

2017–2018 Minerals Yearbook

GERMANY

THE MINERAL INDUSTRY OF GERMANY

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Note: In this chapter, information for 2017 is followed by information for 2018.

In 2017, Germany was the 2d-ranked producer of kaolin in the world, producing about 12% of world output, peat (12%), and fused aluminum oxides (6.2%); the 3d-ranked producer of refined selenium (excluding the United States, 11%); the 4th-ranked producer of salt (4.5%); the 5th-ranked producer of potash (6.5%); the 6th-ranked producer of pig iron (2.4%, the same as Brazil); the 7th-ranked producer of silicon carbide (3.6%), raw steel (2.5%), and lime (1.7%); the 8th-ranked producer of industrial sand and gravel (2.7%); the 9th-ranked producer of bentonite (1.9%) and fluorspar (1.0%); and the 10th-ranked producer of diatomite (2.1%). Germany was also a significant producer of gypsum, iron oxide pigments, nitrogen, and sulfur (Anderson, 2019; Apodaca, 2019a, b; Bolen, 2019; Brioché, 2019; Corathers, 2019; Crangle, 2019a, b; Dolley, 2019; Jasinski, 2019; McRae, 2019; Tanner, 2019; Tuck, 2019; West, 2019a, b).

In 2017, Germany had a nominal gross domestic product (GDP) of 3.277 trillion euros (\$3.724 trillion)¹ and its real GDP increased by 2.2%. The unemployment rate was 5.7%, which was a decrease compared with the 6.1% unemployment rate in 2016. Annual inflation in 2017 was 1.5% (Federal Ministry for Economic Affairs and Energy, 2019a, p. 2).

Minerals in the National Economy

In 2017, 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. All the lignite consumed in the country was supplied by domestic production, but 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 no metals were mined in the country, except low-grade iron ore. 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 factors such 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, 2019, 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, 2019, 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 is most applicable to the mineral industry in 2017. 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 from pollution by certain dangerous substances (BGBl. IS. 542), which was approved on March 18, 1997; these ordinances are still applicable to the use and disposal of many 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, 2019, p. 13–15).

Production

In 2017, the most salient mineral production increases in Germany were those of graphite (estimated), which increased by 60%; cadmium (estimated), liquefied petroleum gas, and

¹Where necessary, values have been converted from euro area euros (EUR) to U.S. dollars (US\$) at an annual average exchange rate of EUR0.85=US\$1.00 for 2018, EUR0.88=US\$1.00 for 2017, and EUR0.94=US\$1.00 for 2016. All values are nominal, at current prices, unless otherwise stated.

secondary smelter copper, by 25% each; marketable kaolin (estimated), by 21%; refined platinum, by 18%; and iron aggregates and refined palladium, by 15% each. Barite production decreased by 31%; mined uranium, by 24%; mineral jelly, waxes, and paraffins, by 23%; fluorspar (acid grade), by 14%; residual fuel oil, by 11%; and petroleum coke, by 10%. These and other data on production of mineral commodities are in table 1.

Structure of the Mineral Industry

Table 2 lists the major mineral industry facilities in Germany. Since the closure of the last metal mines in 1992, there has been no production of metallic mineral ores in Germany, except low-grade iron ore. Many of the leading companies in the global metal-processing sector owned and operated significant facilities in Germany, however. ThyssenKrupp Steel AG (based in Duisburg, Germany) was the leading producer of raw steel in Germany and the 29th-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 (Hydro) 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 (table 2; Bundesanstalt für Geowissenschaften und Rohstoffe, 2019, p. 22–46; World Steel Association, 2019, p. 9).

The majority of mining and quarrying enterprises that extracted building stone, sand and gravel, and clay (including kaolin and ceramic raw materials) were small regional companies. 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 trend was likely the result of the promotion of small enterprises by the Government and the considerable mechanization of the industry (table 2; Bundesanstalt für Geowissenschaften und Rohstoffe, 2019, p. 22–46).

In September 2017, Tata Steel of India and ThyssenKrupp signed a memorandum of understanding to combine their European operations. If the companies formed a 50–50 joint venture, they would become Europe's second-ranked steelmaker (with 13% of the market share) after ArcelorMittal, the global leader (which held a market share of 26% in Europe). The two companies planned to merge operations and to cut 4,000 jobs from a total of 48,000, resulting in planned annual savings of about \$720 million. Each company would own a 50% share of the new company, which would be headquartered in Amsterdam. The deal was still facing many obstacles, such as union

opposition and the need to obtain approval from regulators (Reed, 2017; Thomson Reuters, 2017).

Mineral Trade

In 2017, Germany had a positive trade balance of 230 billion euros (about \$261 billion), which was almost unchanged from that of 2016. The country's total exports (goods and services) amounted to 1,538 billion euros (about \$1,748 billion), of which exports of goods accounted for 1,256 billion euros (about \$1,427 billion). The value of imports of goods and services was 1,308 billion euros (about \$1,486 billion). Germany's share of world trade decreased to 7.30% from 7.44% in 2016. Germany was the most open economy within the Group of Seven (G7) countries, with an 86.8% degree of openness, which is measured as the ratio of the international trade value to the country's GDP (Federal Ministry for Economic Affairs and Energy, 2019b, p. 1–2).

