

## THE MINERAL INDUSTRY OF

# RUSSIA

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Russia extends over more than 75% of the territory of the former Soviet Union (FSU) and accordingly possesses a large percentage of the FSU's mineral resources. Russia was a major mineral producer, accounting for a large percentage of the FSU's production of a range of mineral products, including aluminum, bauxite, cobalt, coal, diamonds, mica, natural gas, nickel, oil, platinum-group metals, tin, and a host of other metals, industrial minerals, and mineral fuels. Still, Russia was significantly import-dependent on a number of mineral products, including alumina, bauxite, chromite, manganese, and titanium and zirconium ores. The most significant regions of the country for metal mining were East Siberia (cobalt, copper, lead, nickel, columbium, platinum-group metals, tungsten, and zinc), the Kola Peninsula (cobalt, copper, nickel, columbium, rare-earth metals, and tantalum), North Caucasus (copper, lead, molybdenum, tungsten, and zinc), the Russian Far East (gold, lead, silver, tin, tungsten, and zinc), and the Urals (bauxite, cobalt, copper, lead, nickel, and zinc) (Novikov and Yastrzhembskiy, 1999).

Russia possesses one of the world's largest mineral raw material bases. According to assessments of analysts from the Russian Federation Ministry of the Economy's Department of the Economics of Metallurgy, at the 1995-2000 levels of extraction there are reserves sufficient to supply existing enterprises mining iron ore for 15 to 20 years and longer and mining nonferrous metals from 10 to 30 years. The picture was less favorable when viewed on a regional basis as it was predicted that in the near future a significant number of existing mining enterprises would be without adequate reserves (Novikov and Yastrzhembskiy, 1999). These analysts stated that because mining enterprises were now working under market economy conditions, production and transport costs have greatly increased. Therefore, it was necessary to reevaluate the criteria for determining reserves. According to these analysts, if this reevaluation were to occur, then actual reserves would diminish by 30% to 50% for ferrous and nonferrous metal reserves (Novikov and Yastrzhembskiy, 1999).

Russia remained one of the world's leading oil producers with 70% of its reserves concentrated in large deposits and was the leading country in the world in natural gas reserves; it has maintained gas production levels since the breakup of the Soviet Union despite a spate of economic difficulties. The country also reportedly possessed 140.2 billion metric tons of explored coal reserves on the basis of the reserve classification system used in the Soviet Union; about 90% was located in the sparsely populated eastern part of the country (Kozlovskiy and Shchadov, 1999).

According to the Minister of Natural Resources, Russia will not begin to replenish diminishing reserves until the period from 2003 to 2005, at the earliest. Although some positive trends were appearing during the 1996-97 period, the financial crisis in 1998 set the geological sector back several years as the minimal funding that had been available for exploration decreased further. In 1998, 74% of all geologic prospecting was for oil and gas (Interfax Mining and Metals Report, 1999n; Novikov and Yastrzhembskiy, 1999).

Lack of funding caused a deterioration of capital stock at mining enterprises. At the majority of mining enterprises, there was a sharp decrease in production indicators. As a result, in the last 7 years more than 20 million metric tons (Mt) of capacity has been decommissioned at iron ore mining enterprises. In the nonferrous sector in the past 7 years, there has been a 9% loss in bauxite mining capacity and a 20% loss in copper mining capacity; there has been a 39% loss in concentrate production capacity for lead; 43% for molybdenum; 41% for tin; 73% for tungsten; and 23% for zinc (Novikov and Yastrzhembskiy, 1999).

Mineral consumption in Russia has fallen drastically since the dissolution of the Soviet Union because of the general downturn in economic activity and the sharp fall in defense industry production, which was a major consumer of a range of metals. Faced with the large downturn in domestic consumption, Russia has become a large exporter of minerals to world markets. It was exporting a large percentage of its production of nonferrous and precious metals and oil and gas. In cases where Russia was still exporting minerals to other FSU countries, it was, at times, incurring heavy debt from nonpayment, as was the case with natural gas shipments. Until economic activity in Russia significantly increases, Russia's mineral industries will continue to try to export a major share of their output to world markets.

