THE MINERAL INDUSTRY OF

GERMANY

By Harold R. Newman

In 1998, the economy of Germany improved in comparison with that of 1997. Stronger export demand from outside Western Europe, an improvement in German competitiveness, productivity increases, and a lower exchange rate were contributing factors to the economic growth. The gross domestic product (GDP) showed about a 2.7% growth rate, which was an improvement over the 2.2% GDP growth rate of 1997. Germany's economy remained the largest in Europe, equivalent to slightly more than \$2 trillion, and accounted for more than 25% of the European Union's (EU) economy. Unemployment during 1998 averaged 4.4 million people, about 11% of the labor force (Tatsachen über Deutschland, January 6, 1998, The economy-Facing new challenges, accessed March 1, 2000, at URL http://www.bundesregierung.de/tats...utsdhland/en glisch/buch/06/01.html). With the unification of the eastern states of the German Democratic Republic (GDR) and the western states of the Federal Republic of Germany (FRG) on October 6, 1990, the complete reorganization of the economy of the enlarged FRG has entailed the elimination of many unproductive and unprofitable economic structures left behind by the former centrally planned system. Growth continues to be stronger in the western states, and the eastern states are 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 (Bureau of Economic and Business Affairs, 1998).

Government Policies and Programs

The German Government's policies were directed towards fighting inflation, lowering unemployment, increasing the country's international competitive status, and safeguarding the environment. The Treuhandanstalt (Trustee Agency), the agency responsible for privatizing the GDR state holdings, ceased to exist at yearend 1994 after privatizing or closing a significant number of operations. The remaining properties were transferred to the Beteiligungs Management Gesellschaft GmbH (Interest Management Association).

Germany has been one of the main advocates of European unification, including monetary union. In harmony with the Schengen Agreement, which became effective on March 26, 1995, most of the EU member states, including Germany, agreed to discontinue border controls. This internal market has provided a boost for European economies, including Germany's export-oriented economy.

On April 29, 1998, new energy legislation designed to introduce competition to the traditionally closed electricity and natural gas sectors came into force. The law will, among other things, abolish utilities-demarcated monopoly supply areas and create a framework for third-party access to electricity grids and natural gas pipelines. Lignite mining in eastern Germany will be protected from competition through as late as 2005. Renewable and cogeneration plants are given special significance under the new law (U.S. Energy Information Administration, November 1998, Country analysis briefs—Germany, accessed September 27, 1999, at URL http://www.eia.doe.gov/emeu/cabs/germany.ht ml).

In April 1998, Germany's constitutional court cleared the way for German membership in the European Monetary Union (EMU), and on April 23, 1998, Germany's parliament (the Bundestag) voted to join the European single-currency zone. The EMU was to begin the process of creating a single European currency, referred to as the euro, on January 1, 1999. Individual member-states' currencies, including the German deutsche mark (DM), were to be phased out by July 1, 2002.

On January 1, 1999, the euro will be introduced in Germany (U.S. Energy Information Administration, November 1998, Country analysis briefs—Germany, accessed September 27, 1999, at URL http://www.eia.doe.gov/emu/cabs/germany.html).

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. The Ministry's policy is based on the following principles:

- Prevention—New projects are to be developed in such a way as to avoid pollution or environmental damage as much as possible.
- The polluter pays—It is not the public at large, but those causing the damage or pollution who bear the responsibility and cost; and
- Cooperation—The Government, the business community, citizens, and groups in society join forces to solve environmental problems because every individual is responsible for the environment (Tatsachen über Deutschland, July 6, 1998, Environmental protection, accessed March 17, 1999, at URL http://www.bundesregieru ng.de/tats..utsland/english/buch/06/07.html).

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, taking into account various design options. The environmental evaluation process in Germany presents a risk for the company involved because even after completion of the assessment, which usually involves considerable time and resources, project approval is not guaranteed.

Following reunification, the major task of energy and environmental policy was to merge the radically different systems of the former GDR and the FRG. The FRG had a diversified and mainly privately owned system of energy supply and a commitment to environmental protection. In contrast, GDR's energy sector was highly centralized, predominantly State-owned, dependent on lignite (brown coal) as its primary fuel, and a major domestic source of air pollution. Lignite mines were either closed or retrofitted with gas desulfurization equipment (U.S. Energy Information Administration, December 1999, Germany—Environmental issues, accessed December 14, 1999, at URL http://www.eia.doe.gov/emeu/cabs/germe.html).

Germany's air quality had also suffered owing to the country's geographic proximity to the highly polluting, centrally planned economies of the Soviet bloc. Emissions blew over Germany, causing acid rain and damaging forests. With the breakup of the Soviet block and dissolution of the Soviet Union, this region has been polluting less owing to stricter emission controls. This has improved Germany's air quality.

