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RECYCLING—METALS [ADVANCE RELEASE]

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Recycling—Metals

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In 2017, the United States recycled 56.6 million metric tons (Mt) of selected metals, an amount equivalent to about 47% of the apparent supply of those metals, with a total value of $33 billion (table 1). Iron and steel accounted for about 89% of recycled metal and about 88% of apparent supply. The percentage of apparent supply that was recycled in 2017 ranged from a low of 16% for zinc to highs of 69% for lead and 62% each for magnesium and titanium (table 1). By gross weight, the United States exported 18.7 Mt of scrap metals, with a total value of $11.1 billion, and imported 6.21 Mt of these same metals, with a total value of $4.3 billion (table 2).

Metals are important, reusable resources. Although the ultimate supply of metal is fixed by nature, human ingenuity determines the quantity available for use by developing economical processes to recover metallic elements from the Earth, recycle metal from the use and (or) process stream, and develop efficient uses for those metals. The reusable nature of metals contributes to the sustainability of their use. Recycling, a significant factor in the supply of many of the metals used by society, provides environmental and economic benefits, such as energy savings and reduced volumes of waste.

The term "primary" is used to indicate materials from ore deposits, and the term "secondary" indicates materials from scrap, including used products and residuals from manufacturing. Recycling practices vary substantially among the metal industries. Generally, scrap is categorized as "new" or "old." "New" indicates preconsumer sources, whereas "old" indicates postconsumer sources. New scrap is supplied during the many stages of industrial processing that precede formation of an end product. For example, when metal is converted into shapes—bars, plates, rods, or sheets—new scrap is generated in the form of cuttings, trimmings, and off-specification forms. When these shapes are converted to parts, additional new scrap may be generated in the form of cuttings, stampings, turnings, and off-specification parts. Similarly, when parts are assembled into products, new scrap may be generated. A wide variety of descriptive terms, many duplicative, including external scrap, home scrap, internal scrap, mill scrap, prompt scrap, and purchased scrap, have evolved to describe scrap generated by diverse industry practices.

Once a product completes its useful life, it becomes postconsumer material, often called old scrap or junk, which is recycled into scrap and reuse material streams. For example, a junked motor might be refurbished for reuse. If it cannot be refurbished, it could be deconstructed to recover its metal constituents, primarily copper and steel. Used appliances, automobiles, and beverage cans are examples of sources of old consumer scrap; used jet engine turbine blades and vanes, junked machinery and ships, and metal recovered from commercial buildings or industrial plants are examples of old industrial scrap. The material flow of recycled metal commodities in the United States has been documented in a series of reports published by the U.S. Geological Survey (Sibley, 2006–11).

Individual annual reviews for each of the metals listed in the tables are included in the respective chapters in this volume of the U.S. Geological Survey Minerals Yearbook, volume I, Metals and Minerals.

Reference Cited

Sibley, S.F., ed., 2006–11, Flow studies for recycling metal commodities in the United States: U.S. Geological Survey Circular 1196–A–Z–AA, [variously paged]. (Accessed May 11, 2018, at https://pubs.usgs.gov/circ/circ1196/.)

TABLE 1
SALIENT U.S. RECYCLING STATISTICS FOR SELECTED METALS[1]

