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2019 Minerals Yearbook

RECYCLING—METALS [ADVANCE RELEASE]

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Recycling—Metals

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In 2019, recycled material as a percentage of apparent supply of various metals, including aluminum, chromium, copper, iron and steel, lead, magnesium, nickel, tin, and titanium, ranged from a low of 27% for chromium to a high of 76% for lead (table 1). In 2019, the United States recycled 56 million metric tons (Mt) of metals with a total value of $30.9 billion (excluding zinc, for which data were withheld to avoid disclosing company proprietary data in 2018 and 2019). Iron and steel accounted for 90% of the quantity of recycled metal. In 2019, the quantity of metals recycled was equivalent to 47% of the apparent supply of those metals, slightly less than 48% of apparent supply in 2017 (table 1). By gross weight, the United States exported 21.4 Mt of scrap metals, with a total value of $11.4 billion and imported 5.59 Mt gross weight worth $3.7 billion of these same metals (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 economic processes to mine and process metallic ores from the Earth, recycle metal from use and (or) process streams, and develop efficient uses for 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 March 5, 2021, via https://pubs.usgs.gov/circ/circ1196/.)

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

Year and metal	Quantity (metric tons)					Value (thousands)			
	Recycled from new scrap[2]	Recycled from old scrap[3]	Total recycled	Apparent supply[4]	Percent recycled[5]	Recycled from new scrap[2]	Recycled from old scrap[3]	Total recycled	Apparent supply[4]
Aluminum:[6]									
2015	1,910,000	1,470,000	3,380,000	7,120,000	47	$3,710,000	$2,850,000	$6,560,000	$13,900,000
2016	2,010,000	1,570,000	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	7,730,000	47	4,430,000	3,440,000	7,870,000	16,700,000
2018	2,140,000	1,570,000	3,710,000	7,040,000 r	53	5,410,000	3,970,000	9,380,000	17,800,000 r
2019	1,920,000	1,540,000	3,470,000	6,860,000	51	4,220,000	3,380,000	7,600,000	15,100,000
Chromium:[7]									
2015	NA	NA	159,000	468,000 r	34	NA	NA	299,000 r	1,660,000 r
2016	NA	NA	156,000	455,000 r	34	NA	NA	228,000 r	1,320,000 r
2017	NA	NA	156,000	545,000 r	29	NA	NA	369,000	2,120,000 r
2018	NA	NA	143,000	587,000 r	24 r	NA	NA	326,000 r	1,670,000 r
2019	NA	NA	142,000	519,000	27	NA	NA	267,000	1,670,000
Copper:[8]									
2015	640,000	166,000	806,000	2,480,000 r	32 r	3,610,000	940,000	4,550,000	14,000,000 r
2016	690,000	149,000	838,000 r	2,570,000	33	3,420,000	737,000	4,160,000	12,800,000 r
2017	702,000	146,000	847,000	2,560,000 r	33	4,410,000	918,000	5,330,000	16,100,000 r
2018	712,000	149,000	861,000	2,540,000 r	34	4,690,000	981,000	5,670,000	16,700,000 r
2019	712,000	153,000	865,000	2,520,000	34	4,390,000	943,000	5,330,000	15,500,000
Iron and steel:[9]									
2015	NA	NA	51,300,000	105,000,000	49	NA	NA	10,900,000	22,300,000
2016	NA	NA	49,800,000 r	100,000,000	50	NA	NA	9,760,000	19,600,000
2017	NA	NA	50,400,000 r	108,000,000	47	NA	NA	13,500,000	28,600,000
2018	NA	NA	51,800,000 r	109,000,000	47 r	NA	NA	16,900,000	36,300,000
2019	NA	NA	50,100,000	106,000,000	47	NA	NA	12,400,000	26,400,000
Lead:[10]									
2015	16,900	989,000	1,010,000	1,410,000	71	34,000	1,990,000	2,020,000	2,830,000 r
2016	19,200 r	1,090,000 r	1,110,000 r	1,480,000 r	75 r	39,900 r	2,280,000 r	2,320,000 r	3,080,000 r
2017	20,000	1,120,000	1,140,000	1,650,000	69	50,600	2,820,000	2,870,000	4,170,000
2018	20,900	1,150,000	1,170,000	1,550,000	75	51,100 r	2,800,000 r	2,850,000 r	3,780,000 r
2019	20,100	1,160,000	1,180,000 r	1,560,000	76	44,300	2,550,000	2,590,000	3,430,000
Magnesium:[11]									
2015	65,600	22,900	88,500	162,000	55	311,000	108,000	419,000	766,000
2016	72,700	29,400	102,000	169,000	60	344,000	139,000	484,000	802,000
2017	85,400	29,000	114,000	186,000	62	405,000	138,000	542,000	881,000
2018	80,400 r	28,700 r	109,000	186,000 r	58	385,000 r	137,000 r	522,000 r	891,000 r
2019	74,500	26,100	101,000	192,000	52	214,000	141,000	355,000	1,030,000
Nickel:[12]									
2015	NA	NA	116,000	234,000	50	NA	NA	1,370,000	2,770,000
2016	NA	NA	131,000	235,000	56	NA	NA	1,260,000	2,250,000
2017	NA	NA	133,000	273,000	49	NA	NA	1,380,000	2,840,000
2018	NA	NA	123,000 r	259,000	48	NA	NA	1,610,000	3,390,000
2019	NA	NA	111,000	217,000	51	NA	NA	1,540,000	3,020,000
Tin:[13]									
2015	1,120	10,100	11,200	43,800	25 r	18,700	168,000	186,000	722,000
2016	8,770 r	9,960 r	18,700 r	50,900 r	37 r	162,000 r	184,000 r	346,000 r	942,000 r
2017	8,080	10,000	18,100 r	52,300 r	35 r	167,000	207,000	374,000 r	1,080,000 r
2018	8,110	9,900	18,000 r	54,800 r	33 r	167,000	204,000	372,000 r	1,130,000 r
2019	8,110	9,900	18,000	52,200	35	155,000	189,000	345,000	998,000
Titanium:[14]									
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	NA
2017	62,400	1,000	63,400	W	62	NA	NA	317,000	NA
2018	52,100	1,000	53,100	W	60	NA	NA	251,000	NA
2019e	50,000	1,000	51,000	W	60	NA	NA	250,000	NA
Zinc:[15]									
2015	145,000	52,800	198,000	1,080,000	18	306,000	111,000	417,000	2,280,000
2016	135,000	29,300	165,000	942,000	17	303,000	65,400	368,000	2,110,000
2017	135,000	30,100	165,000	979,000	17	415,000	92,400	507,000	3,010,000
2018	W	W	W	W	W	W	W	W	W
2019	W	W	W	W	W	W	W	W	W

