 percent and glass at 5 percent. Other miscellaneous wastes make up approximately 3 percent of the MSW generated in 2008 (see Figure 5).

Figure 5. Total MSW Generation (by material), 2008
250 Million Tons (before recycling)

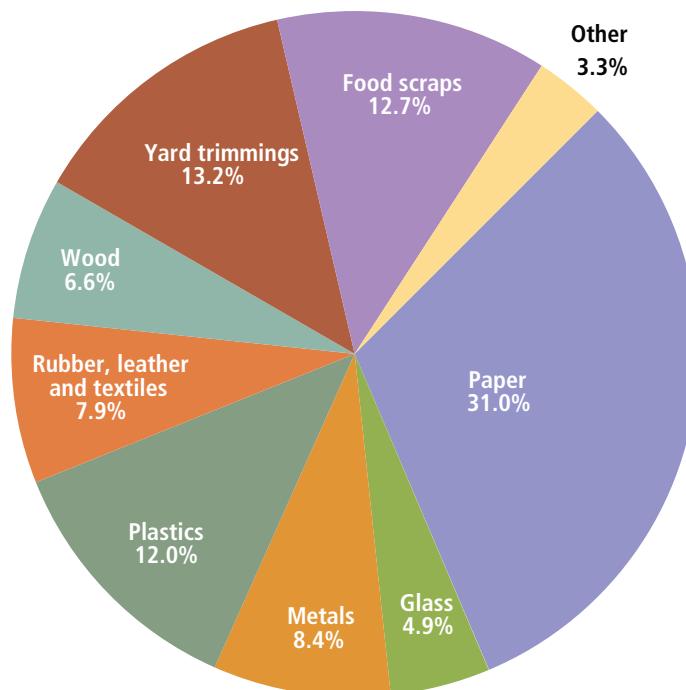


Table 1. Generation and Recovery of Materials in MSW, 2008*
(in millions of tons and percent of generation of each material)

| Material | Weight Generated | Weight Recovered | Recovery as Percent of Generation |
|------------------------------------|------------------|------------------|-----------------------------------|
| Paper and paperboard | 77.42 | 42.94 | 55.5% |
| Glass | 12.15 | 2.81 | 23.1% |
| Metals | | | |
| Steel | 15.68 | 5.29 | 33.7% |
| Aluminum | 3.41 | 0.72 | 21.1% |
| Other nonferrous metals† | 1.76 | 1.21 | 68.8% |
| Total metals | 20.85 | 7.22 | 34.6% |
| Plastics | 30.05 | 2.12 | 7.1% |
| Rubber and leather | 7.41 | 1.06 | 14.3% |
| Textiles | 12.37 | 1.89 | 15.3% |
| Wood | 16.39 | 1.58 | 9.6% |
| Other materials | 4.50 | 1.15 | 25.6% |
| Total materials in products | 181.14 | 60.77 | 33.5% |
| Other wastes | | | |
| Food, other‡ | 31.79 | 0.80 | 2.5% |
| Yard trimmings | 32.90 | 21.30 | 64.7% |
| Miscellaneous inorganic wastes | 3.78 | Negligible | Negligible |
| Total other wastes | 68.47 | 22.10 | 32.3% |
| Total municipal solid waste | 249.61 | 82.87 | 33.2% |

* Includes waste from residential, commercial, and institutional sources.

† Includes lead from lead-acid batteries.

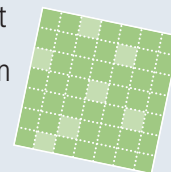
‡ Includes recovery of other MSW organics for composting.

Details might not add to totals due to rounding.

Negligible = Less than 5,000 tons or 0.05 percent.

Significant amounts of material from each category were recycled or composted in 2008. The highest recovery rates were achieved in yard trimmings, paper and paperboard, and metals. About 21 million tons of yard trimmings were composted, representing a five-fold increase since 1990. We recycled more than half the paper and paperboard we generated. Recycling these organic materials alone kept 26 percent of MSW out of landfills and combustion facilities. Recycling amounts and rates (recovery as a percent of generation) for all materials in 2008 are listed in Table 1.

Recycling and composting 83 million tons of MSW saved 1.3 quadrillion Btu of energy, the equivalent of more than 10.2 billion gallons of gasoline.



Products in MSW

The breakdown, by weight, of waste generated in 2008 by product category is shown in Figure 6. Containers and packaging made up the largest portion of MSW generated: 31 percent, or about 77 million tons. The second largest portion came from nondurable goods, which amounted to about 24 percent, or about 59 million tons. Yard trimmings make up the third largest segment, accounting for 13 percent, or almost 33 million tons.

