



2019 Minerals Yearbook

GERMANY [ADVANCE RELEASE]

THE MINERAL INDUSTRY OF GERMANY

By Elena Safirova

In 2019, Germany was the leading producer of kaolin in the world, having produced 11.7%¹ of the world's output; the 2d-ranked producer of peat (13.2%) and fused aluminum oxides (6.2%); the 3d-ranked producer of refined selenium (excluding the United States, 10.4%); the 4th-ranked producer of salt (5.1%); the 5th-ranked producer of potash (7.3%); the 7th-ranked producer of silicon carbide (3.5%), bentonite (2.4%), raw steel (2.2%), pig iron (2.0%), and lime (1.6%); the 8th-ranked producer of refined copper (2.6%); the 9th-ranked producer of diatomite (2.4%); the 10th-ranked producer of industrial sand and gravel (2.3%); and the 11th-ranked producer of gypsum (2.2%). Germany was also a significant world producer of boron compounds, feldspar, fluor spar, graphite, iron oxide pigments, nitrogen, and sulfur (Anderson, 2021; Apodaca, 2021a–d; Bolen, 2021; Briocche, 2021a–d; Crangle, 2021a, b; Dolley, 2021; Flanagan, 2021; Jasinski, 2021; McRae, 2021; Olson, 2021; Simmons, 2021; Tuck, 2021).

In 2019, Germany had a nominal gross domestic product (GDP) of 3.449 trillion euros (\$3.862 trillion),² and its real GDP increased by 0.6%. The unemployment rate was 5.1%, which was a decrease compared with the 5.2% unemployment rate in 2018. Annual inflation in 2017 was 1.45% (Federal Ministry for Economic Affairs and Energy, 2020, p. 2; Macrotrends.net, 2023).

Minerals in the National Economy

In 2019, Germany was a leading global exporter of industrial goods and services, including processed and fabricated mineral products. The country's mineral industry depended heavily on imported mineral raw materials, especially metals; however, all the lignite consumed in the country was supplied by domestic production. Germany was dependent on imports of other mineral fuels (natural gas and crude petroleum) for most of the remainder of its primary energy consumption. Germany's metal processing sector relied on imports of metal ores and concentrates and reprocessing of metallic scrap and waste materials (both imported and produced domestically) because, with the exception of low-grade iron ore, no metals were mined in the country. The country was also heavily reliant on imports of numerous industrial minerals and many refined metals. The international competitiveness of the country's nonfuel mineral processing and fabrication sector relied primarily on such factors as a highly skilled labor force; research, development, and rapid assimilation of new technologies (including metal and other mineral materials recycling technologies); and the

development and maintenance of free-trade relationships both within and outside the European Union (EU). Germany's position in the global mineral economy was predominantly that of a major consumer and processor of minerals (Bundesanstalt für Geowissenschaften und Rohstoffe, 2020, p. 5–45).

Government Policies and Programs

Germany's main mining law is the Federal Mining Act (BGBl. IS. 1310), which was approved on August 13, 1980, and revised on December 9, 2006, through a slight revision to provisions of Article 11 (BGBl. IS. 2833). The country's production of some minerals (including gypsum and anhydrite, limestone and some other types of natural stone, peat, and some types of sand and gravel) was not directly regulated under the Federal Mining Act but was covered by a variety of other land-management and environmental regulations at both the Federal and State levels. Although the creation of the Federal Mines Inspectorate was not mandated in the Federal Mining Act, it does enforce many of the regulations in the main mining law. The Federal Mines Inspectorate was established through Articles 83 and 84 of Germany's Constitution (Bundesministerium der Justiz, 2007, p. 1; Bundesministerium für Wirtschaft und Technologie, 2013, p. 32–46; Bundesanstalt für Geowissenschaften und Rohstoffe, 2020, p. 13–20).

The Environmental Impact Assessment Act (EIA Act) (BGBl. IS. 1757, 2797), which was approved on June 25, 2005, and revised through slight changes to Article 2 (BGBl. IS. 3316) of the act on December 21, 2006, is the environmental law that was most applicable to the mineral industry during 2019. The EIA Act incorporates provisions of an older ordinance concerning the assessment of environmental impacts for mining projects (BGBl. IS. 1420), which was approved on July 13, 1990, and revised through slight changes to Article 8 (BGBl. IS. 2819) on December 9, 2006. The EIA Act also incorporates other older ordinances, such as one for the protection of groundwater against pollution caused by certain dangerous substances (BGBl. IS. 542), which was approved on March 18, 1997, and was still applicable to the use and disposal of many of the chemicals used in mining and mineral processing in Germany. The EIA Act requires environmental impact assessments for all domestic waste repositories created or used by the mineral industry. The Federal Mining Act stipulates how these repositories are to be constructed, operated, and monitored (Bundesministerium der Justiz, 2007, p. 30; Bundesministerium für Wirtschaft und Technologie, 2013, p. 32–46); Bundesanstalt für Geowissenschaften und Rohstoffe, 2020, p. 13–15).

Production

In 2019, the most salient mineral production increase in Germany was that of output of the commodity called “mineral jelly, waxes, and petroleum paraffins,” which increased by 40%.

¹All percentages of world production in this paragraph are calculated based on data in the U.S. Geological Survey Mineral Commodity Summaries.

²Where necessary, values have been converted from euro area euros (EUR) to U.S. dollars (US\$) at the annual average exchange rates of EUR0.893=US\$1.00 for 2019, EUR0.848=US\$1.00 for 2018, EUR0.923=US\$1.00 for 2017, and EUR0.940=US\$1.00 for 2016 and from British pounds sterling (GBP) at the annual average exchange rate of about GBP0.750=US\$1.00 for 2018. All values are nominal, at current prices, unless otherwise stated.

Lignite coal production decreased by 21%; direct-reduced iron and residual fuel oil, by 16% each; and primary refined copper (estimated), by 11%. Anthracite and bituminous coal production stopped in 2018, and there was no production in 2019. These and other data on production of mineral commodities are in table 1.

Structure of the Mineral Industry

Since the closure of the last metal mines in 1992, there has been no production of metallic mineral ores (with the exception of low-grade iron ore) in Germany. Many of the leading companies in the global metal-processing sector owned and operated significant facilities in Germany, however. ThyssenKrupp Steel AG (based near Duisburg, Germany) was the leading producer of raw steel in Germany and the 35th-ranked producer of raw steel in the world. ArcelorMittal S.A. (based in Luxembourg) was the second-ranked producer of raw steel in Germany and the leading producer in the world. Salzgitter AG (based in Salzgitter, Germany) was the third-ranked producer of raw steel in the country but was not among the top 50 producers in the world. Aurubis AG was the leading producer of refined copper in Germany and the EU, and Salzgitter held a 25% ownership interest in Aurubis. Aurubis was the second-ranked producer of copper cathodes and the leading producer of secondary refined copper in the world. Glencore plc (based in Switzerland and registered in the United Kingdom) was the leading producer of zinc metal in Germany and the leading producer of mined zinc in the world. Norsk Hydro ASA of Norway was the second-ranked producer of aluminum in Germany and the fifth-ranked producer of primary aluminum in the world, and the company owned the largest single primary aluminum smelter in Germany (the Rheinwerk primary smelter at Neuss). Berzelius Metall GmbH (based in Stolberg, Germany) was the leading producer of primary lead in the country.

The majority of mining and quarrying enterprises that extract building stone, sand and gravel, and clay (including kaolin and ceramic raw materials) are small regional enterprises. In the sand and gravel industry, 53% of the companies had fewer than 10 employees, and 43% of the crushed stone companies had 10 or fewer employees. This is possibly the result of the promotion of small enterprises by the Government and of the considerable mechanization of the industry. Table 2 lists the major mineral industry facilities in Germany in 2019 (Bundesanstalt für Geowissenschaften und Rohstoffe, 2020, p. 10, 22–46; World Steel Association, 2020, p. 8–9).

