Advancing Sustainable Materials Management: 2013 Fact Sheet

Assessing Trends in Material Generation, Recycling and Disposal in the United States

June 2015

Introduction

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 2013.

Formerly called *Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures*, this fact sheet's new name emphasizes the importance of Sustainable Materials Management (SMM). The new name also reflects continuing efforts to expand, improve and enhance the report with new information on historical landfill tipping fees for municipal solid waste (MSW) and construction and demolition (C&D) debris generation. A new expanded section on source reduction, or waste prevention, is provided in the full report. Please see: www.epa.gov/epawaste/nonhaz/municipal/msw99.htm.

Food
Nationally, the composting of food rose from 1.74 million tons in 2012 (4.8 percent of food) to 1.84 million tons in 2013 (5.0 percent of food).

In 2013, Americans generated about 254 million tons (U.S. short tons unless specified) of trash and recycled and composted over 87 million tons of this material, equivalent to a 34.3 percent recycling rate (see Figure 1 and Figure 2). On average, Americans recycled and composted 1.51 pounds out of our individual waste generation rate of 4.40 pounds per person per day.

EPA's 2009 report, *Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices*, shows that approximately 42 percent of U.S. greenhouse gas (GHG) emissions are

Figure 1. MSW Generation Rates, 1960 to 2013

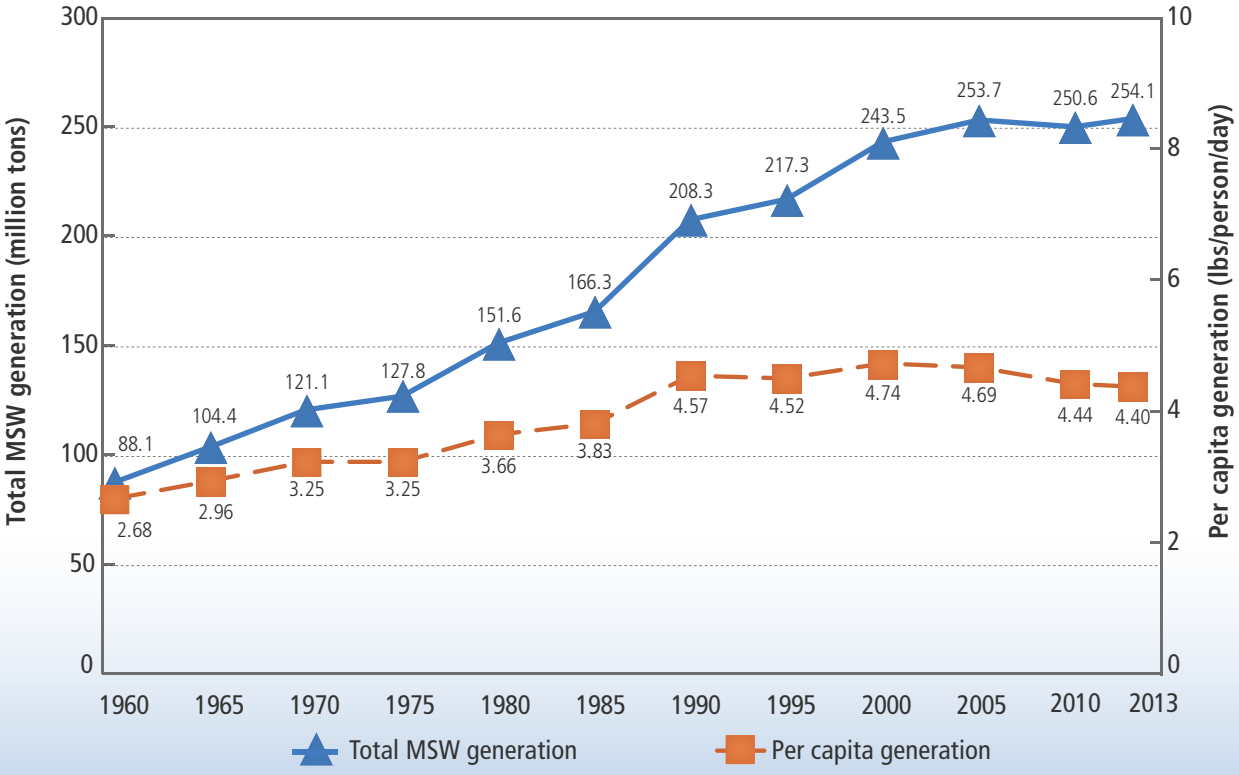
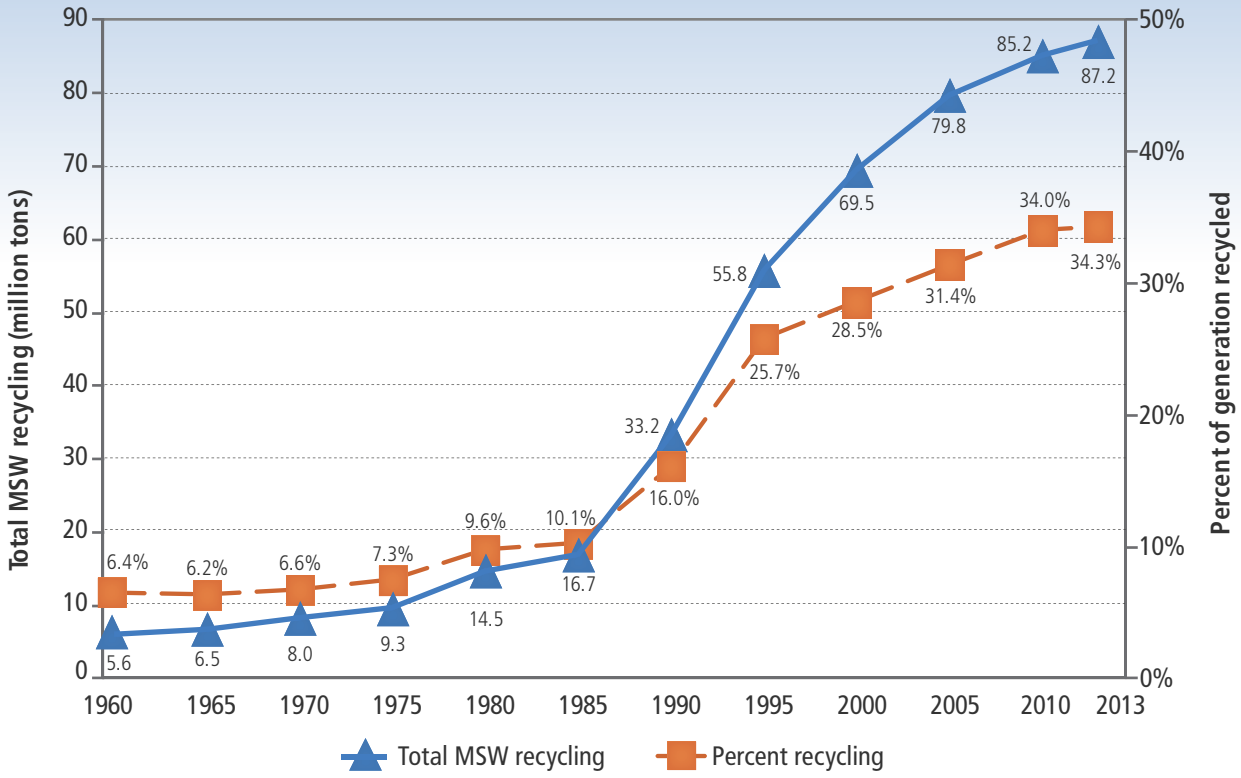


Figure 2. MSW Recycling Rates, 1960 to 2013



associated with materials management. This includes the extraction or harvest of materials and food, production and transport of goods, provision of services and end of life management. These GHG emissions can be reduced through materials recovery. In 2013, the 87 million tons of MSW recycled and composted provided an annual reduction of 186 million tons of carbon dioxide equivalent emissions, comparable to the annual emissions from over 39 million passenger cars.