The generation and recovery of materials in the product categories, by weight and recovery as a percent of generation, are shown in Table 2. This table shows that the recovery of containers and packaging was the highest of the four product categories, with about 44 percent of the generated materials recycled. Steel, paper products, and aluminum were the most recycled materials by percentage in this category. More than 63 percent of steel packaging (mostly cans) was recycled. Sixty-six percent of paper and paperboard containers and packaging was recycled, including nearly 77 percent of all corrugated boxes. The recycling rate for aluminum packaging was 38 percent, including just over 48 percent of aluminum beverage cans.

Figure 6. Total MSW Generation (by category), 2008
250 million tons (before recycling)

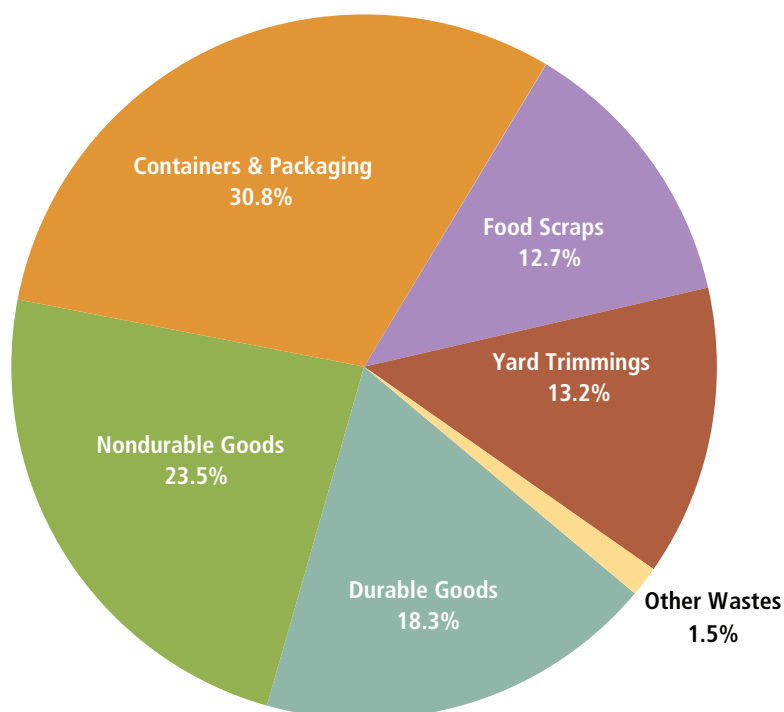


Table 2. Generation and Recovery of Products in MSW, 2008* (in millions of tons and percent of generation of each product)

| Products | Weight Generated | Weight Recovered | Recovery as Percent of Generation |
|---------------------------------------|------------------|------------------|-----------------------------------|
| Durable goods | | | |
| Steel | 13.13 | 3.68 | 28.0% |
| Aluminum | 1.31 | Negligible | Negligible |
| Other non-ferrous metals [†] | 1.76 | 1.21 | 68.8% |
| Glass | 2.10 | Negligible | Negligible |
| Plastics | 10.52 | 0.39 | 3.7% |
| Rubber and leather | 6.34 | 1.06 | 16.7% |
| Wood | 5.68 | Negligible | Negligible |
| Textiles | 3.35 | 0.44 | 13.1% |
| Other materials | 1.48 | 1.15 | 76.2% |
| Total durable goods | 45.67 | 7.93 | 17.4% |
| Nondurable goods | | | |
| Paper and paperboard | 39.12 | 17.86 | 45.7% |
| Plastics | 6.52 | Negligible | Negligible |
| Rubber and leather | 1.04 | Negligible | Negligible |
| Textiles | 8.78 | 1.45 | 16.5% |
| Other materials | 3.25 | Neg. | Neg. |
| Total nondurable goods | 58.71 | 19.31 | 32.9% |
| Containers and packaging | | | |
| Steel | 2.55 | 1.61 | 63.1% |
| Aluminum | 1.88 | 0.72 | 38.3% |
| Glass | 10.05 | 2.81 | 28.0% |
| Paper and paperboard | 38.29 | 25.08 | 65.5% |
| Plastics | 13.01 | 1.73 | 13.2% |
| Wood | 10.71 | 1.58 | 14.8% |
| Other materials | 0.27 | Negligible | Negligible |
| Total containers and packaging | 76.76 | 33.53 | 43.7% |
| Other wastes | | | |
| Food, other [‡] | 31.79 | 0.80 | 2.5% |
| Yard trimmings | 32.90 | 21.30 | 64.7% |
| Miscellaneous inorganic wastes | 3.78 | Negligible | Negligible |
| Total other wastes | 68.47 | 22.10 | 32.3% |
| Total municipal solid waste | 249.61 | 82.87 | 33.2% |

* Includes waste from residential, commercial, and institutional sources.

† Includes lead from lead-acid batteries.

‡ Includes recovery of other MSW organics for composting.

Details might not add to totals due to rounding.