In September 2017, Tata Steel of India and ThyssenKrupp of Germany signed a memorandum of understanding to combine their European operations. In June 2018, the two companies outlined details of the merger and signed an agreement. According to the agreement, the new joint venture would be named ThyssenKrupp Tata Steel and would have about 48,000 workers and about 15 billion euros (about \$17.7 billion) in annual sales. In June 2019, the European Commission prohibited the creation of the joint venture, citing that the merger would have reduced competition and increased prices for different types of steel. In August 2019, ThyssenKrupp filed a complaint with the General Court of the European Union against the Commission's decision. The company stated that

the European Commission used an overly restrictive market definition and failed to take into account the effect of imports on market structure. Specifically, ThyssenKrupp stated that overcapacities and high import pressure from Asia would not have impaired competition (Reed, 2017; Thomson Reuters, 2017; Guardian, The, 2018; Meechan, 2018; Deutsche Welle, 2019b; European Commission, 2019).

Mineral Trade

In 2019, Germany had a positive trade balance of 200.5 billion euros (about \$224.5 billion), which was a decrease compared with a balance of 206.1 billion euros (\$243 billion) in 2018. The country's total exports of goods and services amounted to 1,617.4 billion euros (about \$1,811 billion), of which exports of goods amounted to 1,307.7 billion euros (about \$1,464 billion). Germany's share of world trade (the sum of world exports and imports) decreased to 7.1% from 7.2% in 2018. Germany was the most open economy among the Group of Seven (G7) countries, with the degree of openness (measured as the ratio of the international trade value to the country's GDP) equal to 88.0% (Federal Ministry for Economic Affairs and Energy, 2020, p. 1–3).

In 2019, Germany maintained its position as the world's third-ranked exporter of goods after China and the United States. The main export goods were cars and car parts, accounting for 16.8% of goods exports, machines (14.7%), and chemicals (8.9%); metals constituted 4.3% of exports, by value. Germany's major goods export partners were the United States (which received 9.1% of Germany's exports), France (8.1%), China (7.3%), the Netherlands (7.0%), the United Kingdom (6.0%), Italy (5.2%), Austria and Poland (5.0% each), and Switzerland (4.3%) (Federal Ministry for Economic Affairs and Energy, 2020, p. 3, 4, 9, 11–15).

The value of imports of goods and services was 1,417.8 billion euros (about \$1,587 billion), of which imports of goods were valued at 1,087 billion euros (about \$1,217 billion). The main import goods were cars and car parts (11.5% of goods imports); data processing, electronic, and optical devices (10.7%); and machines (7.9%). Imports of crude petroleum and natural gas constituted 5.7% of goods imports, and those of metals, 5.1%. Germany's major import partners were China (which supplied 10.1% of Germany's imports), the Netherlands (9.1%), the United States (6.6%), France (6.1%), Italy and Poland (5.3% each), Czechia (4.4%), Switzerland (4.3%), Austria (4.1%), and Switzerland (4.0%) (Federal Ministry for Economic Affairs and Energy, 2020, p. 3, 8–15).

Commodity Review

Metals

Bauxite and Alumina and Aluminum.—In 2019, Dadco GmbH was the only producer of alumina in Germany. Its alumina refinery was located in Lower Saxony, 40 kilometers (km) west of Hamburg in the Stade-Buetzflath industrial zone. The company compound extends to 55 hectares (136 acres) on the banks of the Elbe River and had its own port for transporting bauxite. The plant was built in 1973 and was

specialized in the production of two major product groups—smelter-grade alumina and alumina chemicals. Smelter-grade alumina was used for production of aluminum metal. Alumina chemicals included damp aluminum trihydrate, dry aluminum trihydrate, and chemical-grade calcined alumina. Together with Rio Tinto plc of the United Kingdom and Alcoa World Alumina and Chemicals of the United States, Dadco owned a 5% share in Compagnie des Bauxites de Guinee (CBG) of Guinea, which had exclusive rights to bauxite resources and reserves in northwestern Guinea through 2038. In 2019, the company employed about 500 workers, which made it the third largest employer in the Stade region. Germany had several other alumina producers, but none of them were in operation in 2019 (Deutsche Welle, 2019a; Dadco Alumina, 2020).

In 2019, Norsk Hydro was one of the leading producers of aluminum and aluminum products in Europe. In Germany, it operated three rolling mills in Grevenbroich, Hamburg, and Neuss. Norsk Hydro also operated four manufacturing plants in Germany focusing on production of aluminum products in Bellenberg, Offenburg, Rackvitz, and Uphusen. In May 2019, Norsk Hydro announced that it wanted to reduce costs in its rolled products business and restructure its production. Specifically, it planned to close its foil production in Grevenbroich and make other changes that would eventually eliminate 735 full-time positions in the company. Norsk Hydro intended to refocus its rolled products business from aluminum foil production to growth subsectors, such as the automotive industry (Thomson Reuters, 2019; Norsk Hydro ASA, 2020).

Industrial Minerals

Cement.—In 2019, Germany produced an estimated 33.9 million metric tons (Mt) of cement, which was a 0.8% increase compared with production in 2018. Germany had 18 cement manufacturers with a total of 49 cement plants. The apparent cement consumption in the country in 2019 was 28.7 Mt compared with 29.1 Mt in 2018. The residential building sector appears to have contributed to cement consumption. According to the European Cement Association (Cembureau), 4% more apartments were built in 2019 than in the previous year. Construction of multifamily housing—a market segment in which concrete has a higher market share than in single-family homes—was primarily responsible for this growth. The commercial building sector, in which completions were estimated to have increased by 1.6% in 2019 compared with that in 2018, and the civil engineering sector, which benefited from increased public infrastructure funding and construction demand during the year, further contributed to increased consumption of cement (tables 1, 2; European Cement Association, 2020, p. 19; Perilli, 2020).

In December 2019, four European cement producers—Buzzi Unicem-Dyckerhoff, HeidelbergCement AG, Schwenk Zement KG, and the Vicat Group of France—founded a joint research corporation. The new corporation was called Cement Innovation for Climate (CI4C) and would work on a research project called “catch4climate,” which would investigate the practical applicability of the oxyfuel carbon capture technology in the cement production process. The oxyfuel technology is a clinker-burning technology in which, instead of ambient

air, pure oxygen is brought in the kiln system to assure proper combustion of all primary and secondary fuels for heat generation. As a result, the exhaust gas contains a high-purity CO₂, which improves the potential for CO₂ capture and possible use in other industrial processes. With this project, the European cement industry hopes to contribute to reduction in CO₂ emissions and climate change. In this framework, the project participants planned to build a testing facility on a semi-industrial scale at the premises of the Mergelstetten cement plant in southern Germany. Upon receipt of operational and emissions-related permits, the official launch of the project was planned for 2020 (HeidelbergCement AG, 2019).

Lithium.—Germany did not produce lithium in 2019, but it had several lithium projects at different stages of development. In May, Deutsche Lithium GmbH, which was a 50–50 joint venture between Bacanora Minerals (Bacanora) of Canada and SolarWorld (a solar manufacturer based in Germany), completed a feasibility study of its Zinnwald lithium project. The project was located in southeastern Germany about 35 km from the city of Dresden and adjacent to the border with Czechia. The project was in the granite hosted tin-tungsten-lithium belt that had been mined for tin, tungsten, and lithium during the past 300 years. In particular, the area produced lithium carbonate in the 1950s. In the deposit, lithium is incorporated in lithium-bearing mica called zinnwaldite, which contains 1.9% lithium by weight. The minerals in the deposit include quartz, lithium-fluorine mica (zinnwaldite), topaz, fluorite and associated cassiterite, wolframite, and minor amounts of scheelite and sulfides. The Zinnwald lithium project was estimated to contain 31.2 Mt of ore grading 3,004 parts per million (ppm) lithium [a total of 94,000 metric tons (t) lithium]. The indicated and measured mineral resources were estimated to be about 40.4 Mt containing 142,000 t of lithium carbonate equivalent with a mean lithium grade of 3,523 ppm (Globenewswire.com, 2017; Deutsche Lithium GmbH, 2019; Graupner, 2019; Sharesmagazine.co.uk, 2019).

