

# THE MINERAL INDUSTRY OF POLAND

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In 1996, Poland was the second largest producer of copper in Europe and Central Eurasia, and ranked among the top 10 world producers of copper in terms of mine output and refined metal production (U.S. Geological Survey, 1997). Similarly, the country was the third largest mine producer of zinc and the second largest mine producer of lead in the region (Plachy, Joseph, 1997, and Smith Gerald R., 1997). Poland was also the sixth and seventh largest world producer of silver and sulfur, respectively, and was among the leading European and Central Eurasian producers of lime, nitrogen (in ammonia), and salt (U.S. Geological Survey, 1997). With respect to mineral fuels, the country remained a major world producer of bituminous coal, ranking seventh in world production in 1995.

On balance, Poland's economy continued to show improvement compared with its performance in 1995 and in the preceding years. The country's gross domestic product increased by 6.1% compared with that of 1995. Also, the value of total industrial production rose by 8.7% compared with that of 1995; components for mining and quarrying and manufacturing increased by 1.2% and 10.6%, respectively. The combined value of output of the electric power, gas, and water supply sectors, however, declined slightly. In general, the total value of sales by industry rose by 12.4% in 1996 compared with that of 1995. The value of sold production by the mining and quarrying, manufacturing, and combined electric power, gas, and water supply sectors showed increases of 11.8%, 10.7%, and 15.1%, respectively (Główny Urząd Statystyczny, 1997b).

Major activities in the minerals industry for 1996 included construction of a new aluminum extrusion plant at Chrzanow, mine expansion at the Polkowice underground copper mine, and investment in the cement industry by the Rumeli Group of Turkey.

## Government Policies and Programs

In February 1994, the Sejm, Poland's lower legislative assembly, adopted a new law on mining and geologic surveying to establish conformity with the developing market economy. An important provision in this legislation addressed the tension arising from the need to mine and the need to protect the environment. Exploitation of a mineral deposit would require payment of an exploitation fee, fixed by the Ministry of Environmental Protection, Natural Resources, and Forestry. Provisions in the new law also regulated concessions for exploration and mining and worker safety in underground mines and addressed the issue of indemnification for mining damages,

the safeguarding of mineral deposits and underground water, and rules for mining and geological exploration (Dziennik Ustaw Rzeczypospolitej Polskiej, 1994).

In 1996, the Government of Poland continued to promote the denationalization and privatization of the economy, as well as the growth of the domestic and export markets. The private sector's share in industry also continued to grow but was modulated by social demands for slower denationalization of large-scale, state-owned heavy industry enterprises, such as those in mining, metals production, and machine building.

## Environmental Issues

Pollution from heavy industrial point sources (mining, mineral processing, smelting, and electric power generation) continued to be an issue of major concern in 1996, with respect to actual and potential damage to public health and the general environment. Data available for 1995 show the total amount of gaseous and solid industrial waste (noxious to the environment) to have exceeded 1.97 billion metric tons, or about a 5% increase compared with that of 1994. Of this amount, about 838 million metric tons (Mt) of waste rock and overburden was generated by mining; 584 Mt of tailings, by industries involved with beneficiation of nonferrous ores, sulfur, barite, coal, and the mechanical treatment of mine water; 318 Mt of fly ash and cinder, by the electric power industry; 45 and 33 Mt of ash and cinder by iron and steel and nonferrous smelting; 8 Mt of waste and dust, from gas treatment at smelting operations; and 11 Mt of various pollutants, by other sources (Główny Urząd Statystyczny, 1996a, b).

New mining activity in Poland must meet local, as well as regional, requirements. Local requirements pertain to the conservation of soils and forest resources and the preservation of natural, cultural, and historical monuments. Regional requirements are concerned primarily with the protection of the regional landscape, as well as ground water, from contamination and depletion (Kuwalak and others, 1996). Despite having a high-quality ore, the Zawiercie lead and zinc deposit had not been developed because of environmental concerns. The deposit is directly adjacent to the town of the same name, between Krakow and Katowice, and is near a protected zone with an important reservoir of fresh water. Similarly, the vanadium-bearing titanomagnetite deposit near Suwalki was not developed because of the complexity of the mineralization and the location of the deposit under an important national park.

## Production and Trade

The gross weight of output of most mineral commodities remained at or near the levels of output in 1995. (See table 1.) The value of Poland's total exports in 1996 increased by about 19% compared with that of 1995. With respect to the broad trade categories, exports of crude materials (excluding fuels but including ores and concentrates) declined by about 11%; exports of fuels, lubricants, and related materials declined slightly; and exports of chemicals and related products rose by more than 18%. Imports of crude materials; fuels, lubricants, and related materials; and chemicals and related products, showed increases of about 23%, 43%, and 31%, respectively.

## Structure of the Mineral Industry

The information provided in table 2 lists the names of major operating companies, the location of mining and processing facilities, and the annual capacities of the country's mineral industry for 1996.

## Commodity Review

### Metals

**Aluminum.**—Poland's sole producer of primary aluminum was the Huta Aluminium "Konin" S.A. smelter at Konin. The plant produced three grades of primary metal from imported alumina. The plant's current capacity was rated in excess of 52,000 metric tons per year (t/yr) (Zakład Polityki Surowcowej i Energetycznej, 1997). Additionally, secondary aluminum as ingots was produced at Zakłady Metali Lekkich "Kety" SA (ZML Kety), the "Skawina" Metallurgical Plant, and the "Trzebinia" Metallurgical Plant.

In March, spokespersons for ZML Kety, reported that an explosion of one of the plant's furnaces would entail fairly high repair costs. Operations were not, however, disrupted by the explosion, the cause of which was not indicated at that time (Mining Journal 1996e). ZML Kety has been in operation since 1953 (Serjeantson, 1993). The plant is a producer of secondary aluminum ingot and a variety of aluminum alloys, including AlSi, AlSiMg, AlMg, AlSiCu, AlSiMn, AlFe, AlNi, AlCr, and AlTi, at its master alloy plant. Other facilities include an extrusion plant for tubes and pipe, a rolling mill for foil, and a rod-drawing plant.

A new aluminum extrusion plant, Hydro Aluminium Chrzanow Sp.z.o.o., was reported to be under construction at Chrzanow in early 1996. The construction of the plant, a subsidiary of Norsk Hydro AG of Norway, was scheduled for completion before the end of the year. Total investment in the project was estimated to be US\$15 million. The plant's rated capacity was 8,000 t/yr of aluminum extrusions with sales in 1997 anticipated to be US\$18 million in 1997 (Profile, 1996).

**Copper.**—In 1996, the trade unions at Zakłady Hutniczo-Przetworcze Metali Kolorowych Hutmen SA (Hutmen SA) of Wroclaw reportedly opposed the buyout of the enterprise.

Buyout proposals were tendered by KGHM "Polska Miedz" S.A. (KGHM) and Impexmetal SA, a trading company. The two companies, which were on a short list that was prepared by the Ministry for Privatization, each offered to buy 50% of Hutmen SA (Smosarski, 1996d). Union objections reportedly were based on fear of unfair competition. Because KGHM is a potential competitor as a buyer of copper scrap (Hutmen SA operates entirely on scrap); the risk of monopoly position in the domestic scrap market was indicated; and because Impexmetal sells some of Hutmen's scrap, price manipulation was a risk. The privatization scheme favored by the unions would involve up to 50% of the company's assets being held by "passive" investors, 25% being floated on the Warsaw Stock Exchange, 15% being handed to the work force, and 10% being retained by the State (Smosarski, 1996d).

Hutmen SA's production consists mainly of copper and brass pipes and fittings. The company's production in 1995 amounted to 36,500 metric tons (t) and dominated the domestic market for these products; moreover, about 36% of the company's output was exported. Hutmen SA also has expended considerable effort to clean up its industrial processes. In 1990, it was among 80 of the most polluting facilities in Poland (Smosarski, 1996d).

