THE MINERAL INDUSTRY OF

GERMANY

By Harold R. Newman

In 2001, Germany faced slower economic growth than at almost any time since reunification. The German economy was the world's third largest, after the United States and Japan, and accounted for about one-third of Europe's gross domestic product (GDP). The growth rate of real GDP was about 1.5% compared with 3.0% in 2000. The decrease stemmed from poor performance in the construction sector combined with sluggish consumer spending and a global downturn in technology sectors. Also, persistent high unemployment, high outstanding Government debt, an increased share of Government revenues that went for debt service payments, and growing social security and nonwage labor costs contributed to the problem. The unemployment rate of 9.3% continued to be a sensitive political and economic issue. The top priorities of the Government were to seek ways to increase economic growth and to continue the development of the five Länders (States) that make up eastern Germany. These areas were still dependent upon huge net resource transfers from the west via a variety of Federal and State social payments, entitlement and investment grants, and tax waiver incentives for investment and trade (U.S. Embassy, Berlin, Germany, 2002).

Government Policies and Programs

The Government's declared primary objective continued to be seeking ways to stimulate economic growth and employment and to get a grip on rising government debt. To this end, the Government was pursuing a combination of budget consolidation, growth incentives, and structural reform. Although the Government intervenes in the economy through the provision of subsidies to selected sectors and the ownership of some segments of the economy, competition and free enterprise are promoted as significant segments of Government policy.

Germany was one of the main supporters of European unification and a strong advocate of closer European economic integration. Its economic and commercial policies were increasingly determined by agreements among European Union (EU) members. In harmony with the Schengen Agreement, which became effective on March 26, 1995, most EU member states, which included Germany, agreed to discontinue border controls. This internal market has provided a boost for Germany's export-oriented economy as well as for the economies of other European countries.

On April 29, 1998, new energy legislation designed to introduce competition to the traditionally closed electricity and natural gas sectors came into force. The legislation abolished, among other things, utilities-demarcated monopoly supply areas and created a framework for third-party access to electricity grids and natural gas pipelines. Lignite (brown coal) mining in Germany will be protected from competition until 2005. In 2001, Germany was the world's largest lignite producer with about one-fifth of global output. Renewable and cogeneration plants have been given special significance under the new

legislation (U.S. Energy Information Administration, 2001a§¹). In April 1998, Germany's constitutional court cleared the way for German membership in the European Monetary Union (EMU), and on April 23, 1998, the Bundestag (Germany's Parliament) voted to join the European single currency zone. The EMU began the process of creating a single European currency, referred to as the euro (€), by irrevocably setting the exchange rates of individual states on January 1, 1999. Individual member-states' currencies, which included the German deutsche mark, were phased out in early 2002 (U.S. Energy Information Administration, 2001a§).

Environmental Issues

The environment in Germany is the responsibility of the Federal Ministry for the Environment, Water Conservation and Nuclear Safety. Falling within its purview are the Federal Environment Agency in Berlin, the Federal Office for Nature Conservation in Bonn, and the Federal Office for Radiation Protection in Salzgitter.

Environmental concerns that relate to mining are addressed under the Federal mining law and its provisions for environmental impact assessments that must be completed before mining can start. The objective of the assessment is to identify and evaluate all environmental consequences of a planned project by taking into account various design options. The environmental evaluation process in Germany presents a risk for the company involved because project approval is not guaranteed even after completion of the assessment, which usually involves considerable time and resources.

Improvements in all polluting sectors have been marked; transportation continued to represent the largest source of air pollution. In 2001, more than 44 million cars and 4.5 million trucks were on German roads. Consequently, environmental policy has been tied directly to transportation policy (U.S. Energy Information Administration, 2001§).

Production

Production in the mining and metals industries depended on a variety of factors that included the availability of materials and supply and demand. The easing of the worldwide recession was a positive factor for those industries that depended on exporting their products. The importance of certain sectors of the German mining industry has decreased steadily during the past decade. Notwithstanding the general contraction of the industry, the production levels of certain minerals remain important domestically and on a worldwide scale. Even though its underground mining sector has shrunk significantly in recent years, Germany has remained a world leader in the mining equipment manufacturing sector. The high costs of production in Germany compared with those of competing foreign

¹References that include a section twist (§) are found in the Internet References Cited section.

producers and the problems caused by trying to balance production between the reunified former German Democratic Republic (GDR) and former Federal Republic of Germany (FRG) helped constrain production (table 1).

Trade

Germany was one of the world's major trading nations. About one-third of its GDP depended on exports. On average, one job in four depended on trade. Two-way United States-German trade was worth more than \$80 billion in 2000. Germany was the United States' leading European trading partner. Outside the EU, the United States and Japan were Germany's major trading partners (Müller, 2001).