According to a report by the Foreign Investment Promotion Center (FIPC) of the Russian Ministry of the Economy, Russia's economic development has been characterized by its raw materials export orientation, excessive import reliance, a high income and consumption differentiation in the population, and low levels of investment and monetization. Russia's existing advantages (highly educated and technically/ scientifically trained labor force, relatively low labor costs, rich natural resources, etc.) were not used to the full extent (Foreign Investment Promotion Center of the Ministry of Economy of the Russian Federation, Russian economy—Probable parameters of socioeconomic development for the year 2000 and the period till 2002, accessed October 4, 1999 at URL <http://www.fipc.ru/fipctest/reviews/2000.html>).

With the economic crisis that spread to Russia in August, the macroeconomic and financial problems that were afflicting Russia became greatly exacerbated. Along with the economic crisis, the sharp fall in the price of oil and gas that was the source of almost 40% of Russia's hard currency earnings and export revenues imparted additional difficulties to the Russian economy. Russia was the world's largest exporter of natural gas and second largest exporter of crude oil and refinery products. By midsummer 1998, world oil prices had decreased by one-third since late 1997. Russia's revenues from crude oil exports had decreased by 25% during the first half of 1998 compared with the same period in 1997. Revenues from natural gas exports also decreased by 18% during the same period owing largely to declines in natural gas prices (U.S. Department of Energy, September 1998, Russia—Energy situation update, accessed October 12, 1999, at URL <http://www.eia.doe.gov/emeu/cabs/russar.html>).

By the end of 1998, the monetary situation began to stabilize, and production, driven by exports, started to revive. However, Russia's debt-servicing problem remained, and investment activity had not been restored. A restoration of domestic demand, which was still very weak, was considered to be essential for achieving steady economic growth (Foreign Investment Promotion Center of the Ministry of Economy of the Russian Federation, Russian economy—Probable parameters of socioeconomic development for the year 2000 and the period till 2002, accessed on October 4, 1999, at URL <http://www.fipc.ru/fiptest/reviews/2000.html>).

According to the World Bank, the Russian financial crisis dominated economic developments in the FSU. Russia's reliance on short-term debt to finance fiscal deficits coupled with a strong impact from the economic crises in Southeast Asia led to an unsustainable debt repayment situation. In August 1998, the Government sharply devalued the ruble and announced a moratorium on public debt. The devaluation, however, increased exports as well as production in import-competing industries. The Government made important efforts to prevent hyperinflation and to avoid reintroducing foreign exchange and price controls. Sustained stabilization would require aggressive efforts to reduce tax arrears and tax avoidance and to rationalize consolidated public expenditures, which still consisted of about 40% of gross domestic product (GDP). The Russian crisis sharply worsened the external economic environment for many FSU countries. Exports to Russia from FSU countries dropped sharply (World Bank, Europe and Central Asia, The World Bank annual report 1999, accessed October 4, 1999, at URL <http://www.worldbank.org/html/extpb/annrep/eca.htm>).

In 1998, Russia's GDP decreased by 4.6%, and industrial output, by 5.2% in comparison with that of 1997. Production in the construction materials sector reportedly decreased by 5.8%, in the ferrous metals sector, by 8.1%; in the fuel sector, by 2.5%; and in the nonferrous metals sector, by 5% in comparison with those of 1997 (Interfax Statistical Report, 1999a, b).

Regarding data on minerals production, Russia officially published data on nonferrous metals production for a brief period, but in 1995 again reclassified production data in physical units as secret and was officially publishing only percentage

increases or decreases in production in 1998. Despite the reimposed secrecy, data in physical units for a number of nonferrous metals are appearing in Russian sources, although not in a systematic manner. Production data for ferrous metals and fuels were being published, which had been the practice during the Soviet era, although, again, more complete data were available. Regarding industrial minerals, similar to the Soviet period, data were only published for a few commodities, and data for the remaining commodities appeared sporadically in publications and not in a systematic manner.

## Commodity Review

### *Aluminum*

**Reserves.**—More than 50% of the explored bauxite reserves were in the Northwest economic region, and 28% were in the Urals. Urals deposits are characterized by complex geologic and hydrological conditions (Novikov and Yastrzhembskiy, 1999). The Urals deposits accounted for more than 80% of Russian bauxite production (Kozlovskiy and Shchadov, 1999).

**Production Status.**—In 1998, Russia ranked second in the world in primary aluminum output, with Russian output increasing compared with that of 1997 (Plunkert, 1999). However, in 1998, Russia ranked only sixth in the world in alumina production and ninth in the world in bauxite output (U.S. Geological Survey, unpub. data, 1999). Russia was dependent on imported raw materials for the majority of its aluminum production. Bauxite production was centered in the Urals with 84% of production, the majority of which came from the North Urals bauxite mining region (Kozlovskiy and Shchadov, 1999). The major smelters were from 4,000 to 6,000 kilometers from the ports through which imported raw materials arrive. However, these smelters were located near sources of hydroelectric power.