As the new name for our annual report suggests, EPA is thinking beyond waste. We are transitioning from focusing on waste management to focusing on Sustainable Materials Management. SMM refers to the use and reuse of materials in the most productive and sustainable way across their entire life cycle. SMM conserves resources, reduces waste, slows climate change and minimizes the environmental impacts of the materials we use.

In an era of limitless business ingenuity but limited resources, the sustainable management of natural capital is increasingly at the forefront of international dialogue about how to achieve economic growth without compromising human health and the environment upon which that growth depends. By looking across the life cycle, businesses can find opportunities that enhance and sustain their value proposition and reduce risk through sustainably managing materials.

According to the UN Environment Programme (UNEP), "Humans are consuming resources and producing waste at a greater scale than ever before and per capita consumption levels are projected to increase with continued development." For every 1 percent increase in GDP, resource use has risen 0.4 percent.[1] Data indicate that global material resource use during the 20th century rose at about twice the rate of population. The growth rate in materials use was still lower than the pace of growth of the world economy. Despite some decoupling of economic growth and materials use, questions remain about the extent to which economic and environmental policies have impacted this decoupling.[2] Nevertheless, resource use is still on a steep rise and this decoupling is

insufficient to overcome the even higher demands we face in the future given projections around future world population growth, economic growth and energy and material consumption.[3] The United States consumed 46 percent more materials on a per capita basis in the year 2000 than in 1975 (see Figure 1). In the global context, the total volume of material resources extracted or harvested worldwide reached nearly 60 billion metric tons per year in 2007, with nonrenewable resource extraction accounting for 60 percent of global extraction.[4] According to the World Resources Institute, "one half to three quarters of annual resource inputs to industrial economies is returned to the environment as wastes within just one year."[5]

While EPA is currently updating the *U.S. Recycling Economic Information (REI) Study* which is due out later this year, our 2001 study showed we have domestic capacity to process 2 billion pounds of soda bottles, yet currently we only collect 1.4 billion annually. And there is growing demand for more recycled plastic. The aluminum industry is eager for more aluminum cans – yet in the U.S. we dispose of nearly half of our cans, which by the way are valued at nearly $1 billion.[6] Glass recycling capacity exceeds supply. Paper recycling is available to 96 percent of Americans.[7] The structure is in place for steel can recycling. All of the materials collected are used in recycling, and the forecast is for this demand to increase.

Trends in Municipal Solid Waste in 2013

Our trash, or MSW, is comprised of various items Americans commonly throw away after being used. These items include packaging, food, grass clippings, sofas, computers, tires and refrigerators. MSW does not include industrial, hazardous or construction waste.

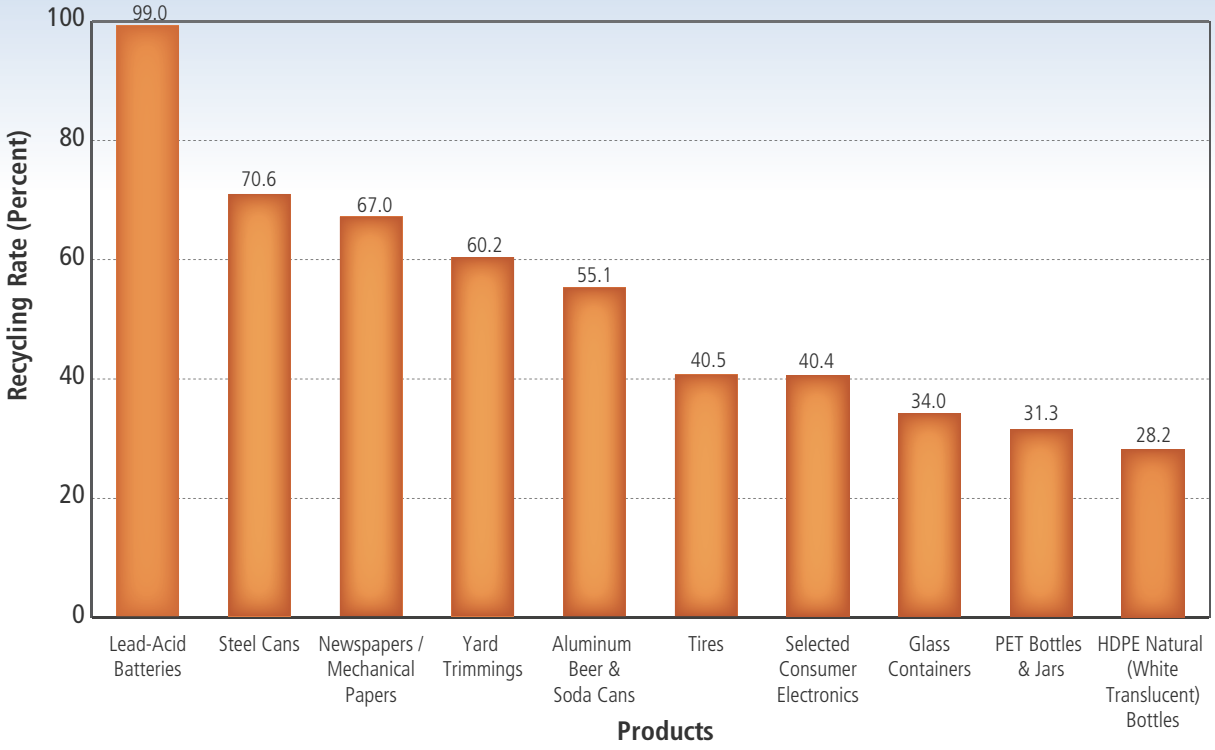
In 2013, Americans recovered over 64.7 million tons of MSW through recycling, and over 22 million tons through composting. This is 1.12 pounds per person per day for recycling and 0.39 pounds per person per day for composting. Americans combusted about 32.7 million tons (about 13 percent) for energy recovery. Subtracting out what is recycled and composted, we combusted (with energy recovery) or discarded in landfills 2.89 pounds per person per day of MSW.