As a major mineral processing nation, Germany relied mainly on imports to feed the metals processing industry, which transformed raw materials into products that supplied the manufacturing industry and provided the bulk of the country's exported materials. The nonferrous metallurgical industry provided its raw materials by imports and recycling. Supply of precious metals originated from domestic nonferrous refineries, domestic supply of scrap, and imports of wrought metal and scrap. In 2000, German consumption of nonferrous metals (aluminum, copper, lead, tin, and zinc) amounted to almost 4 million metric tons (Mt) (Bundesanstalt für Geowissenschaften und Rohstoffe, 2000).

With the exception of potash and rock salt, feldspar is the sole industrial mineral for which Germany is independent from imports. In 2000 (the latest year for which data are available), Germany's import dependence on other industrial minerals was as follows: 35% for kaolin and bentonite, and 70% for barite and natural graphite (Bundesanstalt für Geowissenschaften und Rohstoffe, 2000).

The rationalization of the German steel industry has resulted in a reduction in steel production capacity. This led to a drop in imported raw materials, especially iron ore and coking coke, which previously represented a large sector of the dry bulk tonnage processed through the country's leading ports. Coupled with this, the planned closure of Germany's loss-making coal mines has been slower than anticipated, which has postponed the estimated increase in demand for steaming coal imports (Bulk Materials International, 2002b, p. 10).

Structure of the Mineral Industry

The structure of the industry in Germany and the principal companies operating in the production and processing of metals and minerals are listed in table 2. Most of the producing and processing facilities still in operation were small compared with those in the former FRG, except for lignite and potash, both of which were very large operations. The restructuring and privatization of the facilities in the former GDR continued in 2001. The Treuhandanstalt (Interest Management Association) retained control of a few companies until they were sold or closed.

Commodity Review

Metals

Alumina.—Treibacher Schleifmittel AG purchased a majority share of Surfatec Elektroschmelze Zschornewitz GmbH & Co. The two companies have had a close working relationship for several years. Surfatec, which was one of the oldest fused

alumina operations in Europe, produced about 15,000 t/yr of white, pink, and brown fused aluminas for the bonded abrasive and refractory markets. Surfatec's main product was a low-soda white fused alumina [99.7% aluminum oxide (Al_2O_3)] for abrasive and refractory applications. It also produced chrometoughened pink [99.4% Al_2O_3 , 0.3% chrome oxide (Cr_2O_3)] and red (97.7% Al_2O_3 , 2.0% Cr_2O_3) abrasive aluminas and a 96.1% Al_2O_3 brown fused alumina (Industrial Minerals, 2001c).

Aluminum.—In 2001, Germany's primary aluminum industry was the largest in the EU, although it was considered to be medium sized when compared with other world producers. VAW Aluminium AG (VAW), which was a member of VIAG Group, accounted for more than 75% of the country's primary aluminum production. VAW's wholly owned aluminum smelters in Germany and its participating interests in smelters abroad ensured the supply of input metal for the company's downstream fabricating operations.

Alcoa Inc. announced it had completed the sale of 50% of Aluminium Oxide Stade GmbH alumina refinery in Stade to Dadco Alumina and Chemicals Ltd. Terms were not disclosed. VAW owned the remaining interest. The sale was required under EU regulatory approval that cleared Alcoa's acquisition of Reynolds Metals Co. in mid-2000 (Alcoa Inc., 2001§).

Norsk Hydro ASA of Norway agreed to buy VAW from the German utility group E.ON AG for about \$3 billion. E.ON was seeking to sell VAW to concentrate on its core business of energy. Norsk expected to achieve cost savings with the merger of VAW with its own aluminum business. The deal remains subject to approval of the European Commission (Mining Journal, 2001).

High-pressure die casting dominated aluminum foundry production in Germany and accounted for more than 55% of output followed by gravity/low-pressure die casting with almost 35% share and finally sand casting with less than 9%; other casting methods made up the balance. The market for light metal castings was dominated by the automotive sector whose share of sales rose to more than 70% in 2001 from about 67% in 1993. The actual importance of this sector was even higher than these figures suggest because most of the castings exported end up in some kind of a vehicle (Metal Bulletin Monthly, 2001a).

Copper.—Norddeutsche Affinerie AG (NA) completed two major projects—the posttakeover of the world's largest secondary copper producer Hüttenwerke Kayser AG (HK) in Lünen and the expansion of NA's flash smelter, which treated 1 Mt of copper concentrate in 2001. NA operated the custom smelter and refinery at Hamburg and was the world's fifth largest custom copper smelter with a production capacity of about 500,000 metric tons per year (t/yr) of copper cathode, 320,000 t/yr of copper rod, and 176,000 t/yr of copper billets and cake (Metal Bulletin Monthly, 2001b).

Steel.—Europe's steel industry may look patchy to some observers, but it is the most consolidated in the world. European steel producers included Usinor Group [24-million-metric-ton-per-year (Mt/yr) capacity], Corus Group (22.9-Mt/yr capacity), Arbed Group (22.4-Mt/yr capacity), Thyssen Krupp Group (18.9-Mt/yr capacity), and Riva Group (14-Mt/yr capacity) and accounted for more than 100 Mt/yr of raw steel capacity, which was about one-half of the EU total. In 2001, Germany was estimated to have produced almost 45 Mt of steel. Thyssen Krupp, which was the largest company, produced around 16 Mt (Steel Times, 2001, p. 18).