Negligible = less than 5,000 tons or 0.05 percent.

Table 3. Generation, Materials Recovery, Composting, Combustion With Energy Recovery, and Discards of MSW, 1960 to 2008 (in million of tons)

| Activity | 1960 | 1970 | 1980 | 1990 | 2000 | 2003 | 2005 | 2007 | 2008 |
|--|------------|------------|------------|-------|-------|-------|-------|-------|-------|
| Generation | 88.1 | 121.1 | 151.6 | 205.2 | 239.1 | 242.2 | 249.7 | 254.6 | 249.6 |
| Recovery for recycling | 5.6 | 8.0 | 14.5 | 29.0 | 52.9 | 55.6 | 58.6 | 62.5 | 60.8 |
| Recovery for composting* | Negligible | Negligible | Negligible | 4.2 | 16.5 | 19.1 | 20.6 | 21.7 | 22.1 |
| Total materials recovery | 5.6 | 8.0 | 14.5 | 33.2 | 69.4 | 74.7 | 79.2 | 84.2 | 82.9 |
| Combustion with energy recovery† | 0.0 | 0.4 | 2.7 | 29.7 | 33.7 | 33.1 | 31.6 | 32.0 | 31.6 |
| Discards to landfill, other disposal‡ | 82.5 | 112.7 | 134.4 | 142.3 | 136.0 | 134.4 | 138.9 | 138.4 | 135.1 |

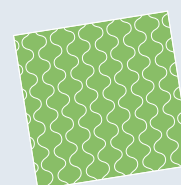
* Composting of yard trimmings, food scraps, and other MSW organic material. Does not include backyard composting.

† Includes combustion of MSW in mass burn or refuse-derived fuel form, and combustion with energy recovery of source separated materials in MSW (e.g., wood pallets, tire-derived fuel).

‡ Discards after recovery minus combustion with energy recovery. Discards include combustion without energy recovery. Details might not add to totals due to rounding.

Around 28 percent of glass containers were recycled, while about 15 percent of wood packaging—mostly wood pallets—was recovered. More than 13 percent of plastic containers and packaging was recycled, mostly from soft drink, milk, and water bottles. Plastic bottles were the most recycled plastic products. Recovery of HDPE natural (white translucent) bottles was estimated at about 29 percent. PET bottles and jars were recovered at 27 percent (see supporting 2008 MSW data tables).

Every ton of mixed paper recycled can save the energy equivalent of 185 gallons of gasoline.



Overall recovery of nondurable goods was 33 percent in 2008. Nondurable goods generally last less than three years. Paper products, such as newspapers and high-grade office papers were the most recycled nondurable goods. Newspapers alone were recycled at a rate of nearly 88 percent. Approximately 71 percent of high-grade office papers and 40 percent of magazines were recovered. Forty-one percent of unwanted mail, 30 percent of books, and 21 percent of telephone directories were recovered for recycling in 2008 (see the supporting data tables). Clothing and other textile products are included in the nondurable goods category. These products were recovered for recycling at a rate of almost 17 percent.

Overall, about 17 percent of durable goods were recovered in 2008. Nonferrous metals other than aluminum had one of the highest recovery rates—around 69 percent—due to the high rate of lead

recovery from lead-acid batteries. With a 99 percent recycling rate, lead-acid batteries continue to be one of the most recovered products. Recovery of steel in all durable goods was 28 percent, with high rates of recovery from appliances and other miscellaneous items.

Measured by percentage of generation, products with the highest recovery rates in 2008 were lead-acid batteries (99 percent), newspapers (88 percent), corrugated boxes (77 percent), office-type papers (71 percent), major appliances (67 percent), steel packaging (63 percent), yard trimmings (65 percent), aluminum cans (48 percent), commercial printing papers (43 percent), standard mail (41 percent), magazines (40 percent), and paper bags and sacks (38 percent) (see supporting 2008 data tables).

Recycling and Composting Collection Programs**

- Approximately 8,660 curbside recycling programs exist nationwide, down from 8,875 in 2002.
- About 3,510 community composting programs are operational, an increase from 3,227 in 2002.

Table 4. Generation, Materials Recovery, Composting, Combustion With Energy Recovery, and Discards of MSW, 1960 to 2008 (in pounds per person per day)

| Activity | 1960 | 1970 | 1980 | 1990 | 2000 | 2005 | 2007 | 2008 |
|--|------------|------------|------------|---------|---------|---------|---------|---------|
| Generation | 2.68 | 3.25 | 3.66 | 4.50 | 4.65 | 4.62 | 4.63 | 4.50 |
| Recovery for recycling | 0.17 | 0.22 | 0.35 | 0.64 | 1.03 | 1.08 | 1.14 | 1.10 |
| Recovery for composting* | Negligible | Negligible | Negligible | 0.09 | 0.32 | 0.38 | 0.39 | 0.40 |
| Total Materials Recovery | 0.17 | 0.22 | 0.35 | 0.73 | 1.35 | 1.46 | 1.53 | 1.50 |
| Combustion with energy recovery† | 0.00 | 0.01 | 0.07 | 0.65 | 0.66 | 0.58 | 0.58 | 0.57 |
| Discards to landfill, other disposal‡ | 2.51 | 3.02 | 3.24 | 3.12 | 2.64 | 2.58 | 2.52 | 2.43 |
| Population (millions) | 179.979 | 203.984 | 227.255 | 249.907 | 281.422 | 296.410 | 301.621 | 304.060 |

