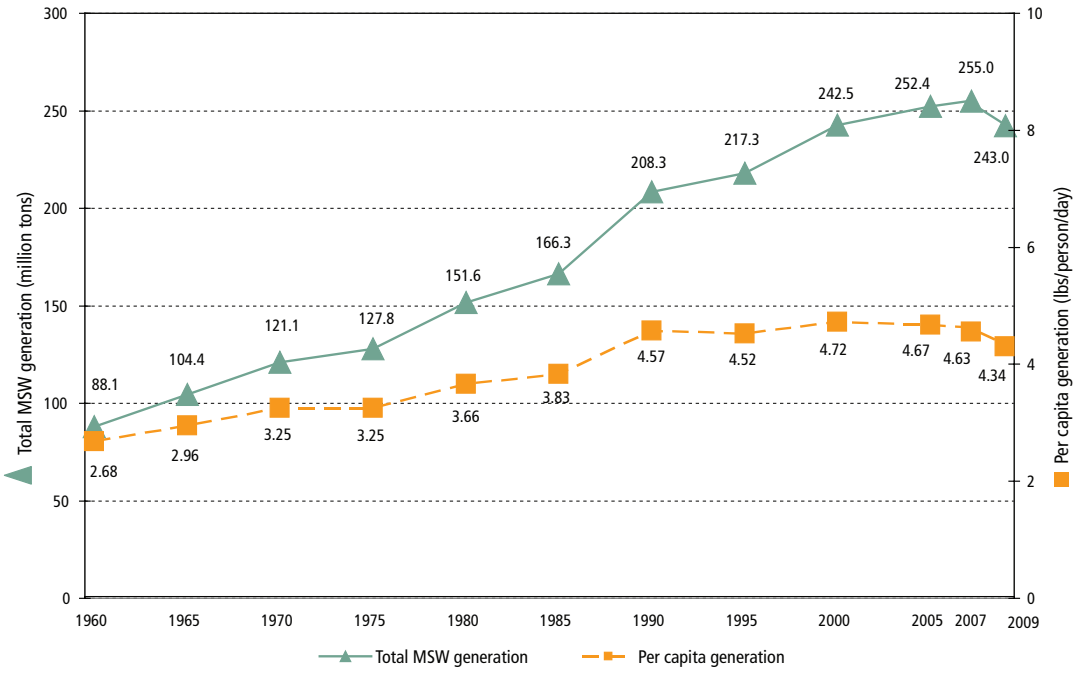
United States
Environmental Protection
Agency

Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2009

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 2009.

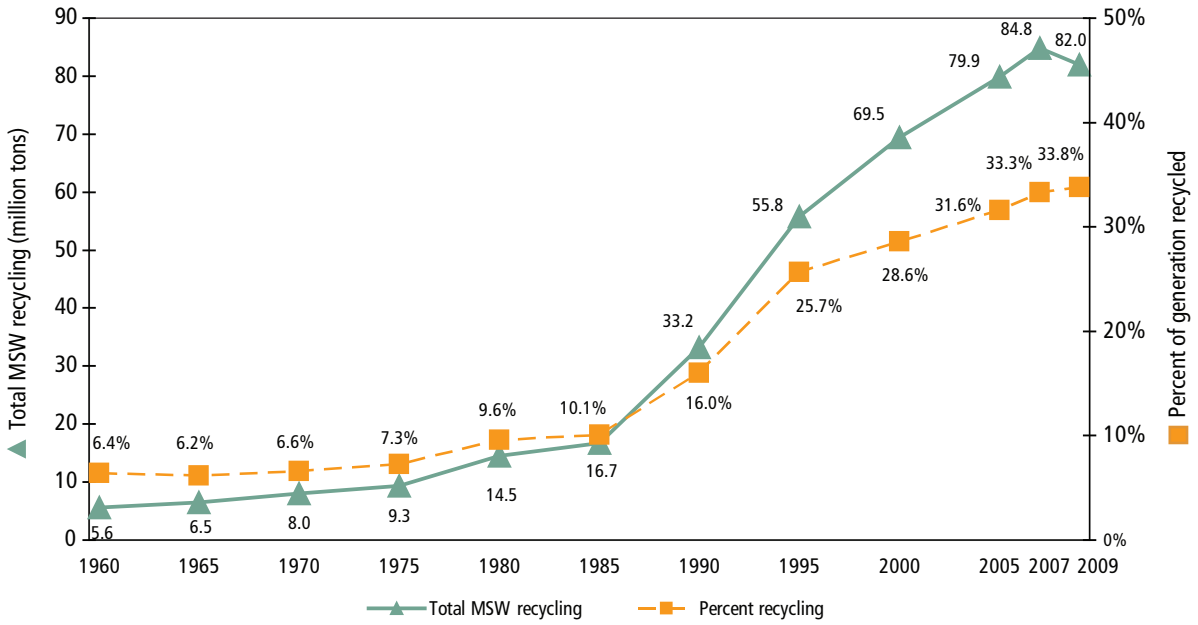
In 2009, Americans generated about 243 million tons of trash and recycled and composted 82 million tons of this material, equivalent to a 33.8 percent recycling rate* (see Figure 1 and Figure 2). On average, we recycled and composted 1.46 pounds of our individual waste generation of 4.34 pounds per person per day.