The dramatic decline in the domestic demand for aluminum products (a sevenfold decrease in 1998 compared with that of 1990) did not affect production at Russian aluminum smelters, which switched almost entirely to producing primary aluminum for export. Russian aluminum plants operated at 100% of their total capacity in 1998. However, production of rolled products, semifinished products, and finished products decreased by more than sevenfold compared with that of 1990 and totaled 280,000 metric tons (t) in 1998. The reason presented for this decrease was that these products were not in demand on the domestic market and that the competitiveness of those products on the world market was negatively affected by the limited ability of Russian manufacturers to ensure Western quality standards (Institute for Stock Market and Management, 1999, Competitiveness of the Russian aluminum industry, accessed October 5, 1999, at URL <http://www.yandex.ru/yandbtm2b=2&...&d=1&text=reserves%20AND%bauxite>).

In 1998, Russia's largest smelter, Bratsk, produced 844,200 t of aluminum, followed by Krasnoyarsk at 802,000 t, Siberian-Ural Aluminum Company (SUAL) at 338,400 t, Sayan at 330,100 t, Nonkuznetsk at 268,600 t, Bogoslovskiy at 156,500 t, Volgograd at 127,600 t, Kandalaksha at 66,000 t, Nadvoitsy at 59,800 t, and Volkhov at 11,500 t. SUAL was an amalgamation

of the Irkutsk and Uralsk aluminum smelters (Interfax Mining and Metals Report, 1999e).

**Production Development.**—Alumina producers were confronted with economic difficulties because of the low quality of domestic raw materials and the rather scarce reserves of bauxite. Plans called for mining new bauxite reserves at the Sredne Timan deposit in the Komi Republic in the northern European part of country to supply raw material for alumina refineries in the Urals. High production costs at the North Urals bauxite mining company were predicted to result in a 35% to 40% reduction in output. The smaller Tikhvin and Southern Urals deposits were predicted to be depleted by 2000 (Kozlovskiy and Shchadov, 1999; Novikov and Yastrzhembskiy, 1999).

All Russian aluminum smelters were in need of large investments for modernization. These investments have not been made despite the fact that the industry has generated large sales during the past decade. Russian aluminum production was directly affected by the world aluminum market. Along with fluctuations in the world price of aluminum, instability in raw materials supply, as well as in aluminum sales, were common problems for most Russian aluminum plants, which operated through importing a large percentage of raw materials and exporting the major portion of their products through short-term tolling contracts concluded between aluminum manufacturers and trade intermediaries (Institute for Stock Market and Management, 1999, Competitiveness of the Russian aluminum industry, accessed October 5, 1999, at URL <http://www.yandex.ru/yandbtm2b=2&...&d=1&text=reserves%20AND%bauxite>).

## **Coal**

**Reserves.**—Russian experts reported that 70% of proven coal reserves totaling 140.2 billion metric tons were termed “economic reserves” according to the Soviet reserve classification system, which was still being used in Russia. However, 90% of these economic reserves were in the Asiatic part of the country, and 40% of the demand for coal came from the European part (Kozlovskiy and Shchadov, 1999). Russia’s two largest coal basins were the Kansk-Achinsk, containing lignite in East Siberia with 79 billion metric tons of explored reserves, and the Kuznetsk, containing steam and coking coal in West Siberia with 68 billion metric tons. The remaining reserves were in basins with 10 billion metric tons or less of explored reserves located in various regions throughout the country (U.S. Central Intelligence Agency, 1985, p. 34-35; Gornaya Entsiklopediya, 1991, p. 233).

**Production Status.**—As of 1997, Russia ranked fifth in the world in coal production (U.S. Department of Energy, 1999, p. 32-33). Russia’s coal production has steadily declined since 1988. In 1998, in comparison with that of 1997, total coal output decreased by 5.4%, with a 4.4% decrease for hard coal and a 7.5% decrease for brown coal, including lignite. Coal production increased in only 7 of Russia’s 31 mining regions. Coal production fell by 0.7% at open pits and by 12.3% at underground mines. Open pits accounted for 62.1% of the total coal production (Interfax Mining and Metals Report, 1999l).