Production

The minerals and metals industry, which included industrial processing, construction, and mining industry, contributed almost 1% to the GDP. Production in the mining and metals industries depended on a variety of forces, including 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 high costs of production in Germany compared with those of competing foreign producers and the problems caused by trying to balance production. (See table 1.)

As in many other parts of Europe, the importance of certain sectors of the German mining industry has decreased steadily over the past decades, and the number of employees has fallen to about 130,000. The last nonferrous metal mine was closed in 1992.

The technological standard of German mining operations was world class. Notwithstanding the general contraction of the industry, the production levels of certain minerals remained important domestically and on a world scale. For example, lignite ranked 1st in the EU and in the world; marketable rock salt and potash, 1st in the EU and 3d in the world; and hard coal, 1st in the EU and 11th in the world (Mining Magazine, 1999).

Trade

Foreign trade was a key element in Germany's economic life. After the United States, Germany had the largest foreign trade volume in the world. In 1997, exports amounted to \$528.2 billion, and imports totaled \$445.7 billion, resulting in a foreign trade surplus for the first time since German reunification. One out of every four German jobs depended on exports (Deutschland Magazine, 1998).

France was the major supplier of goods to Germany. The United States was Germany's sixth largest export market and its fifth largest source of imports. The United States had a positive trade balance (merchandise trade) of \$10.5 billion with Germany (Bureau of Economic and Business Affairs, 1998).

Germany, a major processing nation, 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.

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 is listed in table 2. The restructuring and privatization of the facilities in the former GDR continued in 1998. The Beteiligungs Management Gesellschaft GmbH retained control of some of this area's companies until they were sold or closed. Most of the producing and processing facilities still in operation were small compared with those in the FGR, except for lignite and potash, both of which were very large operations. (See table 2.)

Commodity Review

Metals

Aluminum.—In 1998, 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, a member of the 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 to the company's downstream fabricating operations.

Reynolds Metals Co. of the United States sold its European rolling mill operations to VAW in 1998. The operations being sold included Reynolds Aluminium Deutschland in Hamburg, Reynolds Italy in Cisterna, and Industria Navarra del Aluminio in Irunzun, Spain. The sale was subject to the approval of the respective company boards, as well as governmental regulatory bodies. Further details of the transaction were not released (VAW Aluminium AG, November 1997, VAW acquires Reynolds' rolling mills in Europe, accessed March 3, 1999, at URL http://www.vaw.com/Link1 1 20.html).

Aluminium Essen GmbH started up its third potline in 1998. After being inactive for 6 years, the third line was rebuilt at a cost of \$50 million and will use Alusuisse-Lonza AG of Switzerland's technology and larger 162-kiloampere (kA) pots. The other two lines have 142-kA pots. The total electrolytic capacity at the smelter was 150,000 metric tons (t) with a casthouse capacity of 200,000 t. The shortfall between smelter and casthouse capacity was being met by Russian remelt ingots (50%) and scrap (50%) (Metal Bulletin, 1998a).

In 1997, the secondary aluminum industry consumed 142,000 t of scrap in foundry alloy production, accounting for about 28% of the country's total aluminum scrap consumption. Remelters invested in new furnace technology that enabled them to melt painted scrap (Metal Bulletin, 1998b).

Copper.—Dresdner Bank AG of Germany acquired a 20% interest in Norddeutsche Affinerie AG (NA), the largest copper

smelter in Europe, through the purchase of the 10% residual holdings of two of the original owners, Inmet Mining Corp. of Canada and MIM Holdings Ltd. of Australia. Dresdner's purchase amounted to a total of 6.4 million shares that, according to the bank, was to be sold on to investors. Degussa AG indicated that it would retain its original 10% interest. NA will invest about \$104 million to raise its copper concentrate intake to 1 million tons per year (Mt/yr) at its East Smelter by autumn 2000 (Mining Journal, 1998).

Lead and Zinc.—MIM Holdings of Australia reported that it had received a series of indicative bids for MIM Hüttenwerke Duisberg, its secondary lead and zinc smelter. The smelter combined three feed mechanisms, including a direct injection system that allowed it to process flue dust (Metal Bulletin, 1998d).

Magnesium.—A group of secondary aluminum producers were planning to set up a new company that would specialize in recovering magnesium from residues and scraps. The decision to develop proprietary technology and to construct a specialized magnesium plant came as a result of an increase in magnesium alloy scrap received by secondary aluminum companies. Much of this increase resulted from the Volkswagen, the Mercedes Benz, and the BMW automobile companies changing from aluminum alloy to magnesium alloy in car manufacturing. The group believed that automobile companies will become major consumers of magnesium alloys (Metal Bulletin, 1998c).

