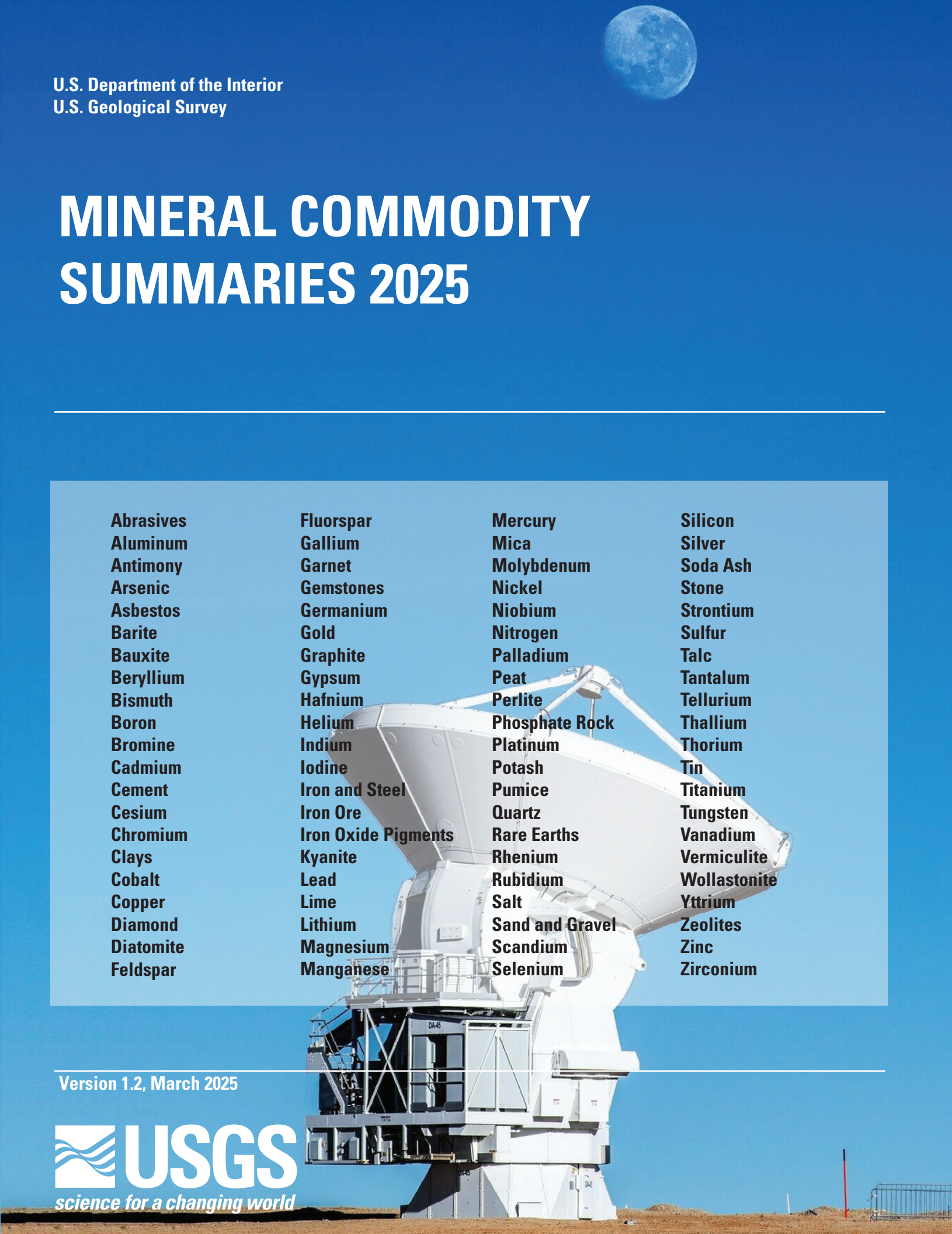
U.S. Department of the Interior
U.S. Geological Survey

MINERAL COMMODITY SUMMARIES 2025



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KEY PUBLICATIONS

Minerals Yearbook—These annual publications review the mineral industries of the United States and of more than 180 other countries and localities. They contain statistical data on minerals and materials and include information on economic and technical trends and developments and are available at https://www.usgs.gov/centers/national-minerals-information-center/publications. The three volumes that make up the Minerals Yearbook are volume I, Metals and Minerals; volume II, Area Reports—Domestic; and volume III, Area Reports—International.

Mineral Commodity Summaries—Published on an annual basis, this report is the earliest Government publication to furnish estimates covering nonfuel mineral industry data and is available at https://www.usgs.gov/centers/national-minerals-information-center/mineral-commodity-summaries. Data sheets contain information on the domestic industry structure, Government programs, tariffs, world production and reserves, and 5-year salient statistics for more than 90 individual minerals and materials.

Mineral Industry Surveys—These periodic statistical and economic reports are designed to provide timely statistical data on production, shipments, stocks, and consumption of significant mineral commodities and are available at https://www.usgs.gov/centers/national-minerals-information-center/mineral-industry-surveys. The surveys are issued monthly, quarterly, or at other regular intervals.

Materials Flow Studies—These publications describe the flow of minerals and materials from extraction to ultimate disposition to help better understand the economy, manage the use of natural resources, and protect the environment and are available at https://www.usgs.gov/centers/national-minerals-information-center/materials-flow.

Recycling Reports—These studies illustrate the recycling of metal commodities and identify recycling trends and are available at https://www.usgs.gov/centers/national-minerals-information-center/recycling-statistics-and-information.

Historical Statistics for Mineral and Material Commodities in the United States (Data Series 140)—This report provides a compilation of statistics on production, trade, and use of approximately 90 mineral commodities since as far back as 1900 and is available at https://www.usgs.gov/centers/national-minerals-information-center/historical-statistics-mineral-and-material-commodities.

WHERE TO OBTAIN PUBLICATIONS

- *Mineral Commodity Summaries* and the *Minerals Yearbook* are sold by the U.S. Government Publishing Office. Orders are accepted over the internet at https://bookstore.gpo.gov, by email at ContactCenter@gpo.gov, by telephone toll free (866) 512–1800; Washington, DC, area (202) 512–1800, by fax (202) 512–2104, or through the mail (P.O. Box 979050, St. Louis, MO 63197–9000).

- All current and many past publications are available as downloadable Portable Document Format (PDF) files through https://www.usgs.gov/centers/national-minerals-information-center.

INTRODUCTION

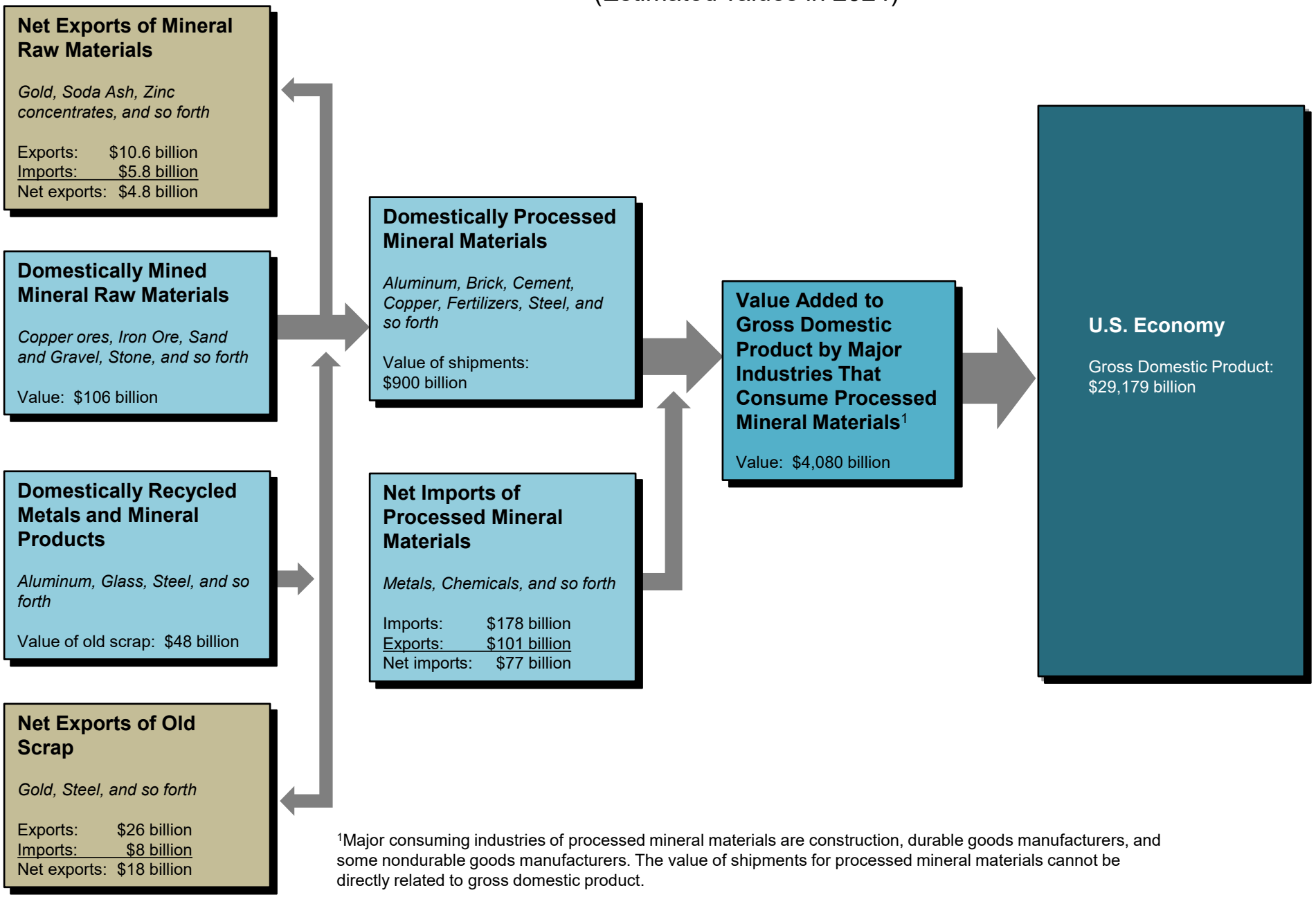
Each mineral commodity chapter of the 2025 edition of the U.S. Geological Survey (USGS) Mineral Commodity Summaries (MCS) includes information on events, trends, and issues for each mineral commodity as well as discussions and tabular presentations on domestic industry structure, Government programs, tariffs, 5-year salient statistics, and world production, reserves, and resources. The MCS is the earliest comprehensive source of 2024 mineral production data for the world. More than 90 individual minerals and materials are covered by two-page synopses.

Abbreviations and units of measure and definitions of selected terms used in the report are in Appendix A and Appendix B, respectively. Reserves and resources information is in Appendix C, which includes “Part A—Resource and Reserve Classification for Minerals” and “Part B—Sources of Reserves Data.” A directory of USGS minerals information country specialists and their responsibilities is in Appendix D.

The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the MCS 2025 are welcomed.

Figure 1.—The Role of Nonfuel Mineral Commodities in the U.S. Economy

(Estimated values in 2024)



[1]Major consuming industries of processed mineral materials are construction, durable goods manufacturers, and some nondurable goods manufacturers. The value of shipments for processed mineral materials cannot be directly related to gross domestic product.

Sources: U.S. Geological Survey and U.S. Department of Commerce.

SIGNIFICANT EVENTS, TRENDS, AND ISSUES

In 2024, the estimated total value of nonfuel mineral production in the United States was $106 billion compared with $105 billion in 2023. The estimated value of metal production in 2024 increased slightly to $33.5 billion from a revised total of $33 billion in 2023. The total estimated value of industrial minerals production was $72.1 billion, unchanged from a revised total of $72.1 billion in 2023 (table 1). Of the total value of industrial minerals production, an estimated $38 billion was construction aggregates production (construction sand and gravel and crushed stone), a 3% increase from that in 2023, and other industrial minerals production value was an estimated $34.2 billion, a 3% decrease from that in 2023. Crushed stone was the leading nonfuel mineral commodity in 2024, with an estimated production value of $25.7 billion, and accounted for 24% of the total estimated value of U.S. nonfuel mineral production.

In 2024, the metal sector had another year of decreasing prices attributed to oversupply in the global market. There were notable reductions in prices of metals from dominant producing countries. In the United States, the value of production of many of the metals used to make lithium-ion batteries, such as cobalt, lithium, and nickel, had 40% to 60% decreases compared with production values in 2023. In the United States, the largest decreases in metal production quantities, in descending order, were nickel, cobalt, platinum, palladium, and cadmium. The reduction in prices caused some domestic mining projects to delay operations or stop processing material.

Gold and silver, however, had some of the highest prices on record in 2024: the estimated production value of gold increased by 9% despite the estimated quantity of gold produced decreasing by 8% compared with that in 2023. The estimated production value of silver increased by 24%, and the quantity of silver produced increased by 6% compared with that in 2023.

For the industrial minerals sector, despite a slight decrease in demand for aggregates, increased prices led to higher production values for aggregates. The largest percentage increases in production value for other industrial minerals, in descending order, were for garnet, gypsum, soda ash, feldspar, perlite, clay (bentonite), and high-purity quartz.

In 2024, one secondary copper smelter became operational in Georgia. One plant in Ohio that processed cobalt and nickel scrap started commercial production of nickel-cobalt intermediate products in 2024. Thirteen commercial recycling plants were either under construction or undergoing expansion in 2024.

The U.S. Geological Survey (USGS) published the “2022 Final List of Critical Minerals” in the Federal Register (87 FR 10381). The 2022 list of critical minerals included 50 mineral commodities. In 2024, there were many initiatives and projects in response to legislation passed previously to advance securing American supply chains and supporting domestic production projects. See the “U.S. Critical Minerals Update” section beginning on page 18 for more details.

Foreign Trade

In 2024, the additional tariffs placed on imports from China remained in place under section 301(b) of the Trade Act of 1974 (19 U.S.C. 2411, as amended): China’s acts, policies, and practices related to technology transfer, intellectual property, and innovation. In September, tariff rates were increased substantially on multiple items including: electric vehicles (EVs) (from 25% to 100%); solar cells whether or not assembled (25% to 50%); semiconductors (25% to 50%, effective January 1, 2025); EV lithium-ion batteries (from 7.5% to 25%); and aluminum and steel products (7.5% to 25%).

On December 2, the U.S. Department of Commerce’s Bureau of Industry and Security announced a package of rules designed to further impair China’s capability to produce advanced-node semiconductors that can be used in the next generation of advanced weapon systems and in artificial intelligence and advanced computing, which have significant military applications. The rules include new export controls on 24 types of semiconductor manufacturing equipment and 3 types of software tools for developing or producing semiconductors as well as Entity List additions and new red flag guidance to address compliance and diversion concerns.

On December 3, China implemented export bans on antimony, gallium, and germanium, expanding existing export restrictions put in place in December 2023 on certain strategic materials and technologies in the “Catalogue of Technologies Prohibited and Restricted from Export in China.” These export restrictions only applied to the United States. China was the dominant global producer for many of the materials and many of these materials are on the United States list of critical minerals.

On December 11, the Office of the United States Trade Representative (USTR) announced increases to Section 301 tariff rates on certain tungsten products, with tariffs increasing to 25%, and semiconductor wafers and polysilicon, with tariffs increasing to 50% effective January 1, 2025. On December 30, USTR initiated a Section 301 investigation of China’s acts, policies, and practices related to targeting of the semiconductor industry for dominance. The investigation will focus on manufacturing dominance in foundational logic semiconductors and silicon carbide substrates and other wafers to determine if excess capacity or concentration of production in China has resulted in harm to United States semiconductor producers and foundries.

U.S. Production and Consumption

As shown in figure 1, minerals remained fundamental to the U.S. economy, contributing to the real gross domestic product at several levels, including mining, processing, and manufacturing finished products. The estimated value of nonfuel minerals produced at mines in the United States in 2024 was $106 billion. Domestic raw materials and domestically recycled materials were used to produce mineral materials worth $900 billion. These mineral materials as well as $77 billion of net imports of processed mineral materials were, in turn, consumed by downstream industries creating an estimated value of $4.08 trillion in 2024, a 4% increase from $3.93 trillion (revised) in 2023.