Coal accounted for 20% of the country’s domestic energy supply and exports accounted for only 7% of total output (U.S. Department of Energy, October 1998, Country analysis briefs—Russia, accessed April 25, 1999, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>).

**Production Development.**—Plans called for restructuring the coal industry to close unprofitable enterprises with 149 enterprises producing 38 Mt scheduled for closure by 2002. The money saved was used to upgrade profitable mines. Plans called for increasing the percentage of coal consumed in the country’s energy balance (U.S. Department of Energy, October 1998, Country analysis briefs—Russia, accessed April 25, 1999, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>).

Factors impeding the growth in exports to world markets were high transport costs and loss of coal quality during transport. If the Russians can resolve problems regarding loss of quality during shipment, then demand for Russian coal could increase in the European Union owing to a projected decrease in this region’s coal mining output. With the enhancement and modernization of port facilities on the Baltic and Black Seas, Russian coal exports have the potential to double. Foreign capital, however, would be required to modernize coal mines to make them cost-competitive producers for world markets (X.M. Prevost, South African Minerals Bureau, unpub. data).

## **Copper**

**Reserves.**—Russia possessed about 10% of the world’s copper reserves (International Copper Study Group, 1998). The majority of reserves were in copper-nickel sulfide and pyrite ores. More than 50% of reserves were in deposits already under development. Ore grades were competitive with other producing deposits in the world (Novikov and Yastrzhembskiy, 1999; Kozlovskiy and Shchadov, 1999). The copper content of ore in Russian deposits under development averaged 1.6% (Piven’, Konovalov, and Shtern, 1999). Approximately 70% of the country’s reserves were in East Siberia; 20%, in the Urals; and 10%, in the North Caucasus (Haeuser and others, 1994, p. 9).

**Production Status.**—In 1998, Russia ranked sixth in the world along with Peru in mine output of copper (Edelstein, 1999). Owing to the economic crisis that occurred in Russia in the summer, it was predicted that it would now take much longer for internal demand to increase and for copper securities on the stock exchange to recover their value. Copper exports played a major role in earning foreign currency and will continue to be a driving economic force (International Copper Study Group, 1998). Approximately 60% of the country’s copper production was from the Norilsk mining and metallurgical complex, and the remainder, from mining and metallurgical enterprises in the Urals. Tolling accounted for about 6% of the country’s refined copper output (International Copper Study Group, 1998). In 1998, Norilsk increased production of blister copper by 5.7% compared with that of 1997 and that of refined copper by 6.9% (Interfax Mining and Metals Report, 1999g). At Norilsk, the Oktyabrskiy underground mine was producing almost 70% of Norilsk’s copper mine output in East Siberia, with Oktyabrskiy reportedly producing 242,154 t of copper in ore in 1998,

235,374 t in 1997, and 237,076 t in 1996 (Piven', Konovalov, and Shtern, 1999). Almost all the remaining mine output of copper at Norilsk in East Siberia came from two other underground mines, the Komsomolskiy and Taymirskiy (Piven', Konovalov, and Shtern, 1999).

**Production Development.**—Based on Russia's economic situation at the end of 1998, foreign investment would be needed for the country to develop its copper reserves adequately (International Copper Study Group, 1998). Growth in reserves in the 1990's occurred in areas contiguous to existing reserves and beneath existing reserves. Underground mines were being developed beneath the Sibay, Uchali, and Molodezhnyy open pits in the Urals because of the depletion of reserves suitable for open pit development. Also, in the Urals, copper mine were being developed at the Aleksandrinskoye deposit, which is part of the Mednogorsk complex; at the Letnyeye deposit to supply the Gai complex; and at the Safyanovskoye deposit, which is at the Rezh nickel plant (Kozlovskiy and Shchadov, 1999; Novikov and Yastrzhembskiy, 1999). At the Norilsk complex in East Siberia, the Oktyabrskiy Mine planned to mine a greater quantity of cuprous ore and a lesser amount of rich ores with high nickel content, which were being depleted. Plans called for increasing cuprous ore production at Oktyabrskiy from 100,000 metric tons per year (t/yr) in 1999 to 1,600,000 t/yr in 2002. During this same period production of rich copper-nickel ores would decrease from 4 million metric tons per year (Mt/yr) to 3.4 Mt/yr (Piven', Konovalov, and Shtern, 1999). The cuprous ores at Norilsk are more than 40% higher in copper content than the rich copper-nickel ores (Natural Resources Canada, unpub. data, 1999).