Steel.—Thyssen Stahl AG and Fried. Krupp AG Hoesch-Krupp, two of Germany's largest steel companies, signed a memorandum of understanding for a merger that would create Thyssen-Krupp Stahl (TKS), a new joint-venture company. This company was expected to have annual sales of more than \$36 billion and an output of more than 15 Mt/yr. This agreement would create the world's fifth largest steel company and the third largest in Europe, after British Steel Plc. of the United Kingdom and Usinor Group of France. This could open the way for a major reshaping of the German and the European steel industries (BT Commodities, 1998, Thyssen, Krupp to merge steel units, accessed July 13, 1998, at URL http://www.asia.com. sg/btcommo/news26 3.htm).

TKS announced in September that it was no longer interested in buying Cockerill Sambre SA of Belgium. The company's decision may be related to a decision to attend to matters thrown up by the merger between its two parent companies, Thyssen and Krupp. Although TKS could have become a European leader in galvanized products and obtained strong distribution in France and the Benelux (Belgium, Luxembourg, and the Netherlands) countries, the company did not consider Belgium to be a core market (Metal Bulletin, 1998e).

Preussag Stahl AG was one of Germany's larger steel producers. In addition to flats and beams, Preussag also supplied specially welded large pipes for long-distance petroleum and natural gas pipelines. Built to advanced technological standards, the Preussag electric steel works, which had been brought on line in Peine in late 1997, had a capacity of 750,000 metric tons per year (t/yr). Between 1964 and mid-1996, the replaced converter steel works provided the rolling mill in Peine with more than 34 million metric tons of crude steel in some 380,000 melts (Preussag Stahl AG, 1998, accessed January 20, 1998, at URL http://www.preussag.de/engl/archiv/m agazin/etstahl.html).

The European Commission gave the green light to a takeover that will create one of the world's largest ferrous scrap operations. SVH Holdings of the Netherlands, which owned scrap giant David J. Joseph Co. of the United States, will take the controlling stake in Thyssen Klöckner Recycling, creating an operation that market observers believed would process and sell more than 20 Mt/yr of recycled metal. The company will operate under the name of Thyssen Sonnenberg Recycling (Metal Bulletin, 1998f).

Uranium.—Cleaning up the former Soviet Union's 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 nightmare. At various sites, 48 waste rock piles cover a surface area of about 15 square kilometers (km²) and contain about 311 million cubic meters (Mm³) of waste material. In addition, 14 tailing ponds contain 160 Mm³ of residue from uranium-ore-processing plants and cover a surface area of 7 km². On-going remediation work has been focused on decommissioning facilities and immobilizing contaminated material in a manner that could limit long-term hazards to humans and the environment. 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, 1998).

Industrial Minerals

Bentonite.—In terms of overseas developments, Süd-Chemie AG was the largest bentonite producer in Europe. The company controlled or had part shares 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. The company, a leader in the supply of specialty bentonite production, had a total estimated output of 500,000 t/yr. About 30% of production was exported (Industrial Minerals, 1998a).

Cement.—The Treuhandanstalt sold the former GDR's cement operations mostly to either German or other Western European companies. A number of these plants were being extensively modernized and upgraded for more cost-efficient production. In German plants, production costs were about \$45 to \$50 per metric ton, which was about 25% higher than those of neighboring France. This made it difficult for German producers to reduce selling prices to combat lower import prices. The continuing recession in the construction industry was expected to affect domestic cement consumption (International Cement Review, 1998).

RMC Industries, the world's largest manufacturer of readymixed concrete, sold a number of facilities in Germany to Lafarge France for \$121 million. Lafarge's acquisitions consisted of a cement plant in Sötenich, a grinding plant in Coswig, and several ready-mixed concrete plants in various locations. Germany became Lafarge's second largest European market after France. Lafarge was a leading producer of cement, concrete, aggregates, and gypsum. Cement represented about 32% of its sales (Industrial Minerals, 1998b).

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

Although Germany was the second largest producer of kaolin in Western Europe after the United Kingdom, it still had to import about 50% of its requirements of high-quality papercoating-grade kaolins. Most of the German kaolin was mined in Bavaria, and Amberger Kaolinwerke GmbH was the largest producer with mines in Hirschau.

Graphite.—Graphitwerk Kropfmühl AG was the only natural graphite mining and processing company 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 producer, Gebr. Knauf Westdeutsche Gipswerke GmbH, accounted for more than two-thirds of the gypsum produced. The company operated mines in Baden-Württemberg, Bavaria, Hesse, Saarrland, and Lower Saxony. The second largest producer, Rigips Baustoffwerke GmbH, operated mines in Baden-Württemberg and Lower Saxony.

Potash.—After closings and restructuring, Kali und Salz AG (K+S) operated 17 mines and plants and had a potassium chloride production capacity of 4 Mt/yr, of which 2 Mt/yr was standard grade and 2 Mt/yr was granular grade. K+S had 14% of the world potash market and a 30% share of the market for potassium sulfate. Its product grades included standard and granular. Germany was the world's second largest potash producer after Canada (Phosphorus & Potassium, 1999).