In early 1996, KGHM sent a delegation to Zaire to study the possibility of acquiring copper mining concessions there. The Polish delegation was headed by the president of KGHM. This was a return courtesy visit to the president of Gecamines in Zaire, who led a delegation to Poland in September 1995 to explore the possibility of acquiring mining equipment produced by KGHM's subsidiaries. The visit to Zaire also was aimed at continuing discussions of possible Polish equipment sales (Mining Journal, 1996c; Smosarski, 1996a).

Plans for privatizing KGHM continued throughout 1996, reportedly following a tender of December 12, 1995 that sought an adviser (professional consultant) for the public sale of the company (Metal Bulletin, 1996). The deadline of January 23, 1996, for selecting a contractor to lead the sale of the company was extended to February 2, 1996. Also, the Ministry for Privatization would require a further 6 to 8 weeks to make final decisions on this matter (Metal Bulletin, 1996). Reportedly 10 consortia already had applied by the deadline. Generally, a consortium included at least one or several large western Banks and one Polish bank. As of early 1996, the plan was to give KGHM employees 15% of the stock in preferential shares; this had been encouraged by the trade unions (presumably only those employees who had been with the company since it became a joint-stock company in 1991 were eligible). Of the total company shares, 51% would be given to the Government, 44% (valued at between US\$2 billion and US\$2.8 billion) would be sold, and 5% would be retained by the company to cover claims arising from former landholders' rights. Two stock flotations had been planned, each amounting to about 15% of the 44% of the stock designated for buyers (Metal Bulletin, 1996). The first flotation was to take place at the Warsaw bourse; the second, in London.

In June, it was reported that the sale of KGHM was to be handled by a consortium consisting of Barclays de Zoete Wedd (BZW), Union Bank of Switzerland, and Wielkopolski Bank

Kreditowy (Bobinski, 1996a). The BZW-led consortium reportedly offered to underwrite the sale of KGHM, whose assets were valued at more than US\$2 billion; the consortium's fee was proposed at 2.3% of this amount. Having decided on the BZW-led consortium to handle KGHM's privatization, Poland's Ministry of Privatization indicated that 51% of KGHM's equity was to be offered for sale during the first quarter of 1997, despite low world prices on copper that could negatively affect the company's profitability (Mining Journal, 1996a). At a meeting in June, a company spokesperson described the directions of the company's research and development—to improve the grade of copper concentrate, to increase the extraction of gold and silver from existing concentrates at the complex, to develop new extraction techniques for thinner ore bodies, and to study the possible use of solvent extraction-electrowinning technology (Mining Journal, 1996b). KGHM's management indicated plans to increase the production of copper by 75,000 t/yr to 470,000 t and gold from 0.5 to 3 t/yr. In the last several years, KGHM has acquired what has been described as an "impressive" environmental protection record—harmful emissions of CO, SO<sub>2</sub>, Cu, and Pb have fallen consistently each year since the 1980's (Mining Journal, 1996b). Some of the recent environmental work included the installation of a Silinoz desulfurization unit and electrostatic precipitators at the Legnica smelter, closed water circuits at the Glogow smelter and refinery, the construction of wastewater treatment facilities, and the use of smelter slag for road repair. Moreover, the company has been considering the production of lead bullion to decrease further the emission of lead into the environment.

During the third quarter of 1996, a strike alert by the principal trade union representing workers and employees of KGHM, reportedly followed the failure by the Government to appoint a mediator to handle a pay dispute between workers and management (Mining Journal, 1996d). The trade union demanded a 7.5% average pay raise for 27,000 union employees. A mediator was appointed and the pay dispute was expected to be resolved by yearend.

Major facility expansion at KGHM was completed in 1995. In 1992, the management of KGHM decided to install a new dewatering plant that was to use the Larox Power PF pressure filters. The first unit was installed in 1993; the second and third units were online in 1995. A conventional dewatering system that was installed at the Rudna concentrator in 1974, in addition to high gas consumption, had high maintenance costs because of the amount of equipment involved in the dewatering process and corrosion caused by salt. The new Larox system was designed to reduce gas consumption by 70% and overall dewatering costs by 30% (Suttill, 1996).

Part of KGHM's investment program developed for 1996 involved a proposed expenditure of US\$2.8 million out of a total investment program of US\$60 million to mine narrow ore seams at the Polkowice underground mine. Generally, the practice at this mine had been to work seams of ore at least 3 meters (m) in thickness. The proposal would entail working seams that are 2 m or less in thickness. According to company experts, the proposal could reduce mining costs by up to 30%, as well as

extend the operational life of the mine (Smosarski, 1996b).

**Iron and Steel.**—Poland remained a major Central European producer of steel. In 1996, the production of crude steel amounted to more than 10.4 Mt; finished hot-rolled steel products, to more than 8.5 Mt; and steel pipes, to more than 0.5 Mt. Compared with that of 1995, production of crude steel, hot-rolled steel products, and steel pipes declined by about 12%, 5%, 7%, and 8%, respectively. Downturns in the steel sector showed the continuing adjustment of the industry to market conditions (Główny Urząd Statystyczny, 1997a).

The latest available foreign trade data (for 1995) show that imports of iron ore and concentrates reached 10.9 Mt, an increase of about 29% compared with that of 1994. The countries of the former Soviet Union (FSU) continued to be the major sources of feedstock to Poland's steel mills. In 1995, Ukraine and Russia supplied Poland with iron ores and concentrates, including roasted iron pyrites valued at US\$141 million and US\$79 million, respectively, or about 79% of the total value of Poland's imports of iron ore and concentrate during the year (Główny Urząd Statystyczny, 1995, 1996). The FSU also was Poland's major source of ferroalloys; the value of imports from Russia, Ukraine, and Kazakstan amounted to US\$11 million, US\$3.9 million, and US\$1.7 million, respectively, or about 33% of the value of total imports [Główny Urząd Statystyczny, 1996]. Poland's apparent consumption of steel in 1995 had increased by more than 6%, rising from 11.2 Mt to 11.9 Mt.

Poland no longer mines iron ore. With the exception of the vanadium-bearing titanium magnetite deposits at Suwalki (Krzemińska and Urdyn deposits), Poland's Ministry of Environmental Protection, Natural Resources, and Forestry removed all the country's sedimentary iron ore deposits from its domestic raw materials register. These deposits (siderite and limonite at Czestochowa and Leczyca) no longer were viewed as potentially economic mineral resources (Polish Geological Institute, 1996; Zakład Polityki Surowcowej i Energetycznej, 1997).

Major developments in Poland's steel industry involved foreign investment and/or participation in this sector. In early 1996, Companhia Vale do Rio Doce (CVRD) of Brazil, the world's largest producer of iron ore, and Huta "Katowice" S.A., Poland's largest producer of steel signed a preliminary agreement to build an iron ore terminal in Gdansk. The project was to be completed by 1998, and the terminal was to have capacity to handle about 5 million metric tons per year (Mt/yr) of iron ore. Huta "Katowice" was to be the majority shareholder in the enterprise, and CVRD was to hold about 40% of the stock. This arrangement, however, would not preclude the participation of other commercial entities in the venture (Kepp, 1996).

In late 1996, a proposed joint venture between Sidmar NV (Sidmar) of Belgium and Huta "Katowice" to build a thin slab caster and hot strip mill failed to materialize. According to Sidmar, the proposed deal failed chiefly because of Huta Katowice's inability to supply liquid steel economically. A spokesperson for Sidmar further indicated that another factor in

the decision to withdraw was the anticipation of major competition from Huta im. Sendzimira, another major state-owned steel producer, thereby avoiding potential vulnerabilities stemming from the restructuring of Poland's steel industry (Metal Bulletin, 1997).