In 2017, 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 18.9% of goods exports), machines (14.1%), chemicals (8.9%), and metals (4.0%). Germany's major goods export partners were the United States (which received 8.8% of Germany's exports), France (8.2%), China (6.8%), the United Kingdom (6.7%), the Netherlands (6.6%), Italy (5.1%), Austria (4.9%), Poland (4.7%), and Switzerland (4.2%) (Federal Ministry for Economic Affairs and Energy, 2019b, p. 2–12).

The main import goods were cars and car parts (11.1%); data processing, electronic, and optical devices (10.8%); machines (8.0%); metals (5.2%); and crude petroleum and natural gas (4.9%). Germany's major import partners were the Netherlands (which supplied 13.8% of Germany's imports), China (7.0%), France (6.6%), Belgium (5.9%), Italy and Poland (5.4% each), Czechia (4.8%), the United States (4.5%), Austria (4.3%), and Switzerland (4.2%) (Federal Ministry for Economic Affairs and Energy, 2019b, p. 2–12).

Commodity Review

Metals

Aluminum.—In May 2017, Hydro inaugurated a new line of automotive aluminum at its Grevenbroich plant. The line cost 130 million euros (about \$148 million) to complete and was the largest automotive materials investment Hydro had made recently. The project took 18 months to construct. The company stated that although the demand for general aluminum products had been increasing by 2% to 3% per year, the demand for automotive aluminum was increasing by about 14% per year. This was due largely to rules and regulations in Europe that gave car makers incentive to build lighter and more environmentally friendly cars. In the Neuss area, Hydro operated the largest aluminum network in Europe, consisting of the aluminum recycling smelter in Dormagen the joint-venture rolling mill Aluminium Norf GmbH (Alunorf), and the finishing mill in Grevenbroich. Overall, Germany was Hydro's main market, with sales in 2016 of about 1.4 billion euros (about \$1.49 billion) and more than 6,000 employees in Hamburg, Rackwitz (near Leipzig),

Neuss, and Grevenbroich. In addition to aluminum production facilities, Hydro had a large central research and development center, based in Bonn, and a sorting center for used aluminum in Dormagen. The main business lines for Hydro in Germany were automotive, cans, foil, general engineering, and lithographic applications. Hydro was founded in 1905 and was approximately 40% owned by the Norwegian Government as of 2017. The company had plants in Brazil, Germany, and Norway (Aluminiuminsider.com, 2016; Hydro.com, 2017).

Iron and Steel.—In 2017, steel production in Germany increased by about 2.9% to 43.3 million metric tons (Mt). Germany's raw steel production increased by 36% between 2009 and 2011 and then maintained a steady average of about 42 Mt through 2016. Apparent consumption between 2009 and 2017 was either on par or slightly above production figures. Between 2009 and 2017, Germany's steel exports—expressed as a percentage of production—decreased slightly but remained above 50%; in 2017, exports amounted to 60.3% of production (U.S. International Trade Administration, 2018).

In 2016 (the latest year for which data were available), 14 steel producers accounted for 99% of Germany's total steel production and the top 6 accounted for 85% of production. The top six producers were ThyssenKrupp, which produced 12.1 Mt of raw steel, ArcelorMittal (7.8 Mt), Salzgitter (7.0 Mt), Hüttenwerke Krupp Mannesmann GmbH (HKM) (3.8 Mt), Saarlöh AG (2.5 Mt), and Badische Stahlwerke GmbH (2.4 Mt). In addition to raw steel, ThyssenKrupp specialized in such products as coated and electrical steel, plate, sheet, strip, and stainless steel. ArcelorMittal produced flat and long products and tube whereas Salzgitter focused on strip, plates, sections, pipe, and tube products. HKM specialized in semifinished products; Saarlöh, in wire rods, bars, and semifinished products; and Badische Stahlwerke, in rebar, wire rod, and steel wire. Germany's leading companies employed predominantly electric arc furnace technology (U.S. International Trade Administration, 2018).

In 2017, Germany was the world's fifth-ranked steel exporter and exported 26.1 Mt of steel, which was a 4.8% increase compared with that of 2016. In terms of value, steel represented only about 1.8% of all Germany's goods exports. Flat products accounted for 54% (or 14.1 Mt) of all steel exports; long products, 26% (6.8 Mt); pipe and tube products, 9.6% (2.5 Mt); semifinished steel, 7.3% (1.9 Mt); and stainless steel products, 3.5% [918,000 metric tons (t)] (U.S. International Trade Administration, 2018).