The mining project at Zinnwald was expected to have a mine life of 30 years and to produce about 5,100 metric tons per year (t/yr) of high-purity lithium fluoride and 32,000 t/yr of potassium sulfate as a byproduct. The project was expected to extract 600,000 t/yr of ore and to produce 1,800 t/yr of lithium metal (Globenewswire.com, 2017; Deutsche Lithium GmbH, 2019; Graupner, 2019; Sharesmagazine.co.uk, 2019).

In March 2019, Deutsche Lithium was granted an additional exploration license for an area of 42 square kilometers in the Erzgebirge region of Saxony. The new Altenberg license, according to the company, had a potential to increase the life of the mine at Zinnwald. Deutsche Lithium planned to investigate the new exploration area during the following 5 years and expected the exploration to result in additional resources and reserves for the Zinnwald project (Sharesmagazine.co.uk, 2019; NSEnergybusiness.com, 2020).

Vulcan Energy Resources Ltd. of Australia was another company planning to produce lithium in Germany. The Vulcan lithium project is located in the Upper Rhine Valley geothermal field in Germany. The area was rich with hot subsurface brines that have a lithium grade of greater than 150 milligrams per liter (mg/l) lithium (average 161 mg/l).

The Vulcan project comprises areas covered by two granted licenses and three license applications with a total area of approximately 78,600 hectares. The company planned to produce battery-grade lithium hydroxide from geothermal brines and to use a direct precipitation process that would use less water and be less carbon-intensive compared with technologies used in South American salars. The company's goal was to produce zero-carbon lithium to be used for lithium car batteries. In addition to the Vulcan project, Vulcan Energy Resources planned to form a joint venture with Pflanzwerke Geofuture GmbH (an international geothermal energy provider) to extract lithium from lithium-rich brines used in energy production. By yearend 2019, it was not known when feasibility studies of the Vulcan projects would be completed (Hoey, 2019; Miningir.com, 2019; Evans, 2020).

In 2019, Lithium Australia NL of Australia continued work on its Sadisdorf tin-tungsten-lithium project. In June 2018, Lithium Australia purchased full rights for the Sadisdorf from Tin International AG for 2 billion euros (about \$2.36 million). The Sadisdorf project is located within 20 km of Dresden. As of 2019, about \$1.2 million had been spent on exploration activity. The inferred mineral resources of the deposit were estimated to be 25 Mt grading 0.45% Li_2O ; the estimate was based on reanalysis and reinterpretation of historical drilling data and underground sampling. In addition to lithium, tin, and tungsten, the mine would also likely produce a range of byproducts that would include potassium sulfate and sodium silicate. Lithium Australia noted that it had a proprietary SiLeach process hydrometallurgical technology that would be able to extract lithium from zinnwaldite mica. Lithium Australia continued testing of the Sadisdorf samples to confirm the effectiveness of the mica processing. As of 2019, it was not known when Lithium Australia would begin to construct a mine at Sadisdorf (Griffin, 2017; Wahlberg, 2017; CSA Global, 2018; Asiaminer.com, 2019; Proactiveinvestors.com.au, 2019; Lithium Australia NL, 2020).

Potash.—In 2019, Germany produced an estimated 3.4 Mt of potash (in K_2O equivalent). The leading potash producer in Germany was K+S Group, which was a chemical company with headquarters in Kassel, Germany, and produced potash through its wholly owned subsidiary K+S Kali GmbH. K+S operated seven potash mines in three districts in Germany and had potash operations in Canada (table 1; K+S Group, 2020).

In February 2019, the Lower Saxony State Authority for Mining, Energy, and Geology (LBEG) granted K+S a permit for possible resumption of potash production at the Siegfried-Giesen site. The Sarstedt salt deposit had proven reserves of more than 100 Mt of sylvinite and hard salt, which was enough for about 40 years of production. Previously, salt mining and processing at the site had continued until 1987. The company estimated that resumption of production would require an investment of between 700 million and 900 million euros (between about \$780 million and \$1 billion) (Roskill Information Services, 2019).

In March 2019, K+S issued a positive production outlook for the rest of 2019 owing to rising potash prices in the world markets and increased demand for potash. Because of the severe drought in Germany in the summer of 2018, K+S had production outages at its largest potash site in Germany on the Werra River. The company stated that it had increased

the storage capacity for saline wastewater in the Werra area and did not expect any production stoppages in 2019. In September 2019, however, the company announced that it intended to reduce its production of potassium chloride by up to 300,000 t by the end of the year. As of yearend 2019, it was not known if K+S was able to reduce production as intended. The company explained that the weak market environment was further exacerbated by the continued import ban on potassium chloride imposed by the Government of China (Copley, 2019; K+S Group, 2019; Mining.com, 2019).

Mineral Fuels and Related Materials

Coal.—The year 2019 was the first one when Germany did not produce hard coal (anthracite and bituminous coal). In 2018, hard coal production in Germany was estimated to have decreased by 28% compared with that in 2017 to about 2.8 Mt. Sales of all domestically mined hard coal amounted to about 4.0 Mt in 2018 compared with 4.5 Mt in 2017. Those developments were in line with the national plan to close the last two hard coal mines and to stop mining completely by December 31, 2018. The last hard coal mine was closed on December 21, 2018. The decision to stop mining hard coal was made on economic grounds in 2007. Hard coal had been mined in the North Rhine Westphalia region for 200 years and powered Germany's industrialization and economic development after the Second World War. In 2017, only about 4,500 coal mine workers remained in Germany compared with about 600,000 in the 1950s. Coal in the Ruhr region is located deep and in geologically complicated areas, which made the hard coal more expensive to produce. Between the 1970s and 2016, the hard coal sector received 337 billion euros in subsidies, including early retirement severance packages for miners (tables 1, 2; Appunn, 2018; Eckert, 2019).

After 2018, Germany expected to mine hard coal no longer, but to continue using hard coal. Instead of mining hard coal, Germany planned to import coal produced in other countries. Despite the shift towards renewable energy, in 2018, Germany's consumption of coal (including both hard coal and lignite) accounted for about 36% of all energy consumption. In 2019, Germany imported 40.2 Mt of hard coal, which was a decrease of 14.7% compared with that in 2018 owing to competition from renewable energies and natural gas, coupled with lower demand by the steel industry (Appunn, 2018; Eckert, 2019, 2020).

In January 2019, the German Government introduced a proposal to phase out coal-fired powerplants by 2038, which would be a part of planned transition to low-carbon domestic power production. As of March 2019, Germany had about 40 gigawatts (GW) of installed coal-powered generation capacity at 84 powerplants across the country, of which 21 GW was fired by bituminous coal and 19 GW, by lignite. The proposal specified retirement of 13 GW of capacity by 2022 and a further reduction of 10 GW by 2030 (U.S. Energy Information Administration, 2019; Deutsche Welle, 2020).

Peat.—In 2019, Germany produced an estimated 4.2 Mt of peat for horticultural use. In February 2019, the Federal Environment Ministry announced that it had committed 2 million euros (\$2.24 million) for peatland protection in the country. The measures included protection and restoration of

near-natural peatlands, efficient use of peat soils for forestry, and phasing out peat extraction in the parts of the country where peat is produced. Because peatlands were among the most effective terrestrial carbon sinks, preservation of peatlands was a viable climate change policy. When drained or burned for agriculture, peatlands go from being a carbon sink to a carbon source. This policy would likely lead to eventual reduction in peat production in the country (United Nations Environment Programme, 2019).