Over the last few decades, the generation, recycling, composting and disposal of MSW changed substantially. Solid waste generation per person per day peaked in 2000. The 4.4 pounds per person per day in 2013 is about the same as in 2012, and is one of the lowest rates since 1980. The recycling rate has increased from less than 10 percent of generated MSW in 1980 to over 34 percent in 2013. Disposal of generated waste in landfills decreased from 89 percent in 1980 to under 53 percent in 2013.

In 2013, the rate of lead-acid battery recovery was about 99 percent (2.85 million tons). The rate of newspapers/mechanical papers recovery was about 67 percent (5.4 million tons), and over 60 percent (20.6 million tons) of yard trimmings were recovered (see Figure 3). About 134.3 million tons of MSW (52.8 percent) were discarded in landfills in 2013 (see Figure 4).

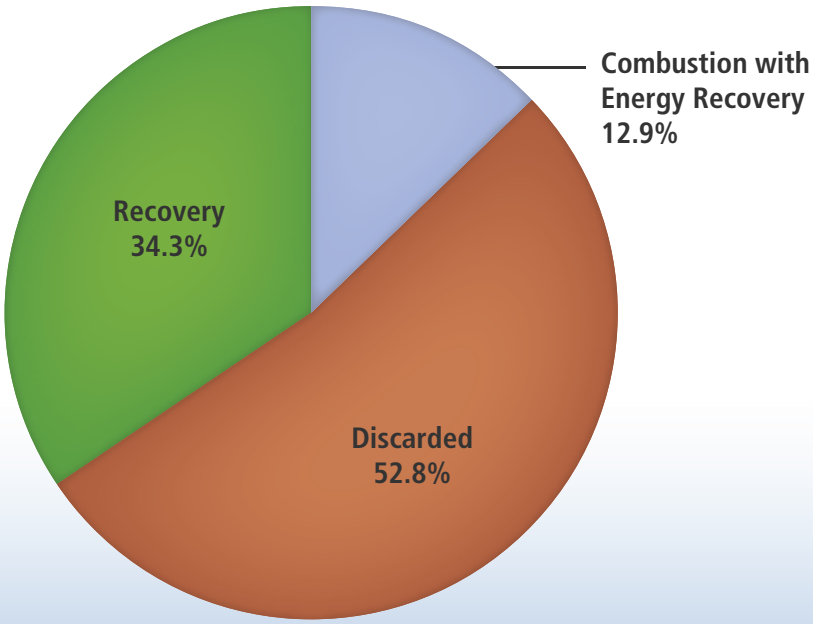
Three materials whose recycling rates rose from 2012 to 2013 are yard trimmings, selected consumer electronics and food. In 2013, the rate of yard trimmings composting was 60.2 percent (20.60 million tons), up from 57.7 percent (19.59 million tons). This translates to 130 pounds per person per year of yard trimmings composted in 2013. In 2013, the rate of selected consumer electronics recovery was 40.4 percent (1.27 million tons) up from 30.6 percent in 2012 (1.00 million tons). This translates to 8 pounds per person per year recovered in 2013. In 2013, the rate of food recovery was 5.0 percent (1.84 million tons), up from 4.8 percent in 2012 (1.74 million tons). This translates to 12 pounds per person per year composted in 2013. Over the last few years, EPA has been heavily invested in these areas.

Figure 3. Recycling Rates of Selected Products, 2013**



**Does not include combustion with energy recovery.

Figure 4. Management of MSW in the United States, 2013



Sources of MSW

Sources of MSW include residential waste (including waste from apartment houses) and waste from commercial and institutional locations, such as businesses, schools and hospitals.

Analyzing MSW

EPA analyzes waste by material, such as plastics, or paper and paperboard, as well as 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).

Nationally, in 2013, Americans recycled and composted over 87 million tons of municipal solid waste. This provides an annual reduction of more than 186 million metric tons of carbon dioxide equivalent emissions, comparable to the annual GHG emissions from over 39 million passenger vehicles.[8]

Materials in MSW

Total MSW generation in 2013 was 254.1 million tons. Figure 5 shows the breakdown of MSW generation by material. Organic materials such as paper and paperboard, yard trimmings and food continue to be the largest component of MSW. Paper and paperboard account for 27 percent, and yard trimmings and food account for another 28.1 percent. Plastics comprise about 13 percent of MSW; metals make up 9 percent; and rubber, leather and textiles account for another 9 percent. Wood follows at over 6 percent, and glass at almost 5 percent. Other miscellaneous wastes make up approximately 3 percent of the MSW generated in 2013.

Total MSW recovery in 2013 was over 87 million tons. Figure 6 shows that in 2013, paper and paperboard accounted for about 50 percent, and yard trimmings accounted for over 23 percent, while food accounted for another 2 percent. Metals comprised 9 percent, glass about 4 percent and plastic and wood about 3 percent each. Other miscellaneous materials made up about 6 percent of MSW recovery.

After MSW recovery through recycling and composting, Amerians discarded almost 167 million tons of MSW in 2013. Food was the largest component of discards at 21 percent. Plastics comprised about 18 percent; paper and paperboard made up over 15 percent; and rubber, leather and textiles accounted for over 11 percent of MSW discards. The other materials accounted for less than 10 percent each (see Figure 7).

Americans recycled and composted significant amounts of material from each category in 2013. The highest recovery rates were achieved in paper and paperboard, yard trimmings and metals. Americans recycled more than 63 percent of the paper and paperboard generated. Over 20 million tons of yard trimmings were composted (almost a five-fold increase since 1990). In 2013, over 34 percent of metal was recovered. Recycling these three materials alone kept over 28 percent of generated MSW out of landfills and combustion facilities. Recycling amounts and rates (recovery as a percent of generation) for all materials in 2013 are listed in Table 1. This table also presents millions of tons of discarded materials.

Recycling and composting over 87 million tons of MSW saved almost 1.1 quadrillion Btu of energy. That's the same amount of energy consumed by over 9.9 million U.S. households in a year.

Figure 5. Total MSW Generation (by material), 2013
254 Million Tons (before recycling)