In terms of steel export destinations, Germany's top 10 steel markets represented 71% of its steel export volume, or 18.4 Mt. France was the leading market, accounting for 13.0% (3.4 Mt); Poland, 10.0% (2.6 Mt); Italy, 9.2% (2.4 Mt); the Netherlands, 8.4% (2.2 Mt); and Belgium, 6.9% (1.8 Mt). The United States ranked seventh, accounting for 5.0% of Germany's exports (1.3 Mt). Germany's major steel export destinations varied by types of steel products. In 2017, the largest share of flat products (1.7 Mt, or 12%) was exported to Poland, followed closely by Italy (1.6 Mt, or 11.7%). The leading destination for Germany's long steel products was France, which received 756,000 t, or 11%. France was also the leading export destination for semifinished steel (1.2 Mt, or 63%) and pipe and tube exports (371,000 t, or 15%). Stainless steel was produced in smaller

amounts and was exported to Austria (97,000 t, or 11%) and Belgium (78,000 t, or 9%), as well as to France, Italy, and Poland (U.S. International Trade Administration, 2018).

Several countries had tariffs and other measures in place to reduce the impact of steel product imports from Germany. As of June 2017, Brazil, Mexico, and the United States had antidumping duties in effect against steel mill products from Germany. In addition, China, India, and Morocco had antidumping duties against steel mill products from the EU (U.S. International Trade Administration, 2018).

Industrial Minerals

Cement.—In 2017, Germany produced about 34.0 Mt of cement, which was a 3.8% increase compared with production in 2016. Cement consumption in the country increased by 4.8% to 28.8 Mt in 2017. According to recent estimates, the main factor contributing to the increase in cement consumption was the increase in residential building construction, in particular a 9% increase in apartment construction in 2017. Additionally, estimated growth in commercial building construction was 5.5% in 2017. Germany had 18 cement manufacturers with a total of 46 cement plants. The cement industry generated annual sales of about 2.7 billion euros (about \$3.1 billion) and employed about 8,000 workers in Germany (table 1; BFT-international.com, 2018; Cembureau.eu, 2018, p. 31; VDZ-online.de, 2019).

Lithium.—In February 2017, Bacanora Minerals (Bacanora) of Canada announced that it had entered into an agreement to acquire a 50% stake of the Zinnwald Lithium project from SolarWorld AG, which was the leading solar panel producer in Europe. The Zinnwald Lithium project was located in southeastern Germany about 35 kilometers from the city of Dresden and adjacent to the border with Czechia. The project was located in the granite-hosted tin-tungsten-lithium belt that had been mined for tin, tungsten, and lithium for the past 300 years. In particular, the area produced lithium carbonate in the 1950s. A resource estimate done in October 2014 reported contained resources of 200,000 t of measured, 311,000 t indicated, and 194,000 t inferred resources of lithium carbonate equivalent. In 2017, Bacanora was working on additional infill drilling and an improved grade model to develop an updated resource estimate in accordance with the NI 43-101 standard. Bacanora planned to invest 5 million euros (about \$5.7 million) to complete a feasibility study on the project that was expected to take between 18 and 24 months. Proximity to existing lithium chemical infrastructure and automotive manufacturing plants that demand batteries for electric vehicles constituted an attractive feature of the project because they formed market demand for lithium (Globenewswire.com, 2017).

In December 2017, Lithium Australia NL announced that a new mineral resource estimate had been completed for the Sadisdorf tin-tungsten project located in Saxony. Lithium Australia was a lithium exploration and processing technology developing company located in Perth, Western Australia, Australia. Earlier, in March, the company announced that it had formed a joint venture with Tin International AG. The inferred mineral resources of the Sadisdorf deposit were estimated to be 25 Mt grading 0.45% Li₂O; the estimate was based on reanalysis and reinterpretation of historical drilling

data and underground sampling. The historic tin mine was characterized by altered granites known to contain lithium mineralization in the form of zinnwaldite, which was a type of lithium mica. X-ray diffraction analysis showed quantities of lithium-bearing mica ranging from 9% (average in the outer granite zone) to 12.5% (average in the inner zone) with localized values in the inner zone reaching 38% zinnwaldite. Tin International AG had previously identified Joint Ore Reserves Committee (JORC)-compliant mineral resources of the deposit as being 3.36 Mt grading 0.44% tin at a cutoff grade of 0.25% tin. In addition to lithium, tin, and tungsten, the mine would also likely produce a range of byproducts that included potassium sulfate fertilizer and sodium silicate. Lithium Australia noted that it owned 100% of the SiLeach process hydrometallurgical technology capable of extracting lithium from zinnwaldite mica. Lithium Australia continued testing Sadisdorf samples to confirm the effectiveness of the mica-processing technology (Griffin, 2017; Wahlberg, 2017).

MINERAL INDUSTRY HIGHLIGHTS IN 2018

Minerals in the National Economy

In 2018, Germany had a nominal GDP of 3.386 trillion euros (\$3.984 trillion) and its real GDP increased by 1.4%. Industrial production contributed 26% to the country's GDP. The unemployment rate was 5.2%, which was a decrease compared with the 5.7% unemployment rate in 2017. Annual inflation in 2018 was 1.8%. In 2018, Germany had a positive trade balance of 206.1 billion euros (about \$242 billion). Germany's share of world trade decreased to 7.2% from 7.3% in 2017 (Federal Ministry for Economic Affairs and Energy, 2019a, p. 2, 5; 2019b, p. 1, 2).