Year	Quantity of metal (metric tons)				Percent recycled[5]	Value of metal (thousands)			
	Recycled from new scrap[2]	Recycled from old scrap[3]	Total recycled	Apparent supply[4]		Recycled from new scrap[2]	Recycled from old scrap[3]	Total recycled	Apparent supply[4]
Aluminum:[6]									
2013	1,790,000	1,630,000	3,410,000	6,310,000	54	$3,710,000	$3,380,000	$7,090,000	$13,100,000
2014	1,870,000	1,690,000	3,570,000	6,940,000	51	4,310,000	3,900,000	8,210,000	16,000,000
2015	2,000,000	1,560,000	3,560,000	7,310,000	49	3,900,000	3,030,000	6,920,000	14,200,000
2016	2,010,000	1,580,000	3,580,000	7,100,000	50	3,560,000	2,790,000	6,350,000	12,600,000
2017	2,050,000	1,590,000	3,630,000	7,740,000	47	4,430,000	3,440,000	7,870,000	16,800,000
Chromium:[7]									
2013	NA	NA	150,000	477,000	31	NA	NA	275,000	1,640,000
2014	NA	NA	157,000	598,000	26	NA	NA	308,000	2,390,000
2015	NA	NA	154,000	463,000	33	NA	NA	303,000	1,650,000
2016	NA	NA	152,000	452,000	34	NA	NA	310,000	1,320,000
2017	NA	NA	158,000	542,000	29	NA	NA	494,000	2,420,000
Copper:[8]									
2013	630,000	166,000	797,000	2,390,000	33	4,720,000	1,250,000	5,970,000	17,900,000
2014	672,000	173,000	845,000	2,450,000	35	4,710,000	1,210,000	5,930,000	17,200,000
2015	640,000	166,000	806,000	2,460,000	33	3,610,000	940,000	4,550,000	13,900,000
2016	690,000	149,000 r	839,000	2,570,000	33	3,420,000	740,000	4,160,000	12,700,000
2017	702,000	146,000	848,000	2,570,000	33	4,430,000	918,000	5,350,000	16,200,000
Iron and steel:[9]									
2013	NA	NA	59,000,000	106,000,000	56	NA	NA	20,100,000	36,200,000
2014	NA	NA	58,500,000	117,000,000	50	NA	NA	20,500,000	38,900,000
2015	NA	NA	52,500,000	106,000,000	49	NA	NA	11,200,000	20,900,000
2016	NA	NA	53,000,000	102,000,000	52	NA	NA	9,770,000	19,200,000
2017	NA	NA	50,400,000	107,000,000	47	NA	NA	13,400,000	28,500,000
Lead:[10]									
2013	19,200 r	1,140,000 r	1,160,000 r	1,440,000 r	80 r	46,600 r	3,760,000 r	3,800,000 r	3,870,000
2014	16,900 r	1,010,000 r	1,020,000 r	1,470,000 r	72 r	39,500 r	2,350,000 r	2,390,000 r	3,650,000
2015	16,900 r	989,000 r	1,010,000	1,410,000 r	74 r	34,000 r	1,990,000 r	2,020,000 r	3,100,000
2016	17,600	1,060,000	1,070,000 r	1,490,000	75 r	36,700	2,200,000	2,230,000 r	3,100,000
2017	18,500	1,080,000	1,100,000	1,650,000	69	46,700	2,790,000	2,840,000	4,170,000
Magnesium:[11]									
2013	54,300	24,900	79,200	136,000	58	260,000	119,000	379,000	653,000
2014	56,100	25,000	81,100	148,000	55	266,000	118,000	384,000	700,000
2015	65,600	22,900	88,500	162,000	55	311,000	108,000	419,000	766,000
2016	72,800	29,400 r	102,000 r	169,000 r	60 r	344,000 r	139,000 r	484,000 r	803,000 r
2017	85,400	29,000	114,000	186,000	62	405,000	138,000	542,000	881,000
Nickel:[12]									
2013	NA	NA	109,000 r	220,000 r	50 r	NA	NA	1,640,000 r	3,300,000 r
2014	NA	NA	115,000 r	264,000 r	44 r	NA	NA	1,940,000 r	4,450,000 r
2015	NA	NA	108,000 r	226,000 r	48 r	NA	NA	1,270,000 r	2,670,000 r
2016	NA	NA	120,000 r	224,000 r	54 r	NA	NA	1,150,000 r	2,150,000 r
2017	NA	NA	122,000	262,000	47	NA	NA	1,270,000	2,730,000
Tin:[13]									
2013	2,150	10,600	12,700	45,100	28	49,300	243,000	292,000	1,050,000
2014	2,060	10,600	12,600	44,900	27	46,400	238,000	285,000	1,040,000
2015	1,120 r	10,100	11,200	43,800	26	18,700	168,000	186,000	722,000
2016	1,080 r	10,300	11,400 r	41,400 r	27	20,000 r	190,000	210,000 r	766,000 r
2017	1,400	10,000	11,400	43,900	26	29,000	207,000	236,000	907,000
Titanium:[14]									
2013	39,100	1,000	40,100	W	60	NA	NA	210,000	NA
2014	44,300	1,000	45,300	W	63	NA	NA	244,000	NA
2015	52,200	1,000	53,200	W	63	NA	NA	310,000	NA
2016	55,000	1,000	56,000	W	62	NA	NA	295,000 r	NA
2017	62,400	1,000	63,400	W	62	NA	NA	317,000	NA

See footnotes at end of table.