Outlook

In 2019, Germany's economy continued expanding and employment was also increasing, although at a slower pace than in 2018. Production within the mineral commodity sector was stable; Germany was mostly a processor of minerals, and its industry responded to external demand for its products. The country's role as one of the leading processors of minerals and metals is likely to remain strong. For the years to come, Germany would seek to overcome the consequences of the liquidation of hard coal mining for the energy sector and the rest of the economy and instead to develop green technologies for energy and other industrial sectors. Although there are some active exploration projects, such as lithium projects, in the country, new mining projects will likely take several years to come to fruition owing to the country's strict environmental and other regulation of the mineral industry.

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TABLE 1
GERMANY: PRODUCTION OF MINERAL COMMODITIES¹

(Thousand metric tons, gross weight, unless otherwise specified)

Commodity ²	2015	2016	2017	2018	2019
METALS					
Aluminum:					
Alumina ^c	1,910	1,900	1,900	1,900	1,900
Metal:					
Primary	541	547	550	529	550 ^e
Secondary	620	723	763	762	760 ^e
Total	1,160	1,270	1,310	1,290	1,310 ^e
Other, aluminum hydroxide	1,400	1,400 ^e	1,400 ^e	1,400 ^e	1,400 ^e
Cadmium, refinery, primary ^c	400	400	500	500	500
Copper:					
Smelter:					
Primary	350	343	333	311	289
Secondary	170	159	198	157	169
Total	520	502	531	468	458
Refinery:					
Primary	400	396	413	397	353
Secondary	278	275	281	276 ^r	278
Total	678	671	694	673 ^r	631
Ferroalloys:^c					
Ferromanganese	17,000 ^r	17,000 ^r	17,000 ^r	17,000 ^r	17,000
Other, unspecified	8,200	8,200	8,200	8,200	8,000
Gallium	11,000	16,000	--	--	--
Gold, refinery, primary and secondary	45,000	50,000	52,000	52,000 ^e	50,000 ^e
Iron ore, mine, concentrate	468	--	--	--	--
Iron and steel:					
Direct-reduced iron	550	600	630	560	470
Pig iron	27,844	27,269	27,816	27,271	25,490
Steel:					
Raw steel	42,674	42,081	43,297	42,435	39,675
Products, semimanufactured	36,551	33,248	34,342	34,300 ^e	34,000 ^e
Lead, refinery:					
Primary	125	115	113	98 ^r	100 ^e
Secondary	253	224	241	217 ^r	215 ^e
Total	378	339	354	315	315 ^e
Magnesium:					
Compounds, byproduct of potash mining	1,376	1,130	1,131	1,100 ^e	1,100 ^e
Metal, secondary	15	17	18	18	18 ^e
Platinum-group metals, refinery:					
Palladium	28,000	27,000	31,000	42,000	42,000 ^e
Platinum	22,000	22,000	26,000	34,000	34,000 ^e
Selenium, Se content	250,000	300,000	300,000 ^e	300,000 ^e	300,000 ^e
Silicon, metal ^c	30,500	30,500	30,000	30,000	30,000
Silver, refinery, primary and secondary	1,506	1,726	1,804	1,591	1,600 ^e
Zinc, smelter:					
Primary	139	134	138	130 ^r	130 ^e
Secondary	30	34	36 ^r	50 ^r	50 ^e
Total	169	168	174	180	180 ^e
INDUSTRIAL MINERALS					
Abrasives, corundum	69,000	64,000	67,000	64,000	65,000 ^e
Barite	45,311	49,374	34,177	39,218 ^r	40,000 ^e
Boron, compounds	136	147	141	121 ^r	120 ^e

See footnotes at end of table.

TABLE 1—Continued
GERMANY: PRODUCTION OF MINERAL COMMODITIES¹

(Thousand metric tons, gross weight, unless otherwise specified)

Commodity ²	2015	2016	2017	2018	2019
INDUSTRIAL MINERALS—Continued					
Cement:					
Hydraulic	31,150	32,737	33,991	33,633	33,900 ^e
Clinker, intended for market	23,355	24,000 ^e	24,000 ^e	24,000 ^e	24,000 ^e
Clay:					
Bentonite	395 ^e	393 ^r	416 ^r	379 ^r	380 ^e
Ceramic, including refractory	3,800	3,261 ^r	3,272 ^r	3,139 ^r	3,100 ^e
Kaolin, marketable	4,300 ^e	4,300 ^e	5,200	5,200 ^e	5,200 ^e
Unspecified	56	55 ^e	55 ^e	55 ^e	55 ^e
Diatomite, siliceous earth, marketable	50	52 ^e	52	52 ^e	52 ^e
Feldspar	200 ^e	285	277	253 ^r	260 ^e
Fluorspar, acid grade	49,801	52,552	45,375	49,197 ^r	50,000 ^e
Graphite, crystalline flake ^c	400	500	800	800	800
Gypsum, mine	4,700 ^{r,e}	4,700 ^r	4,450 ^r	4,550 ^r	4,500 ^e
Iron oxide pigments, including synthetic iron oxide	346	363	373	356 ^r	360 ^e
Lime, quicklime, dead-burned dolomite	6,847	6,973	6,991	7,112	7,100 ^e
Nitrogen, ammonia, N content	2,370	2,500	2,580	2,580 ^r	2,420
Phosphate, compounds, phosphoric acid, manufactured, P ₂ O ₅ content	18	20 ^e	20 ^e	20 ^e	20 ^e
Potash, K₂O equivalent:					
Mine	3,751 ^r	3,270	3,587	3,385 ^r	3,400 ^e
Marketable	3,108 ^r	2,751 ^r	2,964 ^r	2,754 ^r	2,700 ^e
Salt, NaCl content:					
Evaporated, including marketable marine salt ^c	280	290	290	300	300
Industrial brines, marketable	7,747 ^r	7,897 ^r	8,046 ^r	8,090 ^r	8,000 ^e
Rock and other brines, marketable	6,124	5,617 ^r	6,531 ^r	7,176 ^r	7,200 ^e
Sand and gravel, industrial, unspecified	9,700 ^r	9,900 ^r	10,300 ^r	10,700 ^r	11,000 ^e
Soda ash, synthetic, manufactured, Na ₂ CO ₃ ^e	2,600	2,600	2,600	2,500	2,500
Stone, sand, and gravel, construction:					
Sand and gravel:					
Crude gravel, including flint and pebbles	9,002	9,642	9,867	10,000 ^e	10,000 ^e
Gravel	69,184	72,877	76,485	76,400 ^e	76,000 ^e
Iron aggregates	468	464	534	448	450 ^e
Sand	67,912	68,834	72,279	73,810	74,000 ^e
Stone:					
Crushed:					
Chalk ^c	1,700	1,700	1,700	1,700	1,700
Dolomite, neither burnt nor sintered	39,000 ^e	38,700	41,000	40,400	40,000 ^e
Limestone, including dolomite, not for cement manufacture	19,000	14,483	15,153	14,563	15,000 ^e
Marble, including other calcareous stone	200 ^{r,e}	200 ^{r,e}	200 ^{r,e}	200 ^{r,e}	190
Other	154,000	155,000 ^e	155,000 ^e	155,000 ^e	150,000 ^e
Dimension, unspecified, including partially worked	444	450 ^e	462	460 ^e	460 ^e
Sulfur, byproduct, S content:					
Metallurgy	384	352	328	254 ^r	250 ^e
Natural gas and petroleum	628	578	538	420	460
Total	1,010	930	866	674 ^r	710 ^e
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Anthracite and bituminous	6,650	4,079	3,840	2,762 ^r	--
Lignite	178,065	171,547	171,286	166,258	131,314
Coke, metallurgical	9,420	9,546	9,860 ^e	9,357	8,800 ^e

See footnotes at end of table.