Figure 2 illustrates the reliance of the United States on foreign sources for raw and processed mineral materials. In 2024, imports made up more than one-half of the U.S. apparent consumption for 46 nonfuel mineral commodities, and the United States was 100% net import reliant for 15 of those. Of the 50 mineral commodities identified in the “2022 Final List of Critical Minerals,” the United States was 100% net import reliant for 12, and an additional 28 critical mineral commodities (including 14 lanthanides, which are listed under rare earths) had a net import reliance greater than 50% of apparent consumption.

Figure 3 shows the countries that were sources of nonfuel mineral commodities for which the United States was greater than 50% net import reliant and the number of mineral commodities for which each highlighted country was a leading supplier. China and Canada supplied the largest number of these nonfuel mineral commodities with 21 mineral commodities, each; Germany, 11 mineral commodities; Brazil, 10 mineral commodities; and Japan, Mexico, and South Africa, 7 mineral commodities each.

The estimated value of U.S. metal mine production in 2024 was $33.5 billion, a slight increase from the value in 2023 (table 1). In 2024, the capacity utilization for the metal mining industry remained at 53% after declining for the 4 prior years (table 2). Principal contributors to the total value of metal mine production in 2024 were gold, 35%; copper, 30%; iron ore, 16%; zinc, 7%; and molybdenum, 5%.

The estimated value of U.S. industrial minerals production in 2024, including construction aggregates, was $72.1 billion, unchanged from the revised value in 2023 (table 1). In 2024, the capacity utilization for the nonmetallic minerals mining industry decreased to 85%, compared with 89% capacity utilization in 2023 (table 2). The value of industrial minerals production in 2024 was dominated by crushed stone, 36%; construction sand and gravel, 17%; cement (masonry and portland), 16%; and industrial sand and gravel, 7%.

In 2024, U.S. production of 14 mineral commodities was valued at more than $1 billion each and together the estimated production value accounted for 92% of the total estimated value of production. These commodities were, in decreasing order of value, crushed stone, construction sand and gravel, gold, cement, copper, iron ore, industrial sand and gravel, lime, soda ash, salt, zinc, phosphate rock, molybdenum, and helium.

In 2024, 10 States had more than $3 billion worth of publishable nonfuel mineral commodities production value and another 12 States had more than $1.5 billion (fig. 4). The top 10 producing States (based on total value including withheld values) were, in descending order of production value, Nevada, Texas, Arizona, California, Minnesota, Alaska, Florida, Wyoming, Utah, and Missouri (table 3).

The West was the leading region in the production of metals and metallic minerals; the estimated value was $26 billion in 2024 (fig. 5). The South was the leading region in the production of industrial minerals (excluding construction sand and gravel and crushed stone); the estimated value was $14.5 billion in 2024 (fig. 6).

In 2024, eight States produced more than $1 billion worth of crushed stone. These States were, in descending order of production value, Texas, Florida, Pennsylvania, North Carolina, Georgia, Tennessee, Virginia, and Ohio. There were another eight States with more than $500 million worth of crushed stone production (fig. 7).

Construction sand and gravel was produced in every State. California and Texas each produced more than $1 billion worth of construction sand and gravel in 2024, and Arizona, Washington, and Utah produced more than $500 million. Florida, Colorado, New York, Ohio, and Michigan, in descending order of production value, were the other top 10 producing States (fig. 8).

The Defense Logistics Agency Strategic Materials (DLA Strategic Materials) is responsible for the operational oversight of the National Defense Stockpile (NDS) of strategic and critical materials. Managing the security, providing environmentally sound stewardship, and ensuring the readiness of all NDS stocks is the mission of the DLA Strategic Materials. The NDS currently contains 52 unique commodities stored at nine locations within the continental United States. In fiscal year 2024, the NDS added two materials along with additional quantities of seven other materials, and approximately $37.36 million of excess materials were sold. Revenue from the Stockpile Sales Program funds the operation of the NDS and the acquisition of new stocks. For reporting purposes, NDS stocks are categorized as held in reserve or available for sale. Most stocks are held in reserve. Additional information regarding Annual Material Plans for acquisitions and disposals can be found in the “Government Stockpile” sections in the mineral commodity chapters that follow. Under the authority of the Defense Production Act of 1950 (Public Law 81–774), the USGS advises the DLA Strategic Materials on acquisitions and disposals of NDS mineral materials.

Figure 2.—2024 U.S. Net Import Reliance[1]

Commodity	Net import reliance as a percentage of apparent consumption in 2024	Leading import sources (2020–23)[2]
ARSENIC, all forms	100	China,[3] Morocco, Malaysia, Belgium
ASBESTOS	100	Brazil, Russia
CESIUM	100	Germany, China
FLUORSPAR	100	Mexico, Vietnam, South Africa, China[3]
GALLIUM, metal	100	Japan, China, Germany, Canada
GRAPHITE (NATURAL)	100	China,[3] Canada, Mexico, Mozambique
INDIUM	100	Republic of Korea, Japan, Canada, Belgium
MANGANESE	100	Gabon, South Africa, Australia, Malaysia
MICA (NATURAL), sheet	100	China, Brazil, India
NIOBIUM (COLUMBIUM)	100	Brazil, Canada
RUBIDIUM	100	China, Germany, Russia
SCANDIUM	100	Japan, China, Philippines
STRONTIUM	100	Mexico, Germany
TANTALUM	100	China,[3] Australia, Germany, Indonesia
YTTRIUM, compounds	100	China,[3] Germany
GEMSTONES	99	India, Israel, Belgium, South Africa
ABRASIVES, fused aluminum oxide	>95	China,[3] Canada, Brazil, Austria
NEPHELINE SYENITE	>95	Canada
TITANIUM, sponge metal	>95	Japan, Kazakhstan, Saudi Arabia
POTASH	93	Canada, Russia, Belarus, Israel
BISMUTH, metal, alloys, and scrap	89	China,[3] Republic of Korea
IRON OXIDE PIGMENTS, natural and synthetic	87	China,[3] Germany, Brazil, Canada
TITANIUM MINERAL CONCENTRATES	86	South Africa, Madagascar, Canada, Australia
ANTIMONY, metal and oxide	85	China,[3] Belgium, India, Bolivia
PLATINUM	85	South Africa, Belgium, Germany, Italy
STONE (DIMENSION)	83	Brazil, China,[3] Italy, Turkey
DIAMOND (INDUSTRIAL), stones	81	India, South Africa, Russia, Australia
RARE EARTHS,[4] compounds and metals	80	China,[3] Malaysia, Japan, Estonia
PEAT	78	Canada
CHROMIUM, all forms	77	South Africa, Kazakhstan, Canada, Finland
COBALT, metal, oxides, and salts	76	Norway, Finland, Japan, Canada
BARITE	>75	India, China,[3] Morocco, Mexico
BAUXITE	>75	Jamaica, Turkey, Guyana, Australia
MAGNESIUM METAL	>75	Israel, Canada, Turkey, Czechia
TIN, refined	73	Peru, Bolivia, Indonesia, Brazil
ZINC, refined	73	Canada, Mexico, Republic of Korea, Peru
ABRASIVES, silicon carbide	69	China,[3] Brazil, Canada
RHENIUM	65	Chile, Canada, Germany, Poland
SILVER	64	Mexico, Canada, Republic of Korea, Poland
ALUMINA	59	Brazil, Jamaica, Australia, Canada
MAGNESIUM COMPOUNDS	52	China,[3] Israel, Brazil, Canada
GERMANIUM	>50	Belgium, Canada, China, Germany
IODINE	>50	Chile, Japan
LITHIUM	>50	Chile, Argentina
SELENIUM, metal	>50	Philippines, Mexico, Canada, Poland
TUNGSTEN	>50	China,[3] Germany, Bolivia, Vietnam
SILICON, metal and ferrosilicon	<50	Brazil, Russia, Canada, Malaysia
GARNET (INDUSTRIAL)	48	South Africa, Australia, India, China[3]
NICKEL	48	Canada, Norway, Australia, Brazil
ALUMINUM	47	Canada, United Arab Emirates, Bahrain, China[3]
DIAMOND (INDUSTRIAL), bort, grit, and dust and powder	47	China,[3] Republic of Korea, Ireland, Russia
COPPER, refined	45	Chile, Canada, Mexico, Peru
MICA (NATURAL), scrap and flake	41	China, Canada, India, Finland
VANADIUM	40	Canada, Brazil, Austria, South Africa
PALLADIUM	36	Russia, South Africa, Belgium, Italy
VERMICULITE	34	South Africa, Brazil, Zimbabwe
FELDSPAR	33	Turkey, Mexico
LEAD, refined	28	Canada, Republic of Korea, Mexico, Australia
PERLITE	26	Greece, China
BROMINE	<25	Israel, Jordan, China[3]
TELLURIUM	<25	Canada, Philippines, Japan, Germany
ZIRCONIUM, ores and concentrates	<25	South Africa, Australia, Senegal
SALT	24	Canada, Chile, Mexico, Egypt
CEMENT	22	Turkey, Canada, Vietnam, Greece

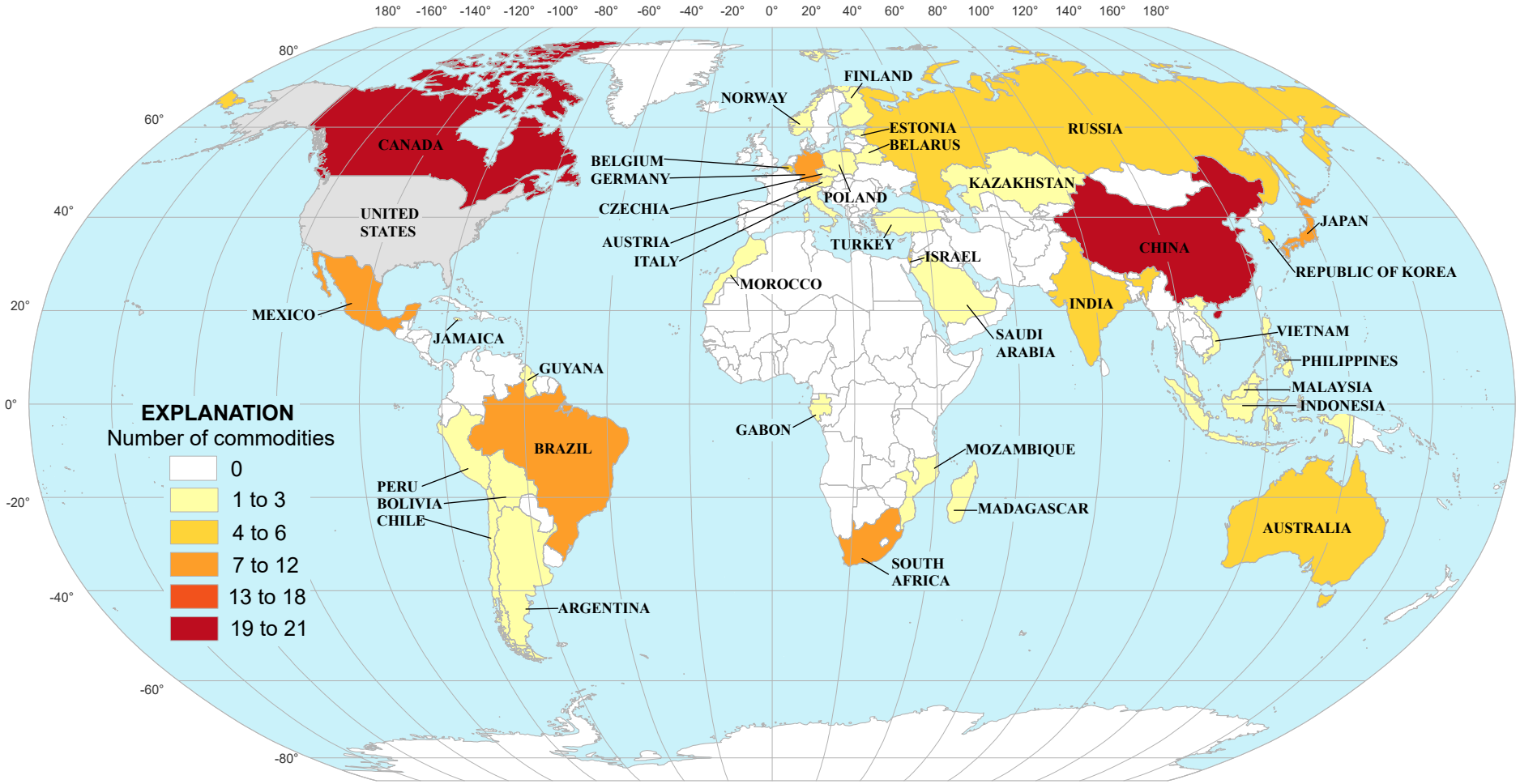
[1]Not all mineral commodities covered in this publication are listed here. Those not shown include mineral commodities for which the United States was a net exporter (abrasives, metallic; beryllium; boron; cadmium; clays; diatomite; gold; helium; iron and steel scrap; iron ore; kyanite; molybdenum; rare earths, mineral concentrates; sand and gravel, industrial; soda ash; titanium dioxide pigment; wollastonite; zeolites; and zinc, ores and concentrates) or less than 20% net import reliant (gypsum; iron and steel; iron and steel slag; lime; nitrogen, fixed—ammonia; phosphate rock; pumice and pumicite; sand and gravel, construction; stone, crushed; sulfur; and talc and pyrophyllite). For some mineral commodities (hafnium; mercury; quartz, high-purity and industrial cultured crystal; thallium; and thorium), available information was inadequate to calculate the exact percentage of import reliance.

[2]Listed in descending order of import share. Only the top four countries are listed. Excludes countries that provided less than 3% import share.

[3]Includes Hong Kong.

[4]Includes lanthanides cerium, dysprosium, erbium, europium, gadolinium, holmium, lanthanum, lutetium, neodymium, praseodymium, samarium, terbium, thulium, and ytterbium.

Figure 3.—Leading Import Sources* (2020–23) of Nonfuel Mineral Commodities for Which the United States Was Greater Than 50% Net Import Reliant



Source: U.S. Geological Survey

*Countries as listed in figure 2.

Table 1.—U.S. Mineral Industry Trends

	2020	2021	2022	2023	2024[e]
Total mine production (million dollars):					
Metals	28,100	36,800	35,200	33,000	33,500
Industrial minerals	54,100	58,900	67,700	72,100	72,100
Coal	16,800	21,000	32,300	31,200	27,500
Employment (thousands of workers):					
Coal mining, all employees	40	38	41	43	43
Nonfuel mineral mining, all employees	136	139	142	144	150
Chemicals and allied products, production workers	537	541	567	563	570
Stone, clay, and glass products, production workers	296	300	312	305	300
Primary metal industries, production workers	272	269	283	291	280
Average weekly earnings of workers (dollars):					
Coal mining, all employees	1,519	1,617	1,756	1,826	2,000
Chemicals and allied products, production workers	1,065	1,102	1,118	1,230	1,300
Stone, clay, and glass products, production workers	981	1,018	1,086	1,127	1,100
Primary metal industries, production workers	1,007	1,074	1,170	1,211	1,200

[e]Estimated.

Sources: U.S. Geological Survey, U.S. Department of Energy, and U.S. Department of Labor.

Table 2.—U.S. Mineral-Related Economic Trends

	2020	2021	2022	2023	2024[e]
Gross domestic product (billion dollars)	21,354	23,681	26,007	27,721	29,179
Industrial production (2017=100):					
Total index:	95	99	103	103	100
Manufacturing:	93	98	100	100	100
Nonmetallic mineral products	97	101	107	106	100
Primary metals:	87	96	95	95	94
Iron and steel	87	102	96	97	93
Aluminum	92	97	96	91	94
Nonferrous metals (except aluminum)	92	95	105	108	110
Chemicals	95	100	102	104	110
Mining:	103	106	114	120	120
Coal	69	75	77	76	67
Oil and gas extraction	123	123	131	141	140
Metals	95	92	86	80	80
Nonmetallic minerals	99	104	107	105	100
Capacity utilization (percent):					
Total industry:	73	78	81	79	78
Mining:	72	82	90	90	89
Metals	66	62	56	53	53
Nonmetallic minerals	84	87	90	89	85
Housing starts (thousands)	1,394	1,605	1,552	1,421	1,350
Light vehicle sales (thousands)	14,472	14,947	13,754	15,502	15,600
Highway construction, value, put in place (billion dollars)	103	104	115	138	140

[e]Estimated.