Figure 1. MSW Generation Rates, 1960 to 2009



* The previously published 2008 recycling rate, 33.2 percent, was revised to 33.4 percent in this year's report, based on updated data (see Figure 2).

Figure 2. MSW Recycling Rates, 1960 to 2009



Trends in Municipal Solid Waste in 2009

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

In 2009, Americans recovered about 61 million tons of MSW (excluding composting) through recycling. Composting recovered about 21 million tons of waste. We combusted about 29 million tons for energy recovery (about 12 percent). Subtracting out what we recycled and composted, we combusted (with energy recovery) or discarded 2.9 pounds per person per day.

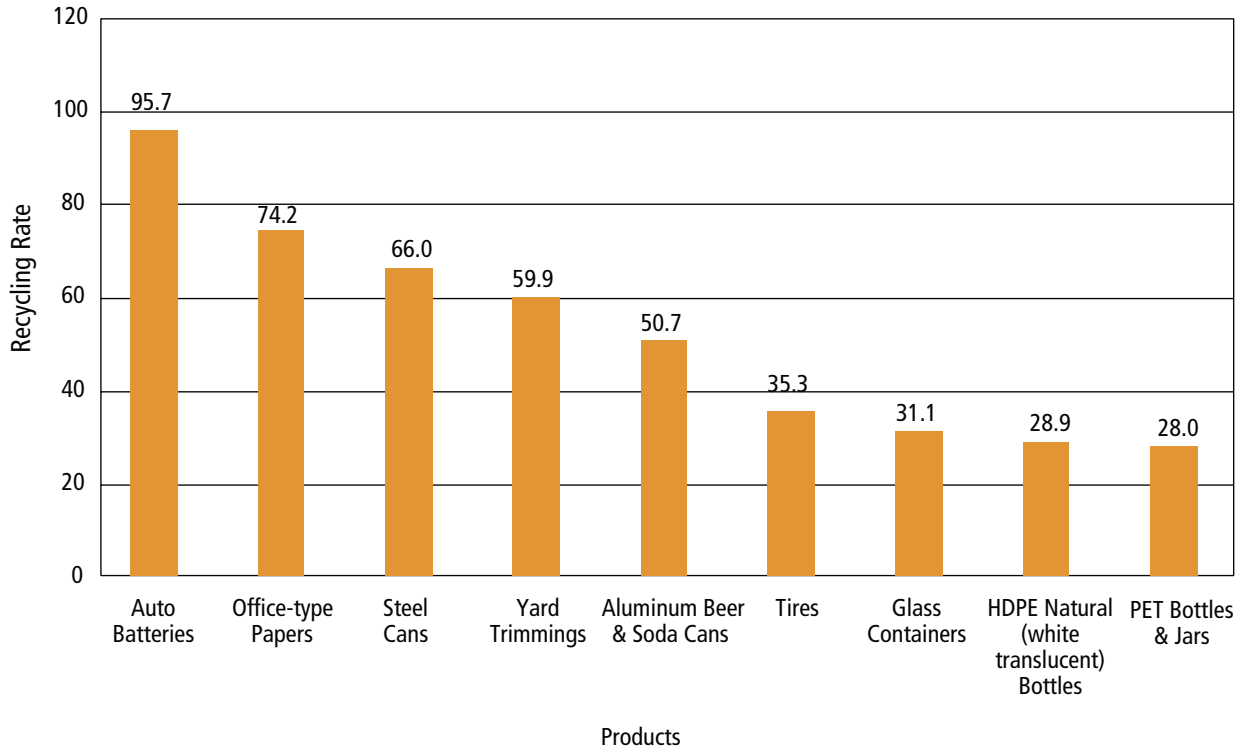
In 2009, office-type paper recovery rose to about 74 percent (4 million tons), and about 60 percent of yard trimmings were recovered (see Figure 3). Metals were recycled at a rate of about 34.5 percent (see Table 1). By recycling more than 7 million tons of metals (which includes aluminum, steel, and mixed metals), we eliminated greenhouse gas (GHG) emissions totaling about 25 million metric tons of carbon dioxide equivalent ($MMTCO_2E$). This is equivalent to removing almost 5 million cars from the road for one year.*