TABLE 1—Continued
SALIENT U.S. RECYCLING STATISTICS FOR SELECTED METALS[1]

Year	Quantity of metal (metric tons)				Percent recycled[5]	Value of metal (thousands)			
	Recycled from new scrap[2]	Recycled from old scrap[3]	Total recycled	Apparent supply[4]		Recycled from new scrap[2]	Recycled from old scrap[3]	Total recycled	Apparent supply[4]
Zinc:[15]									
2013	153,000	113,000	267,000	1,070,000	25	$323,000	$238,000	$562,000	$2,260,000
2014	173,000	74,900	248,000	1,140,000	22	409,000	177,000	586,000	2,700,000
2015	145,000	52,800	198,000	1,080,000	18	324,000	118,000	442,000	2,410,000
2016	135,000	29,300 r	164,000	942,000	17	415,000	89,700	504,000	2,100,000 r
2017	132,000	29,300	161,000	975,000	16	404,000	89,800	494,000	2,990,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data.
[1]Table includes data available through April 2, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Scrap that results from the manufacturing process, including metal and alloy production. New scrap of aluminum, copper, lead, tin, and zinc does not include home scrap, which is scrap generated and recycled in the metal-producing plant.
[3]Scrap that results from consumer products.
[4]Apparent supply, calculated on a contained-weight basis, is primary production plus recycled metal plus imports minus exports with adjustments for stock.
[5]Also referred to as recycling rate. Calculated by dividing the total amount recycled by apparent supply.
[6]Quantity is the calculated metallic recovery from purchased new and old aluminum-base scrap. Monetary value is estimated based on the annual average Midwest U.S. Market price for primary aluminum metal ingot.
[7]Quantity is estimated as chromium content of stainless steel scrap receipts, which includes new plus old scrap. Trade data used in the apparent supply calculation include chromite ore, ferrochromium, chromium metal and scrap, a variety of chromium-containing chemicals, and stainless steel mill products and scrap. Monetary value is estimated based on the average import value of high-carbon ferrochromium.
[8]Quantity includes copper recovered from unalloyed and alloyed copper-based scrap as well as from aluminum-, nickel-, and zinc-based scrap. Monetary value is estimated based on the U.S. producers cathode price (COMEX high grade first position plus Platts Metals Week New York dealer cathode premium).
[9]Quantity is the reported recycled scrap from consuming manufacturers. Apparent supply is calculated as shipments of iron and steel products plus castings corrected for imported semifinished products. Monetary value is estimated based on the annual average American Metal Market U.S. composite price for No. 1 heavy-melting.
[10]Monetary value is estimated based on the annual average Platts Metals Week North American price for refined lead.
[11]Quantity includes magnesium content of aluminum-based scrap. Monetary value is estimated based on the annual average Platts Metals Week U.S. Western spot price for magnesium.
[12]Quantity includes nickel recovered from alloys and stainless steel scrap as well as aluminum-, copper-, and nickel-based scrap among others. Monetary value is estimated based on annual average Platts Metals Week London Metal Exchange cash price for nickel.
[13]Apparent supply does not include withheld stock changes. Monetary value is estimated based on the annual average Platts Metals Week composite price (2013) or New York dealer price (2014–16) for tin.
[14]Percentage recycled based on titanium scrap consumed divided by primary sponge and scrap consumption.
[15]Monetary value is estimated based on the annual average Platts Metals Week North American price for Special High-Grade zinc.

TABLE 2
SALIENT U.S. RECYCLING TRADE STATISTICS FOR SELECTED METALS[1]