In early 1996, the U.S. manufacturer of bearings, Timken of Canton, Ohio, reported signing an agreement with Poland's privatization agency to acquire FLT Prema Milmet SA (FLT) of Sosnowiec, a manufacturer of tapered roller bearings. FLT, about 200 kilometers (km) south of Warsaw, has sales of bearings ranging from US\$12 to \$15 million per year. FLT was to become part of Timken's European operations, which include sales offices throughout Europe and manufacturing operations in France and the United Kingdom. According to Timken spokespersons, the acquisition of FLT should allow Timken to benefit from the economic growth in the region (Robertson, 1996).

During the year, Poland sought to maintain protection for its steel industry by extending duties on imports until 2002. The provisions of Poland's tariff agreements with the European Free Trade Association and the European Union (EU) reduced the duties on steel imports from these areas to Poland from 12% in 1995 to 9% in 1996. The duties were scheduled to decline further to 6% in 1997, 3% in 1998, and to 0% in 1999. A formal application to the European Commission to delay duty reductions was expected during the year. One of the difficulties in resolving this issue was the status of iron and steel scrap in Poland. The EU apparently had indicated favorable resolution of the issue, thus delaying duty reductions, if Poland were to increase its scrap exports. Poland has been unwilling to increase exports owing largely to the increasing domestic demand of the country's growing electric arc furnace capacities. Also, Poland's present classification of scrap as waste technically prevented it from being imported, which served as an added obstacle to trade (Smosarski, 1996c).

### **Industrial Minerals**

**Cement.**—The privatization of Poland's cement industry resulted in foreign ownership of about 65% of the country's total cement capacity by mid-1996. About 25% of Poland's cement capacity was controlled by the State Privatization Agency's National Investment Fund (NIF). Competitive private bids for remaining state-owned cement-producing capacities continued during the year.

The Rumeli Group of Turkey, an investment company that specializes in cement production, acquired a 50% stock share in Poland's Cementownia Nowa Huta SA for US\$41 million. Rumeli further agreed to invest US\$60 million in Nowa Huta to raise output to 1 Mt/yr from production of about 600,000 t/yr, as well as not to lay off workers at the plant for 5 years. (International Cement Review, 1996b, 1997; Bobinski, 1996b).

In 1996, Lafarge of France signed an agreement with NIF to acquire a 60% stake in Cementownia Wierbica SA for an undisclosed sum. Earlier, Lafarge had acquired a 23% share of Cementownia Malogoszcz SA valued at US\$80 million. These acquisitions were in addition to Lafarge's 1995 acquisition of

Cementownia Kujawy SA (Financial Times, 1996). By exercising its option to acquire additional shares in Cementownia Gorazdze SA, CBR Cimenteries SA (CBR) of Belgium, a subsidiary of Heidelberger Zement of Germany, brought its stake in the Gorazdze cement operation to 51% (International Cement Review, 1996a).

The German cement producer Dyckerhoff A.G. acquired a 60% share of Cementownia Nowiny SA (Nowiny) for US\$65.4 million; about 25% of Nowiny's shares continued to belong to the Government of Poland. Dyckerhoff was reported to be interested in acquiring 15% of the shares held by the company's employees. In 1996, Nowiny's share of Poland's cement market was about 8%. Dyckerhoff planned to invest about US\$168 million in modernization between 1996 and 2000. Nowiny was in a good position to participate in Poland's highway development program (International Cement Review, 1996b). The Nowiny operation consisted of the Nowiny I plant, which comprised five small wet-process kilns, and the Nowiny II plant, which comprised two dry-process kilns. In general, Poland's cement industry is relatively polluting and energy intensive compared with that of EU-member countries. More than 50% of the industry is based on the wet process for cement production. The modernization at Nowiny included the replacement of a ZAB-Dessaut-type heat exchanger with a four-stage cyclone exchanger at kiln No. 7 at the Nowiny II plant (Duda and Sladeczaek, 1996).

In 1996, Scancem Ans. of Norway announced plans to construct a cement terminal in Gdynia. The terminal was to have the capacity to handle 100,000 t/yr of cement and would include at least one 10,000-t silo (International Cement Review, 1996b).

In Poland, the major sources of calcareous raw materials (limestone and marl, used in the production of cement and lime, as well as in the food and metallurgical industries) are in the Carpathian Mountains (Cretaceous formations), Holy Cross Mountains (Devonian, Triassic, Jurassic, Cretaceous and Tertiary formations), Kujawy-Pomeranian area (Jurassic formations), Lower Silesia (Cambrian and Triassic formations), Lublin area (Cretaceous formations), and the Silesian-Kracow area (Triassic, Jurassic, and Cretaceous formations). The following plants produce lime: Bukowka, Czatowice, Gorazdze, Kujawy, Marmury, Miedzianka, Morawica, Opolwap, Plaza, Sabonow, Sulejow, Trzuskawica, and Wojcieszow (Polish Geological Institute, 1996; Zaklad Polityki Surowcowej I Energetycznej, 1994-1997).

Although most lime producing facilities were still state-owned and state-operated by yearend 1996, their privatization appeared to be well under way. The most recently privatized lime producers were Silesian Lime Factory in Opolwap, acquired by Elektrim of Poland in 1996, and Lime Factory in Wojcieszow, with major investment by Wulfrath of Germany. Cement and Lime Company in Kujawy, with major investment by Lafarge, and Cement and Lime Company in Gorazdze, with major investment by CBR, were privatized prior to 1996. At yearend 1996, the Trzuskawica and the Bukowa lime plants were reported to be preparing for privatization. Additionally, within Poland's cement sector, privatization and foreign

investment that included limestone quarrying and lime-producing capacities have been substantial (Gypsum, Lime & Building Products, 1997).

**Sodium Compounds.**—Poland mined and manufactured sodium compounds. The country's rich reserves of salt (brine) at Góra and Mogilno formed the basis of caustic soda production. Calcined soda production also is based on domestic salt deposits, as well as limestone quarried at the Piechin and the Barcin deposits (Zakład Polityki Surowcowej i Energetycznej, 1997).

Poland's soda ash enterprises, Janikosoda SA and Soda Matwy SA, were denationalized in 1996 with the decision by the State Privatization Agency to sell the enterprises to the domestic state-owned chemical trading firm, Ciech. In 1995, Rhône Poulenc of France and Solway SA of Belgium had expressed interest in acquiring these assets. The decision to sell Janikosoda SA and Soda Matwy SA, as well as the Inowrocławskie Kopalne salt mining operation, to Ciech reflected the desire on the part of the Government of Poland to maintain domestic ownership of these enterprises. Ciech agreed to buy 75% of the shares (valued at US\$78 million), the employees were to receive 20%, and a compensation fund for individuals whose property was confiscated by the Communist authorities following World War II was created with 5% (Chemical Week, 1996).

### **Mineral Fuels**

The country's bituminous coal, a major source of energy for domestic consumption, accounted for about 60% of Poland's electric power output and more than 80% of heat produced for industrial and municipal needs (Economic and Social Council, 1996). Although some fluctuations (mostly downward) of domestic coal sales were reported in the early 1990's, 1994, and 1995, sales to power generators appeared to have stabilized and amounted to about 39.9 and 39.4 Mt, respectively. During 1994-95, the share of coal sold to the electric-power-generating sector totaled about 40% of total domestic sales (Economic and Social Council, 1996).

In the early 1990's, policies of the Government of Poland were aimed at keeping coal prices below production costs. Losses were subsidized, and this system and/or policy continued until the first quarter of 1992, when subsidies effectively were abolished (Economic and Social Council, 1996).