About 132 million tons of MSW (54.3 percent) were discarded in landfills in 2009 (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 4.34 pounds per person per day between 1980 and 2009, the recycling rate has also increased—from less than 10 percent of MSW generated in 1980 to almost 34 percent in 2009. Disposal of waste to a landfill has decreased from 89 percent of the amount generated in 1980 to about 54 percent of MSW in 2009.

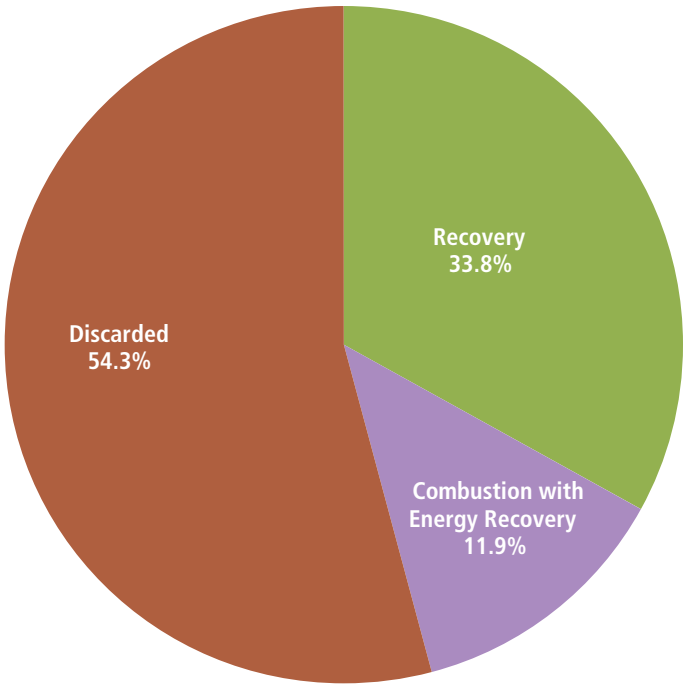
* All benefit calculations in this fact sheet are derived from EPA's Waste Reduction Model (WARM). Please see www.epa.gov/warm

Figure 3. Recycling Rates of Selected Products, 2009*



*Does not include combustion (with energy recovery).

Figure 4. Management of MSW in the United States, 2009



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 82 million tons of municipal solid waste. This provides an annual benefit of 178 million metric tons of carbon dioxide equivalent emissions reduced, comparable to the annual GHG emissions from almost 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 2009 was 243 million tons. Organic materials continue to be the largest component of MSW. Paper and paperboard account for 28 percent and yard trimmings and food scraps account for another 28 percent. Plastics comprise 12 percent; metals make up almost 9 percent; and rubber, leather, and textiles account for 8 percent. Wood follows at around 7 percent and glass at 5 percent. Other miscellaneous wastes make up approximately 4 percent of the MSW generated in 2009 (see Figure 5).