K+S's Zielitz Mine was the company's largest operation and the linchpin of its potassium operations. The mine underwent a major investment program that resulted in a practically new potash operation. Most of the investment of more than \$200 million was expended on the installation of the industrial potash plant, the refurbishment of the power-generation plant, and the refurbishment of the drying plant. The operation had a capacity of 1.25 Mt/yr of potassium oxide and will be the largest potash mine in Western Europe (Phosphorus & Potassium, 1998).

Mineral Fuels

The most important primary energy source in Germany's consumption of primary energy was petroleum with a 40% share of total consumption, followed by natural gas with a 20% share; coal, 15% share; lignite, 13% share; nuclear, 10% share; hydroelectricity and wind power, 1% share each. About 30% of Germany's primary energy requirement was satisfied from domestic sources; the remaining 70% was imported (Reuter, 1998).

Coal.—Anthracite and Bituminous.—Subsidies that have for so long supported Western Europe's coal industry were gradually being phased out. This was in line with EU policy to eliminate subsidies to industries. According to the plan for mine closures, subsidies will be reduced by half, coal production will be reduced to 30 million metric tons, coal industry employment will be reduced to 36,000, and the number of mines will be reduced to 10 or 11 by 2005. Closures will be based on the mines' financial performance, customer requirements for particular coal grades, and the coal reserves available to the mines (Mining Journal, 1998).

About 77% of hard coal production was from the Ruhr Coalfield where it was mined from seams at depths exceeding 900 meters (m). The coal ranged from anthracite to high-volatile bituminous. The Saar Coalfield was also important, with substantial deposits of bituminous coal. The coal mining industry of Germany was controlled by two companies. Ruhrkohle AG, a private company, was the largest and accounted for more than 85% of total production. Saarbergwerke AG, accounted for 12% of production and was a state-owned company. A smaller company, Preussag Anthrazit GmbH, accounted for about 3% of production.

Lignite.—The brown coal (lignite) mining industry was controlled almost entirely by Rheinische Braunkohlenwerke AG, a privately owned company (Coal Age, 1998). Mining was mainly in the Rheinish area to the west of Cologne and the Lusatian area near Dresden. On a much smaller scale, lignite is mined near Helmstedt. Lignite mining was under less economic pressure than hard coal mining.

The lignite deposit in the Rhine region is the largest single formation in Europe and has considerable domestic importance. Rheinbraun AG was Germany's major lignite producer and mined more than 100 Mt/yr from four open-cast mines— Bergheim, Garzweiler, Hambach, and Inden. The Hambach Mine accounted for one-third of total lignite output in the Rheinish mining area. Lignite was the main source of energy, and the coal-fired power stations of RWE Energie accounted for 85% of Rheinbraun's production (Tatsachen über Deutschland, June 8, 1998, Energy and raw materials, accessed February 29, 1999, at URL http://www.bundesregierung.de/tats...utschland/en glisch/buch/06/08.html).

Natural Gas.—Ruhrgas AG of Germany signed a 15-year agreement with BP Ltd. of the United Kingdom to supply 15 billion cubic meters of natural gas valued at more than \$1 billion beginning in October 1998. The gas will be supplied from BP's North Sea fields and delivered via the Interconnector pipeline that was being constructed from Bacton in the United Kingdom to Zeebrugge in Belgium. Onward transmission to the German border will be via a new pipeline to be built by Distrigaz of Belgium (Oil Online, 1997, German gas supplies secured into the future, accessed December 30, 1997, at URL http://www.oilo nline.com/news/igerman.htm).

Infrastructure

Germany had a total of 625,600 kilometers (km) of highways and roads, ranging from the high-speed Autobahn system to undeveloped gravel and packed-dirt country roads. Of this total, the Autobahn consisted of 10,814 km; national highways, 43,786 km; state highways, 99,447 km; and municipal, county, and secondary roads, 471,553 km. The railroad system included 45,468 km of track, about 90% of which is Government owned; of this total, 44,769 km was 1.435-m standard-gauge track, and 699 km was 1.000-m gauge track. Pipelines included a 3,644-km line for petroleum, 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 Sea and the North Sea, and the Rhine-Main-Danube Canal served as a connection between the North Sea and the Black Sea. The major maritime ports of Hamburg, Rostock, Bremerhaven, Bremen, and Wihelmshaven accounted for about 70% of total merchandise traffic.

Outlook

Germany's economy is expected to expand steadily for the next few years despite the huge burden of unification costs on the national economy. As growth in Germany's international trading partners increases, industrial production is expected to grow to meet the demands for consumer products. Restructuring industries, including mineral-resource industries, to be more efficient was expected to 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.