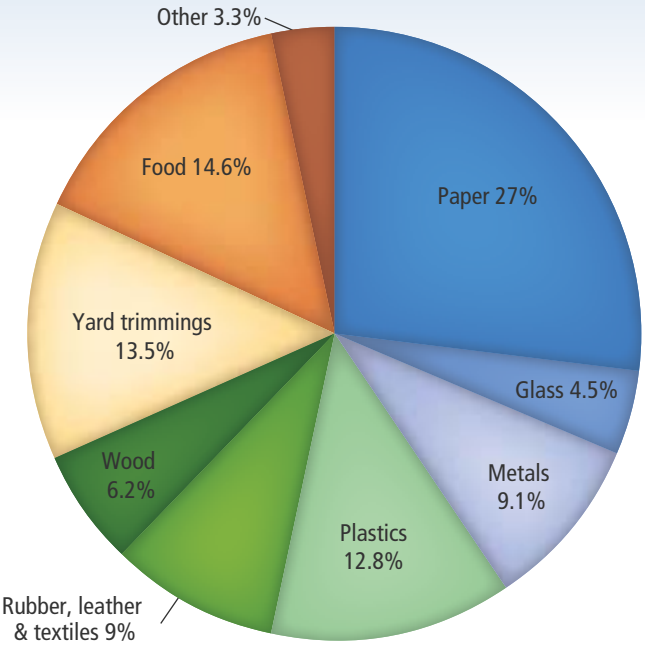


Figure 6. Total MSW Recovery (by material), 2013
87 Million Tons

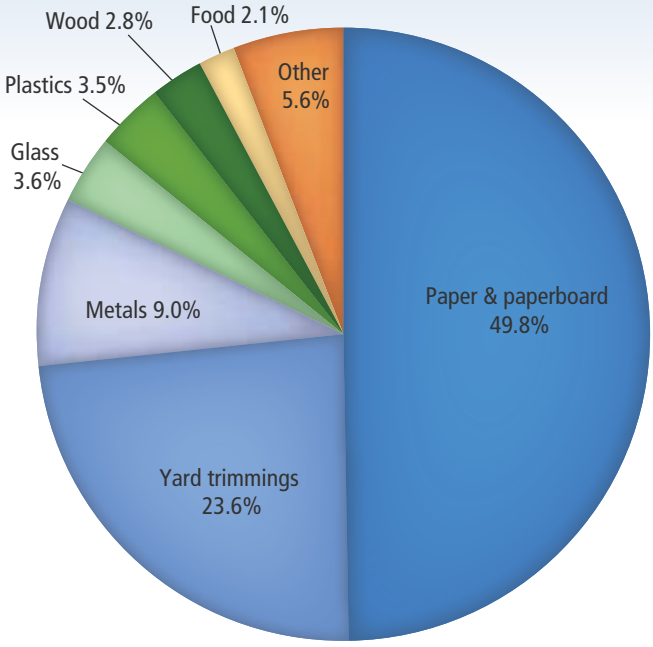


Figure 7. Total MSW Discards (by material), 2013
167 Million Tons (after recycling and composting)

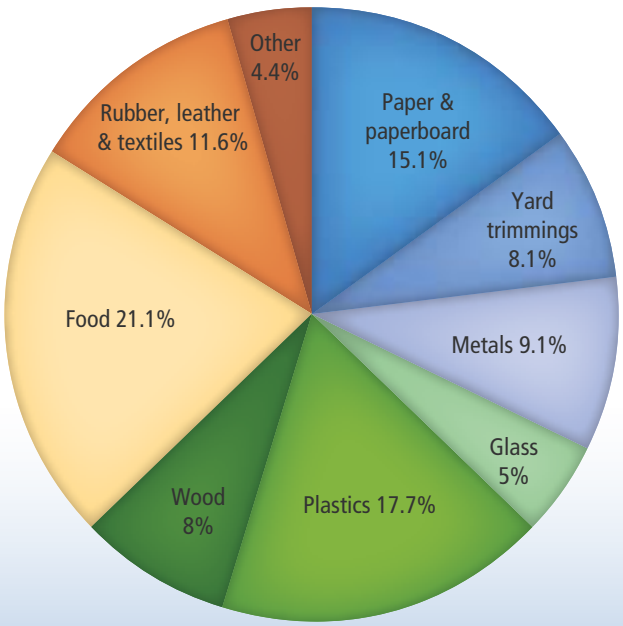


Table 1. Generation, Recovery and Discards of Materials in MSW, 2013*
(in millions of tons and percent of generation of each material)

Material	Weight Generated	Weight Recovered	Recovery as Percent of Generation	Weight Discarded
Paper and paperboard	68.60	43.40	63.3%	25.20
Glass	11.54	3.15	27.3%	8.39
Metals				
Steel	17.55	5.80	33.0%	11.75
Aluminum	3.50	0.70	20.0%	2.80
Other nonferrous metals†	2.01	1.37	68.2%	0.64
Total metals	**23.06**	**7.87**	**34.1%**	**15.19**
Plastics	32.52	3.0	9.2%	29.52
Rubber and leather	7.72	1.24	16.1%	6.48
Textiles	15.13	2.30	15.2%	12.83
Wood	15.77	2.47	15.7%	13.30
Other materials	4.58	1.31	28.6%	3.27
Total materials in products	178.92	64.74	36.2%	114.18
Other wastes				
Food, other‡	37.06	1.84	5.0%	35.22
Yard trimmings	34.20	20.6	60.2%	13.60
Miscellaneous inorganic wastes	3.93	Negligible	Negligible	3.93
Total other wastes	**75.19**	**22.44**	**29.8%**	**52.75**
Total municipal solid waste	254.11	87.18	34.3%	166.93

* 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.

Materials and Products

EPA tracks both materials and products. Materials are what products are made of and will ultimately be what is recovered and reprocessed in the recycling process. Examples of materials are metals and plastic. Products are what people buy and handle. Products are manufactured out of materials. Examples include packaging and newspapers. We track products to learn how people are consuming, using and discarding materials. This information allows us to target activities that will ultimately maximize the recovery of materials.

Products in MSW

The breakdown of the 254 million tons of MSW generated in 2013 by product category follows. Containers and packaging make up the largest portion of MSW generated: 29.8 percent, or over 75 million tons. Nondurable and durable goods each make up about 20.3 percent (over 51 million tons) each. Food makes up 14.6 percent (37 million tons), yard trimmings make up 13.5 percent (34 million tons) and other wastes make up 1.5 percent (4 million tons).

Recycling Trends

Recycling (including composting) did not exceed 15 percent of total MSW generation until 1990. Growth in the recycling rate was significant over the next 15 years. Over the last five years, the recycling growth rate has leveled off.

Table 2 show the generation, recovery and discards of materials in the product categories, by weight and recovery as percent of generation. This table shows that the recovery of containers and packaging was the highest of the four product categories, with over 51 percent of the generated materials recycled. Paper products, steel and aluminum were the most recycled materials by percentage in this category. Over 75 percent of paper and paperboard containers and packaging was recycled. Over 72 percent of steel packaging (mostly cans) was recycled. The recycling rate for aluminum packaging was almost 39 percent, including over 55 percent of aluminum beverage cans.

Thirty-four percent of glass containers were recycled, while over 26 percent of wood packaging (mostly wood pallets) was recovered. Over 14 percent of plastic containers and packaging were recycled—mostly from soft drink, milk and water bottles. Plastic bottles were the most recycled plastic products. Polyethylene terephthalate (PET) bottles and jars were recovered at over 31 percent. Recovery of high density polyethylene (HDPE) natural (white translucent) bottles was also estimated at over 28 percent (see 2013 full report).

Overall recovery of nondurable goods was about 32 percent in 2013. Nondurable goods generally last less than three years. Newspapers/mechanical papers and other paper products were the most recycled nondurable goods. Newspapers/mechanical papers include newspapers, directories, inserts, and some advertisement and direct mail printing. Sixty-seven percent of newspapers/mechanical papers were recovered. Collectively, the recovery of other paper products such as office paper and magazines was over 41 percent in 2013. Clothing, footwear and other textile products are included in the nondurable goods category. These products were recovered for recycling at a rate of over 16 percent.