Figure 5. Total MSW Generation (by material), 2009
243 Million Tons (before recycling)

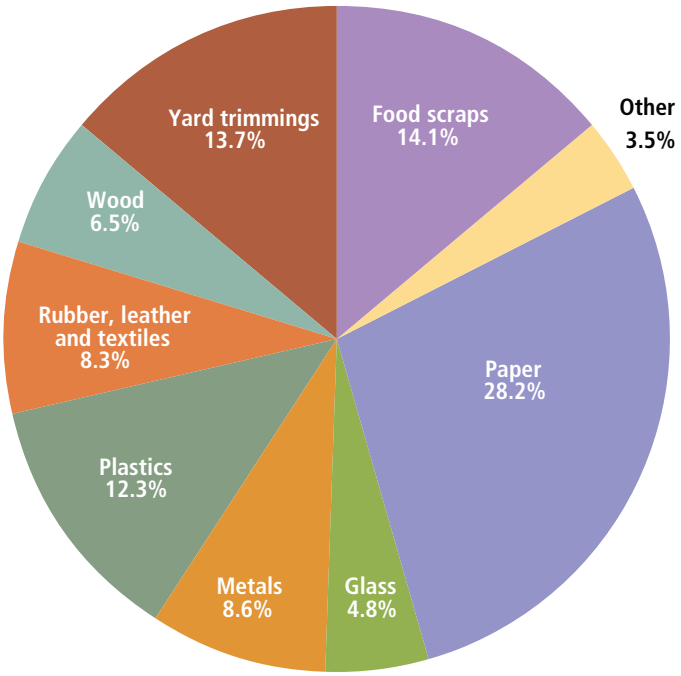


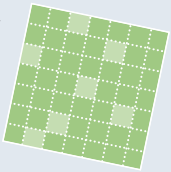
Table 1. Generation and Recovery of Materials in MSW, 2009*
(in millions of tons and percent of generation of each material)

Material	Weight Generated	Weight Recovered	Recovery as Percent of Generation
Paper and paperboard	68.43	42.50	62.1%
Glass	11.78	3.00	25.5%
Metals			
Steel	15.62	5.23	33.5%
Aluminum	3.40	0.69	20.3%
Other nonferrous metals†	1.89	1.30	68.8%
Total metals	**20.91**	**7.22**	**34.5%**
Plastics	29.83	2.12	7.1%
Rubber and leather	7.49	1.07	14.3%
Textiles	12.73	1.90	14.9%
Wood	15.84	2.23	14.1%
Other materials	4.64	1.23	26.5%
Total materials in products	**171.65**	**61.27**	**35.7%**
Other wastes			
Food, other‡	34.29	0.85	2.5%
Yard trimmings	33.20	19.90	59.9%
Miscellaneous inorganic wastes	3.82	Negligible	Negligible
Total other wastes	**71.31**	**20.75**	**29.1%**
Total municipal solid waste	**242.96**	**82.02**	**33.8%**

* 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 2009. The highest recovery rates were achieved in paper and paperboard, yard trimmings, and metals. We recycled more than 60 percent of the paper and paperboard we generated. About 20 million tons of yard trimmings were composted, representing about a five-fold increase since 1990. 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 2009 are listed in Table 1.

Recycling and composting 82 million tons of MSW saved almost 1.3 quadrillion Btu of energy, the equivalent of 224 million barrels of oil.



Products in MSW

The breakdown, by weight, of waste generated in 2009 by product category is shown in Figure 6. Containers and packaging made up the largest portion of MSW generated: almost 30 percent, or about 72 million tons. The second largest portion came from nondurable goods, which amounted to 22 percent, or about 53 million tons. Durable goods make up the third largest segment, accounting for 19 percent, or almost 47 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 48 percent of the generated materials recycled. Steel, paper products, and aluminum were the most recycled materials by percentage in this category. More than 66 percent of steel packaging (mostly cans) was recycled. About seventy-two percent of paper and paperboard containers and packaging was recycled, including 81 percent of all corrugated boxes. The recycling rate for aluminum packaging was about 38 percent, including almost 51 percent of aluminum beverage cans.