TABLE 1—Continued
GERMANY: PRODUCTION OF MINERAL COMMODITIES¹

(Thousand metric tons, gross weight, unless otherwise specified)

Commodity ²	2015	2016	2017	2018	2019	
MINERAL FUELS AND RELATED MATERIALS—Continued						
Natural gas:						
Associated, byproduct of crude petroleum	million cubic meters	65	65	62	67	61
Gross, nonassociated	do.	9,388	8,673	7,995	6,889	6,699
Marketable, dry basis or net	do.	8,558	7,874	7,252	6,303	6,063
Peat, horticultural use		3,699	4,051	3,787	4,289 ^r	4,200 ^e
Petroleum:						
Crude	thousand 42-gallon barrels	17,520	17,097	16,106	15,004	13,963
Refinery:						
Bitumen, bituminous mixtures, and other residues	do.	21,330	24,590	25,950	24,304	23,302
Distillate fuel oil	do.	343,100	345,700	342,800	323,600	330,337
Gasoline, including aviation	do.	164,900	172,400	168,200	164,300	162,320
Kerosene, including jet fuel	do.	40,390	41,470	41,700	39,780	39,594
Liquefied petroleum gas	do.	33,470	34,580	43,080	40,620	40,723
Lubricants, including miscellaneous oils	do.	17,000	16,110	17,710	17,930	17,900 ^e
Mineral jelly, waxes, and paraffins	do.	1,020	878	678	1,580	2,207
Naphtha	do.	68,610	67,590	65,660	54,810	57,297
Petroleum coke	thousand 42-gallon barrels	10,560	10,570	9,502	8,526	8,473
Refinery gas	do.	44,530	45,670	46,990	43,410	44,488
Residual fuel oil	do.	37,370	37,180	33,170	32,620	27,342
Other	do.	7,140	7,740	9,050	8,044 ^r	8,689
Uranium, mine, U content	metric tons	--	45	34	--	--

^eEstimated. ^rRevised. do. Ditto. -- Zero.

¹Table includes data available through November 23, 2020. All data are reported unless otherwise noted. Totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²In addition to the commodities listed, Germany may have produced aluminum salt slag, arsenic, calcium carbonate, carbon black, corundum, manufactured gas, strontium, tin alloys, and zeolites, but available information was inadequate to make reliable estimates of output.

TABLE 2
GERMANY: STRUCTURE OF THE MINERAL INDUSTRY IN 2019

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Abrasives (silicon carbide)		ESK-SiC GmbH	Plant at Grefrath, Frechen	36
Alumina		Almatis GmbH (Dubai International Capital LLC, 100%) ¹	Plant at Ludwigshafen	NA
Do.		Alufin GmbH Tabularoxide (Alteo Holdings, 100%) ¹	Plant at Teutschenthal	17
Do.		Aluminium Oxid Stade GmbH (DADCO GmbH, 100%)	Plant at Stade	2,000
Do.		Martinswerk GmbH (Albemarle Corp., 100%) ¹	Plant at Bergheim	350
Do.		Nabaltec AG ¹	Plant at Schwandorf	120
Alumina, fused		Treibacher Schleifmittel GmbH (Imerys S.A., 100%)	Plant at Zschornowitz	NA
Aluminum:				
Primary and secondary		Aleris Recycling (German Works) GmbH (Aleris Corp., 100%)	Secondary smelters: Erftwerk at Grevenbroich, Innwerk at Toeing am Inn, and Neckarwerk at Deizisau	320
Do.		Aluminiumwerk Voerde Aluminium GmbH (Klesch & Company Ltd., 100%)	Primary smelter at Voerde, North Rhine-Westphalia	130
Do.		Hamburger Aluminium-Werke GmbH (TRIMET Aluminium AG, 100%)	Primary smelter near Hamburg	133
Do.		Hydro Aluminium Deutschland GmbH (Norsk Hydro ASA, 100%)	Rheinwerk smelter at Neuss	235
Do.		Metallhüttenwerke Bruch GmbH	Secondary foundry alloy plant at Dortmund; secondary cast alloy plants at Asperg and Bad Saeckingen	110
Do.		TRIMET Aluminium AG	Primary smelter at Essen-Borbeck	175 ^c
Do.		do.	Recycling plant and secondary smelter at Gelsenkirchen	160 ^c
Do.		do.	Recycling plant and secondary smelter at Harzgerode	40
Products, hot-rolled		Aluminium Norf (Alunorf) GmbH [Novelis Inc. (HindalcoIndustries Ltd., 100%), 50%, and Hydro Aluminium Deutschland GmbH, 50%]	Lippenwerk plant at Luenen (secondary) and rolling mill at Neuss	1,500
Do.		Hydro Aluminium Deutschland GmbH (Norsk Hydro ASA, 100%)	Plants in Bellenberg, Offenburg, Rackvitz, and Uphusen; rolling mills in Grevenbroich, Hamburg, and Neuss	NA
Aluminum salt slag		Befesa Management Services GmbH (Befesa medio ambiente S.L., 100%)	Plants at Hannover, Luenen, and Toeing	380
Do.		K+S Entsorgung GmbH (K+S Aktiengesellschaft, 100%)	REKAL plant at Wanstorf	100
Arsenic, metal	metric tons	PPM Pure Metals GmbH ² (Recylex S.A., 100%)	Plant at Langelsheim	5
Do.	do.	Reinstmetalle Osterwieck GmbH (PPM Pure Metals GmbH, ² 100%)	Plant at Osterwieck	NA
Barite		Sachtleben Bergbau GmbH	Clara Mine in the Black Forest and plant at Wolfach, and Dreislar Mine at Medebach-Dreislar	87
Do.		Deutsche Baryt-Industrie Dr. Rudolf Alberti GmbH & Co. KG (Sachtleben Bergbau GmbH, 75%, and other private, 25%)	Wolkenhügel Mine in the Harz Mountains and plant at Bad Lauterberg	50
Cadmium, metal:				
Primary (byproduct)	metric tons	Metaleurop Zinkbetrieb GmbH & Co. KG (Glencore Xstrata plc, 100%)	Nordenham Smelter, near Bremerhaven	500
Secondary		Accurec Recycling GmbH (I-met GmbH, 100%)	Battery recycling plant at Mülheim an der Ruhr	NA
Calcium carbonate, natural, ground		Alpha Calcit Fullstoff GmbH & Co. KG	Plant at Cologne	250
Do.		Eduard Merkle GmbH & Co. KG (Omya AG, 100%)	Plant at Blaubeuren-Altental	NA
Do.		Omya GmbH (Omya AG, 100%)	Plants at Emden	2,250
Do.		Omya Weil GmbH (Omya AG, 100%)	Plant at Weil am Rhein	NA
Calcium carbonate, natural, including chalk		Vereinigte Kreidewerke Dammann KG (Omya AG, 100%)	Plants at Laegerdorf and Soehle	500
Do.		Kreidewerk Rügen GmbH (Omya AG, 100%)	Quarries and plant at Sassnitz, on Ruegen Island	NA

See footnotes at end of table.