Overall, 18 percent of durable goods was recovered in 2013. Due to the high rate of lead recovery from lead-acid batteries, nonferrous metals (other than aluminum) had one of the highest recovery rates. With an almost 99 percent recycling rate, lead-acid batteries continued to be one of the most recovered products. Recovery of steel in all durable goods was about 27 percent, with high rates of recovery from appliances and other miscellaneous items. Recovery of selected consumer electronics was about 40 percent (see 2013 full report).

Measured by percentage of generation, products with the highest recovery rates in 2013 were lead-acid batteries (99 percent), corrugated boxes (88.5 percent), steel cans (70.6 percent), newspapers/mechanical papers (67.0 percent), yard trimmings (60.2 percent), major appliances (58.6 percent), aluminum cans (55.1 percent), mixed paper (41.3 percent), tires (40.5 percent) and selected consumer electronics (40.4 percent) (see 2013 full report).

Every ton of mixed paper recycled can save the energy equivalent of 166 gallons of gasoline.

Table 2. Generation, Recovery and Discards of Products in MSW, 2013*
(in millions of tons and percent of generation of each product)

Products	Weight Generated	Weight Recovered	Recovery as Percent of Generation	Weight Discarded
Durable goods				
Steel	15.15	4.06	26.8%	11.09
Aluminum	1.51	Not Available	Not Available	1.51
Other non-ferrous metals†	2.01	1.37	68.2%	0.64
Glass	2.28	Negligible	Negligible	2.28
Plastics	12.07	0.83	6.9%	11.24
Rubber and leather	6.66	1.24	18.6%	5.42
Wood	6.31	Negligible	Negligible	6.31
Textiles	3.86	0.47	12.2%	3.39
Other materials	1.70	1.31	77.5%	0.39
Total durable goods	51.55	9.28	18.0%	42.27
Nondurable goods				
Paper and paperboard	30.03	14.45	48.1%	15.58
Plastics	6.47	0.13	2.0%	6.34
Rubber and leather	1.06	Negligible	Negligible	1.06
Textiles	10.96	1.83	16.7%	9.13
Other materials	3.08	Negligible	Negligible	3.08
Total nondurable goods	51.60	16.41	31.8%	35.19
Containers and packaging				
Steel	2.40	1.74	72.5%	0.66
Aluminum	1.80	0.70	38.9%	1.10
Glass	9.26	3.15	34.0%	6.11
Paper and paperboard	38.56	28.95	75.1%	9.61
Plastics	13.98	2.04	14.6%	11.94

(Table 2. Continues)

Table 2. Generation, Recovery and Discards of Products in MSW, 2013*
(in millions of tons and percent of generation of each product) (Continued)

Products	Weight Generated	Weight Recovered	Recovery as Percent of Generation	Weight Discarded
Wood	9.46	2.47	26.1%	6.99
Other materials	0.31	Negligible	Negligible	0.31
Total containers and packaging	**75.77**	**39.05**	**51.5%**	**36.72**
Other wastes				
Food, other‡	37.06	1.84	5.0%	35.22
Yard trimmings	34.20	20.60	60.2%	13.60
Miscellaneous inorganic wastes	3.93	Negligible	Negligible	3.93
Total other wastes	75.19	22.44	29.8%	52.75
Total municipal solid waste	**254.11**	**87.18**	**34.3%**	**166.93**

* 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.

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 for our current disposal practices—although it is limited in some areas.

- Since 1990, the total amount of MSW going to landfills dropped by 11 million tons, from 145.3 million to 134.3 million tons in 2013 (see Table 3).
- The net per capita discard rate to landfills (after recycling, composting and combustion for energy recovery) was 2.32 pounds per day, lower than the 3.19 per capita rate in 1990 (see Table 4).
- From 1985 to 1995 there was a rapid rise in the cost to manage MSW going to landfills, followed by a steady decrease from 1995 to 2004. Since 2004, there has been a steady increase in landfill tipping fees (see Figure 8). The tipping fees are expressed in constant 2013 dollars.

Table 3. Generation, Materials Recovery, Composting, Combustion With Energy Recovery and Discards of MSW, 1960 to 2013 (in millions of tons)

Activity	1960	1970	1980	1990	2000	2005	2009	2011	2012	2013
Generation	88.1	121.1	151.6	208.3	243.5	253.7	244.6	250.5	251.0	254.1
Recovery for recycling	5.6	8.0	14.5	29.0	53.0	59.2	61.9	66.4	65.3	64.7
Recovery for composting*	neg.	neg.	neg.	4.2	16.5	20.6	20.7	20.6	21.3	22.4
Total materials recovery	5.6	8.0	14.5	33.2	69.5	79.8	82.6	87.0	86.6	87.2
Discards after recovery	82.5	113.0	137.1	175.0	174.0	173.9	162.0	163.5	164.4	167.0
Combustion with energy recovery†	0.0	0.4	2.7	29.7	33.7	31.6	29.0	31.8	32.2	32.7
Discards to landfill, other disposal‡	82.5	112.6	134.4	145.3	140.3	142.3	133.0	131.7	132.2	134.3

* Composting of yard trimmings, food 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.

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

Composting Collection Programs[9, 10]

- About 3,560 community composting programs were documented in 2013—an increase from 3,227 in 2002.
- Food composting collection programs served over 2.7 million households in 2013.

Table 4. Generation, Materials Recovery, Composting, Combustion With Energy Recovery and Discards of MSW, 1960 to 2013 (in pounds per person per day)

Activity	1960	1970	1980	1990	2000	2005	2009	2011	2012	2013
Generation	2.68	3.25	3.66	4.57	4.74	4.69	4.37	4.41	4.38	4.40
Recovery for recycling	0.17	0.22	0.35	0.64	1.03	1.10	1.10	1.17	1.14	1.12
Recovery for composting*	neg.	neg.	neg.	0.09	0.32	0.38	0.37	0.36	0.37	0.39
Total Materials Recovery	0.17	0.22	0.35	0.73	1.35	1.48	1.47	1.53	1.51	1.51
Discards after recovery	2.51	3.03	3.31	3.84	3.39	3.21	2.90	2.88	2.87	2.89
Combustion with energy recovery†	0.00	0.01	0.07	0.65	0.66	0.58	0.52	0.56	0.56	0.57
Discards to landfill, other disposal‡	2.51	3.02	3.24	3.19	2.73	2.63	2.38	2.32	2.31	2.32
Population (millions)	179.979	203.984	227.255	249.907	281.422	296.410	307.007	311.592	313.914	316.129