* Composting of yard trimmings, food scraps, and other MSW organic material. Does not include backyard composting.

† Includes combustion of MSW in mass burn or refuse-derived fuel form, and combustion with energy recovery of source separated materials in MSW (e.g., wood pallets, tire-derived fuel).

‡ Discards after recovery minus combustion with energy recovery. Discards include combustion without energy recovery. Details might not add to totals due to rounding.

** Source: For 2002 data: *BioCycle* 2006.

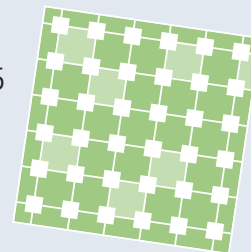
For 2008 data: EPA, *Supporting 2008 data tables and figures*.

Disposing of MSW

While the number of U.S. landfills has steadily declined over the years, the average landfill size has increased. At the national level, landfill capacity appears to be sufficient, although it is limited in some areas.

- Since 1990, the total amount of MSW going to landfills dropped by about 7 million tons, from 142.3 million to 135.1 million tons in 2008 (see Table 3).
- The net per capita discard rate (after recycling, composting, and combustion for energy recovery) was 2.43 pounds per person per day, lower than the 2.51 per capita rate in 1960, when virtually no recycling occurred in the United States (see Table 4).

Recycling just 1 ton of aluminum cans conserves more than 207 million Btu, the equivalent of 36 barrels of oil, or 1,665 gallons of gasoline.



The Benefits of Recycling

Recycling has environmental benefits at every stage in the life cycle of a consumer product—from the raw material with which it's made to its final method of disposal. Aside from reducing GHG emissions, which contribute to global warming, recycling also reduces air and water pollution associated with making new products from raw materials. By utilizing used, unwanted, or obsolete materials as industrial feedstocks or for new materials or products, we can each do our part to make recycling work.

Nationally, we recycled 83 million tons of MSW. This provides an annual benefit of 182 million metric tons of carbon dioxide equivalent emissions reduced, comparable to removing the emissions from 33 million passenger cars. But the ultimate benefits from recycling are cleaner land, air, and water, overall better health, and a more sustainable economy.

Resources

The data summarized in this fact sheet characterizes the MSW stream as a whole by using a materials flow methodology that relies on a mass balance approach. For example, to determine the amounts of paper recycled, information is gathered on the amounts processed by paper mills and made into new paper on a national basis, instead of counting paper collected at curbside on a state-by-state basis. Using data gathered from industry associations, businesses, and government sources, such as the U.S. Department of Commerce and the U.S. Census Bureau, we estimate tons of materials and products generated, recycled, and discarded. Other sources of data, such as waste characterizations and research reports performed by governments, industry, or the press, supplement these data.

The benefits of recycling and composting, such as elimination of GHG emissions, are calculated using EPA's WARM methodology. Please see:

www.epa.gov/warm

Energy Recovered from Waste Combustion

- In 2008, about 32 million tons of materials, or 12.7 percent, were combusted for energy recovery.
- MSW combustion for energy recovery has remained fairly constant since 1990.

WARM calculates and totals GHG emissions of baseline and alternative waste management practices—source reduction, recycling, composting, combustion, and landfilling. The model calculates emissions in metric tons of carbon equivalent (MTCE), metric tons of carbon dioxide equivalent (MTCO₂E), and energy units (million Btu) across a wide range of material types commonly found in MSW. EPA developed GHG emissions reduction factors through a life-cycle assessment methodology. EPA's report, *Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks* (EPA-530-R-02-006), describes this methodology in detail (www.epa.gov/climatechange/wycd/waste/downloads/fullreport.pdf).

Full data tables on MSW characterization that support this Report and Summaries of the MSW characterization methodology and WARM are available on the EPA Web site along with information about waste reduction and recycling. Please see:

www.epa.gov/epawaste/nonhaz/municipal/msw99.htm

www.epa.gov/epawaste/conservation/rrr/index.htm

In percentage of total MSW generation, recovery for recycling (including composting) did not exceed 15 percent until 1990. Growth in the recovery rate to current levels (33.2 percent) reflects an increase in infrastructure and market demand for recovery over the last decade.



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