TABLE 2—Continued
GERMANY: STRUCTURE OF THE MINERAL INDUSTRY IN 2019

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Carbon black	Orion Engineered Carbons GmbH (Rhône Capital LLC, 50%, and Triton Advisors Ltd., 50%)	Kalscheuren plant near Cologne, and plant near Dortmund	NA
Cement	HeidelbergCement AG	Plant at Burglengenfeld; two plants at Ennigerloh; two plants at Geseke; plants at Koenigs Wusterhausen, Leimen, Paderborn, Mainz-Weisenau, and Schelklingen; the Lengfurt plant at Triefenstein; plant at Wetzlar	12,700
Do.	Dyckerhoff AG (Buzzi Unicem SpA, 88.37%, and other private, 11.63%)	Plants at Deuna, Geseke, Goellheim, Lengerich, Neuss, Neuwied, and the Amöneburg plant at Wiesbaden	7,200
Do.	SCHWENK Zement KG	Plants at Allmendingen, Bernburg, Heidenheim-Mergelstetten, and Karlstadt	6,900
Do.	CEMEX Deutschland AG (CEMEX S.A. de C.V., 100%)	Two plants at Beckum; plants at Dortmund, Duisburg, Eisenhuettenstadt, and Ruedersdorf	5,300
Do.	Holcim (Deutschland) AG (LafargeHolcim Ltd., 88.9%, and other private, 11.1%)	HANSA plant at Bremen, plants at Laegerdorf and Rostock, and the Höver plant at Schnde	3,600
Do.	Holcim (Baden-Württemberg) AG (LafargeHolcim Ltd., 100%)	Plant at Dotternhausen	1,600
Do.	TEUTONIA Zementwerk AG (HeidelbergCement AG, 94.2%, and other private, 5.8%)	Plant at Hannover	900
Do.	Märker Zement GmbH	Plants at Harburg and Lauffen	NA
Clay:			
Bentonite	Süd-Chemie AG (Clariant International Ltd., 100%)	Mines near Gammelsdorf, Bavaria, and plants at Duisburg, Heufeld, and Moosburg	500
Do.	S&B Industrial Minerals GmbH (S&B Industrial Minerals S.A., 100%)	Mines in region between Landshut and Mainburg, Bavaria	400
Do.	do.	Stollberg plant at Oberhausen	200 ^e
Do.	do.	Plant at Neuss	50
Do.	Kärlicher Ton- und Schamotte-Werke Mannheim & Co. KG (KTS)	Quarry at Muelheim-Kaerlich	50
Clay, including ball, ceramic, kaolinitic, and refractory	Adolf Gottfried Tonwerke GmbH	Quarries and plant near Grosssheirath, Coburg, Bavaria	100
Do.	Erbsloh Lohrheim GmbH (Erbsloh family, 100%)	Mine at Lohrheim, Rheinland-Pfalz	30
Do.	Goerg & Schneider GmbH & Co. KG	Quarry and main plant at Boden, other quarries and plants at Mogendorf, G118Goddert, Siershahn, Wirges-Staudt, and Kettenbach-Taunus, Westerwald region and in Saxony and Eifel regions	NA
Do.	Marx Bergbau GmbH & Co. KG (Stephan Schmidt KG, 100%)	Lämmersbach and Meudt Mines, Ruppach-Goldhausen quarry, Dornburg-Langendernbach, Westerwald	350
Do.	Mittelhessische Tonbergbau GmbH (Goerg & Schneider GmbH & Co. KG, 50%, and Stephan Schmidt KG, 50%)	Quarry and plant in the Giessen-Lahn region	100
Do.	Rohstoffgesellschaft GmbH Ponnholz	Mine and chamotte plant at Maxhuetten-Haidoff, and Aufofweiher Mine, Bavaria	150
Do.	Sibelco Deutschland GmbH (S.C.R.- Sibelco NV, 100%)	25 quarries and 8 plants, including 2 at Ransbach and the Kannenbäckerland plant in Hoehr-Grenzhausen, Westerwald region; also including quarries and plant of Kaolin- und Tonwerke Seilitz-Loethain, Saxony region	2,000
Do.	Stephan Schmidt KG	Tonbergbau Grube Anton open pit mine, Dornburg-Langendernbach, Müllenbach and Thewald Mines, Hoehr-Grenzhausen; Wiesa-Thonberg and Cunnersdorf quarries, Kamenz-Wiesa, Westerwald	1,600

See footnotes at end of table.

TABLE 2—Continued
GERMANY: STRUCTURE OF THE MINERAL INDUSTRY IN 2019

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Coal:			
Anthracite and bituminous	RAG Deutsche Steinkohle AG (RAG Aktiengesellschaft, 100%)	Augusta Victoria-Blumenthal, Prosper-Haniel, and West Mines, Ruhr region, North Rhine-Westphalia ¹	11,000 ^c
Do.	do.	Ibbenburen Mine, Steinfurt District, North Rhine-Westphalia ¹	2,100
Lignite	RWE Power AG (RWE Aktiengesellschaft, 100%)	Open pit mines in Rheinish mining area: Bergheim, Garzweiler, Inden, and Hambach	105,000
Do.	Vattenfall Europe Mining AG	Jänschwalde-Cottbus-Nord, Nochten, and Welzow-Süd Mines, Lausatian mining area	60,000
Do.	Mitteldeutsche Braunkohlengesellschaft AG	Profen and Vereinigtes Schleenhain mines	25,000
Coke			
	ThyssenKrupp Steel AG	Schwelgern plant at Duisburg	2,100
Do.	ArcelorMittal Bremen GmbH (ArcelorMittal S.A., 100%)	Coking plant at the Prosper-Haniel Mine	2,000 ^c
Do.	Hüttenwerke Krupp Mannesmann GmbH (ThyssenKrupp Steel AG, 50%; Salzgitter AG, 30%; Vallourec & Mannesmann Tubes S.A., 20%)	Plant at Duisburg-Huckingen steel complex	1,100
Copper, refined			
	Aurubis AG (Salzgitter AG, 25%; institutional investors, 45%; other private investors, 30%)	Primary smelter and refinery and secondary plant at Hamburg	500 ^c
Do.	Hüttenwerke Kayser AG (Aurubis AG, 100%)	Secondary plant and refinery at Luenen	210 ^c
Feldspar			
	Saarfeldspatwerke H. Huppert GmbH & Co. KG	Mine at Oberthal, Gudesweiler, Saarland	60
Do.	Gottfried Feldspat GmbH	Mine at Freihung-Thansuss, Weiden, Bavaria	15
Ferrochrome			
	Elektrowerk Weisweiler GmbH (Kermas Ltd., 100%)	Plant at Eschweiler-Weisweiler, near Aachen	30
Fluorspar			
	Sachtleben Bergbau GmbH	Clara Mine in the Black Forest and plant at Wolfach	55 ^c
Gallium	metric tons	Ingal Stade GmbH (SN Plus Inc., 50%, and Molycorp Inc., 50%)	35
Do.		PPM Pure Metals GmbH ¹ (Recylex S.A., 100%)	NA
Gold, metal			
	Allgemeine Gold- und Silberscheideanstalt AG (Umicore S.A., 91.21%, and other, 8.79%)	Plant at Pforzheim	NA
Do.	Aurubis AG (Salzgitter AG, 25%; institutional investors, 45%; other private investors, 30%)	Primary smelter and refinery and secondary plant at Hamburg	NA
Do.	Heraeus Precious Metals GmbH & Co. KG	Primary smelter and refinery and secondary plant at Hanau	NA
Do.	metric tons	Hüttenwerke Kayser AG (Aurubis AG, 100%)	40 ^c
Do.		Umicore AG & Co. KG (Umicore S.A., 100%)	NA
Graphite, manufactured			
	GK Graphit Kropfmühl GmbH (Advanced Metallurgical Group N.V., 100%)	Plant at Kropfmuehl, Passau	20
Do.	do.	Plants at Bad Godesberg and Wedel, Holstein	8
Gypsum			
	VG-ORTH GmbH & Co. KG	Mine and plant at Stadtdendorf, and plants at Osterode, Spremberg, and Witzenhausen	3,500
Do.	Gyproc GmbH (Etex Group S.A., 80%, and LafargeHolcim S.A., 20%)	Mines and plant in Lower Saxony	1,100
Do.	Knauf Gips KG	Mines and plant at Iphofen	NA
Iron and steel:			
Iron, blast furnace	ThyssenKrupp Steel AG	Two blast furnace plants at Hamborn and Schwelgern	12,000
Iron, direct-reduced	ArcelorMittal Hamburg GmbH (ArcelorMittal S.A., 100%)	Plant at Hamburg	600 ^c
Steel, raw			
	ThyssenKrupp Steel AG	Bruckhausen and Beeckerwerth plants, near Duisburg	12,100
Do.	Salzgitter AG	Plants at Peine and Salzgitter	7,000
Do.	ArcelorMittal Bremen GmbH (ArcelorMittal S.A., 100%)	Plant at Bremen	4,000

See footnotes at end of table.