Figure 6. Total MSW Generation (by category), 2009
243 million tons (before recycling)

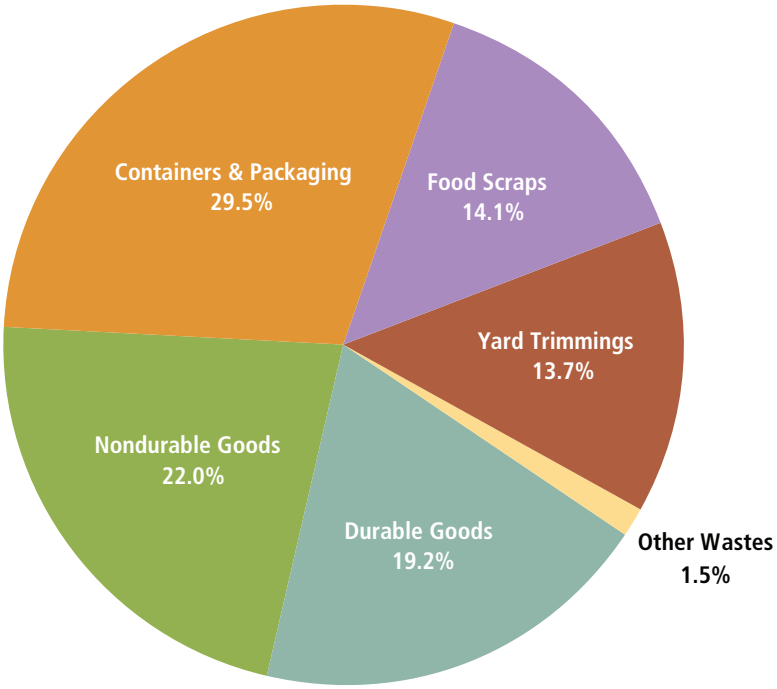


Table 2. Generation and Recovery of Products in MSW, 2009* (in millions of tons and percent of generation of each product)

Products	Weight Generated	Weight Recovered	Recovery as Percent of Generation
Durable goods			
Steel	13.34	3.72	27.9%
Aluminum	1.35	Negligible	Negligible
Other non-ferrous metals†	1.89	1.30	68.8%
Glass	2.12	Negligible	Negligible
Plastics	10.65	0.40	3.8%
Rubber and leather	6.43	1.07	16.6%
Wood	5.76	Negligible	Negligible
Textiles	3.49	.044	12.6%
Other materials	1.61	1.23	76.4%
Total durable goods	**46.64**	**8.16**	**17.5%**
Nondurable goods			
Paper and paperboard	33.48	17.43	52.1%
Plastics	6.65	Negligible	Negligible
Rubber and leather	1.06	Negligible	Negligible
Textiles	9.00	1.46	16.2%
Other materials	3.25	Negligible	Negligible
Total nondurable goods	**53.44**	**18.89**	**35.3%**
Containers and packaging			
Steel	2.28	1.51	66.2%
Aluminum	1.84	0.69	37.5%
Glass	9.66	3.00	31.1%
Paper and paperboard	34.94	25.07	71.8%
Plastics	12.53	1.72	13.7%
Wood	10.08	2.23	22.1%
Other materials	0.24	Negligible	Negligible
Total containers and packaging	**71.57**	**34.22**	**47.8%**
Other wastes			
Food, other‡	34.29	0.85	2.5%
Yard trimmings	33.20	19.90	59.9%
Miscellaneous inorganic wastes	3.82	Negligible	Negligible
Total other wastes	71.31	20.75	29.1%
Total municipal solid waste	**242.96**	**82.02**	**33.8%**

* 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 2009 (in million of tons)

Activity	1960	1970	1980	1990	2000	2005	2007	2008	2009
Generation	88.1	121.1	151.6	208.3	242.5	252.4	255.0	251.0	243.0
Recovery for recycling	5.6	8.0	14.5	29.0	53.0	59.3	63.1	61.8	61.3
Recovery for composting*	Negligible	Negligible	Negligible	4.2	16.5	20.6	21.7	22.1	20.8
Total materials recovery	5.6	8.0	14.5	33.2	69.5	79.9	84.8	83.9	82.0
Combustion with energy recovery†	0.0	0.4	2.7	29.7	33.7	31.6	32.0	31.6	29.0
Discards to landfill, other disposal‡	82.5	112.7	134.4	145.3	139.4	140.9	138.2	135.6	131.9

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

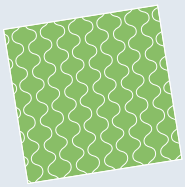
† Includes combustion of MSW in mass burn or refuse-derived fuel form, and combustion with energy recovery of source separated materials in MSW (e.g., wood pallets, tire-derived fuel).