Germany's number two steelmaker was Saltzgitter AG whose production rose to more than 8 Mt in 2001. Saltzgitter, which was the biggest seamless tube and pipe producer in Western Europe, continued to reap dividends from its purchase of Mannesmannröhren Werk in 2000. Results from the first 9 months of 2001 showed the company holding on to a strong position despite the downturn in the European steel economy (Metal Bulletin, 2001d).

A German court freed engineering steel and wire rod producer Saarstahl AG from bankruptcy in December 2001. The shareholders stated they would continue to run Saarstahl as a long-term business. Also, a decision was made to invest in an upgrade of the continuous casting area of the steel shop at Völkingen. The company entered bankruptcy administration in 1993 (Metal Bulletin, 2001a).

Preussag Stahl AG was a steel producer that supplied specially welded large pipes for long-distance petroleum and natural gas pipelines as well as flats and beams. Built to advanced technological standards, the Preussag electric steel works, which had been brought online in Peine in late 1997, had a capacity of 750,000 t/yr (Steel Times, 2001, p. 19).

Zinc.—MIM Holdings Ltd. of Australia stated that it no longer regarded its zinc smelting operations in Duisburg, Germany, and Avonmouth, United Kingdom, as part of its core business and was investigating options for exiting the European smelting business. In 2000, the Duisburg smelter produced 90,000 metric tons (t) of zinc and 31,000 t of lead/silver bullion, and the Avonmouth smelter produced 78,000 t zinc and 30,000 t of lead/silver bullion. MIM stated that the primary reason it bought the smelters at Duisburg and Avonmouth was to take the concentrates from the McArthur River Mine in Northern Territory, Australia, but this was no longer necessary because other markets were developed for the mine's concentrates (Metal Bulletin, 2001b).

Industrial Minerals

Cement.—The privatization process launched by Treuhandstalt, which was the State holding company, 11 years ago in East Germany has resulted in a more fragmented industry and a more diversified range of companies than in other European countries. In 2001, seven cement producers and three or four importers competed in an East German market of only 7 Mt. The slowdown of construction in Germany in 2001 affected the cement sector, and profitability continued to fall in the building materials sector. Construction spending has fallen by more than 25% in the new Länders since its 1996 peak. The rate of spending decline (-12.1%) was particularly noticeable in 2001 (Pinatel and Lefèvre-Moulenq, 2002).

Clays.—Between 140 and 160 small- to medium-sized clay mines were in operation in 2000 in Germany. About one-half of the high-quality refractory and ceramic clays produced were from the Rhineland-Palatinate area. Production in Bavaria was concentrated in the Oberfalz area.

Germany was the second largest producer of kaolin in Western Europe after the United Kingdom. Most German kaolin was mined in Bavaria, and Amberger Kaolinwerke GmbH was the largest producer with mines in Hirschau.

In terms of overseas developments, Süd-Chemie AG was the largest bentonite producer in Europe. The company controlled or had minority interests in companies in France, Indonesia, Mexico, the Republic of Korea, Turkey, and the United States.

Süd-Chemie's main business was in Gammelsdorf, Bavaria, where it produced calcium, sodium, and acid-activated, bentonite products.

After S&B Minerals Beteiligungs GmbH acquired the remaining 25.1% stake in IKO-Erbsloeh GmbH & Co. (IKO-E), this brought S&B's holdings to 100%. IKO-E, which was headquartered in Marl, was a supplier of speciality bentonite products. It supplied materials to the refactory market and foundry moulding market. It also supplied building and drilling bentonite, feed additives, and additives to the paint and paper industries. S&B continued to develop a supply network that would connect the final consumers of bentonites with the production of these ores, thus eliminating any intermediaries (Industrial Minerals, 2001a).

Graphite.—Graphitwerk Kropfmühl AG was the only company that mined and processed natural graphite in Germany. The company operated a mine and plant at Kropfmühl, Passau, and a plant at Werk Wedel, Holstein. About one-half of the company's production, which has been falling in recent years because of declining reserves, went into the European refractory industry.

Gypsum.—Germany was a major European producer of crude gypsum. The largest German producer of gypsum Gipswerke Dr. Karl Würth GmbH accounted for more than two-thirds of gypsum production. The company operated a mine and plant in Lower Saxony. The second largest producer Gyproc GmbH Banstoff Production & Co. KG operated mines in Lower Saxony.

Lafarge Gips GmbH (the German gypsum division of the Larfarge Group of France, was to construct a plasterboard plant in Lippendorf, which will use synthetic gypsum from a nearby power station as its principal raw materials. Lafarge planned to achieve a production capacity of 20 million square meters of plasterboard by 2002 as well as semihydrate for plaster products. The proximity of the plant to the Lippendorf power station will provide Lafarge with high-quality synthetic gypsum formed from the desulfurization of flue gas and will offer immediate savings on logistical costs. The plant, which is located 20 kilometers south of Leipzig, is within easy reach of Austrian and German markets (Industrial Minerals, 2001b).