	Exports			Imports for consumption		
	Quantity			Quantity		
Year	Gross weight (metric tons)	Contained weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Contained weight (metric tons)	Value[2] (thousands)
Aluminum:[3]						
2013	1,870,000	NA	$3,270,000	565,000	NA	$848,000
2014	1,720,000	NA	2,880,000	559,000	NA	931,000
2015	1,550,000	NA	2,450,000	521,000	NA	795,000
2016	1,350,000	NA	1,880,000 r	609,000	NA	806,000
2017	1,570,000	NA	2,330,000	700,000	NA	1,060,000
Chromium:[4]						
2013	644,000	109,000	742,000	226,000	38,600	211,000
2014	548,000	93,200	674,000	329,000	56,000	427,000
2015	514,000	87,500	639,000	192,000	32,800	166,000
2016	654,000	111,000	443,000	263,000	44,900	183,000
2017	488,000	83,100	426,000	283,000	48,300	282,000
Copper:[5]						
2013	1,150,000	908,000	4,070,000	106,000	84,700	521,000
2014	1,040,000	829,000	3,460,000	117,000	92,600	563,000
2015	954,000	769,000	2,750,000	112,000	88,400	457,000
2016	944,000	758,000 r	2,230,000 r	125,000	98,400	459,000
2017	1,000,000	826,000	2,750,000	165,000	129,000	761,000
Iron and steel:						
2013	18,500,000	NA	7,550,000	3,930,000	3,930,000	1,470,000
2014	15,300,000	NA	6,150,000	4,220,000 r	4,220,000 r	1,710,000 r
2015	12,800,000	NA	4,010,000	3,510,000 r	3,510,000 r	955,000 r
2016	12,600,000	NA	3,550,000	3,860,000 r	3,860,000 r	949,000 r
2017	15,000,000	NA	4,860,000	4,630,000	4,630,000	1,490,000
Lead:[6]						
2013	34,400	NA	44,900	9,430	6,160	8,490
2014	36,300	NA	51,200	12,600	7,820	14,400
2015	46,600	NA	57,500	7,560	4,950	5,780
2016	45,900	NA	56,100 r	7,420	5,900	7,700
2017	57,600	NA	80,700	9,850	6,610	9,310
Magnesium:[7]						
2013	471	NA	1,420	17,500	NA	43,300
2014	923	NA	2,460	19,000	NA	43,800
2015	432	NA	895	21,300	NA	44,300
2016	996	NA	2,040	21,900	NA	50,300
2017	1,200	NA	2,270	16,900	NA	32,900
Nickel:[8]						
2013	669,000	61,100	852,000 r	245,000	26,300	359,000 r
2014	578,000	56,300	799,000 r	358,000	39,000	642,000 r
2015	541,000	51,900	746,000 r	218,000	27,100	337,000 r
2016	683,000	63,700	541,000 r	288,000	32,300	325,000 r
2017	518,000	51,500	545,000	316,000	38,100	494,000
Tin:[9]						
2013	5,020	NA	17,300	63,700	NA	23,100
2014	7,480	NA	19,600	49,700	NA	19,400
2015	2,530	NA	7,350 r	32,700	NA	12,300
2016	4,570	NA	11,100 r	27,200	NA	5,460
2017	3,460	NA	8,530	52,100	NA	15,800
Titanium:[10]						
2013	4,700	NA	21,800	12,700	NA	63,600
2014	4,600 r	NA	18,200	19,300	NA	101,000
2015	6,860	NA	25,900	22,100	NA	124,000
2016	9,720	NA	25,600	18,500	NA	93,600
2017	9,450	NA	28,100	25,200	NA	122,000

See footnotes at end of table.

TABLE 2—Continued
SALIENT U.S. RECYCLING TRADE STATISTICS FOR SELECTED METALS[1]

	Exports			Imports for consumption		
	Quantity			Quantity		
Year	Gross weight (metric tons)	Contained weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Contained weight (metric tons)	Value[2] (thousands)
Zinc:[11]						
2013	88,000	NA	$105,000	21,000	NA	$25,300
2014	71,400	NA	93,700	24,900	NA	30,900
2015	55,200	NA	68,600	18,000	NA	20,100
2016	30,100	NA	37,800	11,300	NA	12,800
2017	33,600	NA	41,100	1,100	NA	20,200

[r]Revised. NA Not available.
[1]Table includes data available through April 2, 2020. Contained weight equal to gross weight, unless otherwise specified. Data are rounded to no more than three significant digits.
[2]Import value is customs value.
[3]Includes aluminum remelt scrap ingot and aluminum waste and scrap, Harmonized Tariff Schedule of the United States (HTS) codes 7601.20.9075, 7602.00.0030, and 7602.00.0090.
[4]Includes stainless steel scrap and chromium metal waste and scrap, HTS codes 7204.21.000 and 8112.22.0000. For HTS code 7204.21.0000, the contained weight for imports and exports is 17% of gross weight; for HTS code 8112.22.0000, the contained weight is 100% of gross weight.
[5]Includes copper waste and scrap. For HTS codes 7404.00.0041, 7404.00.0046, 7404.00.0051, 7404.00.0056, 7404.00.0061, 7404.00.0066, 7404.00.0075, 7404.00.0085, and 7404.00.0095, the contained weight for exports is estimated to be 65% of gross weight. For HTS codes 7404.00.3045, 7404.00.3055, 7404.00.3065, 7404.00.3090, 7404.00.6045, 7404.00.6055, 7404.00.6065, and 7404.00.6090, the contained weight for imports is estimated to be 72% of gross weight.
[6]Includes waste and scrap obtained from lead-acid batteries, HTS codes 7802.00.0030 and 7802.00.0060.
[7]Includes magnesium waste and scrap, HTS code 8104.20.0000.
[8]Includes nickel waste and scrap. For HTS code 7204.29.0000, the contained weight for imports and exports is 0.4% of gross weight. For HTS code 7503.00.0000, the contained weight is 50% of gross weight. For HTS code 7204.21.0000, the contained weight is 7.5% of gross weight.
[9]Includes tin waste and scrap, HTS code 8002.00.0000.
[10]Includes titanium waste and scrap, HTS code 8108.30.0000.
[11]Includes zinc waste and scrap, HTS code 7902.00.0000.