## **Diamond**

**Reserves.**—In Russia, diamond deposits are in three regions—Arkhangelsk oblast, Perm oblast, and the Yakut-Sakha Republic. Of the total reserves, 81.6% were in reserve categories A, B, and C1 on the basis of the reserve system of classification used in the U.S.S.R. Almost 100% of production came from kimberlite deposits near Mirnyy in the Yakut-Sakha Republic. The quality of reserves was decreasing, and there is a need to develop new rich deposits of high-quality diamonds (Vaganov, Golybev, and Bogatykh, 1999).

**Production Status.**—In 1998, Russia was thought to be the world's third largest producer of gem and industrial diamonds (U.S. Geological Survey, unpub. data, 1999). Russia accounted for 21% of the world mine output of diamonds. Practically all Russian diamonds were mined by the Almaz Rossii-Sakha-Association (Alrosa) in the Yakut-Sakha Republic. Alrosa's main production unit was the Udachny mining and processing complex, which developed the Udachny and Zarnitsa diamond deposits and produced more than 80% of Alrosa's diamonds; also at Alrosa, the Mirnyy mining and processing complex developed the Mir and International diamond deposits and produced high-quality diamonds; the Aikhalskiy mining and processing complex developed the Aikhalskiy and Jubilee diamond deposits; and the Anabar placer mine developed the Anabar placer (Interfax Mining and Metals Report, 1999a).

Since 1992, growth in reserves has not compensated for the amount of diamonds extracted. In accordance with a contract renegotiated in October 1997, almost all rough diamonds were being exported through De Beers Central Selling Organization (CSO). About 50 Russian companies were engaged in cutting and polishing diamonds, and 80% of Russia's diamond cutting and polishing production was from plants in Moscow and Smolensk (Basel Magazine, 1999; Vaganov, Golybev, and Bogatykh, 1999).

**Production Development.**—In 1998, the Russian company Soglasia entered into the Severalmaz joint venture with De Beers to develop the Lomonosov field in the Arkhangelsk region. The field reportedly contains diamonds, of which 50% are of gem or near gem quality (Summary of World Broadcasts, 1998). Also, a projected world deficit in industrial diamonds could provide justification for developing the Popigayskoye industrial diamond deposit in the northeastern part of country (Vaganov, Golybev, and Bogatykh, 1999; Vaganov and Simonov, 1999). High priority should be given to developing domestic diamond cutting and polishing capacity, and a way was being sought to supply the Russian plants in accordance with the agreement with the CSO (Basel Magazine, 1999; Vaganov, Golybev, and Bogatykh, 1999).

During the next 5 years, the Aikhalskiy complex will replace the Udachny complex as the main diamond producer owing to the commissioning of the Jubilee deposit, which has been under development since 1997. In addition to the Jubilee deposit, the Nyurbinskiy deposit will be brought on-line in 2 to 3 years. In the future, Alrosa plans to produce the main volume of its high-quality jewelry-grade diamonds at the International deposit. At this deposit, the quality of the stones is similar to the Mir deposit, which was Alrosa's main source of large quality gemstones. The International deposit was open pit mined for 8 years until 1981 and then decommissioned once the quarry reached a depth of 286 meters. Construction of the underground mine at the International deposit started in 1976. However, construction work was halted owing to financial and technological difficulties (Interfax Mining and Metals Report, 1999a).

## **Gold**

**Reserves.**—The majority of production was from placer deposits in the eastern part of country. Lode deposits were increasing in importance. In 1995, the Russian Committee on Geology and Use of Subsurface Resources identified 4,569 potential gold deposits in 39 regions of the country, of which 94% were placer deposits. However, only 20% of the gold resources were in placers. More than 65% of the resources were located in Eastern Siberia and the Russian Far East. Hard-rock ores average about 4 grams per ton gold; placer gravels, about 0.9 gram per cubic meter; and placers for alluvial dredging, about 369 milligrams per cubic meter. The main placer resources were located in the Amur, Chita, Chukotka, Irkutsk, Khabarovsk, Magadan, and Sakha-Yakutia regions. The leading regions for lode gold deposits were Chita, Chukotka, Irkutsk, Kamchatka, Khabarovsk, and Magadan in the eastern part of the

country; Krasnoyarsk in East Siberia; and Sverdlovsk in the Urals (Mining Week, 1998).