References Cited

- Bureau of Economic and Business Affairs, 1998, Germany, *in* FY 1999 country commercial guide: Bureau of Economic and Business Affairs, August, 57 p.
- Coal Age, 1998, International longwall—Germany: Coal Age, v. 102, no. 9, September, p. 34.
- Deutschland Magazine, 1998, The EU—Facts and figures: Deutschland Magazine, no. 6/98, December, p. 23.

Engineering and Mining Journal, 1998, Europe's biggest mine rehabilitation project: Engineering and Mining Journal, v. 199, no. 2, February, p. 40ww.

Industrial Minerals, 1998a, Germany–Multinational rule: Industrial Minerals, no. 371, August, p. 31.

International Cement Review, 1998, Germany, *in* The global cement report (3d ed): International Cement Review, p. 140-141.

Metal Bulletin, 1998a, Aluminium Essen starts up third potline: Metal Bulletin, no. 8267, April 6, p. 7.

1998c, German firms plan secondary magnesium plant: Metal Bulletin, no. 8349, February 8, p. 10.

——1998d, MIM receives bids for German smelter: Metal Bulletin, no. 8721, April 23, p. 12.

1998e, TKS pulls out of bidding for Cockerill: Metal Bulletin, no. 8310, September 17, p. 19.

Mining Journal, 1998, Norddeutsche expands copper refining: Mining Journal [London], v. 330, no. 8475, April 10, p. 287.

Phosphorus & Potassium, 1997, Investing in the future: Phosphorus & Potassium, no. 203, June, p. 21.

——1998, Zielitz—A mine for the future: Phosphorus & Potassium, no. 207, January, p. 13.

Reuter, E.U., 1998, Germany—Mining annual review 1998: Mining Journal [London], p. 216-217.

Rheinbraun AG, 1997-98, Annual report: Cologne, Germany, 75 p.

Major Sources of Information

Statistisches Bundesamt (Federal Statistics Office) Gustav-Stresemann-Ring 11 65180 Wiesbaden, Germany
Bundesanstalt für Geowissenschaft und Rohstoffe (Federal Institute for Geosciences and Natural Resources)
Stilleweg 2, Postfach 51 01 53 30361 Hannover, Germany
Bundesministerium für Forschung und Technologie (Federal Ministry for Research and Technology) Heinemannstrasse 2 53175 Bonn, Germany
Bundesministerium für Wirtschaft, Abteiling III, Energiepolitik Mineralische Rohstoffe (Federal Ministry for Economics Section III, Energy Policy and Mineral Raw Materials)
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Deutsches Institut für Wirtschaftsforschung (German Institute for Economic Research) Köningen-Luise Strasse 5 14195 Berlin (Dahlem), Germany

Major Publications

Aussenhandel (Foreign Trade), Statistisches Bundesamt.

Der Bergbau und der Bundesrepublik Deutschland: Statistische Mitteilungen der Bergbehorden, (Mining in the Federal Republic of Germany; Statistical Reports).

Bundesministerium für Wirtschaft. Jahrbuch für Bergbau, Energie, Mineralöl, und Chemie, (Mining, Energy, Petroleum, and Chemical Yearbook) Essen, Glückauf GmbH.

Statistisches Jahrbuch für die Bundesrepublik Deutschlands, (Statistical Yearbook for the Federal Republic of Germany).

Wirtschaft und Statistik (Economics and Statistics), Statistisches Bundesamt.

TABLE 1 GERMANY: PRODUCTION OF MINERAL COMMODITIES 1/2/

(Metric tons unless otherwise specified)