The value of exports of goods and services was 1,586 billion euros (\$1,866 billion), of which exports of goods accounted for 1,295 billion euros (\$1,524 billion) and exports of services, 291 billion euros (about \$342 billion). In 2018, 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 (17.5%), machines (14.8%), and chemicals (9.0%); metals constituted 4.3% of exports (Federal Ministry for Economic Affairs and Energy, 2019b, p. 2–12).

Production

In 2018, production of mineral jelly, waxes, and paraffins increased by 133%; refined palladium, by 35%; refined platinum, by 31%; and marketable potash, by 10%. At the same time, anthracite and bituminous coal output (estimated) decreased by 30%; sulfur from natural gas and petroleum, by 22%; secondary smelter copper, by 21%; naphtha, by 17%; iron aggregates, by 16%; gross, nonassociated natural gas, by 14%; marketable natural gas, by 13%; refined silver, by 12%; direct-reduced iron and refined lead, by 11% each; and petroleum coke, by 10%. There was no uranium production in 2018. These and other production data are in table 1.

Structure of the Mineral Industry

In June 2018, Tata Steel and ThyssenKrupp signed an agreement and outlined details of the merger of their European operations. Both companies stated that the merger would mean more security for workers and that the labor unions welcomed the merger in the form it was signed. The new venture would be named ThyssenKrupp Tata Steel and have about 48,000 workers and about 15 billion euros (about \$17.6 billion) in annual sales. ThyssenKrupp stated that in case of an initial public offering of the joint venture, which was widely expected by investors, it would get a slightly bigger share of the proceeds, reflecting an economic ratio of 55–45 (Guardian, The, 2018; Meechan, 2018).

Commodity Review

Industrial Minerals

Cement.—In 2018, cement production in Germany amounted to 33.6 Mt, which was a 1.1% decrease compared with that of 2017. The apparent consumption in 2018 was 29.1 Mt compared with 28.8 Mt in 2017. About 32% of the cement consumed was used in housing construction, 33.5% in office and industrial building construction, and 34.5% in civil engineering construction projects, such as roads and bridges. In 2018, 5.0% more apartment buildings were constructed and 6.4% more commercial buildings were built than in 2017. In 2018, Germany's per capita cement consumption was 351 kilograms, which is low compared with other industrialized countries, but the country was ranked 17th in the world and 1st in Europe in terms of cement production (Cembureau.eu, 2019, p. 19; Cemnet.com, 2019; VDZ-online.de, 2019).

Cement production was responsible for 7% of global carbon dioxide emissions. LafargeHolcim Ltd. of Switzerland and HeidelbergCement AG, the two top cement producers in Europe, were involved in efforts to lessen emissions in the cement production process. LafargeHolcim, as part of a 3-year investment plan, invested 160 million Swiss francs (\$162 million) in Europe to reduce CO₂ emissions. Germany-based HeidelbergCement announced its participation in Northern Lights, a carbon capture and storage project aimed at injecting CO₂ underneath the North Sea. In addition, in the past several years, HeidelbergCement invested 350 million euros (about \$390 million) in new process technology, energy efficiency, alternative fuels, and environmental protection. HeidelbergCement stated that it intended to sell carbon-neutral concrete by 2050 at the latest. In addition to the efforts mentioned above, European cement companies participated in the Emissions Trading System (ETS)—the main EU instrument to reduce emissions from heavy industrial operations (Matalucci, 2019).

In April 2018, a new kiln line at the Burglengenfeld plant, owned by HeidelbergCement, began production. Construction of the new line took about 2 years. The new line comprised a two-string, five-stage preheater tower with inline calciner and fire bed combustor. The kiln was designed to comply with future regulations of emission levels and was able to use a broad range of alternative fuels (IKN.eu, 2018).

Potash.—In 2018, Germany produced 3.2 Mt of marketable potash in K₂O equivalent, which was a 10.3% increase

compared with that of 2017. Germany was the fifth-ranked potash producer in the world following Canada, Belarus, Russia, and China. K+S Kali GmbH was the leading potash mining company in Germany with six mines in three potash-producing districts—the Hanover district in Lower Saxony, the Calvoerder district in Saxony-Anhalt, and the Werra-Fulda district in Hesse and Thuringia. Because of the composition of Germany’s raw potash material, which had more magnesium sulfate and potassium sulfate than deposits elsewhere, K+S produced a diverse range of fertilizer products (table 1; Investingnews.com, 2014; Jasinski, 2020).