Magnesium.—Thyssen Krupp Stahl AG set up a new company, Magnesium Flachprodukte GmbH, to carry out research and development into the production of magnesium sheet that would be used in automobile production. Thyssen Krupp, which had been formed by the merger of the steel interests of Thyssen AG and Krupp AG had been looking for light- weight material for the automotive sector. Magnesium is mainly used in the automobile industry in castings; Thyssen Krupp, however, was interested in developing rolled flat products for use in vehicle production. The Saxony State Ministry for Economics & Labor will provide funds for the project; the ultimate aim will be to set up an industrial center for magnesium technology in the region (Metal Bulletin, 2001c).

Potash.—After closings and restructuring, Kali und Salz AG (K+S) operated six mines in four potash districts and had a potassium chloride production capacity of 4 Mt/yr; its product grades were 2 Mt/yr of standard grade and 2 Mt/yr of granular grade. Germany was the third largest potash producer in the world after Canada and Russia. K+S had 13% of the world potash market and a 30% share of the market for potassium

sulphate. K+S's largest operation Zielitz Mine underwent a major investment program that resulted in a practically new potash operation (Kali and Salz Group, 2001).

Salt.—K+S and Solvay S.A. of Belgium joined forces on the European salt market. The partners signed an agreement creating a joint venture, European Salt Company (ESCO), that would encompass their salt activities and whose output was intended for third parties. K+S would hold 62% of the new company, and Solvay would own the remaining 38%; this reflected the value of the businesses that both partners brought to the joint venture. ESCO would have a production of about 5 Mt/yr with facilities in Belgium, France, Germany, the Netherlands, Portugal, and Spain (Solvay S.A., 2002§).

K+S started a new production facility at its Sigmundshall potash plant. Production at the plant was based on mining previously untapped reserves of hard salt at the Bokeloh Mine, which are expected to last about 20 years. The facility was designed with a capacity of 300,000 t/yr. Raw salt from the mine was to be processed above ground by using the electrostatic separation process (ESTA®), which was developed by K+S. ESTA® has been used at several sites and has been particularly kind to the environment because it does not require water (K+S Group, 2001§).

Mineral Fuels

Germany has relatively insignificant domestic energy sources and is heavily import-reliant to meet its energy needs. In 2001, the most important energy source in Germany's consumption of primary energy was petroleum with a 41% share of total consumption. About 30% of Germany's energy requirements was satisfied from domestic sources; the remaining 70% was imported. By 2020, the share of imports was expected to rise to 80%; oil was still expected to remain the primary energy source. About 21% of electrical generation was supplied by 19 nuclear plants. The Government signed an agreement with the utility companies to phase out nuclear power generation by 2021 (U.S. Energy Information Administration, 2001a).

German power producers were building four new powerplants with a total capacity of 2,267 megawatts (MW). By 2003, these new powerplants will replace older ones. RWE Rheinbraun AG will build a 965-MW coal-fired plant, which will come online in 2002. RWE Power AG will build a 225- MW gas-fired plant, which will come online at the end of 2002. VEAG Power AG was building a pump storage plant with four reactors at 264 MW to come online 2003. MVV Mannheim AG was building a 20-MW biomass plant, which was to start production in mid-2003. Germany had 112,000 MW of powerplants on the power grid (Alexander's Gas and Oil Connections, 2001b§).

E.ON agreed to buy PowerGen of the United Kingdom for \$14 billion in cash and assumed debt, thus creating Europe's second biggest electricity company. The acquisition, which was the biggest cross-border purchase in the European utilities industry, gave E.ON its first foothold in the United Kingdom. PowerGen's power stations produced enough electricity to supply the homes of more than 8 million people in the United Kingdom. Deregulation of Europe's energy markets was driving companies to expand abroad to counter increased rivalry at home (Alexander's Gas and Oil Connections, 2001a§).

Coal.—Anthracite and Bituminous Coal.—The gradual phase-out of subsidies that have supported Western Europe's coal industry for so long was continuing. This was in line with

EU policy to eliminate subsidies to industries. The reduction in subsidies was to be significant, and inefficient mines were to be closed.

Germany imported close to 40 Mt of hard coal in 2001; this was the first time the country had imported more coal than it produced. German mines produced more than 27 Mt, and it was likely that another 1.5 Mt would be cut in 2002; there were no plans for major mine closures. Poland was the main source with about 10 Mt, although Colombia and South Africa were becoming increasingly more important sources. Imports from the United States were down and were expected to continue to decline (Bulk Materials International, 2002a).

Lignite.—Mining was mainly in the Rheinish area to the west of Cologne and the Lusatian area near Dresden. Lignite mining was under less economic pressure than hard coal mining.

The completion of the so-called Retrofit Program of RWE Rheinbraun brought back into operation the generating block at the Niederaussem powerplant. More than 300 MW of power has been added to the program and will start to supply the power grid in 2003. The new plant will require less coal and significantly reduce carbon dioxide emissions (Engineering and Mining Journal, 2001).