Sources: U.S. Department of Commerce and Federal Reserve Board.

Table 3.—Value of Nonfuel Mineral Production in the United States and Principal Nonfuel Mineral Commodities Produced in 2024[p, 1, 2]

State	Value (millions)	Rank[3]	Percent of U.S. total[4]	Principal nonfuel mineral commodities[5]
Alabama	$2,210	16	2.1	Cement, lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Alaska	4,710	6	4.46	Gold, lead, sand and gravel (construction), silver, zinc.
Arizona	9,290	3	8.79	Cement, copper, molybdenum mineral concentrates, sand and gravel (construction), stone (crushed).
Arkansas	1,140	29	1.08	Bromine compounds, cement, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
California[6]	5,480	4	5.19	Boron minerals, cement, gold, sand and gravel (construction), stone (crushed).
Colorado	2,050	18	1.94	Cement, gold, molybdenum mineral concentrates, sand and gravel (construction), stone (crushed).
Connecticut[7]	259	43	0.25	Sand and gravel (construction), stone (crushed), stone (dimension).
Delaware[7]	27	50	0.03	Magnesium compounds, sand and gravel (construction), stone (crushed).
Florida[6, 7]	3,060	7	2.9	Cement, phosphate rock (marketable), sand and gravel (construction), stone (crushed).
Georgia[6]	2,700	13	2.56	Cement, clay (attapulgite, common clay, kaolin, montmorillonite), sand and gravel (construction), stone (crushed).
Hawaii	175	47	0.17	Sand and gravel (construction), stone (crushed).
Idaho[7]	543	33	0.51	Phosphate rock (marketable), sand and gravel (construction), silver, stone (crushed), zinc.
Illinois	1,470	25	1.39	Cement (portland), magnesium compounds, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Indiana	1,590	22	1.51	Cement, lime, sand and gravel (construction), stone (crushed), stone (dimension).
Iowa	730	36	0.69	Cement (portland), lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Kansas[7]	811	27	0.77	Cement, helium (grade-a), salt, sand and gravel (construction), stone (crushed).
Kentucky[7]	874	28	0.83	Cement (portland), clay [common clay and (or) shale], lime, sand and gravel (construction), stone (crushed).
Louisiana[7]	846	32	0.8	Lime, salt, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Maine[7]	167	46	0.16	Cement, peat, sand and gravel (construction), stone (crushed), stone (dimension).
Maryland[7]	435	34	0.41	Cement, sand and gravel (construction), stone (crushed), stone (dimension).
Massachusetts[7]	412	39	0.39	Clay [common clay and (or) shale], lime, sand and gravel (construction), stone (crushed), stone (dimension).
Michigan	3,080	11	2.92	Cement, iron ore, magnesium compounds, sand and gravel (construction), stone (crushed).
Minnesota[7]	4,830	5	4.58	Iron ore, lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Mississippi[7]	196	42	0.19	Clay (ball clay, bentonite, common clay, montmorillonite), sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Missouri	3,160	10	2.99	Cement, lead, lime, sand and gravel (industrial), stone (crushed).
Montana	1,130	30	1.07	Cement, copper, molybdenum mineral concentrates, palladium metal, sand and gravel (construction).

See footnotes at end of table.

Table 3.—Value of Nonfuel Mineral Production in the United States and Principal Nonfuel Mineral Commodities Produced in 2024[p, 1, 2]—Continued

State	Value (millions)	Rank[3]	Percent of U.S. total[4]	Principal nonfuel mineral commodities[5]
Nebraska[7]	$137	40	0.13	Cement (portland), lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Nevada	9,970	1	9.44	Copper, diatomite, gold, sand and gravel (construction), silver.
New Hampshire[7]	206	45	0.2	Sand and gravel (construction), stone (crushed), stone (dimension).
New Jersey[7]	536	38	0.51	Peat, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
New Mexico	1,530	23	1.45	Cement, copper, potash, sand and gravel (construction), stone (crushed).
New York[7]	1,800	19	1.71	Cement, salt, sand and gravel (construction), stone (crushed), zinc.
North Carolina	2,720	12	2.57	Phosphate rock (marketable), quartz (high-purity), sand and gravel (construction), sand and gravel (industrial), stone (crushed).
North Dakota[7]	84	48	0.08	Clay [common clay and (or) shale], lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Ohio	2,230	15	2.11	Cement, lime, salt, sand and gravel (construction), stone (crushed).
Oklahoma	1,360	26	1.29	Cement, iodine (crude), sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Oregon[7]	493	35	0.47	Cement (portland), diatomite, perlite (crude), sand and gravel (construction), stone (crushed).
Pennsylvania[7]	2,410	14	2.28	Cement, lime, sand and gravel (construction), stone (crushed).
Rhode Island[7]	100	49	0.09	Sand and gravel (construction), sand and gravel (industrial), stone (crushed).
South Carolina	1,920	20	1.82	Cement, gold, sand and gravel (construction), stone (crushed).
South Dakota[7]	389	37	0.37	Cement (portland), gold, lime, sand and gravel (construction), stone (crushed).
Tennessee	2,080	17	1.97	Cement, sand and gravel (construction), sand and gravel (industrial), stone (crushed), zinc.
Texas	9,720	2	9.2	Cement, lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Utah	3,520	9	3.33	Cement (portland), copper, potash, salt, sand and gravel (construction).
Vermont[7]	209	44	0.2	Sand and gravel (construction), stone (crushed), stone (dimension), talc (crude).
Virginia	1,770	21	1.67	Cement, kyanite, lime, sand and gravel (construction), stone (crushed).
Washington	929	31	0.88	Cement, diatomite, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
West Virginia[7]	238	41	0.23	Cement, lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Wisconsin[7]	1,360	24	1.29	Lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed), stone (dimension).
Wyoming[7]	622	8	0.59	Cement, clay (bentonite and common clay), helium (grade-a), sand and gravel (construction), soda ash.
Undistributed	7,910	XX	7.49	XX.
Total	106,000	XX	100.00	

[p]Preliminary. XX Not applicable.

[1]Includes data available through December 17, 2024.

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Rank based on total, unadjusted State values.

[4]"Percent of U.S. total" calculated to two decimal places.

[5]Listed in alphabetical order.

[6]California, Florida, and Georgia also produced significant quantities of titanium mineral concentrates and zirconium mineral concentrates. Breakdown by State is not available to avoid disclosure of company proprietary data.

[7]Partial total; excludes values that must be withheld to avoid disclosing company proprietary data, which are included with "Undistributed."

U.S. CRITICAL MINERALS UPDATE

The United States List of Critical Minerals

On February 24, 2022, pursuant to section 7002 of the Energy Act of 2020 (Public Law 116–260) and using the definition of "critical mineral" and the criteria specified therein, the U.S. Geological Survey (USGS) published the "2022 Final List of Critical Minerals" in the Federal Register (87 FR 10381). The 2022 list of critical minerals, which revised the U.S. list of critical minerals published in 2018 (83 FR 23295), included 50 mineral commodities instead of 35 mineral commodities or mineral groups (table 4). The changes in the 2022 Final List of Critical Minerals from the 2018 list were the addition of nickel and zinc, listing out individual platinum-group metals (excluding osmium) and rare-earth elements, and the removal of helium, potash, rhenium, strontium, and uranium. The list of critical minerals is to be updated at least every 3 years and revised as necessary consistent with available data.

Background

A series of actions by the Government in recent years addressed domestic supply chain vulnerabilities for critical minerals, beginning with Executive Order 13817, "A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals," which was issued on December 26, 2017, and initiated a whole-of-Government call to action to identify critical minerals and develop a strategy to address U.S. supply-chain vulnerabilities. Subsequently, there have been additional actions including the following:

1. The USGS published the 2018 List of Critical Minerals;
2. The U.S. Department of Commerce with interagency input published the "2019 Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals";
3. Several Presidential determinations directed the use of Defense Production Act (DPA) title III authorities to strengthen the U.S. industrial base for rare-earth elements;
4. Executive Order 13953 was issued "Addressing the Threat to the Domestic Supply Chain Reliance on Critical Minerals from Foreign Adversaries and Supporting the Domestic Mining and Processing Industries"; and
5. The Energy Act of 2020 was passed by Congress and signed into law.

Several congressional acts and other Government actions have focused on investments for clean energy projects; critical mineral mapping, production, recycling, reclamation, and resource assessments; domestic production of batteries; infrastructure projects; research and development; ports and rail improvements; semiconductor supply-chain projects; telecommunications broadband networks; and water systems. These actions have included the following:

1. Congress passed and the President signed the $1.2 trillion Bipartisan Infrastructure Law (Infrastructure Investment and Jobs Act, H.R. 3684, Public Law 117–58) in November 2021;
2. A Presidential determination on March 31, 2022, authorized the use of DPA Title III authorities to strengthen the U.S. industrial base for large-capacity batteries and specifically to increase domestic mining and processing of critical materials such as cobalt, graphite, lithium, and nickel for the large-capacity battery supply chain;
3. The Ukraine Supplemental Appropriations Act of 2022 provided $600 million for DPA Title III funds for missiles and munitions in support of Ukraine and for strategic and critical materials to expand domestic capacity;
4. The CHIPS and Science Act of 2022 (Public Law 117–167) provided $280 billion in funding over the next 10 years for domestic research, commercialization, and manufacturing of semiconductors;
5. The Inflation Reduction Act of 2022 (Public Law 117–169) was signed into law with the aim to reduce inflation. Specifically related to critical minerals, it authorized $391 billion in funding for domestic renewable energy production including targeted tax incentives aimed at manufacturing U.S.-sourced materials such as batteries, electric vehicles (EVs), solar, and wind energy parts and technologies;
6. In October 2022, the "American Battery Materials Initiative" was launched to leverage and maximize ongoing efforts throughout the U.S. Government to meet resource requirements and bolster energy security;
7. In December 2022, the $858 billion National Defense Authorization Act included a provision requiring that a Federal strategy be developed to recycle and recover critical minerals from batteries used in the Federal EV fleet; and
8. In July 2023, the Department of Energy (DOE) published its 2023 DOE Critical Materials list of energy-specific critical and near-critical materials for clean energy technology supply chains.

Critical Minerals Investments in 2024

In 2024, the Department of Defense (DoD) through the Defense Production Act Investments program took actions to establish domestic manufacturing capabilities for critical minerals and awarded a total of more than $400 million to U.S.-based projects. These investments included developing or expanding domestic production capabilities for aluminum, magnesium, tin, titanium powder, and zirconium powder for many industrial and defense applications; cobalt, graphite, lithium carbonate, battery-grade manganese, and nickel for the production of batteries; germanium substrates used in solar cells for defense and commercial satellites; high-purity niobium oxide for electronics; and terbium oxide and other rare-earth elements for permanent magnets and other applications.

The Defense Production Act program has considered Canada as a domestic source for funds since 1992 and, in 2024, the DoD announced awards of more than $40 million to Canadian companies to help support the United States-Canada Joint Action Plan on Critical Minerals. These awards will help build resilience in the cobalt and graphite supply chains and are in accordance with the 2024 National Defense Industrial Strategy to continue and expand support for domestic production of critical minerals.

In 2024, the DOE through the Bipartisan Infrastructure Law announced $4.82 billion in funding for 39 projects to support domestic production of advanced batteries and battery materials nationwide in two rounds of funding. The grants awarded in round 1 were for projects for building and expanding commercial-scale facilities for lithium, graphite, and other materials for battery-component and battery manufacturing. Projects selected for round 2, which were still undergoing final approval at yearend, were for increasing battery production nationwide and new approaches to component manufacturing and recycling. Additionally, funding was announced for projects that will support the design and construction of facilities that produce and refine rare-earth elements and other critical minerals and materials from coal-based resources and other recycled materials.

During fiscal year 2023, the DOE's Loan Programs Office completed two loan transactions totaling over $5 billion, including a loan for a lithium-ion battery recycling facility. There were also seven prospective projects being evaluated totaling nearly $14 billion of requested loans, including for lithium carbonate, battery recycling, and battery production facilities.

In January, the National Renewable Energy Laboratory, administrator of the 3-year Cadmium Telluride Photovoltaics Accelerator program, announced that $1.8 million had been awarded in a second round of contracts to support development of cadmium-telluride (CdTe) solar cells that would be more efficient and have a lower cost.

In March, the DOE, the U.S. Department of the Treasury, and the Internal Revenue Service announced $4 billion in tax credits for more than 100 projects across 35 States to accelerate domestic renewable energy manufacturing and reduce greenhouse gas emissions at industrial facilities under the Inflation Reduction Act. Of the $4 billion in tax credits, $1.5 billion supports projects in historical energy communities. It was reported that the private sector has made more than $120 billion in investments in the EV supply chain.

As of December 2024, the U.S. Department of Commerce announced that preliminary agreements had been made with 27 companies for 40 semiconductor manufacturing projects in 21 States since the CHIPS and Science Act was signed into law in 2022. In total, these projects have been awarded almost $34 billion of the available $39 billion in direct funding and almost $29 billion in loans. Companies in the semiconductor supply chain were reported to have invested almost $450 billion since the CHIPS and Science Act was passed.

Critical Minerals Facilities

In January, a primary aluminum smelter in Missouri with a capacity of 263,000 tons per year ceased operations. There were no plans for restarting the operation.

In February, a company began commercial production of spherical graphite in Vidalia, LA. The facility had an initial capacity of 11,300 tons per year.

In April, the West Virginia Department of Environmental Protection through funding from the DOE and the U.S. Department of the Interior's Office of Surface Mining Reclamation and Enforcement began operations at the Richard Mine acid mine drainage (AMD) treatment plant in Monongalia County, WV. The facility treats AMD using a process developed by the University of West Virginia's Water Research Institute that allows for the collection of light- and heavy-rare-earth concentrate before the cleaned drainage is released into Deckers Creek.

In December, a company announced that a flotation plant was delivered to its fluorspar mine in Utah and would enable domestic production of acid-grade fluorspar (also called acidspar) with commissioning expected in 2025.

The leading domestic CdTe solar panel manufacturer, based in Ohio, began commercial production in the third quarter of 2024 at a fourth facility, located in Alabama, that increased solar panel manufacturing capacity to almost 11 gigawatts per year (GW/yr). A fifth site was under construction in Louisiana and was expected to add another 3.5 GW/yr in the second half of 2025. Worldwide, the company's capacity was about 21 GW/yr including a facility in India that opened in early 2024.

One plant in Ohio that processed cobalt and nickel scrap started commercial production of nickel-cobalt intermediate products in 2024.

Owing to low prices and oversupplied market conditions in 2024, a cobalt mine in Idaho remained on care-and-maintenance status, lithium production from the brine-sourced waste tailings of a Utah-based magnesium producer was idled, a platinum-group-metals (PGMs) producer in Montana reduced production, and vanadium production remained suspended in Utah.

Around the world, oversupply of stainless steel in China caused the price for ferrochromium to drop; price decreases in palladium have disrupted the PGM market with mine closures and layoffs, especially in South Africa; and lower vanadium prices hindered development of vanadium and its products because China is the leading vanadium electrolyte producer, and it dominated the vanadium redox flow battery market.

In January 2024, three nickel mines located in Western Australia, Australia, announced closures and other operations in Western Australia were put on care-and-maintenance status. Companies cited oversupply in the global cobalt and nickel markets and low cobalt and nickel prices. In 2024, cobalt mine production increased

by 47% in Indonesia and by 26% in Congo (Kinshasa), which was predominantly shipped to China for processing. China announced increases in cobalt refinery capacity in 2024, almost doubling its metal capacity from that in 2023.