In November 2017, K+S decided to end potash production at the Sigmundshall plant near Hannover in late 2018 because mining conditions had become more difficult and crude salt reserves had dwindled. Toward the end of 2017, the mine, which was part of the Bokeloh salt deposit and operated at a 1,400-meter depth, was reaching human and technological limits, according to the company. The site employed about 730 workers, and the company expected to discuss possible solutions for the closure situation with union representatives. The site had the potential to be redeveloped as an aluminum-salt slag recycling facility (Ewing, 2017).

In January 2018, K+S commissioned a kainite crystallization and flotation (KCF) processing facility at its Hattorf potash site in central Germany. The KCF facility would reduce saline water disposal into the Werra River by about 20% and therefore help maintain potash production at the Hattorf, Wintershall, and Unterbreizback sites in Hesse and Thuringia and protect 4,000 jobs at those sites. The company stated that the facility would allow production of an additional 260,000 t of marketable products, such as potassium chloride and magnesium sulfate. K+S invested 180 million euros (\$205 million) in the KCF facility, making it the company’s largest individual investment in water protection to date. The facility construction involved integration of a new building into the plant structure and took 24 months to complete (Baumgarten, 2018).

In November 2018, K+S revised its full-year earnings projection downward after a severe drought affected production at its main mine network in the third quarter. K+S had to shut down production at its Wintershall site in late August and the Hattorf site in September because exceptionally low water levels in the Werra River precluded the company from disposing wastewater. The mine was fully operational by early October, but every day of stoppage cost the company about 1.5 million euros (about \$1.76 million) (Jamasmie, 2018).

Mineral Fuels and Related Materials

Coal.—In 2018, hard coal (anthracite and bituminous) production in Germany was estimated to have decreased to 2.7 Mt, or by 30% compared with that of 2017. Sales of all domestically mined hard coal amounted to about 4.0 Mt in 2018 compared with 4.5 Mt the previous year. Fewer sales and less production in 2018 aligned with the national plan to close the last two hard coal mines and stop mining completely by December 31, 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 success after the

Second World War. In 2017, only about 4,500 hard coal mine workers remained in Germany compared with 600,000 in the 1950s. Coal in the Ruhr region was located in deep, 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 benefits for miners (table 1; Appunn, 2018; Eckert, 2018).

After 2018, Germany was expected to stop mining hard coal, but would not stop using hard coal. Instead, Germany was expected to import cheaper coal from 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 2018, Germany was expected to import about 45 Mt of coal, which was a 12% decrease compared with that of 2017 (Appunn, 2018; Eckert, 2018).

Outlook

In 2018, Germany’s economy continued to expand and employment to increase, although at a slower pace than in 2017. Production within the mineral commodity sector was stable, as Germany was mostly a mineral processor and its industry responds to external demand for its products. The country’s role as one of the leading processors of minerals and processed metals is likely to remain strong. For the near future, Germany needs to overcome the consequences of the liquidation of hard coal mining for the energy sector and the rest of the economy.

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TABLE 1
GERMANY: PRODUCTION OF MINERAL COMMODITIES¹

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

Commodity ²	2014	2015	2016	2017	2018
METALS					
Aluminum:					
Alumina ^c	1,910	1,910	1,900	1,900	1,900
Metal:					
Primary	531	541	547	550	529
Secondary	599	620	723 ^r	763	762
Total	1,130	1,160 ^r	1,270 ^r	1,310	1,290
Other, aluminum hydroxide	1,300	1,400	1,400 ^c	1,400 ^c	1,400 ^c
Cadmium, refinery, primary ^c metric tons	400	400	400	500	500
Ferroalloys: ^c					
Ferrochromium do.	17,800	17,800	17,800 ^r	17,800	17,800
Other, unspecified do.	8,200	8,200	8,200	8,200	8,200
Copper:					
Smelter:					
Primary	350	350 ^r	343 ^r	333	311
Secondary	179	170 ^r	159 ^r	198	157
Total	529	520 ^r	502 ^r	531	469
Refinery:					
Primary	391 ^r	400 ^r	396 ^r	413	397
Secondary	283 ^r	278 ^r	275 ^r	281	275
Total	674	678	671	694	672
Gallium kilograms	16,000	11,000	16,000 ^r	--	--
Gold, refinery, primary and secondary do.	53,000	45,000	50,000	52,000	52,000 ^c
Iron ore, mine, concentrate:					
Gross weight	456	468	-- ^r	--	--
Fe content	73	NA ^r	-- ^r	--	--
Iron and steel:					
Direct-reduced iron	570	550	600	630	560
Pig iron	27,379	27,844	27,269 ^r	27,816	27,271
Steel:					
Raw steel	42,943	42,674	42,081	43,297	42,435
Products, semimanufactured	36,500	36,551	33,248	34,342	34,300 ^c
Lead, refinery:					
Primary	159 ^r	125 ^r	115 ^r	113	101
Secondary	249 ^r	253 ^r	224 ^r	241	214
Total	408 ^r	378	339	354	315
Magnesium:					
Compounds, byproduct of potash mining	1,455	1,376 ^r	1,130 ^r	1,131	1,100 ^c
Metal, secondary, including castings	15	15	17 ^r	18	18
Platinum-group metals, refinery:					
Palladium kilograms	37,000	28,000	27,000	31,000	42,000
Platinum do.	26,000	22,000	22,000	26,000	34,000
Selenium, Se content do.	250,000 ^r	250,000 ^r	300,000 ^r	300,000 ^c	300,000 ^c
Silicon, metal ^c metric tons	30,500	30,500	30,500	30,000	30,000
Silver, refinery, primary and secondary do.	1,750	1,506	1,726	1,804	1,591
Zinc, smelter:					
Primary	140	139 ^r	134 ^r	138	140 ^c
Secondary	28	30	34 ^r	37	40 ^c
Total	168	169 ^r	168	174	180