Renewable Energy.—The wind power sector has continued its strong expansion. After 1,115 new units were installed during the first 9 months of 2001, 10,500 wind generators were in operation with an installed capacity of 7,500 MW. The installed capacity, which was up 23% from that of 2000, can produce one-third of the electricity that Germany's nuclear powerplants were producing (Alexander's Gas and Oil Connections, 2001d§).

The Government approved a project to build the world's first wind-propelled electricity power station in the high seas. The project will be located in the North Sea 45 kilometers (km) off the island of Borkum outside the 12-sea-mile sovereign zone of Germany and will be fastened by steel structure in 30 meters (m) of deep water. The project will involve 208 wind propellers that will generate 1,000 MW of electricity. The estimated cost of the project was \$1.5 billion (Alexander's Gas and Oil Connection's, 2001c§).

Uranium.—The ongoing cleanup of the former Soviet Union uranium mining operations in the former GDR was viewed as Europe's biggest mine rehabilitation project. When the Wismut Mines were in production, the only goal was to maximize uranium output. This resulted in an environmental problem of "monumental proportions." At various sites, 48 waste rock piles covered a surface area of about 15 square kilometers (km²) that contained about 311 million cubic meters of waste material. In addition, 14 tailing ponds contained 160 million cubic meters of residues from uranium ore processing plants and covered a surface area of 7 km². The German Government was expected to spend more than \$9 billion on this rehabilitation project during the next 10 to 15 years (Engineering and Mining Journal, 1999). Continuing remediation work in 2001 focused on decommissioning facilities and immobilizing contaminated material in a manner that would limit long-term hazards to humans and the environment.

Infrastructure

Germany had a total of 636,282 km of highways and roads that ranged from the high-speed autobahn system to undeveloped gravel-and-packed-dirt country roads. Of this

total, paved highway was 501,282 km, and unpaved was 135,000 km. The railroad system included 45,468 km of track, about 90% of which was Government owned. Of this total, 44,769 km was 1.435-m standard-gauge track, and 699 km was 1.000-m gauge track. Germany had 600 airports. Pipelines included a 3,644-km line for crude petroleum, a 3,964-km line for refined products, and a 97,564-km line for natural gas. Inland waterways and canals consisted of 7.541 km and 31 major ports; the Kiel Canal served as an important connection between the Baltic and North Seas, and the Rhine-Main-Danube Canal served as a connection between the North and Black Seas. The major maritime ports of Hamburg, Rostock, Bremerhaven, Bremen, and Wihelmshaven, in descending order, accounted for about 70% of total merchandise traffic.

Outlook

Germany's economy grew more slowly during 2001 compared with 2000 and may be on the verge of a slight contraction. This could be offset if growth in Germany's international trading partners increases. Industrial production is expected to remain around current levels. Export-led growth has diminished as the global economy lost momentum. Restructuring industries, which included mineral-resource industries, to be more efficient may result in increased unemployment, which, in turn, would cut into the available resources of the Federal Government in the form of payments for unemployment compensation, retraining, and other social costs. This is expected to continue in the short term.

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Statistisches Bundesamt [Federal Statistics Office]

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 ${\bf TABLE~1}$ GERMANY: PRODUCTION OF MINERAL COMMODITIES 1/2/

(Metric tons unless otherwise specified)