In January 1993, Poland's coal mines and powerplants reached an agreement on coal prices for electric power generation and heat production. The agreement was renegotiated after the restructuring of the coal mining sector between March and June 1993. A major outcome of the restructuring process was the development of joint-stock companies that were owned by the state Treasury (in preparation for privatization), which began to set sale prices that reflected actual production costs (Economic and Social Council, 1996). In August 1993, an agreement that determined prices for standard coal to be US\$32 per ton of coal for yearend 1993 was reached between coal companies, powerplants and cogeneration

plants. Standard coal was specified at 21,000 kilojoules per kilogram, ash content, at 22%; and sulfur content, at 0.9%. Domestic market stability in the coal sector was maintained through long-term agreements with domestic consumers, including electric-power-generating plants (Economic and Social Council, 1996).

Similarly, the restructuring of the country's coal industry also has had a major effect on foreign commerce in coal by decentralizing and privatizing Poland's monopoly coal trade apparatus. This was to include the following (Russell, 1997):

- The foreign trade arm of Poland's coal industry, "Weglokoks," should complete its privatization process by the end of 1998.
- About 65% of the stock was to have been offered for sale—about 45% to selected foreign and domestic investors and 20% to Weglokoks employees. The remaining 35% was to have been retained by the state.
- The state's restructuring and divestiture of Weglokoks also was to have involved the sale and/or disposal of Weglozbyt, the former domestic distributing arm of Weglokoks, and Kopex, a subsidiary that traded both in mining machinery and coal.

In 1996, coal industry losses reportedly were expected to amount to about US\$518 million. More than 20 Mt out of a total of the 29 Mt exported during the year (69%) was handled by Weglokoks. Overall, total coal exports declined compared with those of 1995. In 1995, Poland's total coal exports amounted to 32 Mt; those of Weglokoks amounted to 23 Mt. The largest receiver of coal exported by Weglokoks in 1995 was Ukraine, with imports amounting to 4 Mt. About 3 Mt was exported to Denmark and Finland; about 1 Mt was exported to the Czech Republic, Germany, the Netherlands, and the United Kingdom. Beyond Europe, Brazil was the major importer of coal from Poland in 1995, with purchases amounting to 800,000 t (Russell, 1997). Three 45,000-t cargoes of coke were to be shipped from Poland to the Acesa steel mill in Brazil; two shipments were scheduled for delivery in the fourth quarter of 1995, and the third shipment was scheduled for delivery in 1996 (World Coal, 1995).

The startup a major reverse osmosis and thermal desalination plant for purifying water at the Debiensko and the Budryk coal mines improved Poland's serious problem with water in coal mines. The plant became operational in late 1995 and cost about US\$60 million. The Polish company Energotechnika Ltd. built the plant in joint venture with the Swedish firms, Axel Johnson International Ltd. and Nordcap International Ltd. The technology used at this facility was from the United States and Sweden. The plant has been designed to treat 17,300 cubic meters per day (m<sup>3</sup>/d) of mine water. The plant's output included 11,800 m<sup>3</sup>/d of drinking and industrial process water; 5,500 m<sup>3</sup>/d of distilled water; 300 tons per day (t/d) of marketable sodium chloride, and 30 t/d of calcium sulfate (McDermott, 1996).

In Poland, deposits of bituminous coal and anthracite are found in three basins. As of December 31, 1995, the Upper Silesian, Lower Silesian, and Lublin Basins have exploitable resources amounting to 60,185 Mt of coal in 126 deposits. The

calorific values used by Poland's coal industry to classify coals are as follows (Zakład Polityki Surowcowej i Energetycznej, 1997):

- 1) Bituminous coal—above 5,700 kilocalories per kilogram (kcal/kg)
- 2) Subbituminous Coal:
  - A. Brown Coal—4,165-5,700 kcal/kg
  - B. Lignite— below 4,165 kcal/kg.

The Upper Silesian Basin consists of 103 deposits with reserves amounting to about 51,272 Mt. In 1995, 60 underground mines were operational. These deposits mostly contain steam coal (both bituminous and subbituminous); however, coking coal and anthracite also were mined. Low-quality coal [low calorific value; high ash (20%) and sulfur (2%) content] was mined in the eastern part of the basin, but this product was of lesser marketability. The western and northern parts of the basin contain coal with high calorific values (6300 kcal/kg, average) low moisture (3.8%, average) with low average sulfur (1.3%) and ash values (13%) (Zakład Polityki Surowcowej i Energetycznej, 1997). It should be noted that the Upper Silesian Basin has accounted for more than 95% of the country's total hard coal output. As part of the restructuring process, 49 individually operated mines in the Upper Silesian Basin were initially organized into 7 major coal companies (Chadwick, 1996a). In 1996, the following coal companies were operating in Upper Silesia in 1996:

- Bytomska Spolka Weglowa S.A.— Steam coal only. Mines: Andaluzja, Julian, Rozbark, Szombierki-Centrum, Powstancow Slaskich, Bobrek, Miechowice, Pstrowski, Jowisz, and Grodziec. Total production for the Bytomska operation in 1994 amounted to 13.9 Mt of coal.
- Gliwicka Spolka Weglowa S.A.— Mainly steam coal. Mines: Boleslaw Smialy, Debiensko, Gliwice, Knurow, Makoszowy, Sosnica, and Szczyglowice. Total production for the Gliwicka operation in 1994 was 17.9 Mt of coal.
- Jastrzebska Spolka Weglowa S.A.— Mainly coking coal. Mines: Borynia, Jastrzebie, Krupinski, Morcinek, Mszcenica, Pniowek, and Zofiowka. Total production for the Jastrzebska operation in 1994 amounted to 14.7 Mt of coal.
- "Jan Kanty" S.A. ("Jan Kanty" Hard Coal Joint Stock Company)—one mine. Only steam coal.
- Katowicki Holding Weglowy, S.A.—Entirely steam coal. Mines: Kleofas, Kazimierz-Juliusz, Murcki, Myslowice, Niwka-Modrzejow, Wesola, Wiczorek, Wujek, Staszic, Katowice, Slask Boleslaw Smialy, Debiensko, and Gliwice.
- KWK "Porabka- Klimontow" S.A. Steam coal only.
- Nadwislanska Spolka Weglowa S.A.—Only steam coal. Mines: Brzeszcze, Czeczott, Janina, Jaworzno, Piast, Siersza, Silesia, and Ziemowit. Total production for the Nadwislanska operation in 1994 amounted to 24.8 Mt of coal.
- Rudzka Spolka Weglowa S.A.—Mainly steam coal. Mines: Halemba, Nowy Wirek, Pokoj, Polska, Wawel, and Zabrze-Bielszowice. Total production for the Rudzka operation in 1994 amounted to 13.1 Mt of coal.

- Rybnicka Spolka Weglowa S.A.— Steam and coking coal (parity). Mines: Rydultowy, Anna, Marcel, Chwalowice, Jankowice, and 1 Maja. Total production for 1994 for the Rybnicka operation was 15.3 Mt of coal.

Reserves in the lower Silesian Coal Basin were nearly exhausted. Potentially exploitable resources amounted to 150 Mt; as of December 31, 1995, reserves were estimated to be 5 Mt. The complex (difficult) geologic conditions and depletion of reserves have resulted in the decision to close most coal mining operations in the Basin. Owing to exploitable deposits of coking coal and anthracite coals in the Basin, however, sections of the Chrobry and the Victoria deposits were combined to form the Walbrzych-Gaj anthracite deposit in 1992. Commercially exploitable resources at this deposit amount to about 40.9 Mt, include 20.9 Mt of reserves (Chadwick, 1996a). Operating mines and plants in the Lower Silesian Basin were as follows:

- 1) KWK Nowa Ruda—Mainly coking coal.
- 2) KWK Walbrzyskie—Mainly coking coal.
- 3) Zakład Wydobywczo-Przetworczy Antracytu Walbrzych-Gaj mainly the production of anthracite.