See footnotes at end of table.

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

[e]Estimated. [r]Revised. NA Not available. W Withheld to avoid disclosing company proprietary data.
[1]Table includes data available through March 18, 2021. 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 includes 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-base scrap as well as from aluminum-, nickel-, and zinc-base scrap. Monetary value is estimated based on the U.S. producers cathode price (COMEX high grade first position plus S&P Global 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 S&P Global Platts Metals Week North American price for refined lead.
[11]Quantity includes magnesium content of aluminum-base scrap. Monetary value is estimated based on the annual average S&P Global 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-base scrap among others. Monetary value is estimated based on annual average S&P Global 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 New York dealer price 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 S&P Global 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 and metal	Gross weight (metric tons)	Metal content (metric tons)	Value (thousands)	Gross weight (metric tons)	Metal content (metric tons)	Value[2] (thousands)
Aluminum:[3]						
2015	1,550,000	NA	$2,450,000	521,000	NA	$795,000
2016	1,350,000	NA	1,880,000	609,000	NA	806,000
2017	1,570,000	NA	2,330,000	700,000 r	NA	1,060,000
2018	1,760,000	NA	2,630,000	695,000	NA	1,200,000
2019	1,860,000	NA	2,280,000	596,000	NA	847,000
Chromium:[4]						
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
2018	545,000	92,800	320,000	331,000	56,400	347,000
2019	469,000	79,800	349,000	205,000	35,000	184,000
Copper:[5]						
2015	954,000	769,000	2,750,000	112,000	88,400	457,000
2016	944,000	758,000	2,230,000	125,000	98,400	459,000
2017	1,000,000	826,000	2,750,000	165,000	129,000	761,000
2018	913,000	772,000	3,150,000	157,000	123,000	766,000
2019	872,000	714,000	2,820,000	138,000	108,000	606,000
Iron and steel:						
2015	12,800,000	NA	4,010,000	3,590,000	3,590,000	967,000
2016	12,600,000	NA	3,550,000	3,870,000	3,870,000	953,000
2017	15,000,000	NA	4,860,000	4,640,000	4,640,000	1,490,000
2018	17,100,000	NA	5,900,000	5,050,000	5,050,000	1,810,000
2019	17,600,000	NA	5,320,000	4,290,000	4,290,000	1,300,000
Lead:[6]						
2015	46,600	NA	57,500	7,560	4,950 r	5,780
2016	45,900	NA	56,100	7,420	5,900	7,700
2017	57,600	NA	80,700	9,850	6,610	9,310
2018	49,500	NA	79,100	6,240	4,120	5,710
2019	39,100	NA	61,400	6,600	4,430	5,260
Magnesium:[7]						
2015	432	NA	895	21,300	NA	44,300
2016	996	NA	2,040	21,900 r	NA	50,300 r
2017	1,200	NA	2,270	16,900	NA	32,900 r
2018	784	NA	1,450	22,200	NA	40,700
2019	933	NA	1,480	32,100	NA	67,500
Nickel:[8]						
2015	541,000	51,900	746,000	218,000	27,100	337,000
2016	683,000	63,700	541,000	288,000	32,300	325,000
2017	518,000	51,500	545,000	316,000	38,100	494,000
2018	582,000	59,400	479,000	371,000	45,100	664,000
2019	501,000	51,100	483,000	249,000	37,700	510,000
Tin:[9]						
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
2018	5,980	NA	4,570	47,700	NA	15,700
2019	2,470	NA	2,270	30,400	NA	11,200
Titanium:[10]						
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	28,000 r	25,200	NA	122,000
2018	11,900	NA	33,500	26,700	NA	123,000
2019	15,000	NA	40,200	30,100	NA	134,000
Zinc:[11]						
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	11,100	NA	20,200
2018	40,400	NA	49,800	12,900	NA	22,000
2019	30,800	NA	40,200	10,400	NA	18,200

See footnotes at end of table.

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

[r]Revised. NA Not available.
[1]Table includes data available through March 18, 2021. Contained quantity 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 quantity; for HTS code 8112.22.0000, the contained quantity is 100% of gross weight.
[5]Includes copper waste and scrap. For alloyed exports (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 quantity is estimated to be 65% of the gross weight. For alloyed imports for consumption (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 quantity is estimated to be 72% of the 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 quantity for imports and exports is 0.4% of gross weight. For HTS code 7503.00.0000, the contained quantity is 50% of gross weight. For HTS code 7204.21.0000, the contained quantity 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.