Foreign Trade

In December 2024, China implemented export bans on antimony, gallium, and germanium, expanding existing export restrictions that were put in place in December 2023 on certain strategic materials and technologies in the "Catalogue of Technologies Prohibited and Restricted from Export in China." Export restrictions only applied to the United States. Those items under an export ban included a category called "Nonferrous Metal Smelting and Processing Industry" that had export restrictions that required exporters to apply for a license, which required export contracts, technical product specifications, and the identity of the end user, as well as the specific end use. Restrictions applied to items including rare-earth extraction and separation technology, rare-earth magnets and rare-earth compounds, and rare-earth mining, mineral processing, and smelting technologies; preparation technologies for single-crystal materials; lithium tetraborate and lithium triborate crystal technology as well as several other crystal growth processes; beryllium material preparation; flake graphite, spherical graphite (natural and synthetic), expandable graphite, and some synthetic graphite products; and superalloys for aviation. China was the dominant global producer for many critical mineral materials, and many of the materials were on United States list of critical minerals. See the "Significant Events, Trends, and Issues" section beginning on page 5 for more details on trade actions.

U.S. Geological Survey Earth Mapping Resources Initiative for Critical Minerals

The USGS Earth Mapping Resources Initiative (Earth MRI) is a collaborative project between the USGS and State geological surveys to collect and modernize the Nation's geologic mapping and data resources. In 2024, the USGS invested millions of dollars to strengthen domestic supply chains for mineral commodities that are critical to every economic sector. The flagship effort within these investments is a nationwide mapping effort for critical minerals, which has been expanded and accelerated by funding from the Bipartisan Infrastructure Law. The USGS is improving the understanding of resources of these minerals, in the ground and in mine waste, across the Nation through Earth MRI. In fiscal year 2024 alone, the USGS distributed more than $57 million across 39 States to fund geoscience data collection and mapping in partnership with State geological surveys, data preservation programs, and scientific interpretation efforts to identify areas of the country with potential for the occurrence of critical minerals. Funding from approximately $51 million of the overall $57 million was part of the broader $510.7 million investment in the USGS from the Bipartisan Infrastructure Law to support scientific innovation.

In 2024, priority areas for new data collection were guided by the "National Map of Focus Areas for Potential Critical Mineral Resources in the United States" (USGS Fact Sheet 2023–3007). Mapping of focus areas was based on a framework of mineral systems and their associated mineral deposit types that could possibly contain critical minerals. Knowledge gained by mapping these focus areas will be used to guide future efforts to collect new geologic, geophysical, geochemical, and topographic data through Earth MRI.

A significant part of Earth MRI's activity in 2024 involved partnerships with State geological surveys across the Nation. State geological surveys conducted new geologic mapping and reconnaissance geochemical surveys that provided insights into critical mineral focus areas. State geological surveys contributed directly to USGS efforts to inventory and characterize mine waste at legacy and active sites, and they also were offered Earth MRI funding to preserve vital geologic data and samples through the USGS National Geological and Geophysical Data Preservation Program (NGGDPP). In 2024, Earth MRI funded 22 new geologic or reconnaissance geochemical mapping projects through cooperative agreements with 25 different State geological surveys, and 14 State geological surveys were funded for mine waste inventory and (or) characterization projects. Fifteen States were funded for critical mineral data preservation through the NGGDPP, and every dollar awarded through this program was matched by the State geological surveys. In total, more than $12 million was invested by Earth MRI directly into State geological surveys in 2024, with most of the funding (approximately 79%) provided by the Bipartisan Infrastructure Law.

Airborne magnetic and radiometric surveys.—In 2024, more than $40 million was invested to collect new, high-resolution airborne magnetic and radiometric geophysical data in multiple regions of the United States to aid in bedrock geologic mapping and modeling of regions prospective for the occurrence of critical mineral resources. New airborne geophysical surveys funded in Alaska continued data collection across the Kuskokwim Mountains region in the southwestern part of the State, which may contain resources of antimony, gold, rare-earth elements, tin, and tungsten and has high favorability for the occurrence of undiscovered resources of other minerals. In the Western United States, magnetic-radiometric surveys funded in 2024 covered an area greater than 102,000 square kilometers (39,700 square miles) in parts of Colorado, Idaho, Montana, Nevada, New Mexico, western Texas, and Wyoming. Companion geologic mapping, reconnaissance geochemical mapping, and mine waste investigations were also started in many of these States. When completed, these and previously funded surveys will cover and connect with active Earth MRI geophysical surveys in northern Colorado and southern Wyoming, providing new insights into multiple mineral systems in the region. New surveys in Idaho and Montana bridged active surveys focused on the Pioneer batholith to the east and Idaho cobalt belt to the west. New airborne magnetic-radiometric data collection in Nevada will cover approximately 22,200 square kilometers (8,570 square

miles) of the east-central part of the State. Survey targets include Carlin, porphyry copper, reduced intrusion-related, and lacustrine evaporite mineral systems which may contain critical minerals such as antimony, beryllium, lithium, tellurium, tin, and tungsten.

In the central United States, a new airborne magnetic-radiometric survey spans more than 79,700 square kilometers (30,800 square miles) of central Missouri and adjacent parts of northern Arkansas and eastern Kansas to investigate basin-brine path and marine chemocline mineral systems. These systems underlie historical mining districts and encompass areas that may contain rare-earth elements. Another new geophysical survey was initiated over parts of southeastern Nebraska and northeastern Kansas, focused on mapping buried crystalline rocks related to the Precambrian Midcontinent Rift System and the Paleozoic Elk Creek carbonatite. In the north-central United States, two new surveys focused on a region around Sioux Falls, SD, and on the Upper Peninsula of Michigan and northern Wisconsin. The Sioux Falls survey builds on a larger regional survey started in 2022. The new survey in northern Michigan covers a large region of variably exposed Precambrian rocks that may host graphite, nickel, and platinum-group elements, in addition to many other critical mineral commodities.

In the Eastern United States, two major airborne magnetic-radiometric surveys were initiated in 2024. A new survey covering parts of Connecticut, Massachusetts, New Hampshire, Rhode Island, and Vermont investigated mineral systems and geologic provinces that may host cobalt, graphite, lithium, nickel, and tin deposits. The survey was also designed to aid in mapping the distribution of rocks containing pyrrhotite, a sulfide mineral that is common in the region and presents infrastructure challenges when incorporated into concrete. In the Southeastern United States, a new survey extends from the coastal plain of North Carolina across the Piedmont and Appalachian Mountains of Virginia and West Virginia. The survey will cover prospective heavy-mineral-sand deposits enriched in rare-earth elements, titanium, and zirconium that are common throughout the coastal plain and are being mapped in greater detail using active and completed Earth MRI magnetic-radiometric surveys. The survey will also cross historical mining districts and mineral systems in the Appalachian Mountains that may host deposits of barite, chromium, cobalt, manganese, tin, tungsten, and zinc.

Airborne electromagnetic surveys.—In 2024, approximately $3 million was invested in regional and small-scale airborne electromagnetic (AEM) surveys in the Western and Central United States. Two multiyear survey efforts began in Wyoming and Michigan. The Wyoming AEM survey began in the southern part of the State and focused on the Cheyenne Belt. The AEM survey in the Upper Peninsula of Michigan will aid mapping and modeling of Precambrian graphite-bearing strata in the region in addition to mafic magmatic rocks associated with the Midcontinent Rift System that contain cobalt, nickel, and platinum-group elements. The Michigan AEM survey will also be optimized in selected areas to facilitate groundwater modeling in support of Tribes in the region. A focused AEM survey was conducted around Dubuque, IA, to investigate phosphate-rich strata that underlie portions of Illinois, Iowa, and Wisconsin. The survey area covers a phosphate horizon in Ordovician shale that is enriched in rare-earth elements; the survey was designed to map the location and thickness of the shale unit. The survey area also overlaps the Upper Mississippi Valley mineral district in southwestern Wisconsin that is known to host zinc and lead mineralization in other Ordovician strata.

Airborne hyperspectral remote sensing surveys.—In 2024, more than $5 million was invested in new hyperspectral remote sensing data in the Western United States. The collection of high-altitude regional hyperspectral data in 2022 was conducted through a partnership with the National Aeronautics and Space Administration using the Airborne Visible/InfraRed Imaging Spectrometer (AVIRIS-Classic). Secondary thermal infrared (TIR) sensors such as MASTER and HyTES were also used as available. New hyperspectral data have been collected over parts of Arizona, California, Nevada, and New Mexico, and the reflectance data are being calibrated by concurrent ground studies conducted by USGS scientists. In 2024, new data coverage totaled approximately 368,000 square kilometers (142,000 square miles) of the Western and Southwestern United States. When combined with data collected through Earth MRI in 2023 and with legacy data funded by the USGS Mineral Resources Program in 2018, current coverage of these hyperspectral data exceeds 802,000 square kilometers (310,000 square miles), which is presently the largest terrestrial area of contiguous hyperspectral coverage at 15-meter spatial resolution.

In 2024, a district-scale hyperspectral survey was conducted over selected areas of eastern Arizona and western New Mexico. The selected areas included active and legacy mine sites and surrounding bedrock areas that may host critical mineral resources. Detailed descriptions of these and other Earth MRI-funded projects can be accessed using the Earth MRI Acquisitions Viewer (https://ngmdb.usgs.gov/emri/).

U.S. Production and Consumption of Critical Minerals in 2024

In 2024, the value of domestic primary mine production of critical minerals was $3.3 billion, a 24% decrease from $4.1 billion in 2023. Reduced prices for these mineral commodities contributed the most to the reduced value and delayed new production or restarting production of some critical minerals. At least 12 individual mineral commodities and the rare-earths group of minerals (without specification of the specific lanthanides) had primary production in the United States. Zinc contributed the most to the total value of critical-mineral production (70%), followed by palladium and rare-earth elements (8% each).

The United States was 100% net import reliant for 12 of the 50 individually listed critical minerals and was more than 50% net import reliant for an additional 28 critical mineral commodities (including 14 lanthanides, which

are listed under rare earths) (fig. 2, tables 4, 5). The United States had secondary production for 13 critical minerals, which resulted in net import reliance being less than 100%. The total value of domestically recycled critical mineral commodities in 2024 was $9.7 billion, 20% of the $48 billion of domestically recycled old scrap. Recycling provided the only source of domestic supply for antimony, bismuth, chromium, germanium, magnesium metal, tin, tungsten, and vanadium (table 5).

China was the leading producing country for 30 of 44 critical minerals (including 14 lanthanides, which are listed under rare earths) for which information was available to make reliable estimates. The other leading producing countries of critical minerals were South Africa with three critical minerals and Australia and Congo (Kinshasa) with two critical minerals each (table 5). Production of several critical minerals was highly concentrated (50% or more) in a single country: 5 critical minerals had 80% or more of global production dominated by one country, 6 critical minerals had 70% to less than 80% of global production dominated by one country, 17 critical minerals (including 14 lanthanides, which are listed under rare earths) had 60% to less than 70% of global production dominated by one country, and 2 critical minerals had 50% to less than 60% of global production dominated by one country (table 5).

Figure 9 shows the trends in net import reliance for critical minerals over the past 20 years. For most critical minerals, the United States has been heavily reliant on foreign sources for its consumption requirements; exceptions in 2024 include beryllium, tellurium, and zirconium.

Figure 10 shows both the 1-year percent change in prices of critical mineral commodities between 2023 and 2024 and the 5-year compound annual growth rate (CAGR) in the prices for critical minerals from 2020 through 2024. In 2024, the 1-year percent change in the prices of antimony and germanium increased by more than 50% compared with their respective prices in 2023. These changes are attributed to export restrictions. Prices decreased by 66% for lithium and decreased by more than 20% for cobalt, dysprosium, magnesium metal, neodymium, nickel, palladium, rhodium, terbium, vanadium, and yttrium. The CAGR for many critical minerals has been positive over the past 5 years, but there is a trend of decreasing prices for some mineral commodities: cerium, cobalt, europium, gallium, graphite, lanthanum, palladium, rhodium, and vanadium.

In 2024, consumption for many mineral commodities decreased from that in 2023 (fig. 11). There were reduced imports for many mineral commodities, which was reflected in the reduction in consumption in 2024.

For the 5-year period from 2020 through 2024, consumption declined for many mineral commodities indicating substitution of the material or potentially less domestic production of downstream products that required the raw mineral commodities. The largest decreases (greater than 25%) in consumption, in descending order, were for thallium, asbestos, bauxite, bismuth, industrial diamond (stones), and strontium. The largest increases (greater than 25%) in consumption, in descending order, were for indium, vanadium, natural graphite, industrial sand and gravel, platinum, niobium, and feldspar (fig. 12).

In 2024, the value of domestically recycled old scrap was $48 billion and the total value of net exports of old scrap was $18 billion (fig. 1). The total value of old scrap domestically recycled, imported, and exported was $82 billion. The mineral commodities with the highest value of domestically recycled old scrap as a percentage of the commodity's total old scrap value (domestically recycled, imported, and exported) were antimony, lead, and tin. Antimony and lead were primarily consumed and recycled in lead-acid batteries. The mineral commodities with the highest value of exports in proportion to total old scrap value, in descending order, were copper, silver, aluminum, chromium, and gold. In 2024, domestic secondary processing capacity of copper increased because one new secondary smelter became operational. Another secondary copper plant was under construction and there were three secondary aluminum facilities under construction in 2024. The mineral commodities with the highest value of imports in proportion to total old scrap value, in descending order, were titanium, magnesium metal, cobalt, and platinum-group metals (fig. 13).

Figure 14 shows the relation between primary metals and byproduct or companion metals. As discussed in USGS Open-File Report 2021–1045, "Methodology and Technical Input for the 2021 Review and Revision of the U.S. Critical Minerals List," the degree to which a metal is obtained largely or entirely as a byproduct of one or more host metals from ores may complicate the supply of these mineral commodities.

Table 5.—Estimated Salient Critical Minerals Statistics in 2024[1]

(Metric tons, mine production, unless otherwise specified)

Critical mineral	United States					World			
	Primary production	Secondary production	Apparent consumption	Net import reliance as a percentage of apparent consumption	Primary import source (2020–23)	Leading producing country	Production in leading country	Percentage of world total	World production total
Aluminum (metallurgical grade bauxite)	—	—	[2]1,800,000	>75	Jamaica	Guinea	130,000,000	29	[3]450,000,000
Antimony	—	3,500	24,000	85	China[4]	China	60,000	60	100,000
Arsenic	—	NA	[5]9,100	100	China[4]	Peru	[6]27,000	47	[6]58,000
Barite	W	—	W	>75	India	India	2,600,000	32	[3]8,200,000
Beryllium	180	NA	170	E	Kazakhstan	United States	180	50	360
Bismuth[7]	—	80	760	89	China[4]	China	13,000	81	16,000
Chromium	—	100,000	440,000	77	South Africa	South Africa	21,000,000	45	47,000,000
Cobalt	300	2,000	8,500	76	Norway	Congo (Kinshasa)	220,000	76	290,000
Fluorspar	NA	—	430,000	100	Mexico	China	5,900,000	62	9,500,000
Gallium	—	—	[2]19	100	Japan	China	750	99	760
Germanium[7]	—	NA	NA	>50	Belgium	China	NA	NA	NA
Graphite (natural)	—	—	52,000	100	China[4]	China	1,270,000	79	1,600,000
Indium[7]	—	—	[5]250	100	Republic of Korea	China	760	70	1,080
Lithium	W	NA	W	>50	Chile	Australia	88,000	37	[3]240,000
Magnesium[7]	—	110,000	[2]50,000	>75	Israel	China	950,000	95	[3]1,000,000
Manganese	—	—	680,000	100	Gabon	South Africa	7,400,000	37	20,000,000
Nickel	8,000	92,000	[8]180,000	48	Canada	Indonesia	2,200,000	59	3,700,000
Niobium	—	NA	8,400	100	Brazil	Brazil	100,000	91	110,000
Palladium	8	45	83	36	Russia	Russia	75	39	190
Platinum	2	8.5	71	85	South Africa	South Africa	120	71	170
Rare earths (compounds and metals)[9]	1,300	NA	6,600	80	China[4]	China	[10]270,000	69	[10]390,000
Scandium	—	—	NA	100	Japan	China	NA	NA	NA
Tantalum	—	NA	770	100	China[4]	Congo (Kinshasa)	880	42	2,100
Tellurium[7]	W	—	W	<25	Canada	China	750	77	[3]980
Tin	—	17,900	37,000	73	Peru	China	69,000	23	300,000
Titanium (metal)[7]	W	W	[3]40,000	>95	Japan	China	220,000	69	[3]320,000
Tungsten	—	W	W	>50	China[4]	China	67,000	83	81,000
Vanadium	—	8,200	14,000	40	Canada	China	70,000	70	100,000
Yttrium	NA	—	500	100	China[4]	China	NA	NA	NA
Zinc[7]	[11]220,000	([11])	820,000	73	Canada	China	4,000,000	33	12,000,000
Zirconium (ores and concentrates)	<100,000	NA	<100,000	<25	South Africa	Australia	500,000	33	1,500,000

E Net exporter. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.