		-				
Commodity		1994	1995	1996	1997	1998 e/
METALS Aluminum:						
Alumina, Al2O3 equivalent:						
Calcined	thousand tons	824	750	755	738 3/	750
Hydrate	do.	951	994 r/	792 r/	800 r/	800
Metal:		504.054	575 1 60	57.6 400	571.044	(12 201 2)
Primary Secondary		504,956 438,082	575,160 530,990	576,422 416,915	571,944 432,467	612,381 3/ 453,328 3/
Arsenic, white, Ar2O3 content e/		438,082	250	250	452,467	435,528 5/
Cadmium metal, refinery including secondary e/		1,145	1,145	250 950 r/	1,000 r/	1,020 3/
Cobalt metal including alloys		856	800	800	600 e/	500
Copper, metal:						
Smelter:						
Primary		237,400	242,100	296,800	273,100	258,600 3/
Secondary e/		54,800	66,000	88,600	76,000	60,000
Refined: Primary		252,900	247,200	315,600	297,800	312,000
Secondary		339,000	369,100	355,200	297,800 375,800 e/	312,000
Iron and steel:		337,000	509,100	555,200	575,000 0	504,000
Ore and concentrate:						
Gross weight		145,760	68,700	100,200	200,900	200,000
Fe content		20,400	960	14,600	28,100	28,000
Metal:		00.007	00.017	05 50 F	20.025	
Pig iron	thousand tons	29,923	30,012	27,722	30,939	30,162 3/
Ferroalloys 4/	do.	291 17	280 16	95 25	96 26	100
Of which ferrochromium Steel, crude	<u>do.</u> do.	40,836	42,051	25 39,791	45,009	28 44.046 3/
Semimanufactures	do.	32,067	34,316	32,889	37,074	36,591 3/
Lead:	<u>uo.</u>	52,007	54,510	52,007	57,074	50,571 5/
Metal:						
Smelter		166,630	146,040	140,000	128,500 e/	161,300 3/
Refined:						
Primary		189,435	146,750	68,700 r/	131,000 r/	176,800
Secondary		142,249	164,400	149,400 r/	198,300 r/	203,400 3/
Platinum-group metals, metal, refined e/	kilograms	65,000	65,000	60,000	60,000	60,000
Selenium metal	do.	125	120	115	100	100
Silver. metal, refined e/ Tin metal, primary including secondary	do.	600,000 16,000 e/	600,000 15,000 e/	600,000 14,836	500,000 15,708	500,000 15,000
Uranium concentrate, U3O8 content		47	15,000 e/ 35	46	27	25
Zinc metal, including secondary		359,878	322,460	327,015	317,681 r/	333,968 3/
INDUSTRIAL MINERALS			,		,	,
Abrasives: e/						
Natural, pumice		504,000 3/	300,000	210,000	212,000 r/	214,000
Artificial, corundum		56,601 3/	56,000	60,000	60,000	60,000
Barite, marketable (contained BaSO4)		127,383	122,268	121,476	118,698	123,272 3/
Boron materials, processed borax, Na2B4O7 10H2O content e/ Bromine e/		1,500 750	1,500 750	1,500 750	1,200 700	1,200 600
Cement:		750	730	730	700	600
Clinker (intended for market)	thousand tons	1,160	1,200	1,100	1,200 e/	1.000
Hydraulic	do.	40,380	37,480	36,104	35,945	36,610 3/
Chalk, crude including ground	do.	445	450	1,000	1,093	1,022 3/
Clays:						
Bentonite	do.	499	529	491	511	478 3/
Ceramic clay e/	do.	3,540 3/	3,500	3,500	3,500	4,500
Fire clay	do.	1,079	1,000 e/	1,000	1,000 e/	1,500
Fuller's earth	do.	498	500 e/	600	500 e/	600
Kaolin, marketable Other, including brick clay	do. do.	1,631 20,000 e/	1,925 20,000 e/	1,794 21,600	1,800 e/ 22,000	1,600 20,000
Diatomite	<u>uo.</u>	1,030	20,000 e/	21,000	22,000	20,000
Feldspar		379,427	432,624 r/	359,666	455,969	460,000
Fluorspar:		,.=/		,500		,000
Acid-grade e/		35,000	38,000	31,000	22,500	28,000
Metallurgical-grade		641	1,081	1,448	1,500 e/	1,500
Total		35,641	39,081	32,448	24,000 e/	29,500
Graphite, marketable		4,369	5,214	2,603	1,030 r/	300
Gypsum and anhydrite, marketable	thousand tons	2,264	2,829	3,000 e/	3,000 e/	2,500
Lime, quicklime, dead-burned dolomite e/	<u>do.</u>	8,511 3/	8,000	7,570	7,600	7,000
Magnesium salts (byproduct of potash mining)	do.	818	1,000	1,169	1,200 e/	1,200
Nitrogen, N content of ammonia Phosphate materials:	do	2,170	2,518	2,485	2,471	2,512 3/
Phosphate materials: Phosphatic fertilizers, P2O5 content		750	750	750	800 e/	700
Thomas slag:		750	150	150	000 C/	700
Gross weight	thousand tons	134	150	150	150 e/	150
P2O5 content e/		19,000	19,000	19,000	19,000 e/	19,000
See footnotes at end of table.		,				,