TABLE 2—Continued
GERMANY: STRUCTURE OF THE MINERAL INDUSTRY IN 2019

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iron and steel:—Continued			
Steel, raw—Continued	Hüttenwerke Krupp Mannesmann GmbH (ThyssenKrupp Steel AG, 50%; Salzgitter AG, 30%; Vallourec & Mannesmann Tubes S.A., 20%)	Plant at Duisburg-Huckingen	3,800
Do.	Saarstahl AG (Struktur-Holding-Stahl GmbH & Co. KG, 74.9%, and Dillinger Hüttenwerke AG, 25.1%)	Plants at Burbach, Neunkirchen, and Voelklingen	3,000
Do.	AG der Dillinger Hüttenwerke (Saarstahl AG, 33.75%; ArcelorMittal S.A., 30.08%; Struktur-Holding-Stahl GmbH & Co. KG, 26.17%; Dillinger Hütte und Saarstahl GmbH, 10%)	Plant at Dillingen	2,800
Do.	Badische Stahlwerke GmbH	Plant at Kehl	2,500 ^e
Do.	ArcelorMittal Eisenhüttenstadt GmbH (ArcelorMittal S.A., 100%)	Plant at Eisenhuettenstadt	2,400
Do.	Brandenburger Elektrostahlwerk GmbH (RIVA FIRE S.p.A., 100%)	Plant at Brandenburg	1,700 ^e
Do.	Outokumpu Norosta GmbH (Outokumpu oyj, 100%)	Plants at Bochum and Krefeld	1,600 ^e
Do.	ArcelorMittal Ruhrort GmbH (ArcelorMittal S.A., 100%)	Plant at Duisburg	1,500 ^e
Do.	Georgsmarienhütte GmbH	Plants at Bous, Georgsmarienhütte, and Groeditz	1,300 ^e
Do.	Stahlwerk Thüringen GmbH (Alfonso Gallardo S.A., 100%)	Plant at Unterwellenborn	1,100
Do.	Deutsche Edelstahlwerke GmbH	Plants at Siegen and Witten	1,100 ^e
Do.	Lech-Stahlwerke GmbH (Max Aicher GmbH & Co. KG, 100%)	Plant at Herbertshofen	1,100 ^e
Do.	ArcelorMittal Hamburg GmbH (ArcelorMittal S.A., 100%)	Plant at Hamburg	1,100 ^e
Do.	Hennigsdorfer Elektrostahlwerk GmbH (RIVA FIRE S.p.A., 100%)	Plant at Hennigsdorf	1,000 ^e
Do.	Elbe-Stahlwerke Feralpi GmbH (Feralpi Siderurgica S.p.A., 100%)	Plant at Riesa	950 ^e
Iron oxide pigments	Lanxess AG	Plant at Krefeld-Uerdingen	300
Kaolin, feldspar, and quartz	Amberger Kaolinwerke GmbH—Eduard Kick GmbH & Co. KG (Quarzwerke GmbH, 100%)	Mines at Caminau, Hirschau, Kemmlitz, and Schnaittenbach, Bavaria	350
Do.	Gebrüder Dorfner GmbH & Co. Kaolin- und Kristallquartzsand Werk KG	Mine near Hirschau, Bavaria	NA
Kyanite, mullite:			
Fused	Imerys Fused Minerals Zschornowitz GmbH (Imerys S.A., 100%)	Plant at Zschornowitz	31
Sintered	Nabaltec AG	Plant at Schwandorf	10
Lead, metal	Berzelius Metall GmbH [Eco-Bat Technologies Ltd. (Quexco Inc., 100%), 100%]	Secondary smelters at Braubach am Rhein and Freiberg-Sachsen	200
Do.	do.	Primary smelter at Stolberg	160 ^e
Do.	Weser Metall GmbH (Recylex S.A., 100%)	Primary and secondary smelter and refinery at Nordenham	145
Do.	Johnson Controls Recycling GmbH (Johnson Controls Inc., 100%)	Battery recycling plant and secondary smelter at Krautscheid	120
Do.	Muldenhütten Recycling- und Umwelttechnik GmbH	Secondary smelter at Freiburg, Saxony	55
Do.	Aurubis AG (Salzgitter AG, 25%; institutional investors, 45%; other private investors, 30%)	Refinery at Hamburg	50
Lead, oxide, Pb content	Weser Metall GmbH (Recylex S.A., 100%)	Primary and secondary smelter and refinery at Nordenham	20
Magnesium, metal, secondary	Norsk Hydro Magnesiumgesellschaft GmbH (Norsk Hydro ASA, 100%)	Plant at Bottrop	26
Do.	Aleris Recycling (German Works) GmbH (Aleris International Inc., 100%)	Plant at Toeging am Inn	15

See footnotes at end of table.

TABLE 2—Continued
GERMANY: STRUCTURE OF THE MINERAL INDUSTRY IN 2019

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Natural gas	million cubic meters	Mobil Erdgas-Erdöl GmbH (Exxon Mobil Corp., 100%), including any fields owned or operated by BEB Erdgas und Erdöl GmbH (Exxon Mobil Corp., 50%, and Royal Dutch Shell plc, 50%)	Goldenstedt, Hemmelte, Klosterseele, Sohlingen, and other fields in Lower Saxony	14,000 ^c
Do.	do.	RWE-Dea AG (RWE Power AG, 100%)	Botersen, Hemsbunde, Volkersen, and smaller fields in Lower Saxony; Inzenham-West Field, Bavaria	3,000 ^c
Do.	do.	Engie Deutschland GmbH (Engie S.A., 100%)	Salzwedel Field, Saxony-Anhalt; Schneeren and smaller fields in Lower Saxony	1,500 ^c
Do.	do.	Wintershall Holding AG (BASF AG, 100%)	A6-B4 Blocks offshore Schleswig Holstein; smaller fields in Lower Saxony	1,200 ^c
Do.	do.	EEG-Erdgas Erdöl GmbH (GDF Suez S.A., 100%)	Muehlhausen and other fields in Thüringen	50 ^c
Petroleum:				
Crude	thousand 42-gallon barrels	Wintershall Holding AG (BASF AG, 100%), 50%, and RWE-Dea AG (RWE Power AG, 100%), 50%	Mittelplate-Dieksand field in tidal flats of the North Sea offshore Schleswig-Holstein	15,500
Do.	do.	Engie Deutschland GmbH (Engie S.A., 100%)	Bramberge, Ruehlertwist, Scheerhorn, and Ringe fields in Lower Saxony; smaller fields in the States of Bavaria, Hamburg, Lower Saxony, and Mecklenburg-Western Pomerania	3,500 ^c
Do.	do.	BEB Erdgas und Erdöl GmbH (Exxon Mobil Corp., 50%, and Royal Dutch Shell plc, 50%)	Georgsdorf, Meppen, and Ruelermoor fields, west of the Ems River (Emsland), Lower Saxony	3,000 ^c
Do.	do.	Wintershall Holding AG (BASF AG, 100%)	A6-B4 Blocks offshore Schleswig Holstein; Aitingen field, Bavaria; Emlichheim field, Lower Saxony; and smaller fields in Lower Saxony and Rheinland-Pfalz	2,000 ^c
Do.	do.	Mobil Erdgas-Erdöl GmbH (Exxon Mobil Corp., 100%)	Barenburg, Ruedme, and Lueben fields, Lower Saxony; smaller fields in the States of Lower Saxony and Rheinland-Pfalz	1,800 ^c
Refined	do.	Deutsche Shell AG (Royal Dutch Shell plc, 100%)	Refineries at Godorf, Hamburg, and Grasbrook	256,000 ^c
Do.	do.	Esso Deutschland GmbH (ExxonMobil Central Europe Holding GmbH, 100%)	Refineries at Karlsruhe and Ingolstadt	245,000 ^c
Do.	do.	Ruhr Oel GmbH (Petróleos de Venezuela S.A., 50%, and BP Gelsenkirchen GmbH, 50%)	Refinery at Gelsenkirchen	216,000 ^c
Do.	do.	BAYERNOIL Raffineriegesellschaft GmbH (OMV AG, 45%; Ruhr Oel GmbH, 25%; AGIP Deutschland GmbH, 20%; Deutsche BP AG, 10%)	Refinery at Neustadt-Donau	145,000 ^c
Do.	do.	Raffinerie Heide GmbH (Klesch & Co. S.A., 100%)	Refinery near Heide, State of Schleswig Holstein	35,000 ^c
Platinum-group metals, refined		Aurubis AG (Salzgitter AG, 25%; institutional investors, 45%; other private investors, 30%)	Primary smelter and refinery and secondary plant at Hamburg	NA
Do.		Heraeus Precious Metals GmbH & Co. KG	Primary smelter and refinery and secondary plant at Hanau	NA
Do.		Umicore AG & Co. KG (Umicore S.A., 100%)	Plant at Hanau	NA
Do.		Allgemeine Gold- und Silberscheideanstalt AG (Umicore S.A., 91.21%, and other, 8.79%)	Plant at Pforzheim	NA
Potash, K ₂ O content		K+S Kali GmbH (K+S Group, 100%)	Mines at Hattorf, Neuhoef-Ellers, Niedersachsen-Riedel, Sigmundshall, Unterbreizbach, Wintershall, and Zielitz	6,000
Salt (evaporated and rock)		ESCO - European Salt Company GmbH & Co. KG [K+S Salz GmbH (K+S AG, 100%)]	Bernburg Mine and evaporated salt works; Borth Mine and evaporated salt works near Wesel; Braunschweig-Lüneburg Mine near Helmstedt	5,300 ^c
Do.		Südsalz GmbH (Südwestdeutsche Salzwerke AG, 90%, and Vereinigte Schweizerische Rheinsalinen AG, 10%)	Rock salt mine at Berchtesgaden and evaporated salt works at Bad Reichenhall, Bavaria; and mine at Heilbronn and evaporated salt works at Bad Friedrichshall-Kochendorf, Heilbronn district, State of Baden-Württemberg	5,000
Do.		Saline Luisenhall GmbH	Evaporated salt works at Gottingen	NA
Do.		Wacker Chemie AG	Stetten rock salt mine near Haigerloch	500