[1]Critical minerals as published in the Federal Register on February 24, 2022 (87 FR 10381). Not all critical minerals are listed here. Cesium, hafnium, iridium, rhodium, rubidium, and ruthenium are not shown because available information was inadequate to make estimates of U.S. or world production.

[2]Reported consumption.

[3]Excludes U.S. production.

[4]Includes Hong Kong.

[5]Estimated consumption.

[6]Arsenic trioxide.

[7]Refinery production.

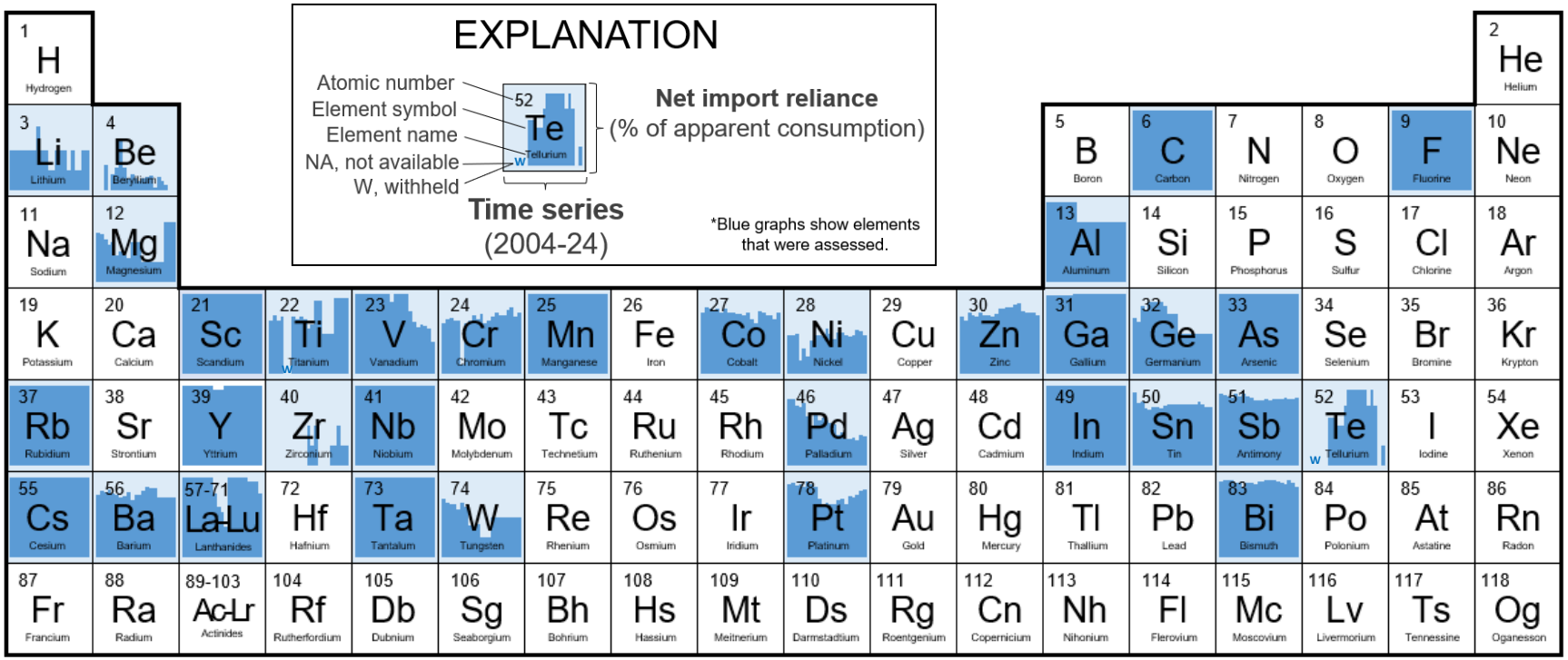
[8]Nickel in primary metal and secondary scrap.

[9]Data include lanthanides cerium, dysprosium, erbium, europium, gadolinium, holmium, lanthanum, lutetium, neodymium, praseodymium, samarium, terbium, thulium, and ytterbium.

[10]Mine production of rare-earth concentrates.

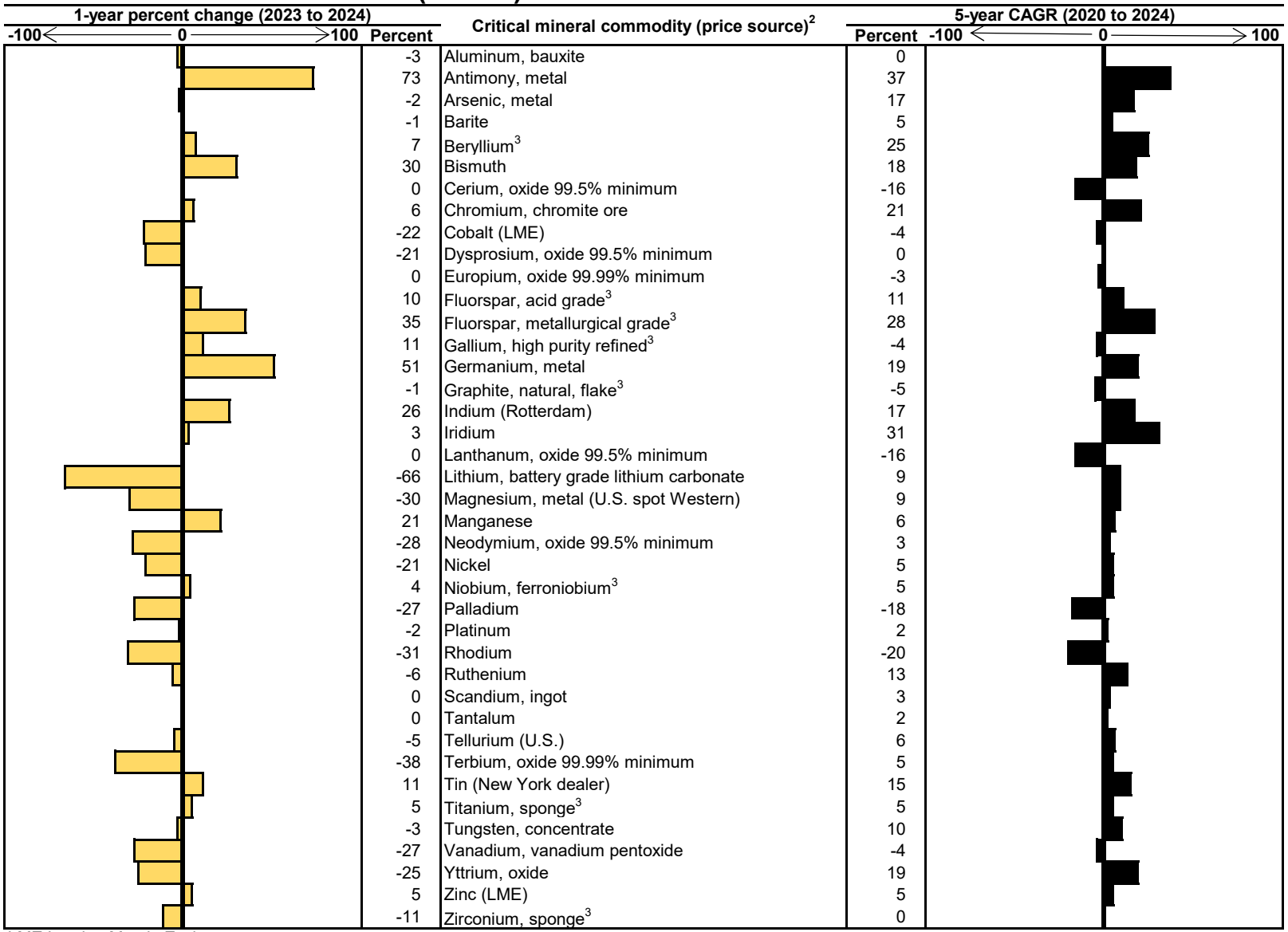
[11]Primary production includes both primary and secondary metal production.

Figure 9.—20-Year Trend of U.S. Net Import Reliance for Critical Minerals



For elements of the periodic table associated with mineral commodities identified as critical in 2024 (87 FR 10381), the figure displays the U.S. net import reliance (NIR) as a percent of apparent consumption from 2004 through 2024. Barite is listed under barium (Ba). Bauxite is listed under aluminum (Al). Fluorspar is listed under fluorine (F). Graphite (natural) is listed under carbon (C). Rare earths are listed under lanthanides (La–Lu). Net import reliance data were not available for hafnium, iridium, and rhodium for 2004 through 2024; data were withheld for tellurium prior to 2010 and for titanium for 2008 and 2009. For some years, the NIR for antimony, barite, bauxite, germanium, lithium, magnesium, rare earths, tellurium, titanium, tungsten, yttrium, and zirconium are rounded to avoid disclosing company proprietary data.

Figure 10.—Estimated 1-Year Percent Change and 5-Year Compound Annual Growth Rate (CAGR) in Prices of Critical Minerals[1]



1-year percent change (2023 to 2024) Percent	Critical mineral commodity (price source)[2]	5-year CAGR (2020 to 2024) Percent
-3	Aluminum, bauxite	0
73	Antimony, metal	37
-2	Arsenic, metal	17
-1	Barite	5
7	Beryllium[3]	25
30	Bismuth	18
0	Cerium, oxide 99.5% minimum	-16
6	Chromium, chromite ore	21
-22	Cobalt (LME)	-4
-21	Dysprosium, oxide 99.5% minimum	0
0	Europium, oxide 99.99% minimum	-3
10	Fluorspar, acid grade[3]	11
35	Fluorspar, metallurgical grade[3]	28
11	Gallium, high purity refined[3]	-4
51	Germanium, metal	19
-1	Graphite, natural, flake[3]	-5
26	Indium (Rotterdam)	17
3	Iridium	31
0	Lanthanum, oxide 99.5% minimum	-16
-66	Lithium, battery grade lithium carbonate	9
-30	Magnesium, metal (U.S. spot Western)	9
21	Manganese	6
-28	Neodymium, oxide 99.5% minimum	3
-21	Nickel	5
4	Niobium, ferroniobium[3]	5
-27	Palladium	-18
-2	Platinum	2
-31	Rhodium	-20
-6	Ruthenium	13
0	Scandium, ingot	3
0	Tantalum	2
-5	Tellurium (U.S.)	6
-38	Terbium, oxide 99.99% minimum	5
11	Tin (New York dealer)	15
5	Titanium, sponge[3]	5
-3	Tungsten, concentrate	10
-27	Vanadium, vanadium pentoxide	-4
-25	Yttrium, oxide	19
5	Zinc (LME)	5
-11	Zirconium, sponge[3]	0

LME London Metals Exchange.

[1]Critical minerals as published in the Federal Register on February 24, 2022 (87 FR 10381). Not all critical minerals are listed here. Cesium, erbium, gadolinium, hafnium, holmium, lutetium, praseodymium, rubidium, samarium, thulium, and ytterbium are not shown because available information regarding prices was inadequate.

[2]Price source is only included for those commodities that have multiple price sources in their Salient table. For those commodities with a single price source, please refer to that commodity chapter's Salient Statistics table.

[3]Average annual unit value of imports.

Figure 11.—Change in U.S. Consumption of Nonfuel Mineral Commodities From 2023 to 2024

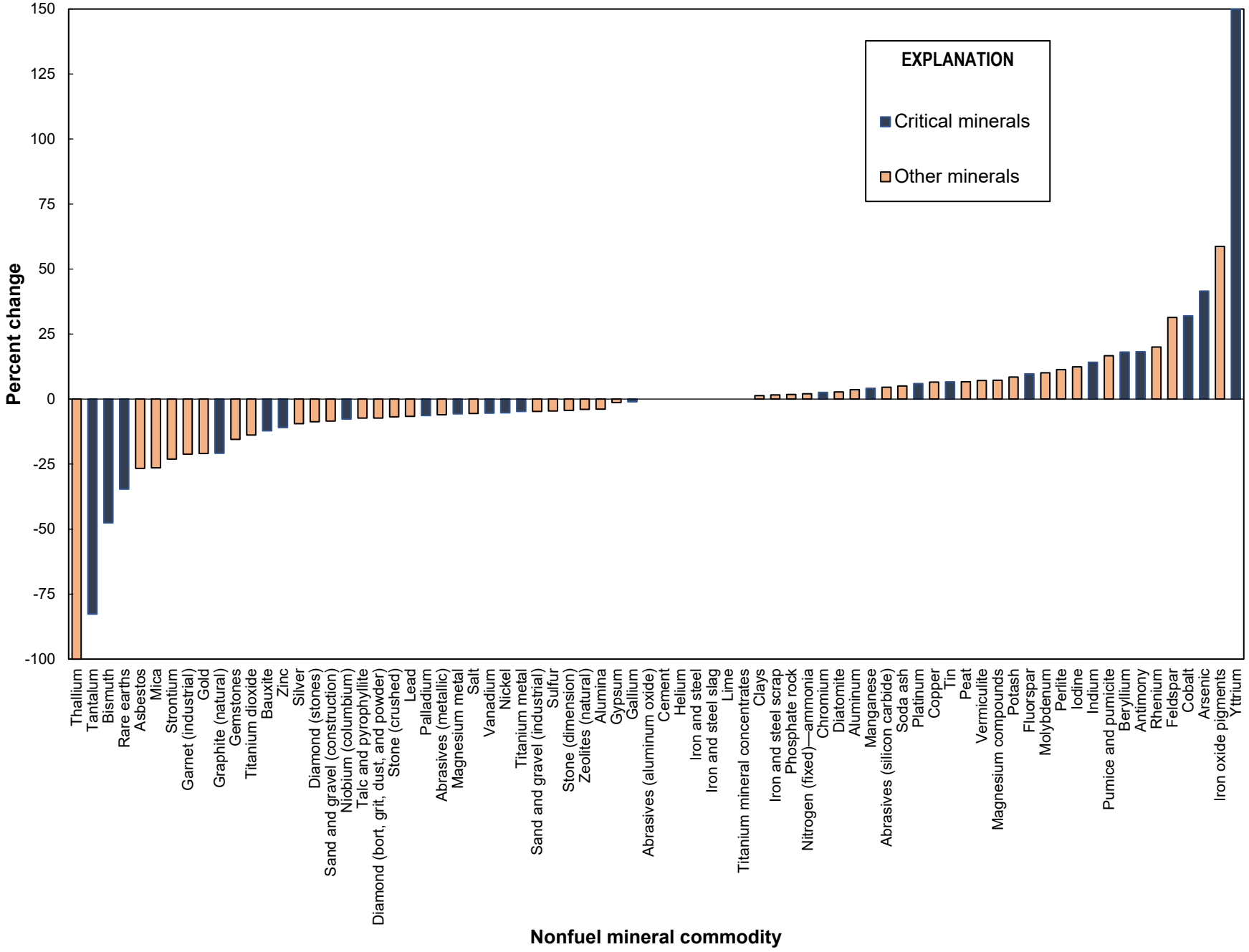


Figure 12.—Change in U.S. Consumption of Nonfuel Mineral Commodities From 2020 to 2024