The Lublin Coal Basin is the easternmost coal mining region of Poland. Thirteen deposits found with total exploitable resources (as of December 31, 1995) amounting to 8,763 Mt of mostly steam coal. Owing to complex geologic and difficult mining conditions, only 543 Mt has been classified as available reserves. Calorific values of coal from the Lublin Coal Basin range from 4,100 to 7,500 kcal/kg, with an average value of 6,200 kcal/kg. Ash and sulfur contained in the coal has ranged from 2% to 40% (average 14.6%) and 0.3% to 8.5% (average 1.36%), respectively (Chadwick, 1996a). Operating mines in the Lublin Basin included KWK "Bogdanka" S.A. ("Bogdanka" Hard Coal Mine Joint Stock Company)—Steam coal production only.

Poland's lignite deposits are found mainly in the central part of the country, although the Turow deposit and mining operation is in the southwest, bordering Germany and the Czech Republic. The lignite deposits are of Miocene age, and all are mined by open pit method. Commercially exploitable resources reportedly amount to about 37 billion metric tons (t) of which 14 billion t are considered to be reserves (Chadwick, 1996b). More than 40% of Poland's total power generation is based on lignite. About 97% of the lignite produced in Poland is consumed by four domestic electric power stations [combined capacity—8,700 megawatts (MW)]; the balance is sold domestically or exported. In the central group, the Belchatow thermal electric powerplant with a capacity of 4,320 MW is reputedly the largest coal-fired electric power station in the world. The overburden covering the central lignite deposits varies from 30 to 180 m in thickness and consists of silts, clays, sands, and gravels. Each year, about 230 million cubic meters (Mm<sup>3</sup>) of overburden and 350 Mm<sup>3</sup> of water must be removed and pumped out, respectively, to produce 70 Mt/yr of lignite. Open pit mining equipment used in lignite mining included 62 bucketwheel and bucketchain excavators with capacities ranging from 900 to 11,000 cubic meters (m<sup>3</sup>) per hour; 20 spreaders with capacities of 1,920 to 15,400 m<sup>3</sup> per hour; and 265 km of

belt conveyors with speeds up to 5.5 m per second and widths up to 2,500 millimeters (Chadwick, 1996b).

Kopalnia Wegla Brunatnego (KWB) Belchatow was the country's largest lignite producer with the capacity to produce 38.5 Mt/yr of lignite. The open pit mine was about 240 m in depth and about 110 million cubic meters per year of overburden is removed, using 13 bucketwheel excavators, 6 spreaders, and 72 km of belt conveyors. The average calorific value of the lignite produced at KWB "Belchatow" is 1,900 kcal/kg, containing 0.55% sulfur and 9.7% ash. Future plans at KWB "Belchatow" included development of the Szczercow lignite field with commercially exploitable resources of about 800 Mt. At full capacity, the Szczercow deposit would produce about 29 Mt/yr and have a strip ratio of 2.3:1. It was anticipated that by 2020 the Belchatow lignite field would be mined out and that the Szczercow field would be producing about 20 Mt/yr.

The most recent environmental protection investment at Belchatow included the installation of flue gas desulfurization systems on four generators to reduce SO<sub>2</sub> emissions by 90% per unit. Additionally, the installation of an industrial sludge purification plant recently had been completed. The installation was designed to dispose of ash from electrostatic precipitators at the plant into areas of the open-pit mine that have been worked out and could be sealed. The disposal system comprised 12 ash entrainment stations (1 per precipitator), 8 retention reservoirs, 2 belt conveyor units, and 1 compressor plant and compressed air and water installations (Chadwick, 1996b).

The KWB "Adamow" open-pit lignite mine, producing 4.5 million Mt/yr of lignite, is the country's smallest producer. The removal of overburden amounts to about 22 million cubic meters per year (Mm<sup>3</sup>/yr). The mining operation uses 12 bucketwheel excavators, 3 spreaders, and 30 km of belt conveyors. The average calorific value of the lignite is 2,140 kcal/kg; the average sulfur and ash contents amount to 0.2% and 10%, respectively. At the current level of output, production at the Adamow operation was anticipated to last until 2015.

KWB "Konin" produces about 14 Mt of lignite while removing about 64 Mm<sub>3</sub>/yr of overburden. Mining operations employ 14 bucketwheel excavators, 7 bucketchain excavators, 6 spreaders, and 42 km of belt conveyors. The average calorific value of lignite produced at Konin is 2,150 kcal/kg; sulfur and ash contents are as much as 0.8% and up to 7.5 %, respectively. Production was anticipated to last until 2030. Operations at KWB Konin also have included the production of about 100,000 t/yr of lignite briquettes. Reportedly, 60% of the briquettes were exported. On balance, 95% of the lignite output at Konin is consumed by thermal electric power stations (Chadwick, 1996b).

KWB Turow, with the annual removal of about 45 Mm<sub>3</sub> of overburden, produces 15 Mt/yr of lignite. Operations include the use of 16 bucketwheel and bucketchain excavators, 5 spreaders, and 120 km of belt conveyors. The calorific value of the lignite from Turow ranges from 1,550 to 2,630 kcal/kg, the ash content of 18% is reportedly the highest in the industry, and the sulfur content ranges from 0.4% to 0.8%. Mining operations were expected to last until 2020. Overall, peak lignite production of 81 Mt was expected to be achieved in 2004 and

to decline to 45.5 Mt by 2020.

## Infrastructure

Poland's inland system of transportation consisted of 396,163 km of highways, railroads, and waterways. The railroad system comprised 22,655 km of 1.435-m standard gauge track (11,496 km, electrified; 8,978 km, double track); 656 km of 1.520-m broad gauge; and 1,855 km of various narrow gauges of track. The total highway network amounted to 366,990 km, consisting of 235,237 km of paved and 131,753 km of unpaved roads. Poland had 3,997 km of navigable rivers and canals, with ports at Gliwice on Kanal Gliwice, Wroclaw on the Oder River, and Warsaw on the Vistula River. The major maritime ports were at Gdansk, Gdynia, Szczecin, and Swinoujscie. In 1996, Poland's merchant fleet consisted of 131 vessels, totaling 3,167,660 deadweight tons, under national flag registry. Poland also had 4,600 km of pipeline for natural gas, 1,986 km for petroleum, and 360 km for petroleum refinery products.

## Outlook

Because of their developed infrastructures and operations and abundant mineral resources, Poland's coal, copper, lead and zinc, and sulfur mining and processing industries should be able to continue operations into the foreseeable future. Also, the need for expanded, as well as newer, commercial infrastructure should increasingly stimulate the growth of the country's industrial minerals sector for the production of cement, construction materials, and steel.