Commodity		1997	1998	1999	2000	2001 e/
METALS						
Aluminum:						
Alumina, Al2O3 equivalent		500	500 /	500	5 00 /	
	sand tons	738	600 e/	583	500 e/	520
Hydrate e/	do.	800 3/	700	700	652 3/	650
Metal:		571.044	(10.201	622.004	642.545	651 600 2
Primary		571,944	612,381	633,804	643,545	651,600 3/
Secondary		432,467	453,328	482,658	572,257	620,300 3/
Arsenic, white, Ar2O3 content e/		250	200	200	200	200
Cadmium, metal, refinery including secondary		1,145	1,020	1,145	458 r/	539 3/
Cobalt, metal including alloys e/		600	500	500	500	500
Copper, metal:						
Smelter:		272 100	250,600	266 100	275 000 /	256 400
Primary		273,100	258,600	266,400	275,000 e/	256,400
Secondary e/		76,000	80,000 3/	60,000	75,000	60,000
Refined:		207.000	222 000	271 000	225 000 /	224.000
Primary		297,800	322,800	271,000	335,000 e/	334,000
Secondary		375,800	373,000	425,000	375,000 e/	375,000
Iron and steel:						
Ore and concentrate:		****	100.000			
Gross weight		200,900	100,000 e/			
Fe content		28,100	14,000 e/			
Metal:		20.020	20.4.2	27.022	20.044	20.404.0
	sand tons	30,939	30,162	27,932	30,846	29,184 3/
Ferroalloys e/ 4/	do.	96 3/	100	90	80	72
Of which ferrochromium	do.	26	21	17	22 r/	19 3/
Steel, crude	do.	45,009	44,046	42,056	46,376	44,803 3/
Semimanufactures	do.	37,074	36,591	35,879	38,974	37,011 3/
Lead, metal:						
Smelter		161,300	100,000 e/	160,600	170,000 e/	155,900 3/
Refined:						
Primary		164,800	176,800	169,557	210,515	153,743 3/
Secondary		164,400	203,400	204,000	204,000 e/	219,640 3/
	kilograms	60,000	60,000	60,000	50,000	50,000
Selenium, metal	do.	115,000 r/	100,000 r/	100,000 r/	100,000 r/e/	100,000
Silver, metal, refined e/	do.	500,000	500,000	500,000	500,000	500,000
Tin, metal, primary and secondary e/		15,708 3/	1,000	1,000	500	100
Uranium, concentrate, U ₃ O ₈ content		27	25 e/	25 e/	28	26
Zinc, metal including secondary		317,681	333,968	332,852	327,500 r/	358,300 3/
INDUSTRIAL MINERALS						
Abrasives: e/						
Natural, pumice		212,000	300,000	250,000	200,000	200,000
Artificial, corundum		60,000	60,000	50,000	60,000	60,000
Barite, marketable (contained BaSO4)		118,698	123,300	118,500	111,800	108,100 3/
Boron materials, processed borax e/		1,200	1,200	1,000	1,000	1,000
Bromine e/		700	600	500	500	500
Cement:						
	sand tons	1,200	1,000	1,000	1,000	1,000
Hydraulic	do.	37,000 e/	36,610	36,219 r/	35,207 r/	30,989 3/
Chalk, crude including ground	do.	425	400	400 e/	1,061 r/	1,045 3/
Clays:						
Bentonite	do.	511	509	477	465	448 3/
Ceramic clay	do.	3,500 e/	5,000 e/	3,543	4,100	3,900
Fire clay e/	do.	1,000	1,000	1,000	1,000	1,000
Fuller's earth e/	do.	500	600	500	500	500
Kaolin, marketable	do.	1,800 e/	3,400	3,543	3,655	3,779 3/
Other, including brick clay	do.	22,000	20,000	20,000 e/	21,000 e/	20,000
Diatomite	do.		54	53	54	50
Feldspar e/		455,969 3/	460,000	500,000	544,000	500,000
Fluorspar:					<u> </u>	
Acid-grade e/		22,500	25,000	26,800	29,600	30,000
Metallurgical-grade e/		1,500	1,500	1,500	1,500	400
Total		24,000 e/	26,500 e/	28,300	31,100	30,400 3/

See footnotes at end of table.

TABLE 1--Continued GERMANY: PRODUCTION OF MINERAL COMMODITIES 1/ 2/ 3/ $\,$

(Metric tons unless otherwise specified)

Commodity		1997	1998	1999	2000	2001 e/
INDUSTRIAL MINERALSContinued						
Graphite, marketable		1,030	270	300	300 e/	300
_	usand tons	3,000	4,000	4,600	2,300 r/	2,000
Lime, quicklime, dead-burned dolomite	do.	7,600 e/	7,000 e/	6,440	6,850	6,900
Magnesium salts (byproduct of potash mining) e/	do.	1,200	1,200	1,200	1,200	1,200
Nitrogen, N content of ammonia	do.	2,471	2,512	2,406	2,473	2,522 3/
Phosphate materials: e/						
Phosphatic fertilizers, P2O5 content		800	700	700	700	700
Thomas slag:						
Gross weight thou	usand tons	150	150	150	200	200
P2O5 content		19,000	19,000	19,000	20,000	20,000
Pigments, mineral, natural e/		4,176 3/	4,000	4,000	4,000	3,000
Potash, K2O content thou	usand tons	3,423	3,582	3,543	3,407	3,549 3/
Pumice, marketable e/	do.	600	600	500	500	500
Salt, marketable:						
Evaporated	do.	700 e/	9,098	8,965	9,322	8,456 3/
Rock and other		15,087	5,056	6,921	4,904	5,052 3/
Sodium compounds, n.e.s.: e/						
Soda ash, manufactured thou	usand tons	1,400	1,400	1,400	1,500	1,500
Sulfate, manufactured	do.	100	100	100	100	100
Stone, sand and gravel:						
Stone:						
Dimension, crude and partly worked e/		100,000	100,000	100,000	100,000	100,000
Dolomite and limestone, industrial thou	usand tons	68,000 e/	71,900	81,000	75,151 r/	68,552 3/
Quartz and quartzite e/		26,000	25,000 3/	25,000	25,000	25,000
Slate e/		70,000	70,000 3/	70,000	70,000	70,000
Sand and gravel:						
Building sand and gravel thou	usand tons	382,000	372,500	382,700	343,200	324,200 3/
Gravel including terrazzo splits e/	do.	200,000	200,000	200,000	200,000	200,000
Sand:						
Foundry	do.	4,000 e/	3,500	3,500	3,500 e/	3,000
Industrial (glass) e/	do.	9,800	10,000	10,000	8,500	8,500
Sulfur, byproduct: e/						
Of metallurgy thou	usand tons	25	25	25	30	30
Of natural gas and petroleum	do.	1,085 3/	1,100	1,135 3/	1,026 r/	988 3/
Other	do.	50	50	60	100	100
Total	do.	1,160	1,175	1,220	1,156 r/	1,118
Talc and steatite e/		8,819 3/	9,000	9,000	8,000	7,000
MINERAL FUELS AND RELATED MATER	IALS					
Asphalt and bitumen, natural e/		11,285 3/	10,000	9,000	10,000	10,000
Coal:						
Anthracite and bituminous, marketable thou	usand tons	46,792	40,960	43,849	33,590 r/	27,361 3/
Lignite	do.	177,099	166,035	162,242	168,051	175,364 3/
Coke:						
Of anthracite and bituminous coal	do.	10,744	10,277	8,568	9,115	7,289 3/
Of lignite e/	do.	185 3/	175	175	175	173
Fuel briquets:						
Of anthracite and bituminous coal	do.	322	185	174	146	140
Of lignite (including dust and dried)	do.	3,539	2,345	2,072	1,819 r/	1,740 3/
Gas: e/						
Manufactured:						
Blast furnace million cul	bic meters	4,655 3/	4,500	4,000	4,000	4,000
Coke oven	do.	2,539 3/	2,500	2,000	2,000	2,000
Total	do.	7,194 3/	7,000	6,000	6,000	6,000
Natural:						
Gross	do.	22,473 3/	22,000	23,000	22,000	22,000
Marketed	do.	20,780 3/	19,900 3/	21,200 3/	21,720	21,698 3/
Peat:						
Agricultural use thousand cul	bic meters	2,800 r/	9,561	9,473	9,648 3/	9,722 3/
Fuel use	do.	180,000	175,000	175,000 e/	160,000 e/	150,000
Petroleum:						
Crude thousand 42-gall	lon barrels	20,361	21,146	19,728	22,658	23,603 3/
0 0 1 1 0 11						