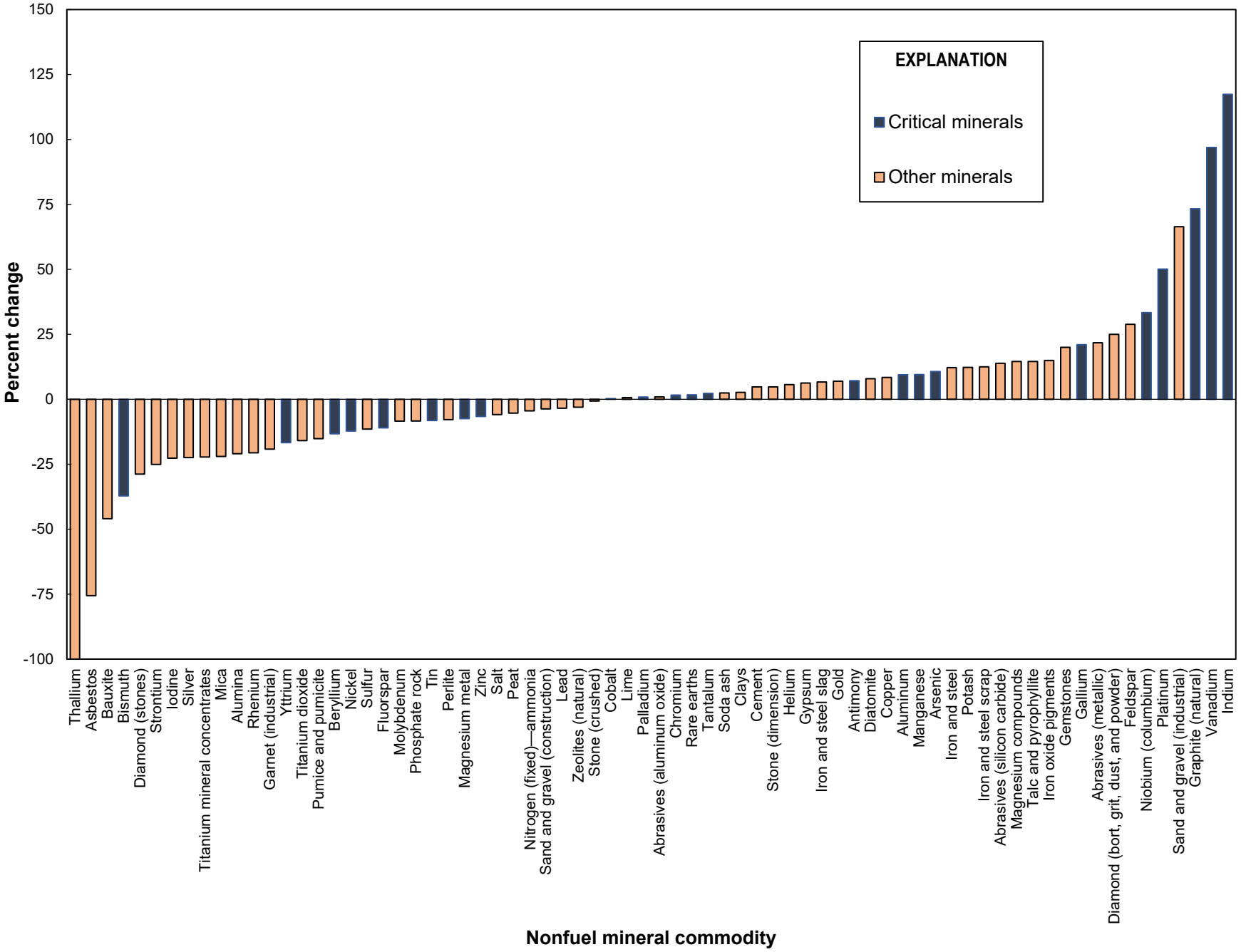
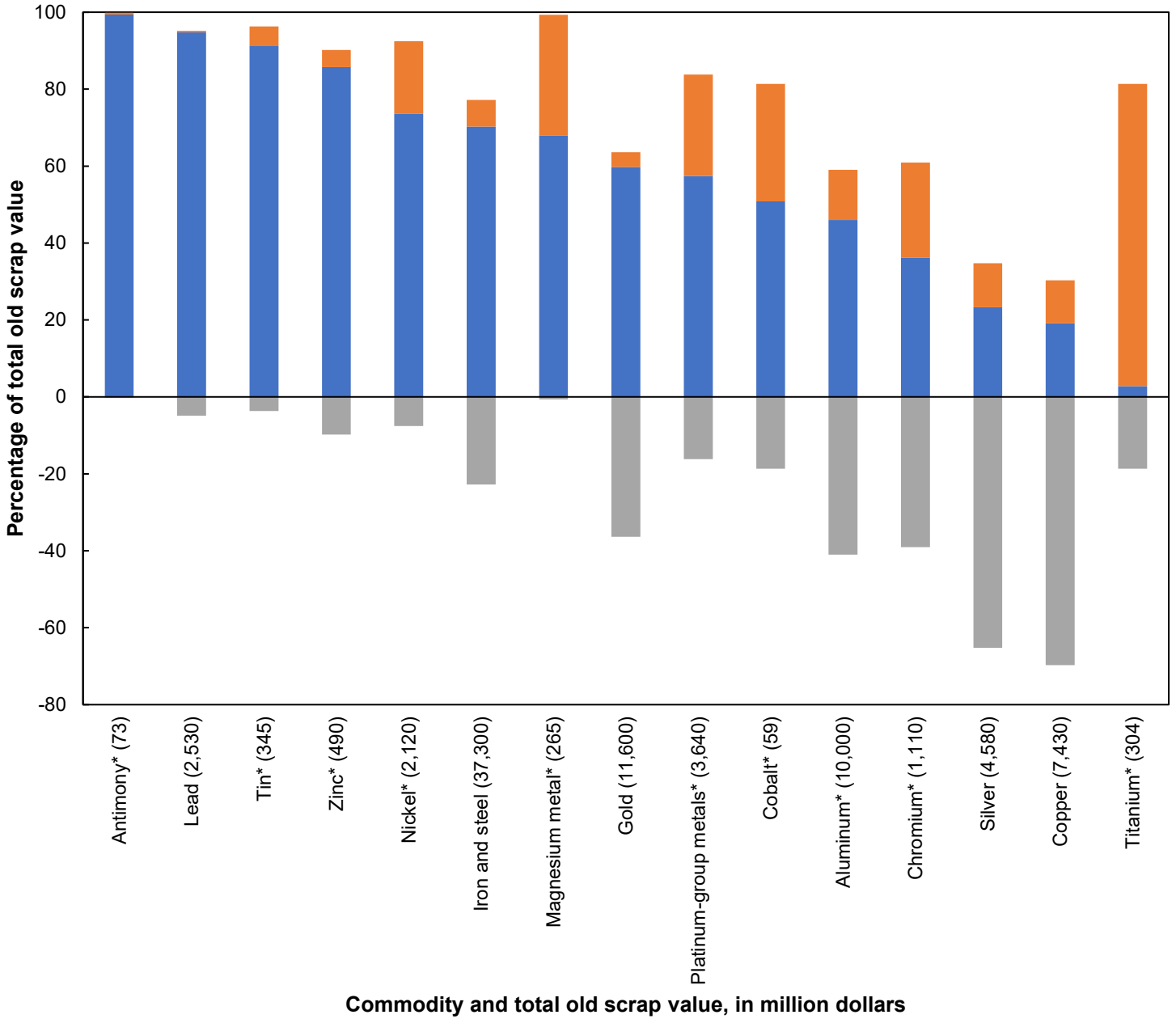


Figure 13.—Value of Old Scrap Domestically Recycled, Imported, and Exported in 2024, as a Percentage of Total Old Scrap Value

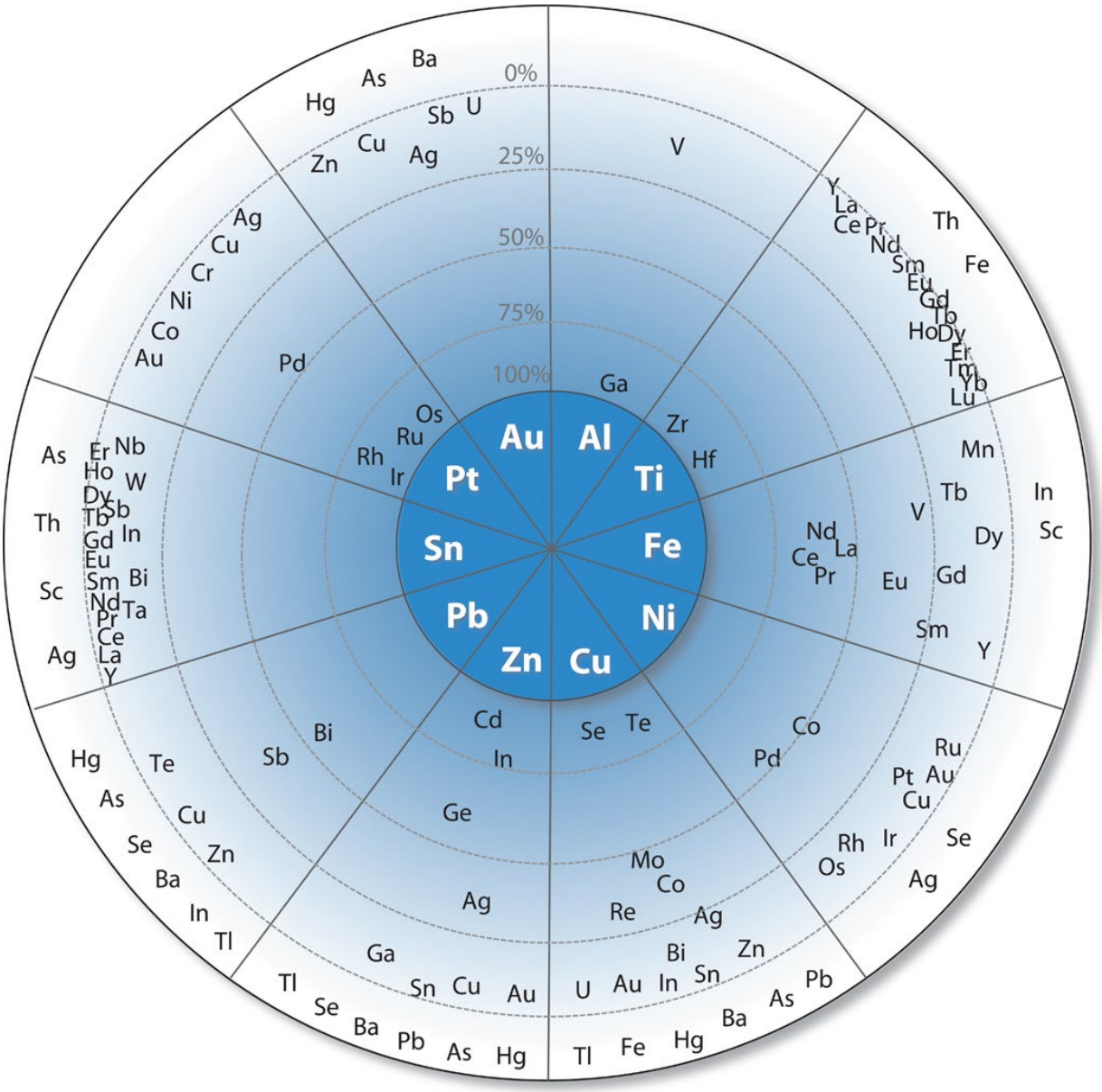


* Indicates commodity is included in the final 2022 critical minerals list

Percentages for exports, imports, and domestically recycled old scrap add to 100 percent of the total old scrap value for each commodity. Exports are shown as negative percentages to indicate value of supply lost.

Data not available for Molybdenum and Tantalum*. Data for Tungsten* are withheld.

Figure 14.—Relation Between Byproduct Elements and Host Metals



The principal host metals form the inner circle. Byproduct elements are in the outer circle at distances proportional to the percentage of their primary production (from 100% to 0%) that originates with the host metal indicated. The companion elements in the white region of the outer circle are elements for which the percentage of their production that originates with the host metal indicated has not been determined. Al, aluminum; Ag, silver; As, arsenic; Au, gold; Ba, barium; Bi, bismuth; Cd, cadmium; Ce, cerium; Co, cobalt; Cr, chromium; Cu, copper; Dy, dysprosium; Er, erbium; Eu, europium; Fe, iron; Ga, gallium; Gd, gadolinium; Ge, germanium; Hf, hafnium; Hg, mercury; Ho, holmium; In, indium; Ir, iridium; La, lanthanum; Lu, lutetium; Mn, manganese; Mo, molybdenum; Nd, neodymium; Ni, nickel; Os, osmium; Pb, lead; Pd, palladium; Pt, platinum; Pr, praseodymium; Re, rhenium; Rh, rhodium; Ru, ruthenium; Sb, antimony; Sc, scandium; Se, selenium; Sm, samarium; Sn, tin; Ta, tantalum; Tb, terbium; Te, tellurium; Th, thorium; Ti, titanium; Tl, thallium; U, uranium; V, vanadium; W, tungsten; Y, yttrium; Yb, ytterbium; Zn, zinc; Zr, zirconium. Source: Nassar, N.T., Graedel, T.E., and Harper, E.M., 2015, By-product metals are technologically essential but have problematic supply: ScienceAdvances, v. 1, no. 3, article E1400180. (Accessed December 19, 2023, at https://doi.org/10.1126/sciadv.1400180.)

COPPER

(Data in thousand metric tons, copper content, unless otherwise specified)

Domestic Production and Use: In 2024, the recoverable copper content of U.S. mine production was an estimated 1.1 million tons, a decrease of 3% from that in 2023, and was valued at an estimated $10 billion, slightly greater than $9.83 billion in 2023. Arizona was the leading copper-producing State and accounted for approximately 70% of domestic output; copper was also mined in Michigan, Missouri, Montana, Nevada, New Mexico, and Utah. Copper was recovered or processed at 25 mines (17 of which accounted for more than 99% of mine production), 2 primary smelters, 1 secondary smelter, 2 primary electrolytic refineries, 14 electrowon refineries, and 3 secondary fire refineries. A new secondary smelter and secondary refinery were expected to start up by yearend. Refined copper and scrap were consumed at about 30 brass mills, 14 rod mills, and several hundred foundries and miscellaneous manufacturers. According to the Copper Development Association, copper and copper alloy products were used in building construction, 42%; electrical and electronic products, 23%; transportation equipment, 18%; consumer and general products, 10%; and industrial machinery and equipment, 7%.

Salient Statistics—United States:	**2020**	**2021**	**2022**	**2023**	**2024[e]**
Production:					
Mine, recoverable	1,200	1,230	1,230	1,130	1,100
Refinery:					
Primary (from ore)	872	922	930	843	850
Secondary (from scrap)	43	49	40	39	40
Copper recovered from old (post-consumer) scrap[1]	161	169	152	[e]150	150
Imports for consumption:					
Ore and concentrates	2	11	12	3	([2])
Refined	676	919	732	771	810
Exports:					
Ore and concentrates	383	344	351	339	320
Refined	41	48	27	33	60
Consumption:					
Reported, refined copper	1,680	1,750	1,720	1,570	1,600
Apparent, primary refined copper and copper from old scrap[3]	1,660	1,960	1,820	1,690	1,800
Price, annual average, cents per pound:					
U.S. producer, cathode (COMEX + premium)	286.7	432.3	410.8	395.3	430
COMEX, high-grade, first position	279.9	424.3	400.7	385.7	420
London Metal Exchange, grade A, cash	279.8	422.5	399.8	384.8	420
Stocks, refined, held by U.S. producers, consumers, and metal exchanges, yearend	118	117	84	127	70
Employment, mine and plant, number	11,000	11,400	12,000	12,600	13,000
Net import reliance[4] as a percentage of apparent consumption	38	44	41	41	45

Recycling: Old (post-consumer) scrap, converted to refined metal, alloys, and other forms, provided an estimated 150,000 tons of copper in 2024, and an estimated 720,000 tons of copper was recovered from new (manufacturing) scrap derived from fabricating operations. Brass and wire-rod mills accounted for approximately 85% of the total copper recovered from scrap. Copper recovered from scrap contributed about 35% of the U.S. copper supply.[5]

Import Sources (2020–23): Copper content of blister and anodes: Finland, 92%; Malaysia, 3%; and other, 5%. Copper content of matte, ash, and precipitates: Canada, 48%; Belgium, 23%; Japan, 13%; Spain, 6%; and other, 10%. Copper content of ore and concentrates: Canada, >99%; and other, <1%. Copper content of scrap: Canada, 46%; Mexico, 42%; Dominican Republic, 3%; and other, 9%. Refined copper: Chile, 65%; Canada, 17%; Mexico, 9%; Peru, 6%; and other, 3%. Refined copper accounted for 88% of all unmanufactured copper imports.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–24**
Copper ore and concentrates, copper content	2603.00.0010	1.7¢/kg on lead content.
Unrefined copper anodes	7402.00.0000	Free.
Refined copper and alloys, unwrought	7403.00.0000	1% ad valorem.
Copper scrap	7404.00.0000	Free.
Copper wire rod	7408.11.0000	1% or 3% ad valorem.