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TABLE 1  
POLAND: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1992	1993	1994	1995	1996 e/
<b>METALS</b>					
Aluminum metal, primary	43,628	46,942	49,509	55,728 r/	52,100 3/
Alumina, nonmetallurgical (<30% Al <sub>2</sub> O <sub>3</sub> ) e/	200	200	-- r/	-- r/	--
Cadmium metal, primary	132	149	61 r/	-- r/	100
<b>Copper:</b>					
<b>Ore:</b>					
Gross weight thousand tons	24,114	27,113	26,136	26,463 r/	27,427 3/
Metal content	372,600 r/	430,800 r/	423,600 r/	431,100 r/	445,000
<b>Concentrate:</b>					
Gross weight thousand tons	1,453 r/	1,559 r/	1,494 r/	1,507 r/	1,500
Metal content	331,900 r/	382,800 r/	378,200 r/	384,200 r/	382,000
<b>Metal:</b>					
<b>Smelter:</b>					
Primary	385,486	396,000 e/	390,000 r/ e/	395,000 r/ e/	410,000
Secondary	15,963	16,000 e/	14,000 r/ e/	15,000 r/ e/	20,000
Total	401,449	412,000	404,000 r/	410,000 r/	430,000
Refined (cathode)	387,010	404,170	405,093	407,000	425,000 3/
<b>Gold: e/</b>					
Mine output, Au content, recoverable thousand kilograms	30	30	30	30	30
Metal, smelter 4/ kilograms	300	300	628 r/	510 r/	600
<b>Iron and steel:</b>					
<b>Pig iron:</b>					
For foundry use thousand tons	294	206	204	227 r/	281
For steel production do.	6,021	5,899	6,662	7,146 r/	6,300
Other	1 r/	-- r/	-- r/	-- r/	--
Total	6,316 r/	6,105 r/	6,866 r/	7,373 r/	6,581 3/
<b>Ferroalloys:</b>					
Ferromanganese	35,300	38,400	8,700 r/	18,300 r/	20,000
Ferrosilicomanganese	28,000	27,000	31,800	20,500	25,000
<b>Ferromanganese:</b>					
From blast furnaces	43,400	56,400	66,300 r/	46,300 r/	55,000
From electric furnaces	4,800	1,100	-- r/	-- r/	--
Ferrosilicon	36,100	43,100	54,200 r/	70,400 r/	65,000
Other electric furnace ferroalloys	2,800 r/	3,000 r/	2,700 r/	3,000 r/	3,000
Total electric furnace	107,000	112,600 r/	97,400 r/	112,200 r/	113,000
Spiegeleisen	100	-- r/	--	--	--
<b>Steel, crude:</b>					
From open-hearth furnaces thousand tons	1,820	1,660	1,631	1,526 r/	1,731
From oxygen converters do.	6,248 r/	6,162 r/	7,033	7,685	6,000
From electric furnaces do.	1,798 r/	2,115 r/	2,447	2,677 r/	2,700
Other do.	1 r/	2 r/	2 r/	2 r/	2
Total do.	9,867 r/	9,939 r/	11,113	11,890 r/	10,433 3/
<b>Semimanufactures:</b>					
Hot rolled do.	7,550	7,632 r/	8,595	8,998 r/	8,526 3/
Cold rolled	1,315	1,401	1,611	1,943	1,800
Pipe do.	520	489 r/	503	576 r/	550
<b>Lead:</b>					
Pb-Zn ore, gross weight do.	5,022 r/	4,819 r/	4,871	5,040 r/	5,034 3/
Mine output, Pb content	70,100	68,400	72,300 r/	74,400 r/	74,000
Concentrate, gross weight	68,600	67,400	80,300 r/	88,300 r/	85,000
Pb content	49,700 r/	47,700 r/	53,300 r/	57,000 r/	55,000
<b>Metal:</b>					
<b>Smelter:</b>					
Primary	22,300	30,400	30,700 r/	34,800 r/	30,000
Secondary	36,200	35,500	35,700 r/	38,600 r/	35,000
Total	58,500	65,900	66,400 r/	73,400 r/	65,000
Refined	53,700 r/	62,300	61,300	66,421 r/	63,000
Silver, mine output, Ag content, recoverable	798	767	1,064	1,001 r/	935 3/
<b>Zinc:</b>					
Mine output, Zn content	186,200 r/	182,600 r/	182,800 r/	183,200 r/	185,000
Concentrate output, Zn content	151,700 r/	150,900 r/	151,000 r/	154,500 r/	150,000
Metal, refined, including secondary	134,594 r/	149,107 r/	157,618 r/	166,421 r/	165,000 3/

See footnotes at end of table.

TABLE 1--Continued  
POLAND: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1992	1993	1994	1995	1996 e/	
<b>INDUSTRIAL MINERALS</b>						
<b>Barite:</b>						
Crude	14,000 r/	20,400 r/	26,600 r/	22,400 r/	20,000	
Beneficiated	10,900	8,500	9,100	6,100	5,000	
Cement, hydraulic	thousand tons	11,908	12,200	13,834	13,914 r/	13,879 3/
<b>Clays and clay products, crude:</b>						
Bentonite	do.	18	9	1 r/	2 r/	2
Fire clay	do.	362	316	319 r/	275 r/	300
<b>Kaolin:</b>						
Crude	do.	229	265	294 r/	269 r/	270
Beneficiated	do.	42	48	53 r/	53 r/	50
Diamond, synthetic	thousand carats	320	98	270	256	250
Diatomite		1,700 r/	1,500 r/	2,700 r/	2,200	2,000
<b>Feldspar:</b>						
Run of mine		34,000	43,000	46,000 r/	46,000 r/	45,000
Beneficiated		22,600	30,700	38,100 r/	45,600 r/	40,000
Gypsum and anhydrite, crude 5/	thousand tons	843 r/	832	1,055	1,023 r/	1,000
Lime, hydrated and quicklime	do.	2,526	2,584	2,516	2,526 r/	2,500
<b>Magnesite:</b>						
Ore, crude	do.	17,000	34,000	30,000 r/	26,000 r/	30,000
Concentrate	do.	12,900	13,000	16,400	21,500 r/	20,000
Calcined		1,800	1,400	1,500 r/	1,200 r/	1,500
Nitrogen, N content of ammonia	thousand tons	1,490	1,419	1,500 r/	1,726 r/	1,700
<b>Salt:</b>						
Rock	do.	582	718	750	812 r/	800 3/
Other	do.	3,305	3,099	3,324	3,402 r/	3,363
Total	do.	3,887	3,817	4,074 r/	4,214	4,163 3/
<b>Sand, excluding glass sand:</b>						
Foundry sand	do.	744	669	507	521	550
Filling sand		20,356	19,990	18,765	19,067	20,000
Lime-sand brick production sand	thousand cubic meters	1,556	1,565	1,453	1,435	1,450
<b>Silica:</b>						
Quartz, crystal		30,600	55,600	39,900 r/	14,200 r/	20,000
Quartzite, refractory		104,400 r/	128,800 r/	208,000 r/	233,000 r/	230,000
Quartz schist		13,300	11,500	11,400 r/	8,500 r/	10,000
Glass sand	thousand tons	783	824	759	874 r/	850
<b>Glass:</b>						
Construction, flat	do.	308	295	266	327 r/	300
Technical	do.	40	44	46	48 r/	45
Commercial	do.	53	48	54	64 r/	60
Packing	do.	565	624	712	777 r/	750
<b>Sodium compounds, n.e.s.:</b>						
Carbonate (soda ash)	do.	929	815	997	1,019 r/	950
Caustic soda (96% NaOH)	do.	326	296	297	327	300
<b>Stone:</b>						
Dolomite, mine output	do.	4,653 r/	4,708 r/	6,068 r/	7,808 r/	7,500
Limestone, for lime production	do.	11,373 r/	11,075 r/	12,230 r/	12,079 r/	12,000
Limestone for nonlime end use	do.	25,343	23,360	26,760	27,036	25,000
Crushed and dimension stone, mine output	do.	13,979	13,644	16,865	19,688	20,000
<b>Sulfur:</b>						
<b>Native:</b>						
Frasch	do.	2,329 r/	1,861 r/	2,129 r/	2,392 r/	2,200
Other than Frasch	do.	562	--	--	--	--
Total	do.	2,891	1,861	2,129	2,392	2,200
<b>Byproduct:</b>						
From metallurgy	do.	207	210 r/	200	210 r/	200
From petroleum	do.	26	29	34 r/	33 r/	30
Total	do.	233	239	234	243	230
From gypsum e/	do.	10	10	12 r/	12 r/	12
Total sulfur e/	do.	3,134	2,110	2,375	2,647	2,442

See footnotes at end of table.