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

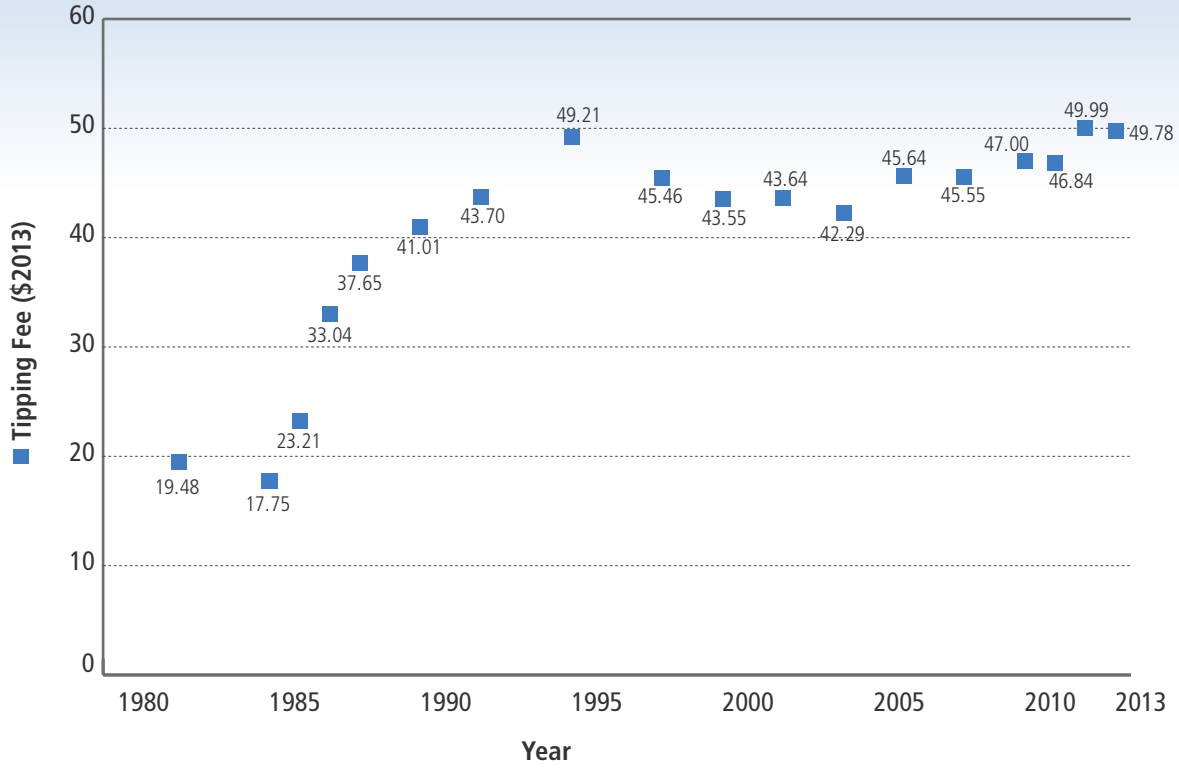
† Includes combustion of MSW in mass burn or refuse-derived fuel form, and combustion with energy recovery of source separated materials in MSW (e.g., wood pallets, tire-derived fuel).

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

Details might not add to totals due to rounding.

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

Figure 8. National Landfill Tipping Fees, 1982-2013 ($2013 per ton)



National mean annual landfill tipping fees normalized to constant $2013 using the consumer price index (CPI) from the Bureau of Labor Statistics to allow meaningful comparisons. This figure shows an average increase from 1985 to 1995 of $3.15 per year followed by a steady decrease of $0.77 per year followed by an increase of $0.83 from 2004 to 2013.

Sources: National Solid Wastes Management Association (NSWMA) Municipal Solid Waste Landfill Facts. October 2011. Data from 1985 to 2010. Waste & Recycling News, 2013 Landfill Tipping Fee Survey. Spring 2013. Data for 2012 and 2013.

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. By utilizing used, unwanted or obsolete materials as industrial feedstocks, or for new materials or products, Americans can each do their part to make recycling —including composting—work. Aside from reducing GHG emissions, which contribute to global warming, recycling (including composting) also provides significant economic and job creation impacts.

The energy and GHG benefits of recycling and composting shown in Table 5 are calculated using EPA's WARM methodology (see: www.epa.gov/warm). WARM calculates and totals GHG emissions of baseline and alternative waste management practices, including source reduction, recycling, composting, combustion and landfilling. Paper and paperboard recovery at about 43 million tons resulted in a reduction of 149 MMTCO$_2$E in 2013. This is equivalent to removing 31 million cars from the road in one year.

In 2013, Americans recycled and composted over 87 million tons of MSW. This provides an annual reduction of more than 186 million metric tons of carbon dioxide equivalent emissions, comparable to removing the emissions from over 39 million passenger vehicles from the road in one year.

Table 5. Greenhouse Gas Benefits Associated with Recovery of Specific Materials, 2013* (in millions of tons recovered, $MMTCO_2E$ and in numbers of cars taken off the road per year)

Material	Weight Recovered (millions of tons)	GHG Benefits $MMTCO_2E$	Numbers of Cars Taken Off the Road per Year
Paper and paperboard	43	149	31 million
Glass	3.2	1	210 thousand
Metals			
Steel	5.8	9.5	2 million
Aluminum	0.7	6.4	1.3 million
Other nonferrous metals†	1.37	5.9	1.2 million
Total metals	**7.87**	**21.8**	**4.5 million**
Plastics	3	3.6	760 thousand
Rubber and leather‡	1.24	0.6	127 thousand
Textiles	2.3	5.8	1.2 million
Wood	2.47	3.8	798 thousand
Other wastes			
Food, other^	1.84	1.7	308 thousand
Yard trimmings	20.6	1.04	220 thousand

* Includes materials from residential, commercial and institutional sources.

These calculations do not include an additional 1.32 million tons of MSW recovered that could not be addressed in the WARM model. Recently WARM assumptions and data have been revised. $MMTCO_2E$ is million metric tons of carbon dioxide equivalent.

† Includes lead from lead-acid batteries. Other nonferrous metals calculated in WARM as mixed metals.

‡ Recovery only includes rubber from tires.

^ Includes recovery of other MSW organics for composting.

Source: WARM model (www.epa.gov/warm)