Depletion Allowance: 15% (domestic), 14% (foreign).

Government Stockpile: None.

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COPPER

Events, Trends, and Issues: In 2024, production decreased at a majority of copper mines in the United States, and domestic mined copper output declined by an estimated 3% from that in 2023. At the Bingham Canyon Mine in Utah, changes to the mine plan required to mitigate geotechnical risks resulted in lower ore grades and copper recoveries. Production at the Eagle Mine in Michigan was affected by decreased copper ore grades and reduced mill throughput rates owing to a fall of ground along an ore access ramp. Output also decreased at multiple mines in Arizona and New Mexico because of lower ore grades and mining rates. These decreases were partially offset by a significant increase in mined copper production at the Robinson Mine in Nevada owing to planned mine sequencing that yielded higher ore grades and copper recovery rates. At U.S. refineries, copper production increased slightly in 2024 compared with that in 2023. The Kennecott smelter and electrolytic refinery near Salt Lake City, UT, returned to normal operations in the first quarter of 2024 following major rebuilds in 2023. A new secondary copper refinery in Kentucky and a new secondary copper smelter in Georgia were expected to begin operating by yearend 2024.

The COMEX copper price reached a record high in May 2024 and was projected to average $4.20 per pound in full year 2024, an increase of 9% from the annual average price in 2023. Analysts attributed the higher price to multiple factors, such as expectations for reduced global copper supply in the near future, optimistic sentiment regarding world copper demand, strong manufacturing production in China, and decreasing inflation in the United States.

World Mine and Refinery Production and Reserves: Reserves for Canada, Indonesia, Peru, and the United States were revised based on company, Government, and (or) industry association reports.

	Mine production		Refinery production		Reserves[6]
	2023	2024[e]	2023	2024[e]	
United States	1,130	1,100	882	890	47,000
Australia	778	800	442	460	[7]100,000
Canada	500	450	315	320	8,300
Chile	5,250	5,300	2,080	1,900	190,000
China	1,820	1,800	12,000	12,000	41,000
Congo (Kinshasa)	2,930	3,300	2,170	2,500	80,000
Germany	—	—	609	630	—
India	27	30	509	510	2,200
Indonesia	907	1,100	225	350	21,000
Japan	—	—	1,490	1,600	—
Kazakhstan	[e]740	740	458	470	20,000
Korea, Republic of	—	—	604	620	—
Mexico	699	700	509	350	53,000
Peru	2,760	2,600	403	390	100,000
Poland	395	410	592	590	34,000
Russia	[e]890	930	[e]1,000	960	80,000
Zambia	712	680	222	170	21,000
Other countries	3,020	2,700	2,460	2,500	180,000
World total (rounded)	22,600	23,000	27,000	27,000	980,000

World Resources:[6] The most recent U.S. Geological Survey assessment of global copper resources indicated that, as of 2015, identified resources contained 1.5 billion tons of unextracted copper (2.1 billion tons when past production of 0.6 billion tons is included) and undiscovered resources contained an estimated 3.5 billion tons of copper.[8]

Substitutes: Aluminum substitutes for copper in automobile radiators, cooling and refrigeration tube, electrical equipment, and power cable. Optical fiber substitutes for copper in telecommunications applications, and plastics substitute for copper in drain pipe, plumbing fixtures, and water pipe. Titanium and steel are used in heat exchangers.

[e]Estimated. — Zero.

[1]Copper converted to refined metal, alloys, and other forms by brass and wire-rod mills, foundries, refineries, and other manufacturers.

[2]Less than ½ unit.

[3]Primary refined production + copper recovered from old scrap + refined imports – refined exports ± adjustments for refined copper stock changes.

[4]Defined as refined imports – refined exports ± adjustments for refined copper stock changes.

[5]Primary refined production + copper from old and new scrap + refined imports – refined exports ± adjustments for refined copper stock changes.

[6]See Appendix C for resource and reserve definitions and information concerning data sources.

[7]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 27 million tons.

[8]Source: Hammarstrom, J.M., Zientek, M.L., Parks, H.L., Dicken, C.L., and the U.S. Geological Survey Global Copper Mineral Resource Assessment Team, 2019, Assessment of undiscovered copper resources of the world, 2015 (ver. 1.2, December 2021): U.S. Geological Survey Scientific Investigations Report 2018–5160, 619 p. (Accessed November 18, 2024, at https://doi.org/10.3133/sir20185160.)

GOLD

(Data in metric tons,[1] gold content, unless otherwise specified)

Domestic Production and Use: In 2024, domestic gold mine production was estimated to be 160 tons; the value was estimated to be $12 billion, a 9% increase from the value in 2023. Gold was produced at more than 40 lode mines in 12 States, at several large placer mines in Alaska, and at numerous smaller placer mines (mostly in Alaska and in the Western States). Nevada was the leading gold-producing State, accounting for about 70% of total domestic production, followed by Alaska, which produced about 16% of domestic gold. About 7% of domestic gold was recovered as a byproduct of processing domestic base-metal ores, chiefly copper ores. The top 26 operations yielded about 97% of the mined gold produced in the United States. Commercial-grade gold was produced at approximately 15 refineries. A few dozen companies, out of several thousand companies and artisans, dominated the fabrication of gold into commercial products. U.S. jewelry manufacturing was heavily concentrated in the New York, NY, and Providence, RI, areas, with lesser concentrations in California, Florida, and Texas.

Salient Statistics—United States:	2020	2021	2022	2023	2024[e]
Production:					
Mine	193	187	173	170	160
Refinery:					
Primary	181	181	181	179	170
Secondary (new and old scrap)	92	92	93	96	90
Imports for consumption[2]	545	192	138	216	150
Exports[2]	297	386	420	252	300
Consumption, reported[3]	187	265	252	253	200
Stocks, Treasury, yearend[4]	8,130	8,130	8,130	8,130	8,130
Price, dollars per troy ounce[5]	1,774	1,801	1,802	1,945	2,400
Employment, mine and mill, number[6]	11,500	11,700	11,500	12,200	12,000
Net import reliance[7] as a percentage of reported consumption	([8])	E	E	E	E

Recycling: In 2024, an estimated 90 tons of new and old scrap was recycled, equivalent to about 45% of reported consumption. The domestic supply of gold from recycling decreased by 6% compared with that in 2023.

Import Sources (2020–23): Ores and concentrates: Canada, 99%; and other, 1%. Dore: Mexico, 38%; Colombia, 20%; Argentina, 12%; Nicaragua, 8%; and other, 22%. Bullion: Switzerland, 35%; Canada, 27%; South Africa, 8%; Australia, 7%; and other, 23%. Total: Switzerland, 24%; Canada, 19%; Mexico, 15%; Colombia, 9%; and other, 33%.

Tariff: Item	Number	Normal Trade Relations 12–31–24
Precious metal ore and concentrates:		
Gold content of silver ores	2616.10.0080	0.8 ¢/kg on lead content.
Gold content of other ores	2616.90.0040	1.7 ¢/kg on lead content.
Gold bullion	7108.12.1013	Free.
Gold dore	7108.12.1020	Free.
Gold scrap	7112.91.0100	Free.

Depletion Allowance: 15% (domestic), 14% (foreign).

Government Stockpile: The U.S. Department of the Treasury maintains stocks of gold (see salient statistics above) and the U.S. Department of Defense administers a Governmentwide secondary precious-metals recovery program.

Events, Trends, and Issues: The estimated gold price in 2024 increased by 23% and reached a new record-high annual price compared with the previous record-high annual price in 2023. The Engelhard daily price for gold in 2024 fluctuated with an increasing trend in the first quarter, a decreasing trend into the second quarter, and an increasing trend into the beginning of the fourth quarter.

In 2024, worldwide gold mine production was an estimated 3,300 tons compared with 3,250 tons in 2023. China, Russia, Australia, Canada, and the United States were the leading gold producers, in descending order of production, and together accounted for 41% of estimated global production in 2024.

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GOLD

Estimated global gold consumption, excluding exchange-traded funds and other similar investments, was in jewelry, 45%; central banks and other institutions, 21%; physical bars, 19%; official coins and medals and imitation coins, 7%; electrical and electronics, 6%; and other, 1%. In the first 9 months of 2024, global consumption of gold in physical bars increased by 12%, electronics increased by 12%, other industrial applications were unchanged, dentistry decreased by 5%, jewelry decreased by 7%, and coins and medals decreased by 25% compared with those in the first 9 months of 2023. During the first 9 months of 2024, gold holdings in central banks decreased by 17%, and global investments in gold-based exchange-traded funds and similar investments decreased by 87%. Total global consumption in the first 9 months of 2024 decreased by 3% compared with that in the first 9 months of 2023.[9]

World Mine Production and Reserves: Reserves for Canada, China, Colombia, Indonesia, Kazakhstan, Peru, Russia, and Tanzania were revised based on company and Government reports.

	Mine production		Reserves[10]
	2023	2024[e]	
United States	170	160	3,000
Australia	296	290	[11]12,000
Brazil	71	70	2,400
Burkina Faso	57	60	NA
Canada	198	200	3,200
China	375	380	3,100
Colombia	61	60	700
Ghana	126	130	1,000
Indonesia	[e]100	100	3,600
Kazakhstan	133	130	2,300
Mali	[e]67	70	800
Mexico	127	130	1,400
Peru	100	100	2,500
Russia	313	310	12,000
South Africa	104	100	5,000
Tanzania	55	60	400
Uzbekistan	120	120	1,800
Other countries	777	780	9,200
World total (rounded)	3,250	3,300	64,000

World Resources:[10] An assessment of U.S. gold resources indicated 33,000 tons of gold—15,000 tons in identified and 18,000 tons in undiscovered resources.[12] Nearly one-quarter of the gold in undiscovered resources was estimated to be contained in porphyry copper deposits. The gold resources in the United States, however, are only a small portion of global gold resources.

Substitutes: Base metals clad with gold alloys are widely used to economize on gold in electrical and electronic products and in jewelry; many of these products are continually redesigned to maintain high-utility standards with lower gold content. Generally, palladium, platinum, and silver may substitute for gold.

[e]Estimated. E Net exporter. NA Not available.
[1]One metric ton (1,000 kilograms) = 32,150.7 troy ounces.
[2]Includes refined bullion, dore, ores, concentrates, and precipitates. Excludes waste and scrap, official monetary gold, gold in fabricated items, gold in coins, and net bullion flow (in tons) to market from foreign stocks at the New York Federal Reserve Bank.
[3]Includes gold used in the production of consumer purchased bars, coins, and jewelry. Excludes gold as an investment (except consumer purchased bars and coins). Source: World Gold Council.
[4]Includes gold in the Exchange Stabilization Fund. Stocks were valued at the official price of $42.22 per troy ounce.
[5]Engelhard's average gold price quotation for the year. In 2024, the price was estimated by the U.S. Geological Survey based on data from January through November.
[6]Data from the Mine Safety and Health Administration.
[7]Defined as imports – exports.
[8]Large unreported investor stock purchases preclude calculation of a meaningful net import reliance.
[9]Source: World Gold Council.
[10]See Appendix C for resource and reserve definitions and information concerning data sources.
[11]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 4,600 tons.
[12]Source: U.S. Geological Survey National Mineral Resource Assessment Team, 2000, 1998 assessment of undiscovered deposits of gold, silver, copper, lead, and zinc in the United States: U.S. Geological Survey Circular 1178, 21 p.

NICKEL

(Data in metric tons, nickel content, unless otherwise specified)

Domestic Production and Use: In 2024, the underground Eagle Mine in Michigan produced approximately 8,000 tons of nickel in concentrate, which was exported to smelters in Canada and overseas. Nickel in crystalline sulfate was produced as a byproduct of smelting and refining platinum-group-metal ores mined in Montana. In Missouri, a company produced nickel-copper-cobalt concentrate from historic mine tailings. In the United States, the leading uses for primary nickel were alloys and steels, electroplating, and other uses including catalysts and chemicals. Stainless and alloy steel and nickel-containing alloys typically account for more than 85% of domestic consumption.

Salient Statistics—United States:	2020	2021	2022	2023	2024[e]
Production:					
Mine	16,700	18,400	17,500	16,400	8,000
Refinery, byproduct	W	W	W	W	W
Secondary	111,000	100,000	[e]97,000	[e]90,000	92,000
Imports:					
Ores and concentrates	95	18	([1])	4	10
Primary	105,000	108,000	127,000	112,000	100,000
Secondary	31,800	34,400	37,300	39,700	40,000
Exports:					
Ores and concentrates	13,400	14,900	15,200	9,100	5,000
Primary	11,300	11,600	11,100	12,200	17,000
Secondary	46,300	29,200	44,400	56,800	48,000
Consumption:					
Reported, primary	96,900	92,100	[e]100,000	[e]110,000	110,000
Reported, secondary, purchased scrap[e]	110,000	100,000	[e]97,000	[e]90,000	92,000
Apparent, primary[2]	94,100	97,500	[e]120,000	[e]100,000	84,000
Apparent, total[3]	205,000	198,000	[e]210,000	[e]190,000	180,000
Price, average annual, London Metal Exchange (LME), cash:					
Dollars per metric ton	13,772	18,476	25,815	21,495	17,000
Dollars per pound	6.25	8.38	11.71	9.75	7.70
Stocks, yearend:					
Consumer	26,900	25,100	23,200	21,600	22,000
LME U.S. warehouses	1,734	1,296	6	1,506	400
Net import reliance[4, 5] as a percentage of total apparent consumption[e]	46	49	55	53	48

Recycling: Most secondary nickel was in the form of nickel content of stainless-steel scrap. Nickel in alloyed form was recovered from the processing of nickel-containing waste. Most recycled nickel was used to produce new alloys and stainless steel. In 2024, nickel recovered from scrap accounted for approximately 54% of apparent consumption.

Import Sources (2020–23): Primary nickel: Canada, 46%; Norway, 11%; Australia, 8%; Brazil, 6%; and other, 29%. Nickel-containing scrap, including nickel content of stainless-steel scrap: Canada, 41%; Mexico, 27%; United Kingdom, 9%; Russia, 4%, and other, 19%.

Tariff: Item	Number	Normal Trade Relations 12–31–24
Nickel ores and concentrates, nickel content	2604.00.0040	Free.
Ferronickel	7202.60.0000	Free.
Unwrought nickel, not alloyed	7502.10.0000	Free.
Nickel waste and scrap	7503.00.0000	Free.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile:[6] The U.S. Department of Energy is holding approximately 9,700 tons of radiologically contaminated nickel at Paducah, KY.

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NICKEL

Events, Trends, and Issues: In 2024, the annual average LME nickel cash price was estimated to have decreased by 21% compared with that in 2023. Prices continued their downward trend, having ended 2023 at an average price of $16,400 per metric ton, largely owing to continued surplus of nickel from Indonesia. In early 2024, supply concerns related to nickel asset closures, delays in issuing new nickel mining quotas in Indonesia, social unrest in New Caledonia, and a ban on nickel from Russia increased the LME nickel cash price to about $19,000 per metric ton. However, by June, supply concerns had subsided, and the LME annual average cash price decreased to about $16,000 per metric ton by November.