See footnotes at end of table.

TABLE 1--Continued GERMANY: PRODUCTION OF MINERAL COMMODITIES 1/ 2/ 3/

(Metric tons unless otherwise specified)

Commo	1997	1998	1999	2000	2001 e/	
MINERAL FUELS AND RELATE						
PetroleumContinued:						
Refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	29,208	29,255	31,888	32,688	35,032 3/
Gasoline including aviation	do.	219,311	223,465	228,038	229,101	293,378 3/
Naphtha	do.	73,925	81,379	82,648	82,085	82,548 3/
Mineral jelly and wax	do.	3,600 e/	1,527	1,472	1,575	1,554 3/
Kerosene and jet fuel	do	28,094	211,676	233,046	234,461	227,153 3/
Distillate fuel oil	do.	338,744	265,555	343,167	345,637	349,853 3/
Refinery gas	do.	2,821	3,227	2,706	3,269	3,276 3/
Lubricants	do.	4,800 e/	10,787	11,298	10,556	10,675 3/
Nonlubricating oils	do.	7,000 e/	7,867	8,197	8,100	7,197 3/
Residual fuel oil	do.	70,216	14,626	67,399	75,756	76,257 3/
Bitumen and other residues e/	do.	26,000 e/	16,968	22,228	22,592	19,450 3/
Bituminous mixtures	do.	1,200 e/	1,211	1,199	1,210	1,100 3/
Petroleum coke	do.	7,399	7,539	10,428	5,819	9,328 3/
Unspecified	do.	16,000	18,242	16,254	11,977	9,919 3/
Total	do.	828,000 e/	893,324	859,968	1,064,826	1,090,720 3/

e/ Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. r/ Revised. -- Zero.

TABLE 2 GERMANY: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina		VAW Aluminium AG (VAW)	Plant at Schwandorf (special aluminas)	430
Do.		Aluminium Oxid Stade GmbH (VAW, 50%, Dadco Alumina and Chemicals Ltd., 50%)	Plant at Stade	750
Do.		Martinswerke GmbH (Alusuisse, 100%)	Plant at Bergheim (fused alumina)	350
Aluminum		VAW Aluminium AG	Smelters: Innwerke at Töging, Elbewerke at Stade,	300
			Rheinwerke at Neuss, Lippenwerke at Lünen (secondary)	
Do.		Aluminium Essen GmbH	Smelter at Essen-Borbeck	95
Do.		Hamburger Aluminium-Werke GmbH (VAW, 33%)	Smelter at Hamburg	120
Arsenic, metal	tons	Metaleurop Handel GmbH	Plant at Langelsheim	5
Cement		38 companies, of which the major ones are:	64 mills (grinding) including:	59,000
Do.		Heidelberger Zement AG	Plants at Blaubeuren-Schelklingen, Leimen, Hassmersheim, Burglengenfeld, Kieferssfelden, and others	(9,200)
Do.		Dyckerhoff AG	Plants at Amoneburg, Golheim, Neuwied, Neubeckum, and others	(7,250)
Do.		E. Schwenk, Zementwerke KG	Plants at Allmendingen, Karlstadt, and Mergelstetten	(6,000)
Do.		Anneliese Zementwerke AG	Plants at Ennigerloh-Nord, Ennigerloh-Süd, Geske, and Paderborn	(3,500)
Do.		Zementwerke Deunan GmbH	Plant at Deuna	(3,000)
Chalk		Kreidewerke Rugen GmbH	Quarries on Rugen Island	500
Coal, anthracite and bituminous		Four companies, including:	About 27 mines, including:	72,500
Do.		Ruhrkohle AG	14 mines in Ruhr region	(40,000)
Do.		Saarbergwerke AG	5 mines in Saar basin	(14,000)
Do.		Preussag Anthrazit GmbH	Mine at Ibbenbüren	(2,500)