MSW Generation and Household Spending

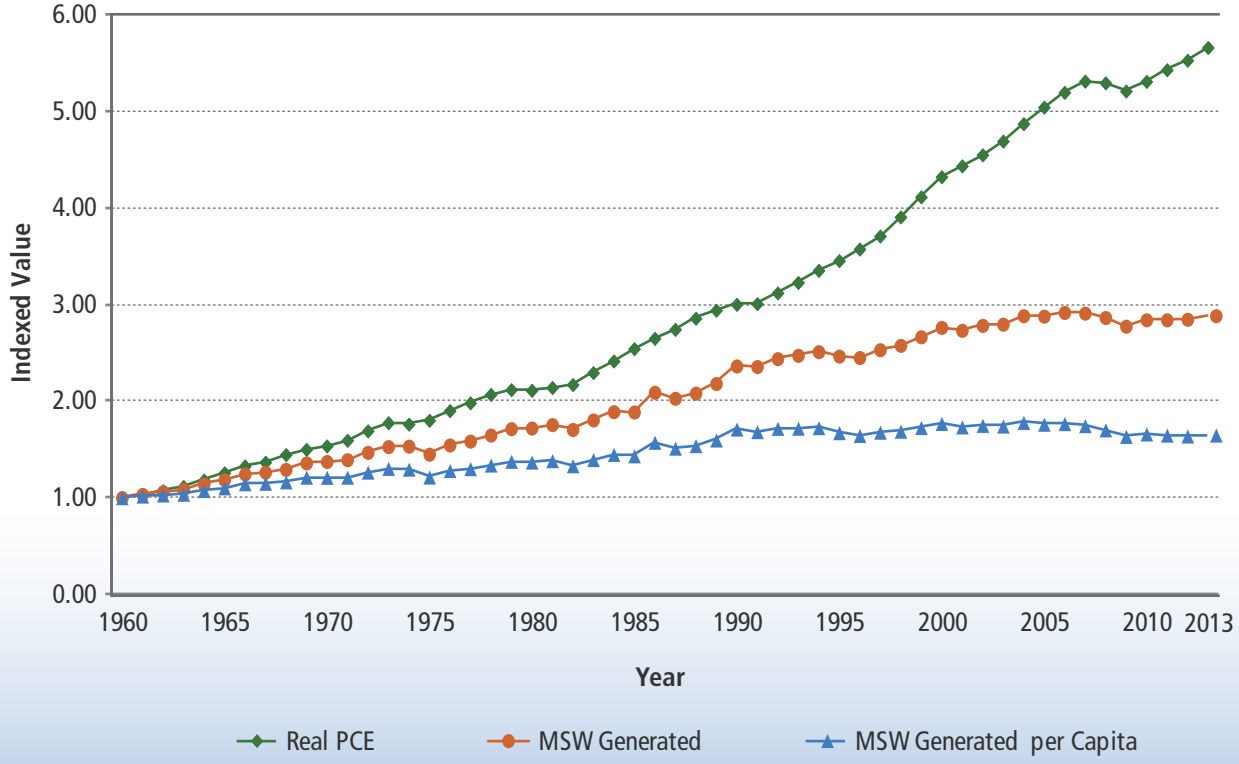
Over the years, the change in the amount of MSW generated typically imitated trends in how much money American households spend on goods and services. Personal Consumer Expenditures (PCE) measure U.S. household spending on goods and services such as food, clothing, vehicles and recreation services. PCE accounts for approximately 70 percent of U.S. Gross Domestic Product, a key indicator of economic growth. PCE adjusted for inflation is referred to as real PCE. This is a more useful metric in making comparisons over time because it normalizes the value of a dollar by considering how much a dollar could purchase in the past versus today. Figure 9 explores the relationship between MSW generated and real PCE since 1960.

Figure 9 is an indexed graph showing the relative changes in real PCE, MSW generated and MSW generated per capita over time. It is indexed to allow all three of these metrics to be shown on the same graph and compare their relative rates of change since 1960. The indexed value indicates the change in the value of the data since 1960. For example, if for a given year the value is three, then the data value for that year would be three times the 1960 value. In this case, if the 1960 value was 200, then the resulting year's value would be 600. The 2013 MSW per capita generation indexed value is 1.6, which means MSW per capita generation has increased by 60 percent since 1960.

Figure 9 shows that real PCE has increased at a faster rate than MSW generation, and the disparity has become even more distinct since the mid 1990s. This indicates the amount of MSW generated per dollar spent is falling. In other words, America's economy has

Recycling just one ton of aluminum cans conserves more than 153 million Btu, the equivalent of 26 barrels of oil, or 1,234 gallons of gasoline.

Figure 9. Indexed MSW Generated and Real PCE over Time (1960-2013)



been able to enjoy dramatic increases in household spending on consumer goods and services without this being at the expense of the societal impact of similarly increasing MSW generation rates. This figure also shows that the MSW generated per capita leveled off in the early-to-mid 2000s and has since fallen. This is important because as population continues to grow, it will be necessary for MSW generated per capita to continue to fall to maintain or decrease the total amount of MSW generated as a country.

Construction and Demolition (C&D) Debris Generation Results

C&D debris is a type of waste which is not included in MSW. Materials included in C&D are steel, wood products, drywall and plaster, brick, clay tile, asphalt shingles, asphalt concrete and Portland cement concrete. These materials are used in building as well as road and bridge sectors. Our generation estimate represents C&D amounts from construction, renovation and demolition activities for buildings, roads and bridges.

In 2013, 530 million tons of C&D debris were generated. Figure 10 shows the 2013 generation composition for C&D. Portland cement concrete is the largest portion (67 percent), followed by asphalt concrete (18 percent). Wood products make up eight percent and the other products account for seven percent combined. The 2013 generation estimates are presented in more detail in Table 6. As shown in Figure 11, demolition represents over 90 percent of total C&D debris generation as opposed to construction which represents under 10 percent.

Table 7 displays the amount of C&D debris generation from buildings, roads and bridges and other structures

Figure 10. C&D Generation Composition by Material, 2013
530 Million Tons (before recycling)