See footnotes at end of table.

TABLE 1—Continued
GERMANY: PRODUCTION OF MINERAL COMMODITIES¹

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

Commodity ²	2014	2015	2016	2017	2018
INDUSTRIAL MINERALS					
Abrasives, corundum metric tons	76,000	69,000	64,000	67,000	64,000
Barite do.	87,585	45,311	49,374 ^r	34,177	34,000 ^e
Boron, compounds	139	136 ^r	147 ^r	141	143 ^e
Cement:					
Hydraulic	32,099	31,150	32,737	33,991	33,633
Clinker, intended for market	23,871	23,355	24,000 ^e	24,000 ^e	24,000 ^e
Clay:					
Bentonite	395	395 ^e	395 ^e	395 ^e	395 ^e
Ceramic, including refractory	3,863	3,800	3,800 ^e	3,800 ^e	3,800 ^e
Kaolin, marketable	4,275	4,300 ^e	4,300 ^e	5,200	5,200 ^e
Unspecified	54	56	55 ^e	55 ^e	55 ^e
Diatomite, siliceous earth, marketable	50	50	52 ^e	52	52 ^e
Feldspar, mine	200 ^e	200 ^e	285 ^r	277	280 ^e
Fluorspar, acid grade metric tons	58,100	49,801	52,552 ^r	45,375	45,000 ^e
Graphite, crystalline flake ^c do.	500	400	500	800	800
Gypsum, mine	2,835 ^r	2,872 ^r	3,090	3,238	3,271
Iron oxide pigments, including synthetic iron oxide	340 ^{r, e}	346 ^r	363 ^r	373	370 ^e
Lime, quicklime, dead-burned dolomite	6,747	6,847	6,973	6,991	7,112
Nitrogen, ammonia, N content	2,540	2,370 ^r	2,500 ^r	2,580	2,600 ^e
Phosphate, compounds, phosphoric acid, P ₂ O ₅ content	24	18	20 ^e	20 ^e	20 ^e
Potash, K ₂ O equivalent:					
Mined	3,738	3,750	3,270 ^r	3,587	3,900 ^e
Marketable	3,127	3,110	2,800	2,900	3,200
Salt, NaCl content:					
Evaporated, including marketable marine salt	274	280 ^e	290 ^e	290 ^e	300 ^e
Industrial brines, marketable	6,776 ^r	7,765 ^r	7,770 ^{r, e}	7,800 ^e	7,900 ^e
Rock and other brines, marketable	4,999 ^r	6,124 ^r	6,200 ^{r, e}	6,200 ^e	6,100 ^e
Sand and gravel, industrial, unspecified	7,836	7,500	7,500 ^e	7,500 ^e	7,500 ^e
Soda ash, synthetic, manufactured, Na ₂ CO ₃	2,558	2,600 ^e	2,600 ^e	2,600 ^e	2,500 ^e
Stone, sand, and gravel, construction:					
Sand and gravel:					
Crude gravel, including flint and pebbles	8,270 ^r	9,002 ^r	9,642 ^r	9,867	10,000 ^e
Gravel	71,811	69,184	72,877 ^r	76,485	76,400 ^e
Iron aggregates	456	468	464	534	448
Sand	71,841	67,912	68,834	72,279	73,810
Stone:					
Crushed:					
Chalk	1,736	NA	NA	NA	NA
Limestone, including dolomite, not for cement manufacture	19,000	19,000 ^r	14,483 ^r	15,153	14,563
Marble, including other calcareous stone	350	350 ^e	350 ^e	360 ^e	350 ^e
Other	154,000	154,000	155,000 ^e	155,000 ^e	155,000 ^e
Dimension, unspecified, including partially worked	495	444	450 ^e	462	460 ^e
Sulfur, byproduct, S content:					
Metallurgy	438 ^r	384 ^r	352 ^r	328	330 ^e
Natural gas and petroleum	708 ^r	628	578	538	420
Total	1,150 ^r	1,010 ^r	930 ^r	866	750 ^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	2014	2015	2016	2017	2018
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Anthracite and bituminous	8,340	6,650	4,079 ^r	3,840	2,700 ^e
Lignite	178,178	178,065	171,547	171,286	166,258
Coke, metallurgical	8,945	9,420	9,546	9,860 ^e	9,357
Natural gas:					
Associated, byproduct of crude petroleum million cubic meters	67	65	65	62	67
Gross, nonassociated do.	10,127	9,388	8,673	7,995	6,889
Marketable, dry basis or net do.	9,193	8,558	7,874	7,252	6,303
Peat, horticultural use	5,071 ^r	3,699 ^r	4,051 ^r	3,787	3,800 ^e
Petroleum:					
Crude thousand 42-gallon barrels	17,737	17,520	17,097	16,106	15,004
Refinery:					
Bitumen, bituminous mixtures, and other residues do.	20,940 ^r	21,330 ^r	24,590 ^r	25,950	24,304
Distillate fuel oil do.	332,000	343,100 ^r	345,700 ^r	342,800	323,600
Gasoline, including aviation do.	164,400	164,900 ^r	172,400 ^r	168,200	164,300
Kerosene, including jet fuel do.	37,900	40,390 ^r	41,470 ^r	41,700	39,780
Liquefied petroleum gas do.	31,730 ^r	33,470 ^r	34,580 ^r	43,080	40,620
Lubricants, including miscellaneous oils do.	17,000	17,000	16,110 ^r	17,710	17,930
Mineral jelly, waxes, and paraffins do.	1,110 ^r	1,020 ^r	878 ^r	678	1,580
Naphtha do.	67,510 ^r	68,610 ^r	67,590 ^r	65,660	54,810
Petroleum coke do.	9,880 ^r	10,560 ^r	10,570 ^r	9,502	8,526
Refinery gas do.	42,290	44,530 ^r	45,670 ^r	46,990	43,410
Residual fuel oil do.	38,150 ^r	37,370 ^r	37,180 ^r	33,170	32,620
Other do.	8,260 ^r	7,140 ^r	7,740 ^r	9,050	9,000 ^e
Uranium, mine, U content metric tons	33 ^r	--	45 ^r	34	--