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

	,	1	,			
Commodity	•	1994	1995	1996	1997	1998 e/
INDUSTRIAL MINERALSContinue Pigments, mineral, natural	ed	7 475	5 000 -/	2 751	4 176	4.000
Pigments, mineral, natural Potash, K2O content	thousand tons	7,475 2,916	5,000 e/ 2,916	3,754 3,332	4,176 3,423	4,000 3,582 3/
Pumice, marketable	do.	504	625	600	600 e/	5,562 5/
Salt, marketable:		201	020	000	000 0	
Evaporated	do.	542	617	731	700 e/	500
Rock and other		12,557	14,607	15,176	15,087	14,000
Sodium compounds, n.e.s.:						
Soda ash, manufactured	thousand tons	1,380	1,400	1,400	1,400 e/	1,400
Sulfate, manufactured	do.	113	110	100 e/	100 e/	100
Stone: Stone:						
Dimension, crude and partly worked e/	do.	200,000	200,000	200,000	100,000	100,000
Dolomite	do.	800	1,000	1,000	4,500 e/	5,000
Limestone, industrial	do.	62,271	60,000	64,000	68,000 e/	65,000
Quartz and quartzite		28,744	29,500	30,000	26,000 e/	25,000
Slate		89,400	90,000	90,000	70,000 e/	70,000
Sand and gravel:				200.000	202 000 /	2 < 0 0 0 0
Building sand and gravel Gravel including terrazzo splits e/	thousand tons	244,000	250,000	300,000	382,000 r/	360,000
Sand:	do.	201,000 3/	200,000	225,000	200,000	200,000
Foundry	do.	3,240	3,000	3,000	4,000 e/	3,500
Industrial (glass)	do.	5,680	7,315	5,503	9,800 e/	9,600
Sulfur, byproduct: e/						
Of metallurgy		35,000	30,000	30,000	25,000	25,000
Of natural gas and petroleum		1,200,000	1,200,000	1,000,700 3/	1,085,000 3/	1,100,000
Other		90,000	90,000	90,000	50,000	60
Total		1,325,000	1,320,000	1,120,700	1,160,000	1,125,060
Talc and steatite MINERAL FUELS AND RELATED MATE		11,538	14,170	10,005	8,819	15,473 3/
Asphalt and bitumen, natural	EKIALS	9,017	14,652	9,821	11,285	10,000
Coal:		9,017	14,052	9,021	11,205	10,000
Anthracite and bituminous, marketable	thousand tons	52,408	53,563	47,913	46,792	41,640 3/
Lignite	do.	207,131	192,753	187,247	177,099	166,100 3/
Coke:						
Of anthracite and bituminous coal	do.	10,919	11,000 e/	10,662	10,744	10,277 3/
Of lignite	do.	172	175	178	185	180
Fuel briquets:		160	270	257	202	105
Of anthracite and bituminous coal Of lignite (including dust and dried)	do. do.	460 6,849	379 5,011	357 4,896	322 3,539	185 2,400
Gas:	<u>uo.</u>	0,047	3,011	4,070	3,337	2,400
Manufactured:						
Blast furnace	million cubic meters	4,730	4,800	4,239	4,655	4,500
Coke oven	do.	2,640	2,600	2,406	2,539	2,500
Total	do.	7,370	7,400	6,645	7,194	7,000
Natural:		2 0 11 2			aa (50	a 4 000
Gross	do.	20,442	21,452	23,058	22,473	24,000
Marketed Peat:	do.	18,330	19,000 e/	21,360	20,780	21,824 3/
Agricultural use	thousand tons	2,800	2,800	2,800	2,800	3,000
Fuel use	uiousuila tonis	173,000	180,000	180,000	180,000	175,000
Petroleum:			,	,	,	
	and 42-gallon barrels	21,198	21,638	20,756	20,361	21,146 3/
Refinery products:						
Liquefied petroleum gas	do.	39,500	35,287	32,352	29,208	29,255 3/
Gasoline including aviation	do.	225,000	246,660	226,058	219,311	223,465 3/
Naphtha Mineral jelly and wax	do.	87,300	81,736	79,058	73,925	81,379 3/
Kerosene and jet fuel	<u>do.</u> do.	3,820 23,000 e/	3,600 e/ 24,258	3,600 25,691	3,600 28,094 r/	3,600 28,660 3/
Distillate fuel oil	do.	355,000 e/	337,416	353,052	338,744	356,237 3/
Refinery gas	do.	3,680	3,600 e/	3,437	2,821	3,227 3/
Lubricants e/	do.	4,880 3/	4,800	4,800	4,800	4,800
Nonlubricating oils e/	do.	6,920 3/	7,000	7,000	7,000	7,000
Residual fuel oil	do.	87,200	78,588	77,769	70,216	78,255 3/
Bitumen and other residues	do.	25,500	25,000	25,000	26,000 e/	25,000
Bituminous mixtures e/	do.	1,170 3/	1,200	1,200	1,200	1,200
Petroleum coke	do.	9,540	5,247	5,813	7,399	7,539 3/
Unspecified Total e/	<u>do.</u> do.	17,400 889,910	18,000 872,392	18,000 862,830	16,000 e/ 828,318 r/	<u>16,000</u> 865,617
e/Estimated r/Revised	u0.	007,910	012,392	002,030	020,310 1/	005,017

e/ Estimated. r/ Revised. 1/ Table contains data available through July 1999. 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 GERMANY: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Thousand metric tons unless otherwise specified)