TABLE 1--Continued  
POLAND: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1992	1993	1994	1995	1996e/
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
<b>Coal:</b>					
Bituminous thousand tons	131,531	130,479	133,933	137,166 r/	137,444 3/
Lignite and brown do.	66,852	68,105 r/	66,770	63,547	63,845 3
Total do.	198,383	198,584	200,703	200,713	201,289
<b>Coke:</b>					
Coke oven thousand tons	11,036	10,275	11,454	11,579	10,340 3/
Gashouse do.	27	7	2	--	--
Semicoke do.	31	--	--	--	--
Total do.	11,094	10,282	11,456	11,579	10,340 3/
Fuel briquets, all grades do.	95	102	99 r/	100 r/	100
<b>Gas:</b>					
Natural million cubic meters	4,019 r/	4,949 r/	4,635	4,803 r/	4,754 3/
<b>Manufactured:</b>					
Town gas do.	21 r/	14 r/	15	33 r/	30
Coke oven gas do.	4,563 r/	4,077 r/	4,840 r/	4,872 r/	4,500
Generator gas do.	670	554	399	400	400
Total do.	5,254	4,645	5,254	5,305	4,930
Natural gas liquids, e/ thousand 42-gallon barrels	30	30	30	30	30
Peat, fuel and agricultural thousand tons	134	110	109 r/	199 r/	150
<b>Petroleum:</b>					
Crude, as reported do.	199	235	284	292	317 3/
Refinery products 6/ do.	25,250 r/	27,169 r/	27,795 r/	28,435 r/	30,000

e/ Estimated. r/ Revised.

1/ Table includes data available through Nov. 1997.

2/ In addition to the commodities listed, antimony, cobalt, germanium, a variety of crude nonmetallic construction materials, and carbon black also are produced, but available information is inadequate to make reliable estimates of output levels. Poland also may produce alumina in small quantities, but details of such an operation if it exists are not available.

3/ Reported figure.

4/ Based on official Polish estimates.

5/ Includes building gypsum, as well as an estimate for gypsum used in production of cement.

6/ Includes virtually all major products.

TABLE 2  
POLAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996 1/

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
<b>Aluminum:</b>			
Primary	Huta Aluminium "Konin" S.A.	Konin	50.
Secondary	Zakłady Metalurgiczne "Skawina"	Skawina	20.
	Zakłady Metali Lekkich SA "Kety"	Kety	
	Zakłady Metalurgiczne "Trzebinia"	Trzebinia	
Barite	Kopalnia Barytu "Buguszow" Sp. zo.o.	Boguszow, Stanislawow	40.
Cement	20 cement plants (in order of size): Gorazdze, Ozarow, Chelm, Warta, Malogoszcz, Nowiny, Strzelce Opolskie, Kujawy, Rudniki, Wierbica, Nowa Huta, Rejowice, Odra, Warszawa, Groszowice, Polcement-Saturn, Wysoka, Cem-Con, Wick, Wejherowo	Primarily in southern Poland. Kujawy, Warszawa, Cem-Con and Wejherowo are in Central and northern Poland	16,000.
<b>Coal:</b>			
Anthracite	Zakład Wydobywczó Przetworczy Antracytu Walbrzych-Gaj	Lower Silesia	200.

See footnotes at end of table.

TABLE 2--Continued  
POLAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996 1/

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
<b>Coal--Continued:</b>			
Bituminous	Bytomska Spolka Weglowa S.A.	Upper Silesia (9 mines)	140,000.
	Rudzka Spolka Weglowa S.A.	do. (6 mines)	
	Gliwicka Spolka Weglowa S.A.	do. (7 mines)	
	Katowicki Holding Weglowy S.A.	do. (11 mines)	
	Nadwislanska Spolka Weglowa S.A.	do. (8 mines)	
	Rybnicka Spolka Weglowa S.A.	do. (5 mines)	
	Jastrzebska Spolka Weglowa S.A.	do. (6 mines)	
	Seven independent mines	do.	
	Walbrzyskie Kopalnie Wegla Kamienego	Lower Silesia	
KWK "Nowa Ruda"	do.		
KWK "Bogdanka" S.A.	do.		
Lignite	KWK "Belchatow"	Belchatow	75,000.
	KWK "Turow"	Turow	
	KWK "Konin"	Konin	
	KWK "Adamow"	Adamow	
	KWK "Sieniawa"	Sieniawa	
Coke	Zaklady Koksownicze im. Powstancow Sl.	Upper Silesia	12,000.
	Zaklady Koksownicze "Przyjazn"	do.	
	Kombinat Koksochemiczny "Zabrze"	do.	
	Huta im. Sendzimira	do. (Krakow)	
	Huta "Czestochowa"	do. (Czestochowa)	
Zaklady Koksownicze "Walbrzych"	Lower Silesia		
<b>Copper:</b>			
Concentrate, gross weight	Kombinat Gorniczo Hutniczy Miedzi (KGHM)	Mines and concentrators at Konrad, Lubin, Polkowice, Rudna, and Sieroszowice	1,900. (385 Cu).
Metal, refined	do.	Refineries at Glogow I, Glogow II, and Legnica	415.
Feldspar	Strzeblowskie Kopalnie Surowcow Mineralnych	Mine at Sobotka, Lower Silesia, workings at Pagorki Zachodnie and Pagorki Wschodnie	50
<b>Ferroalloys:</b>			
Electric furnace (FeSiMn, FeMn, FeCr, FeSi)	Huta "Laziska"	Upper Silesia at Laziska Gome	170.
Blast furnace (FeMn)	Huta "Pokoj" S.A.	Upper Silesia, Ruda Slaska	90.
Gold (kilograms)	KGHM "Polska Miedz" S.A.	Refinery at Glogow "Trzebinia"	550.
Gypsum and anhydrite	Zaklady Przemyslu Gipsowego "Dolina Nidy"	Southeastern Poland, Gacki	1,400.
	Zaklad Gipsowy "Stawiany"	Southeastern Poland, Szarbkow	
	Kopalnia Anhydrytu "Nowy Lad" KGHM "Polska Miedz" S.A.	Lower Silesia, Niwnice Lower Silesia, Iwiny	
Helium, million cubic meters	Zaklad Odazotowania Gazu	Western Poland, Odolanow	3.
Kaolin	KSM "Surmin-Kaolin"	Lower Silesia, Nowogrodziec	50.
<b>Lead-zinc:</b>			
Concentrate	Zaklady Gorniczo-Hutnicze "Boleslaw"	Mines and concentrators at Olkusz and Pomorzany, Bukowno region	60 Pb, 160 Zn.
	Zaklady Gornicze "Trzebinia" S.A.	Mines and concentrator at Trzebinia	
<b>Metal:</b>			
Pb, refined	Huta Cynku "Miasteczko Slaskie"	Refinery at Miasteczko Slaskie	60.
Do.	Huta Metali Niezaleznych "Szopienice"	Katowice	35.
Zn, refined	Huta Cynku "Miasteczko Slaskie"	Imperial Smelter at Miasteczko Slaskie	60.
Do.	[Zaklady Metalurgiczny "Silesia" (input from Huta "Miasteczko Slaskie")]	[Refinery at Katowice]	(30).
Do.	Zaklady Gorniczo-Hutnicze "Boleslaw"	Refinery at Boleslaw	65.
Do.	Huta Metali Niezaleznych "Szopienice"	Katowice	28.

See footnotes at end of table.