^eEstimated. ^rRevised. do. Ditto. NA Not available. -- Zero.

¹Table includes data available through December 11, 2019. 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 commodities listed, Germany may have produced aluminum salt slag, calcium carbonate, carbon black, dolomite, 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 2018

(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%)	Plant at Ludwigshafen	NA
Do.		Alufin GmbH Tabularoxide (Alteo Holdings, 100%)	Plant at Teutschenthal	17
Do.		Aluminium Oxid Stade GmbH (DADCO Alumina & Chemicals Ltd., 100%)	Plant in Stade	1,050
Do.		Martinswerk GmbH (Albemarle Corp., 100%)	Plant at Bergheim	350
Do.		Nabaltec AG	Plant at Schwandorf	120
Alumina, fused		Treibacher Schleifmittel GmbH (Imerys S.A., 100%)	Plant at Zschornewitz	NA
Aluminum:				
Primary and secondary		Aleris Recycling (German Works) GmbH (Aleris Corp., 100%)	Secondary smelters: Erftwerk at Grevenbroich, Innwerk at Toeging 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 °
Do.		do.	Recycling plant and secondary smelter at Gelsenkirchen	160 °
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 at Luenen (secondary) and rolling mill at Neuss	1,500
Aluminum salt slag		Befesa medio ambiente S.A.	Plants at Hannover, Luenen, and Toeging	380
Do.		K+S Entsorgung GmbH (K+S Aktiengesellschaft, 100%)	REKAL plant at Wanstorf	100
Arsenic, metal	metric tons	PPM Pure Metals GmbH ¹ (Recylex S.A., 100%)	Plant at Langelsheim	5
Do.	do.	Reinstmetalle Osterwieck GmbH (PPM Pure Metals GmbH, ¹ 100%)	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 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 Soehldede	500
Do.		Kreidewerk Rügen GmbH (Omya AG, 100%)	Quarries and plant at Sassnitz, on Ruegen Island	NA
Carbon black		Orion Engineered Carbons GmbH (Rhône Capital LLC, 50%, and Triton Advisors Ltd., 50%)	Kalscheuren plant near Cologne, and plant near Dortmund	NA

See footnotes at end of table.

TABLE 2—Continued
GERMANY: STRUCTURE OF THE MINERAL INDUSTRY IN 2018

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
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 Sehnde	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%)	Mining near Gammelsdorf, Bavaria, and plants at Duisburg, Heufeld, and Moosburg	500
Do.	S&B Industrial Minerals GmbH (S&B Industrial Minerals S.A., 100%)	Mining in region between Landshut and Mainburg, Bavaria	400
Do.	do.	Stollberg plant at Oberhausen	200 ^c
Do.	do.	Plant at Neuss	50
Do.	Kärlicher Ton- und Schamotte-Werke Mannheim & Co. KG (KTS)	Quarry at Muelheim-Kaerlich	50
Clay, including ball clay, ceramic clay, kaolinitic, and refractory clay	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, others at Mogendorf, Goddert, Siershahn, Wirges-Staudt, and Kettenbach-Taunus, Westerwald region; others 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 Ponholz	Mine and chamotte plant at Maxhuetten-Haidoff, and Aufhofweiher 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 plants 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 2018