‡ Discards after recovery minus combustion with energy recovery. Discards include combustion without energy recovery.

Details might not add to totals due to rounding.

Around 31 percent of glass containers was recycled, while about 22 percent of wood packaging—mostly wood pallets—was recovered. Almost 14 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 high density polyethylene (HDPE) natural (white translucent) bottles was estimated at about 29 percent. Polyethylene terephthalate (PET) bottles and jars were recovered at 28 percent (see full 2009 MSW report).

Every ton of mixed paper recycled can save the energy equivalent of 165 gallons of gasoline.



Overall recovery of nondurable goods was just over 35 percent in 2009. 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 88 percent. Approximately 74 percent of high-grade office papers and 54 percent of magazines were recovered. Sixty-three percent of unwanted mail, 37 percent of telephone directories, and 33 percent of books were recovered for recycling in 2009 (see the full MSW report). Clothing and other textile products are included in the nondurable goods category. These products were recovered for recycling at a rate of 16 percent.

Overall, about 18 percent of durable goods was recovered in 2009. 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 96 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 2009 were lead-acid batteries (96 percent), newspapers (88 percent), corrugated boxes (81 percent), office-type papers (74 percent), major appliances (67 percent), steel packaging (66 percent), yard trimmings (60 percent), commercial printing papers (66 percent), standard mail (63 percent), magazines (54 percent), aluminum cans (51 percent), and folding cartons (50 percent) (see full 2009 MSW report).

Recycling and Composting Collection Programs**

- Approximately 9,000 curbside recycling programs exist nationwide, up from 8,875 in 2002.
- About 3,000 community composting programs were documented in 2009, a decrease from 3,227 in 2002.

Disposing of MSW

Table 4. Generation, Materials Recovery, Composting, Combustion With Energy Recovery, and Discards of MSW, 1960 to 2009 (in pounds per person per day)

Activity	1960	1970	1980	1990	2000	2005	2007	2008	2009
Generation	2.68	3.25	3.66	4.57	4.72	4.67	4.63	4.52	4.34
Recovery for recycling	0.17	0.22	0.35	0.64	1.03	1.10	1.15	1.11	1.09
Recovery for composting*	Negligible	Negligible	Negligible	0.09	0.32	0.38	0.39	0.40	0.37
Total Materials Recovery	0.17	0.22	0.35	0.73	1.35	1.48	1.54	1.51	1.46
Combustion with energy recovery†	0.00	0.01	0.07	0.65	0.66	0.58	0.58	0.57	0.52
Discards to landfill, other disposal‡	2.51	3.02	3.24	3.19	2.71	2.61	2.51	2.44	2.36
Population (millions)	179.979	203.984	227.255	249.907	281.422	296.410	301.621	304.060	307.007

* 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.

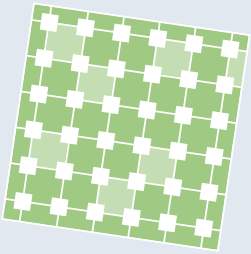
** Source: For 2002 data: *BioCycle* 2006.
For 2009 data: EPA, *Municipal Solid Waste in the United States: 2009 Facts and Figures.*

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 more than 13 million tons, from 145.3 million to 131.9 million tons in 2009 (see Table 3).

• The net per capita discard rate (after recycling, composting, and combustion for energy recovery) was 2.36 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. Recycling also provides significant economic and job creation impacts, a topic discussed at www.epa.gov/epawaste/conserve/rrr/rmd/econ.htm.

Nationally, we recycled 82 million tons of MSW. This provides an annual benefit of 178 million metric tons of carbon dioxide equivalent emissions reduced, comparable to removing the emissions from almost 33 million passenger vehicles. 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 plus recycled paper exported, instead of counting paper collected for recycling 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 2009, about 29 million tons of materials, or 11.9 percent, were combusted for energy recovery.
- MSW combustion for energy recovery has decreased from about 34 million tons in 2000 to about 29 million tons in 2009.

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 ($MTCO_2E$), 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/conserve/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 (33.8 percent) reflects an increase in infrastructure and market demand for recovery over the last decade.

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United States Environmental Protection Agency
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