See footnotes at end of table.

TABLE 2—Continued
GERMANY: STRUCTURE OF THE MINERAL INDUSTRY IN 2019

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Sand and gravel:				
Silica sand (industrial sand)		Quarzwerke GmbH	Mines and plants at Frechen, Gambach, Haltern, Hohenbocka, and Weferlingen	4,500 ^e
Do.		Amberger Kaolinwerke GmbH—Eduard Kick GmbH & Co. KG (Quarzwerke GmbH, 100%)	Mines and plants at Hirschau and Schnaittenbach	850
Siliceous earth, silica		Hoffmann Mineral and Co. KG	Mine and plant near Neuburg	55
Selenium, metal	metric tons	Retorte GmbH (Aurubis AG, 100%)	Plant at Röthenbach	500
Silicon, metal	do.	RW Silicium GmbH (Advanced Metallurgical Group N.V., 100%)	Four electric arc furnaces in plant at Pocking	32,000
Silver, metal		Allgemeine Gold- und Silberscheideanstalt AG (Umicore S.A., 91.21%, and other, 8.79%)	Plant at Pforzheim	NA
Do.		Aurubis AG (Salzgitter AG, 25%; institutional investors, 45%; other private investors, 30%)	Primary smelter and refinery and secondary plant at Hamburg	NA
Do.	metric tons	Berzelius Metall GmbH [Eco-Bat Technologies Ltd. (Quexco Inc., 100%), 100%]	Secondary (lead) smelters at Braubach am Rhein and Freiberg-Sachsen; primary (lead) smelter at Stolberg	400 ^e
Do.		Heraeus Precious Metals GmbH & Co. KG	Primary smelter and refinery and secondary plant at Hanau	NA
Do.	metric tons	Hüttenwerke Kayser AG (Aurubis AG, 100%)	Secondary plant and refinery at Luenen	1,300 ^e
Do.		Umicore AG & Co. KG (Umicore S.A., 100%)	Plant at Hanau	NA
Soda ash		Solvay S.A.	Plant at Rheinberg	NA
Stone:				
Dolomite		Rheinkalk Hagen-Halden GmbH & Co. KG (Lhoist NV, 100%)	Steinbruch-Donnerkuhle quarry and Hönnetal plant at Menden, and plant at Hagen-Halden	7,500
Dolomite and lime		Geomin Erzgebirgische Kalkwerke GmbH	Underground mines at Hermsdorf and Lengenfeld	NA
Limestone		Rheinkalk GmbH & Co. KG (Lhoist NV, 100%)	Flandersbach quarry and plant at Wuelfrath, and lime plant at Menden-Hoennetal	7,500
Do.		Schäfer Kalk GmbH & Co. KG	Plants at Hahnstaetten, Steeden, Stromberg, and Grevenbrueck	3,000
Do.		Harz-Kalk GmbH	Quarry at Ruebeland	2,000 ^e
Do.		Kalkwerke Bad Kösen GmbH	Quarry at Bad Koesen	2,000 ^e
Do.		Fels-Werke GmbH	Quarry at Kaltes Tal	2,000 ^e
Strontium, strontium carbonate		Solvay & CPC Barium Strontium GmbH & Co. KG (Solvay S.A., 75%, and Chemical Products Corp., 25%)	Plant at Bad Hoenningen, near Hannover	95
Sulfur		Norddeutsche Erdgas-Aufbereitungs GmbH NEAG [BEB Erdgas und Erdöl GmbH (ExxonMobil Production Deutschland GmbH, 50%, and Royal Dutch Shell plc, 50%), 100%]	Natural gas desulfurization plants at Grossenkneten and Voigtei (near Nienburg-Weser), Lower Saxony	600
Sulfuric acid		Aurubis AG (Salzgitter AG, 25%; institutional investors, 45%; other private investors, 30%)	Acid plant, part of primary copper production facilities at Hamburg	2,500 ^e
Do.		Weser Metall GmbH (Recylex S.A., 100%)	Acid plant near primary lead smelter and refinery at Nordenham	55
Do.		BASF SE	Plant at Ludwigshafen	NA
Do.		Berzelius Metall GmbH [Eco-Bat Technologies Ltd. (Quexco Inc., 100%), 100%]	Plant near primary lead smelter at Stolberg	NA
Do.		Evonik Degussa GmbH (Evonik Industries AG, 100%)	Plant at Worms	NA
Do.		Lanxess AG	Plant at Leverkusen	NA
Do.		Metaleurop Zinkbetrieb GmbH & Co. KG (Glencore plc, 100%)	Acid plant near primary zinc smelter and refinery at Nordenham	NA
Tin alloys, tinplate		ThyssenKrupp Rasselstein GmbH	Plant at Andernach	NA
Zeolites		Hans G. Hauri Mineralstoffwerk GmbH	Mine and plant at Boetzingen, near Freiburg	NA

See footnotes at end of table.

TABLE 2—Continued
GERMANY: STRUCTURE OF THE MINERAL INDUSTRY IN 2019

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
<u>Zinc:</u>			
Metal	Metaleurop Zinkbetrieb GmbH & Co. KG (Glencore plc, 100%)	Nordenham Smelter, near Bremerhaven	180
Oxides	Harz Metall GmbH (Recylex S.A., 100%)	Waelz rotary kilns at Oker-Goslar	80 ^c
Do.	Norzinco GmbH (Recylex S.A., 100%)	Secondary plant at Harlingerode	20
Powder	do.	do.	5

^cEstimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

¹Not in operation as of 2019.

²In addition to producing arsenic as a byproduct of chemical manufacturing and gallium as a byproduct of aluminum production, PPM Pure Metals GmbH produced small quantities of germanium as a byproduct of processing imported ores and concentrates and small quantities of indium and tellurium as byproducts of zinc metal production by PPM's parent company, Recylex S.A.