TABLE 2--Continued  
POLAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996 1/

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Lime	In order of size: Zakłady Przemysłu Wapienniczego Trzuskawica Ślaskie Zakłady Przemysłu Wapienniczego Opolwap S.A. Zakłady Przemysłu Wapienniczego Bukowa Kombinat Cementowo-Wapienniczy Kujawy S.A. Zakłady Cementowo-Wapiennicze Gorazdze S.A. Zakłady Cementowo-Wapiennicze Nowiny Produkcyjno-Handlowo-Uslugowe Wapno-Sabinow Wojcieszowskie Zakłady Przemysłu Wapienniczego Sp. z o.o. Zakłady Przemysłu Wapienniczego w Sulejowie Zakład Wapienniczy w Plazie	Kieleckie County, Swietokrzyskie Mountains  Opole County  Kieleckie County, Swietokrzyskie Mountains  Bydgoskie County  Opole County  Kieleckie County  Czestochowa County  Jeleniogorskie County  Piotrkowskie County  Katowickie County	4,500.
Natural gas ( million cubic meters)	Ministry of Mining and Energy	Gasfields at pre-Carpathian foothills Carpathian Mountains Lowlands, near Ostrow Wielkopolski, Poznan, and Trzebnica, north of Wroclaw	4,900.
Nitrogen:			2,400.
Ammonia (NH <sub>3</sub> )	Zakłady Azotowe "Pulawy" S.A. Zakłady Azotowe "Kedzierzyn" S.A. Zakłady Azotowe "Wloclawek" S.A. Zakłady Azotowe S.A. w Tarnowie Zakłady Azotowe S.A. w Chorzowie Zakłady Chemiczne "Police"	Pulawy in eastern Poland Kedzierzyn in Upper Silesia Wloclawek in central Poland Tarnow in southern Poland Chorzow in Upper Silesia Police in Northwest Poland	
Fertilizer (N)	do.	do.	1,700.
Petroleum :			
Crude	Polskie Gornictwo Naftowe i Gazownictwo Warszawa	Oilfields in northern and northwestern lowlands; sub-Carpathian region and Carpathian Mountains	200.
Do.	Predsiębiorstwo Poszukiwan i Eksploracji Rpy i Gazu "Petrobaltic"	Baltic sea shelf	100.
Refined	"Petrochimia-Plock" Rafineria "Gdansk" Rafineria "Czechowice" Rafineria "Trzebinia" Rafineria "Glimar" Gorilice Rafineria "Jedlicze" Podkarpackie Zakłady Rafyneryjne w Jasle	Plock in central Poland Gdansk in northern Poland Czechowice in southern Poland Trzebinia in southern Poland Gorilice in southern Poland Jedlicze in southern Poland Jaslo in southern Poland	13,500.
Salt, all types	Inowroclawskie Kopalnie Soli S.A.  Kopalnia Soli "Klodawa" Kopalnia Soli "Wieliczka"  Kopalnia Soli "Bochnia"  KGHM "Polska Miedz" S.A. Kopalnia Węgla Kamiennego "Debiensko" Janikowskie Zakłady Sodowe "Janikosoda" S.A.	Gora, Mogilno I, and Mogilno II Mines at Inowroclaw in central Poland Klodawa in central Poland Wieliczka in southern Poland, near Krakow, mining deposits at Barycz and Wieliczka Southern Poland, mines at the Lezkowice and Siedlec-Moszczenica-Lapczyca deposit. Not known to operate in 1996 Sierszowice in southwestern Poland Debiensko, Upper Silesia  Janikowo in central Poland	6,500.
Selenium	Huta Metali Niezelaznych 'Szopienice" KGHM "Polska Miedz" S.A.	Katowice Refinery at Glogow	80.

See footnotes at end of table.

TABLE 2--Continued  
POLAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996 1/

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Silver	KGHM "Polska Miedz" S.A. Zaklady Metalurgiczne Trzebinia	Refined from dore produced by the Szopienice Pb-Zn smelter-refinery largely from KGHM supplied slimes	1.
<b>Steel:</b>			
Crude and semimanufactures	Huta "Katowice" S.A.	Plant at Dobrowa Gornicza, producing pig iron, crude steel, hot rolled products, and cast steel	14,000 (crude).
	P.P. Huta im. T. Sendzimir	Steelworks at Krakow, producing pig iron, crude steel, hot rolled products, cold rolled products, pipes, and cast iron	
	P.P. Huta "Zawierciu"	Steelworks at Zawierciu, producing crude steel, hot rolled products, cast iron, cast steel	
	P.P. Huta "Czestochowa"	Steelworks at Czestochowa, producing pig iron, crude steel, hot rolled sheets, pipes, and cast iron	
	Huta "Ostrowiec" S.A.	Steelworks at Ostrowiec-Swietokrzyski, producing crude steel, hot rolled products	
	P.P. Huta "Labyd"	Steelworks at Gliwice, producing crude steel, and hot rolled products	
	Huta "Lucchini-Warszawa" Sp. z o.o.	Steelworks in Warsaw, producing crude steel, hot rolled products, and cold rolled strip	
	P.P. Huta "Florian"	Steelworks in Swietochlowicach, producing crude steel, hot rolled products, galvanized sheet, and cold rolled strip	
	Huta "Stalowa Wola" S.A.	Steelworks at Stalowa Wola, producing crude steel,	
	Huta "Jednosc" S.A.	Steelworks at Siemianowice Slaskie, producing crude steel, hot rolled products, and pipes	
	Huta "Batory" S.A.	Steelworks at Chorzow, producing crude steel, hot rolled products, and pipes	
	P.P. Huta "Baildon"	Steelworks in Katowice, producing crude steel, hot rolled products, cold rolled strip, and cast steel	
	Huta "Malapanew" S.A.	Steelworks at Ozimek, producing crude steel and cast steel	
	Huta "Zabrze" S.A.	Steelworks at Zabrze, producing crude steel, cast iron, and cast steel	
	Huta "Zygmunt" S.A.	Steelworks at Bytom, producing crude steel, cast iron, and crude steel	
Semimanufactures only	P.P. Huta im. Cedlera	Steelworks in Sosnowiec, producing hot rolled products, cold rolled strip, and cast iron	
	P.P. Huta "Kosciuszko"	Steelworks at Chorzow, producing hot rolled products	
	Huta "Pokoj" S.A.	Steelworks at Ruda Slaska, producing hot rolled products	
	Huta "Andrzej" S.A.	Steelworks at Zawadskie, producing pipes	
	Huta "Ferrum" S.A.	Steelworks in Katowice, producing pipes	
	P.P. Huta "Bobrek"	Steelworks in Bytom, producing pig iron, hot rolled products, and cast iron	
	Huta "Buczek" S.A.	Steelworks in Sosnowiec, producing pipes and cast iron	
	P.P. Huta "1 Maja"	Steelworks in Gliwice, producing hot rolled products	
Zaklad Wielkopiecowy "Szczecin" Sp. z o.o.	Steelworks at Szczecin, producing pig iron		
Sulfur	P.P. Kopalne i Zaklady Przetworcze Siarki "Siarkopol"	Operations at Tarnobrzeg, mining Jeziorko-Grebow-Wydza deposit	5,700.
	P.P. Kopalnie i Zaklady Chemiczne Siarki "Siarkopol"	Operations at Grzybow, minig Osiek and Grzybow-Gacki deposits	

1/ The data presented in this table was compiled, in large measure, from information provided in the Minerals Yearbook of Poland (Bilans Gospodarki Surowcami Mineralnymi w Polsce Na Tle Gospodarki Swiatowej 1995) prepared and published by the Department of Mineral and Energy Policy, Mineral and Energy Economy Research Centre of the Academy of Science of Poland, The Ministry of Environmental Protection, Natural Resources, and Forestry. Additionally, very valuable information and criticism was provided by Mr. Krystof Galos and other members of this academic department.