			-	
Com	nmodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina	ý	VAW Aluminium AG	Plant at Schwandorf (special aluminas)	430
Do.		Aluminium Oxid Stade GmbH (VAW, 50%)	Plant at Stade	750
Do.		Martinswerke GmbH (Alusuisse, 100%)	Plant at Bergheim (fused alumina)	350
Aluminum		VAW Aluminium AG	Smelters at Innwerke at Töging, Elbewerke at Stade, Rheinwerke at Neuss, Lippenwerke at Lünen (secondary)	300
Do.		Aluminium Essen GmbH	Smelter at Essen-Borbeck	150
Do.		Hamburger Aluminium-Werke GmbH (VAW 33%)	Smelter at Hamburg	120
Bentonite		Süd-Chemie AG	Gammelsdorf, Bavaria	500
Cement		38 companies, 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-Sud, Geske, and Paderborn	(3,500)
Do.		Zementwerke Deunan GmbH	Plant at Deuna	(3000)
Chalk		Kreidewerke Rugen GmbH	Quarries on Rugen Island	500
	te and bituminous	Four companies:	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)
Copper		Norddeutsche Affinerie AG (Dresdner Bank	Smelter and refinery, both at Hamburg	290
		AG 20%; Degussa AG, 10%)		350
Do.		Hüttenwerke Kayser AG	Refinery at Lünen	120
Graphite		Graphitwerk Kropfmühl AG	M' 'D 'H O III O	5
Gypsum		Gebr. Knauf Westdeutsche Gipswerke GmbH	Mines in Bavaria, Hesse, Saarrland, Lower Saxony	2,000
Kaolin Do.		Amberger Kaolinwerke GmbH	Mines at Gröppendorf, Hirschau, and Sachsen Plant at Sachen	100
Limestone		Harz Kalk GmbH	Quarries at Bad Kösen, Rubelaand, and Kaltes Tal	6000
Lead		Metaleurop Weser Blei GmbH	Smelter and refinery at Nordenham	120
Do. Do.		Berzelius Metallhütten GmbH do.	QSL smelter at Stolberg	75 120
 Do.		Norddeutsche Affinerie AG	Refinery at Duisberg Refinery at Hamburg	50
Lignite		Rheinische Braunkohlenwerke AG	Surface mines in Rhenish mining area: Garzweiler,	105,000
Do.		(Rheinbraun AG) Lausitzer Braunkohle AG (LAUBAG)	Bergheim, Inden, and Hambach Surface mines in Lausatian mining area: Jänschwal	50000
Natural gas	on cubic meters	Brigitta Erdgas und Erdöl GmbH and	Cottbus-Nord, Welzow-Süd, Nochten/Reichswalde Plants at Clenze and Grossenkmeten	
Do.	do.	Elwerath Erdgas-Erdöl GmbH Mobil Erdgas-Erdöl GmbH	Plants at Scholen	4,000
 Do.	do.	Other companies	Plants at Duste, Rutenbrock, and others	2,000
Petroleum:	uo.	ould companies	Thanks at Duste, Rutenbrock, and others	2,000
Crude	2-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:	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		Kali und Salz AG	Mines (17) at Bergmannssegen-Hugo, Niedersacher Riedel, Salzdetfurth, Sigmundshall, Hattorf, Neuhof-Ellers, and Wintershall	4,000
Salt (rock)		do.	Mines at Bad Friedrichshall-Kochendorf, Braunschweig-Luneburg, Heilbronn, Riedel, Stetten, and Wesel (Borth)	15,000
		Major companies including:	About 25 plants, including:	45,000
Steel		Thyssen Stahl AG	Plants at Krefeld, Duisburg, Hattungen, Oberhause	
Steel Do.		5	and Written	
Do.		-	and Written Plants at Bochum Dortmund and Rheinhausen	
Do. Do.		Fried. Krupp AG Hoesch-Krupp	Plants at Bochum, Dortmund, and Rheinhausen	(9,000)
Do. Do. Do.		Fried. Krupp AG Hoesch-Krupp Stahlwerke Peine-Salzgitter AG	Plants at Bochum, Dortmund, and Rheinhausen Plants at Peine and Salzgitter	(9,000) (4,500)
Do. Do.		Fried. Krupp AG Hoesch-Krupp	Plants at Bochum, Dortmund, and Rheinhausen Plants at Peine and Salzgitter Plants at Bremen and Osnabruck	(9,000)
Do. Do. Do. Do.		Fried. Krupp AG Hoesch-Krupp Stahlwerke Peine-Salzgitter AG Klöckner-Werke AG	Plants at Bochum, Dortmund, and Rheinhausen Plants at Peine and Salzgitter	(9,000) (4,500) (4,200)