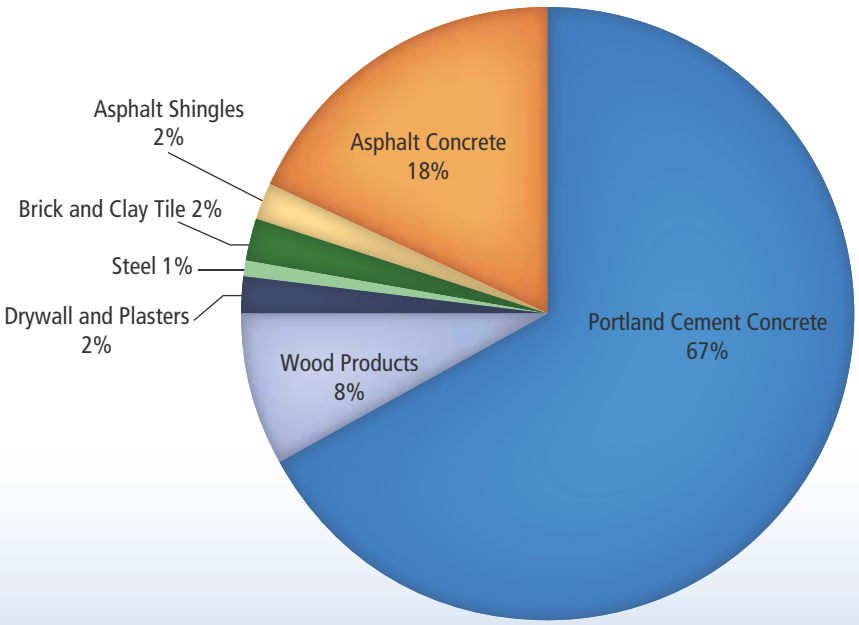


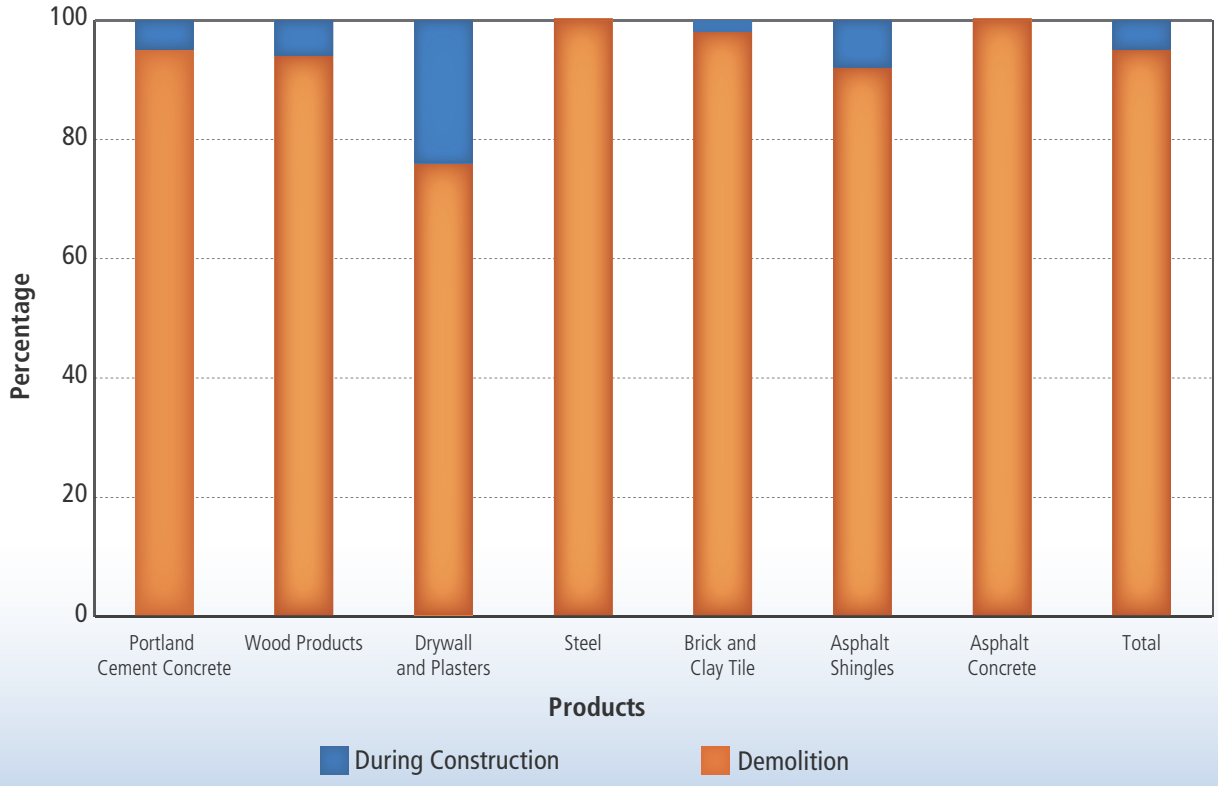
Table 6. C&D Debris Generation by Material and Activity (million tons)

	Waste During Construction	Demolition Debris	Total C&D Debris
	2013	2013	2013
Portland Cement Concrete	17.5	335.4	352.9
Wood Products	2.5	37.7	40.2
Drywall and Plasters	3.1	9.9	13.1
Steel[1]	0	4.3	4.3
Brick and Clay Tile	0.3	11.8	12.1
Asphalt Shingles	1.0	11.6	12.6
Asphalt Concrete	0	95.1	95.1
Total	**24.4**	**505.9**	**530.3**

[1] Steel consumption in buildings also includes steel consumed for the construction of roads and bridges. Data were not available to allocate steel consumption across different sources.

Details might not add to totals due to rounding.

Figure 11. Contribution of Construction and Demolition Phases to Total 2013 C&D Debris Generation



for each material. The other structures category includes communication, power, transportation, sewer and waste disposal, water supply, conservation and development and manufacturing infrastructure. In 2013, roads and bridges contributed significantly more to C&D debris generation than buildings and other structures, and Portland cement concrete made up the largest share of C&D debris generation for all three categories.

Table 7. C&D Debris Generation by Source (million tons)

	Buildings	Roads and Bridges	Other
	2013	2013	2013
Portland Cement Concrete	79.9	148.4	124.5
Wood Products	40.2		
Drywall and Plasters	13.1		
Steel[1]	4.3		
Brick and Clay Tile	12.1		
Asphalt Shingles	12.6		
Asphalt Concrete		95.1	
Total	**162.2**	**243.5**	**124.5**

[1] Steel consumption in buildings also includes steel consumed for the construction of roads and bridges. Data were not available to allocate steel consumption across different sources.

Thinking Beyond Waste

EPA is helping change the way our society protects the environment and conserves resources for future generations by thinking beyond recycling, composting and disposal. Building on the familiar concept of Reduce, Reuse, Recycle, the Agency is employing a systemic approach that seeks to reduce materials use and associated environmental impacts over their entire life cycle, called sustainable materials management (SMM). This starts with extraction of natural resources and material processing through product design and manufacturing, then the product use stage, followed by collection/processing and final end of life (disposal). By examining how materials are used throughout their life cycle, an SMM approach seeks to use materials in the most productive way with an emphasis on using fewer materials and products, reducing toxic chemicals and environmental impacts throughout the material's life cycle and assuring we have sufficient resources to meet today's needs and those of the future. Data on municipal solid waste generation, recycling and disposal is an important starting point for the full SMM approach.

Energy Recovered from Waste Combustion

- In 2013, about 32.7 million tons (12.9 percent) of materials were combusted for energy recovery.
- MSW combustion for energy recovery has decreased from about 34 million tons in 2000 to 32.7 million tons in 2013.

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 data on C&D debris generated summarized in this report is also developed using a materials flow methodology (see Appendix B to full 2013 report).

The benefits of MSW recycling and composting, such as elimination of GHG emissions, are calculated using EPA's WARM methodology. WARM calculates and totals GHG emissions of baseline and alternative waste management practices including 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. Please see: www.epa.gov/warm.

The full report, Advancing Sustainable Materials Management: Facts and Figures 2013, and Summaries of the MSW characterization methodology and WARM are available on the EPA website along with information about waste reduction and recycling. Please see:

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

www.epa.gov/recycle

Endnotes

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7. "Ninety-six Percent of Americans Have Access to Community Paper Recycling." American Forest & Paper Association Media (2015). http://www.afandpa.org/media/news/2015/03/10/ninety-six-percent-of-americans-have-access-to-community-paper-recycling
8. All benefit calculations in the fact sheet are derived from WARM. Recently WARM assumptions and data have been revised, resulting in higher annual benefits related to recycling and composting. Source: Waste Reduction Model (WARM). U.S. Environmental Protection Agency. Last modified March 2015. www.epa.gov/warm.
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10. Sources for food composting collection programs: "Residential Food Waste Collection in the U.S. — BioCycle Nationwide Survey." Supplemental tables. *BioCycle* 54, no. 3, p. 23 (2013); *Advancing Sustainable Materials Management: Facts and Figures 2013*. U.S. Environmental Protection Agency (2015). www.epa.gov/epawaste/nonhaz/municipal/msw99.htm

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