(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	11,000 ^c
Do.	do.	Ibbenburen Mine, Steinfurt District, North Rhine-Westphalia	2,100
Lignite	RWE Power AG (RWE Aktiengesellschaft, 100%)	Open pit mines in Rheinisch 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 (5N Plus Inc., 50%, and Molycorp Inc, 50%)	Ingal plant at Stade	35
Do.	PPM Pure Metals GmbH ¹ (Recylex S.A., 100%)	Plant at Langelsheim	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%)	Secondary plant and refinery at Luenen	40 ^c
Do.	Umicore AG & Co. KG (Umicore S.A., 100%)	Plant at Hanau	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 Stadtoldendorf, and plants at Osterode, Spremberg, and Witzenhausen	150
Do.	Gyproc GmbH (Etex Group S.A., 80%, and LafargeHolcim S.A., 20%)	Mines and plant in Lower Saxony	110
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 (ThyssenKrupp AG, 100%)	Bruckhausen and Beeckerwerth plants, near Duisburg	12,100
Do.	Salzgitter AG	Plants at Peine and Salzgitter	7,000
Do.	Hüttenwerke Krupp Mannesmann GmbH (ThyssenKrupp Steel AG, 50%; Salzgitter AG, 30%; Vallourec & Mannesmann Tubes S.A., 20%)	Plant at Duisburg-Huckingen	3,800

See footnotes at end of table.

TABLE 2—Continued
GERMANY: STRUCTURE OF THE MINERAL INDUSTRY IN 2018

(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	ArcelorMittal Bremen GmbH (ArcelorMittal S.A., 100%)	Plant at Bremen	4,000
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 ^c
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 ^c
Do.	Outokumpu Norosta GmbH (Outokumpu oyj, 100%)	Plants at Bochum and Krefeld	1,600 ^c
Do.	ArcelorMittal Ruhrort GmbH (ArcelorMittal S.A., 100%)	Plant at Duisburg	1,500 ^c
Do.	Georgsmarienhütte GmbH	Plants at Bous, Georgsmarienhütte, and Groeditz	1,300 ^c
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 ^c
Do.	Lech-Stahlwerke GmbH (Max Aicher GmbH & Co. KG, 100%)	Plant at Herbertshofen	1,100 ^c
Do.	ArcelorMittal Hamburg GmbH (ArcelorMittal S.A., 100%)	Plant at Hamburg	1,100 ^c
Do.	Hennigsdorfer Elektrostahlwerk GmbH (RIVA FIRE S.p.A., 100%)	Plant at Hennigsdorf	1,000 ^c
Do.	Elbe-Stahlwerke Feralpi GmbH (Feralpi Siderurgica S.p.A., 100%)	Plant at Riesa	950 ^c
Iron oxide pigments	Lanxess AG	Plant at Krefeld-Uerdingen	300
Kaolin, feldspar, and quartz	Amberger Kaolinwerke GmbH—Eduard Kick GmbH & Co. KG (Quarzwerte GmbH, 100%)	Mines at Caminau, Hirschau, Kemmlitz, and Schnaittenbach, Bavaria	350
Do.	Gebrüder Dorfner GmbH & Co Kaolin- und Kristallquarzsand 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 ^c
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 2018

(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, Söhlingen, and other fields in Lower Saxony	14,000 ^c
Do.	do.	RWE-Dea AG (RWE Power AG, 100%)	Bötersen, Hemsbünde, Völkersen, 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-Dicksand field in tidal flats of the North Sea offshore Schleswig-Holstein	15,500
Do.	do.	Engie Deutschland GmbH (Engie S.A., 100%)	Bramberge, Ruchlertwist, 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 Ruehlernmoor 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, Ruchme, and Lueben fields, Lower Saxony; smaller fields in the States of Lower Saxony and Rheinland-Pfalz	1,800 ^c
Refined	do.	Deutsche Shell AG	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, Neuhoof-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 Aktiengesellschaft, 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 Salzwerte 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 2018

(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)	Quarzwerte GmbH	Mines and plants at Frechen, Gambach, Haltern, Hohenbocka, and Weferlingen	4,500 °
Do.	Amberger Kaolinwerke GmbH—Eduard Kick GmbH & Co. KG (Quarzwerte 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 °
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 °
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 °
Do.	Kalkwerke Bad Kösen GmbH	Quarry at Bad Koesen	2,000 °
Do.	Fels-Werke GmbH	Quarry at Kaltes Tal	2,000 °
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 °
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 2018

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Zinc:			
Metal	Metaleurop Zinkbetrieb GmbH & Co. KG (Glencore plc, 100%)	Nordenham Smelter, near Bremerhaven	180
Oxides	Harz Metall GmbH (Recylex S.A., 100%)	Wärlz 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.

¹In 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.