In May, the U.S. Department of Defense under the Defense Production Act, Title III, awarded a grant of $7 million to a Missouri company to develop a hydrometallurgical demonstration plant to produce cobalt and nickel products. The plant would be capable of extracting the metals from a variety of feedstocks.

Estimated global nickel mine production decreased to an estimated 3.7 million tons in 2024, even though production in Indonesia increased by an estimated 8%. Production in Australia and the Philippines declined by an estimated 26% and 20%, respectively, after multiple companies reduced or halted production owing to unfavorable market conditions related to declining prices and increased production in Indonesia. In New Caledonia, production decreased by an estimated 52% owing to widespread unrest in addition to reduced global nickel prices. In June, a company began commercial production at a new nickel sulfide mine in Kalumbila, Zambia.

World Mine Production and Reserves: Reserves for China and the United States were revised based on company and Government reports.

	Mine production		Reserves[7]
	2023	2024[e]	
United States	16,400	8,000	[8]310,000
Australia	149,000	110,000	[9]24,000,000
Brazil	82,700	77,000	16,000,000
Canada	159,000	190,000	2,200,000
China	[e]117,000	120,000	4,400,000
Indonesia	2,030,000	2,200,000	55,000,000
New Caledonia[10]	231,000	110,000	7,100,000
Philippines	[e]413,000	330,000	4,800,000
Russia	210,000	210,000	8,300,000
Other countries	340,000	300,000	>9,100,000
World total (rounded)	3,750,000	3,700,000	>130,000,000

World Resources:[7] Globally, nickel resources have been estimated to contain more than 350 million tons of nickel, with 54% in laterites and 35% in magmatic sulfide deposits. Hydrothermal systems such as iron-nickel alloy, sedimentary-hosted polymetallic, and volcanogenic massive sulfide deposits, as well as seafloor manganese crusts and nodules contain 10%, and miscellaneous resources such as tailings, 1%.

Substitutes: Low-nickel, duplex, or ultrahigh-chromium stainless steels have been substituted for austenitic grades in construction. Nickel-free specialty steels are sometimes used in place of stainless steel in the power-generating and petrochemical industries. Titanium alloys can substitute for nickel metal or nickel-base alloys in corrosive chemical environments.

[e]Estimated. W Withheld to avoid disclosing company proprietary data.

[1]Less than ½ unit.

[2]Defined as primary imports – primary exports ± adjustments for industry stock changes, excluding secondary consumer stocks.

[3]Defined as apparent primary consumption + reported secondary consumption.

[4]Defined as imports – exports ± adjustments for consumer stock changes.

[5]Includes the nickel content of stainless steel and alloy scrap. Excluding scrap, net import reliance would be nearly 100%.

[6]See Appendix B for definitions.

[7]See Appendix C for resource and reserve definitions and information concerning data sources.

[8]Includes reserve data for three projects. An additional three domestic projects have defined resources but have not yet defined reserves.

[9]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 8.6 million tons.

[10]Overseas territory of France.

SILVER

(Data in metric tons,[1] silver content, unless otherwise specified)

Domestic Production and Use: In 2024, U.S. mines produced approximately 1,100 tons of silver with an estimated value of $960 million. Silver was produced at 4 silver mines and as a byproduct or coproduct from 31 domestic base- and precious-metal operations. Silver was produced in 12 States, and Alaska continued as the country's leading silver-producing State, followed by Idaho. There were 24 U.S. refiners that reported production of commercial-grade silver with an estimated total output of 2,400 tons from domestic and foreign ores and concentrates and from new and old scrap. The physical properties of silver include high ductility, electrical conductivity, malleability, and reflectivity. In 2024, the estimated domestic uses for silver were physical investment (bars), 30%; electrical and electronics, 29%; coins and medals, 12%; photovoltaics (PV), 12%; jewelry and silverware, 6%; brazing and solder, 4%; and other industrial uses and photography, 7%. Other applications for silver include use in antimicrobial bandages, clothing, pharmaceuticals, and plastics; batteries; bearings; brazing and soldering; catalytic converters in automobiles; electroplating; inks; mirrors; photography; photovoltaic solar cells; water purification; wood treatment; and processing of spent ethylene oxide catalysts. Mercury and silver, the main components of dental amalgam, are biocides, and their use in amalgam inhibits recurrent decay.

Salient Statistics—United States:	2020	2021	2022	2023	2024[e]
Production:					
Mine	1,080	1,020	1,010	1,020	1,100
Refinery:					
Primary	1,360	1,920	1,850	1,140	1,200
Secondary (new and old scrap)	582	908	1,090	1,150	1,200
Imports for consumption[2]	6,730	6,160	4,490	4,950	4,200
Exports[2]	141	137	276	73	140
Consumption, apparent[3]	8,250	7,950	6,320	7,070	6,400
Price, bullion, average, dollars per troy ounce[4]	20.58	25.23	21.88	23.54	27.70
Stocks, yearend:					
Industry	55	56	55	27	35
Treasury[5]	498	498	498	498	498
New York Commodities Exchange—COMEX	12,334	11,064	9,299	8,643	9,520
Employment, mine and mill, number[6]	1,175	1,440	1,396	1,455	1,400
Net import reliance[7] as a percentage of apparent consumption	80	76	67	69	64

Recycling: In 2024, approximately 1,200 tons of silver was recovered from new and old scrap, accounting for about 19% of apparent consumption.

Import Sources (2020–23):[2] Mexico, 44%; Canada, 17%; Republic of Korea, 5%; Poland, 5%; and other, 29%.

Tariff: Item	Number	Normal Trade Relations 12–31–24
Silver ores and concentrates	2616.10.0040	0.8 ¢/kg on lead content.
Bullion	7106.91.1010	Free.
Dore	7106.91.1020	Free.

Depletion Allowance: 15% (domestic), 14% (foreign).

Government Stockpile: The U.S. Department of the Treasury maintains stocks of silver (see salient statistics above).

Events, Trends, and Issues: The estimated average silver price in 2024 was $27.70 per troy ounce, 18% higher than the average price in 2023. The price began the year at $24.00 per troy ounce and decreased to the low of $22.00 per troy ounce on January 22. During the first 10 months of 2024, the price reached a high of $34.60 per troy ounce on October 22.

In 2024, global consumption of silver was an estimated 37,000 tons, a slight increase from that in 2023. Coin and bar consumption decreased by 13% in 2024, but consumption of silver for industrial uses was estimated to have increased by 9% compared with that in 2023 owing to growth in the global economy, which was expected to increase demand for consumer electronics, and rising electric vehicle output. Consumption of silver in jewelry and silverware was estimated to have increased by 4% and 7%, respectively. Global consumption of silver exceeded supply and was cited as a reason for price increases in 2024.[8]

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SILVER

World silver mine production decreased in 2024 to an estimated 25,000 tons compared with 25,500 tons in 2023. Domestic silver mine production was estimated to have increased by 6% in 2024. The Rochester Mine in Nevada was ramping up an expansion project and the Lucky Friday Mine in Idaho resumed production in January 2024 after a fire in August 2023.

World Mine Production and Reserves: Reserves for China, Peru, and Poland were revised based on Government reports.

	Mine production		Reserves[9]
	2023	2024[e]	
United States	1,020	1,100	23,000
Argentina	808	800	6,500
Australia	1,030	1,000	[10]94,000
Bolivia	1,350	1,300	22,000
Canada	306	300	4,900
Chile	1,260	1,200	26,000
China	3,400	3,300	70,000
India	813	800	8,000
Kazakhstan	985	1,000	NA
Mexico	6,290	6,300	37,000
Peru	3,200	3,100	140,000
Poland	1,320	1,300	61,000
Russia	1,240	1,200	92,000
Sweden	404	400	NA
Other countries	2,050	2,100	57,000
World total (rounded)	25,500	25,000	640,000

World Resources:[9] Although silver was a principal product at several mines, silver was primarily obtained as a byproduct from lead-zinc, copper, and gold mines, in descending order of silver production. The polymetallic ore deposits from which silver was recovered account for more than two-thirds of U.S. and world resources of silver. Most recent silver discoveries have been associated with gold occurrences; however, copper and lead-zinc occurrences that contain byproduct silver will continue to account for a significant share of reserves and resources in the future.

Substitutes: Digital imaging, film with reduced silver content, silverless black-and-white film, and xerography substitute for traditional photographic applications for silver. Surgical pins and plates may be made with stainless steel, tantalum, and titanium in place of silver. Stainless steel may be substituted for silver flatware. Nonsilver batteries may replace silver batteries in some applications. Aluminum and rhodium may be used to replace silver that was traditionally used in mirrors and other reflecting surfaces. Silver may be used to replace more costly metals in catalytic converters for off-road vehicles.

[e]Estimated. NA Not available.

[1]One metric ton (1,000 kilograms) = 32,150.7 troy ounces.

[2]Silver content of base metal ores and concentrates, ash and residues, refined bullion, and dore; excludes coinage and waste and scrap material.

[3]Defined as mine production + secondary production + imports – exports ± adjustments for Government and industry stock changes.

[4]Engelhard's industrial bullion quotations. Source: S&P Global Platts Metals Week.

[5]Source: U.S. Mint. Balance in U.S. Mint only; includes deep storage and working stocks.

[6]Source: U.S. Department of Labor, Mine Safety and Health Administration (MSHA). Only includes mines where silver is the primary product.

[7]Defined as imports – exports ± adjustments for Government and industry stock changes.

[8]Source: Metals Focus, 2024, World silver survey 2024: Silver Institute, prepared by Metals Focus, 88 p. (Accessed October 10, 2024, at https://www.silverinstitute.org/wp-content/uploads/2024/04/World-Silver-Survey-2024.pdf.)

[9]See Appendix C for resource and reserve definitions and information concerning data sources.

[10]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 27,000 tons.

TIN

(Data in metric tons, tin content, unless otherwise specified)

Domestic Production and Use: Tin has not been mined or smelted in the United States since 1993 or 1989, respectively. Twenty-five firms accounted for more than 93% of the primary tin consumed domestically in 2024. The uses for tin in the United States were tinplate, 23%; chemicals, 22%; solder, 11%; alloys, 10%; babbitt, brass and bronze, and tinning, 6%; bar tin, 2%; and other, 26%. In 2024, the estimated customs value of imported refined tin was $750 million, and the estimated value of tin recovered from old scrap domestically was $310 million based on the average S&P Global Platts Metals Week New York dealer price for tin.

Salient Statistics—United States:	2020	2021	2022	2023	2024[e]
Production, secondary:[e]					
Old scrap	9,320	9,430	9,420	9,430	10,000
New scrap	8,000	7,600	7,900	7,900	7,900
Imports for consumption:					
Refined	31,600	38,100	33,200	28,200	25,000
Tin alloys, gross weight	840	1,110	740	990	740
Tin waste and scrap, gross weight	20,700	18,600	11,600	10,700	9,500
Exports:					
Refined	519	1,290	1,310	918	560
Tin alloys, gross weight	1,130	630	531	652	1,400
Tin waste and scrap, gross weight	1,200	2,800	30,300	38,000	15,000
Shipments from Government stockpile, gross weight[1]	–7	437	—	NA	NA
Consumption, apparent, refined[2]	40,300	48,000	41,200	34,700	37,000
Price, average, cents per pound:[3]					
New York dealer	799	1,580	1,546	1,256	1,400
London Metal Exchange (LME), cash	777	1,478	1,423	1,177	1,400
Stocks, consumer and dealer, yearend	10,400	9,030	9,180	11,200	9,100
Net import reliance[4] as a percentage of apparent consumption, refined tin	77	80	77	73	73

Recycling: About 18,000 tons of tin from old and new scrap was estimated to have been recycled in 2024. Of this, about 10,000 tons was recovered from old scrap at 1 detinning plant and 31 secondary nonferrous-metal-processing plants, accounting for 27% of apparent consumption.

Import Sources (2020–23): Refined tin: Peru, 30%; Bolivia, 23%; Indonesia, 20%; Brazil, 11%; and other, 16%. Waste and scrap: Canada, 95%; Mexico, 4%; and other, 1%.

Tariff: Item	Number	Normal Trade Relations 12–31–24
Unwrought tin:		
Tin, not alloyed	8001.10.0000	Free.
Tin alloys, containing, by weight:		
5% or less lead	8001.20.0010	Free.
More than 5% but not more than 25% lead	8001.20.0050	Free.
More than 25% lead	8001.20.0090	Free.
Tin waste and scrap	8002.00.0000	Free.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile:[5]

	FY 2024		FY 2025	
Material	Potential acquisitions	Potential disposals	Potential acquisitions	Potential disposals
Tin (gross weight)	—	640	—	640

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TIN

Events, Trends, and Issues: The estimated amount of new and old scrap tin recycled domestically in 2024 increased by 3% compared with that in 2023. The estimated annual average New York dealer price for refined tin in 2024 was 1,400 cents per pound, an 11% increase compared with that in 2023. The estimated annual average LME cash price for refined tin in 2024 was 1,400 cents per pound, a 19% increase compared with that in 2023.

In 2024, the United States Department of Commerce proposed antidumping and countervailing duties on tin mill product imports from Canada, China, Germany, and the Republic of Korea following its investigation into dumping and subsidization. However, the U.S. International Trade Commission concluded that these imports did not materially injure the domestic tin mill products industry; therefore, the duties were not implemented. In September 2024, $19 million was awarded by the U.S. Department of Defense under the Defense Production Act, Title III, to establish a tin smelting, refining, and recycling facility in Coatesville, PA.

In April, a Uganda-based tin-mining company commissioned a tin refinery in Mbarara, Uganda. The refinery was expected to produce approximately 1,000 tons per year of more-than-99%-pure tin ingots. In May, a Mauritius-based company announced that it began production at its new processing plant in North Kivu Province, Congo (Kinshasa). Annual tin production was expected to increase to approximately 20,000 tons from the current 12,000 tons. In September, two state-owned leading refined-tin producers from China and Indonesia entered into a strategic partnership to collaborate in mining, smelting and refining, trading, and downstream product development.

World Mine Production and Reserves: Reserves for China and Vietnam were revised based on company and Government reports.

	Mine production		Reserves[6]
	2023	2024[e]	
United States	—	—	—
Australia	9,850	9,900	[7]620,000
Bolivia	18,700	21,000	400,000
Brazil	29,300	29,000	420,000
Burma	[e]34,000	34,000	700,000
China	[e]70,000	69,000	1,000,000
Congo (Kinshasa)	[e]20,000	25,000	120,000
Indonesia	[e]69,000	50,000	NA
Laos	[e]1,700	1,500	NA
Malaysia	3,770	3,000	NA
Nigeria	[e]7,000	7,000	NA
Peru	26,200	31,000	130,000
Russia	[e]2,700	3,000	460,000
Rwanda	[e]3,600	3,600	NA
Vietnam	[e]7,600	6,700	23,000
Other countries	1,840	1,800	310,000
World total (rounded)	305,000	300,000	>4,200,000

World Resources:[6] Identified resources of tin in the United States, primarily in Alaska, were insignificant compared with those in the rest of the world. World resources, principally in western Africa, southeastern Asia, Australia, Bolivia, Brazil, Indonesia, and Russia, are extensive and, if developed, could sustain recent annual production rates well into the future.

Substitutes: Aluminum, glass, paper, plastic, or tin-free steel substitute for tin in cans and containers. Other materials that substitute for tin are epoxy resins for solder; aluminum alloys, alternative copper-base alloys, and plastics for bronze; plastics for bearing metals that contain tin; and compounds of lead and sodium for some tin chemicals.

[e]Estimated. NA Not available. — Zero.

[1]Defined as change in inventory from prior yearend inventory. If negative, increase in inventory. Beginning in 2023, Government stock changes no longer available.

[2]Defined for 2020–22 as production from old scrap + refined tin imports – refined tin exports ± adjustments for Government and industry stock changes. Beginning in 2023, Government stock changes no longer included.

[3]Source: S&P Global Platts Metals Week.

[4]Defined for 2020–22 as refined imports – refined exports ± adjustments for Government and industry stock changes. Beginning in 2023, Government stock changes no longer included.

[5]See Appendix B for definitions.

[6]See Appendix C for resource and reserve definitions and information concerning data sources.

[7]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 320,000 tons.