 $^{1/\,} Table$ contains data available through August 2002.

^{2/} Data are from a combined Germany.

^{3/} Reported figure.

^{4/} Includes speigeleisen, unspecified crude iron, and blast furnace ferromanganese with 2% or more carbon.

TABLE 2--Continued GERMANY: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

	Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper	Commodity	Norddeutsche Affinerie AG (Dresdner Bank AG,	Smelter and refinery at Hamburg	500
Соррег		20%; Degussa AG, 10%)	Sinciter and refinery at Francourg	350
Do.		Hüttenwerke Kayser AG	Refinery at Lünen	120
Kaolin		Kemmlitzer Kaolinwerke GmbH	Mines at Gröppendorf, Oschatz, and Sachsen	100
Do.		Do.	Plant at Sachen	100
Limestone		Harz Kalk GmbH	Quarries at Bad Kösen, Rubelaand, and Kaltes Tal	6,000
Lead		Metaleurop Weser Blei GmbH	Smelter and refinery at Nordenham	120
Do.		Berzelius Metallhütten GmbH	QSL smelter at Stolberg	75
Do.		do.	Refinery at Duisberg	120
Do.		Norddeutsche Affinerie AG	Refinery at Hamburg	50
Lignite		Rheinische Braunkohlenwerke AG (Rheinbraun)	Surface mines in Rhenish mining area: Garzweiler,	105,000
J		,	Bergheim, Inden, and Hambach	
Do.		Lausitzer Braunkohle AG (LAUBAG)	Surface mines in Lausatian mining area:	50,000
		,	Jänschwalde/Cottbus-Nord, Welzow-Süd, and	
			Nochten/Reichswalde	
Natural gas	million cubic meters	Brigitta Erdgas und Erdöl GmbH and Elwerath Erdgas-Erdöl GmbH	Plants at Clenze and Grossenkmeten	9,500
Do.	do.	Mobil Erdgas-Erdöl GmbH	Plants at Scholen	4,000
Do.	do.	Other companies	Plants at Duste, Rutenbrock, and others	2,000
Petroleum:		1		
Crude	thousand 42-gallon barrels	The largest companies are:	6 areas with about 85 oilfields, including:	80,000
Do.	do.	Elwerath Erdgas-Erdöl GmbH	West of Ems River	(30,000)
Do.	do.	Wintershall AG	Weser-Ems Rivers	(21,000)
Do.	do.	Deutsche Texaco AG	Elbe-Weser Rivers	(20,000)
Refined	do.	About 25 companies, of which the largest are:	20 refineries, including:	2,062,000
Do.	do.	Deutsche Shell AG	Refineries at Godorf, Hamburg, and Grasbrook	(256,000)
Do.	do.	Esso AG	Refineries at Karlsruhe and Ingolstadt	(245,000)
Do.	do.	Ruhr Oel AG	Refinery at Gelsenkirchen	(215,500)
Do.	do.	Erdoel Raffinerie Neustadt GmbH	Refinery at Neustadt-Donau	(145,000)
Potash, K20	Ocontent	Kali und Salz AG	Mines at Bergmannssegen-Hugo, Niedersachen-	3,500
			Riedel, Salzdetfurth, Sigmundshall, Hattorf,	
			Neuhof-Ellers, and Wintershall	
Do.		MDK (Mitteldeutsche Kali und Sondershausen)	10 mines mostly in the State of Thüringen	2,500
Salt (rock)		Kali und Salz AG	Mines at Bad Friedrichshall-Kochendorf,	15,000
			Braunschweig-Luneburg, Heilbronn, Riedel,	
			Sletten, and Wesel (Borth)	
Steel		Major companies, including:	About 25 plants, including:	
Do.		Thyssen Krupp Stahl AG	Plants mostly in the Westphalia Region	21,000
Do.		Salzgitter AG	Plants at Peine and Salzgitter	9,000
Do.		Klöckner-Werke AG	Plants at Bremen and Osnabruck	4,200
Zinc		Ruhr-Zink GmbH (Metallgesellschaft AG, 100%)	Refinery at Datteln	200
Do.		Berzelius Metallhütten GmbH	Imperial smelter and fire refinery at Duisburg	100
Do.		Metaleurop Weser Zink GmbH	Refinery at Nordenham	130