**Production Status.**—In 1998, Russia ranked sixth in world gold output (Amey, 1999). Production has fallen by about 40% in the past 10 years. In 1998, gold production fell by about 10% compared with that of 1997. In 1998, the largest producing regions were Magadan Oblast with output of 30.4 t compared with 26.1 t in 1997, the Krasnoyarsk region with output of 15.2 t compared with 16.5 t in 1997, and the Yakut-Sakha Republic with output of 11.1 t compared with 20 t in 1997. Reasons given for the decrease in production were the decreases in gold prices on the world market and the inability of the gold-producing enterprises to receive timely Government financing (Interfax Mining and Metals Report, 1999j, p).

**Production Development.**—At recent production levels, Russia was thought to possess probable resources to sustain gold mining for about 50 years. However, because production was mainly from placer deposits for which the resource base was being depleted, it will be necessary to develop lode deposits to maintain production levels, which will require major new investments in mines and processing plants. Major new investment in lode deposits could enable Russia to more than double its current output level (Mining Week, 1998).

### *Iron and Steel*

In 1998, Russia ranked fifth in the world in crude steel production (U.S. Geological Survey, unpub. data, 1999). Following the economic crisis in August, when demand for steel products in Asian markets sharply decreased, Russia began exporting larger volumes of steel products to the United States and other countries, which resulted in these countries imposing trade restrictions (Interfax Mining and Metals Report, 1999c, o). Slightly less than 75% of Russia's total steel output was produced in oxygen converter furnaces or electric furnaces with 60% produced in oxygen converter furnaces and 13% in electric furnaces. In 1998, compared with that of 1997, output decreased at most of Russia's largest steel mills—at the Kuznetsk complex in Novokuznetsk, by 41.2%; at the Mechel steelworks in Chelyabinsk, by 18.4%; at the Nizhniy Tagil Metallurgical Complex, by 33.5%; at the Nosta steelworks in Novotroitsk in the Orenburg region, by 7.7%; at the Novolipetsk Metallurgical Complex, by 13.2%; at the Oskol Electrometallurgical Combine in Sary Oskol, by 4.9%; and at the Severstal mill in Cherepovets, by 2.7%. However, production increased at the Magnitogorsk and West-Siberian (in Novokuznetsk) metallurgical complexes, which produced 3.2% and 4.2% more finished rolled products, respectively (Interfax Mining and Metals Report, 1999f).

### *Iron Ore*

**Reserves.**—There were 26 iron ore deposits under development with reserves adequate for 15 to 20 years at the current rate of extraction. However, these reserves averaged about 35% iron, which was low by world standards. The ratio of overburden to ore is four times greater on average than in other countries, which greatly increases the comparative cost of iron

ore extraction. Large quantities of explored reserves exist in the Kursk Magnetic Anomaly (KMA), which are potential sources of new development (Kozlovskiy and Shchadov, 1999; Novikov and Yastrzhembskiy, 1999). Explored reserves in categories A, B, C1, and C2 in the KMA totaled 47 billion metric tons, of which 29 billion metric tons were considered to be rich ores (Gornaya Entsiklopediya, 1989, p. 357).

**Production Status.**—In 1998, Russia ranked fourth in the world in mine output of iron ore (Kirk, 1999). More than 63% of iron ore extraction capacity and 77% of reserves were in developed deposits in the Central and North West economic regions, which contained 32% of the country's ferrous metallurgical capacity. Although 68% of the country's metallurgical capacity was in the Urals and Siberia, only 33% of iron ore extraction capacity and 23% of reserves were in these regions (Kozlovskiy and Shchadov, 1999; Novikov and Yastrzhembskiy, 1999).

**Production Development.**—In the near future, regions of Siberia and the Urals may be without their own iron ore base because many of the existing mining enterprises lack adequate reserves. Long-distance rail transport of iron ore from other parts of Russia and Kazakhstan to metallurgical enterprises has been increasing the price of iron ore by 15% to 30%. New development of iron ore deposits has been hampered by increasing costs for energy and transport and a lack of economic reserves in areas close to metallurgical centers. The comparatively low grade of ore and high ratio of overburden to ore have been posing serious problems for the competitiveness of the Russian iron ore industry (Kozlovskiy and Shchadov, 1999; Novikov and Yastrzhembskiy, 1999).

### *Natural Gas*

**Reserves.**—The U.S. Department of Energy reported Russia's gas reserves to be more than 48 trillion cubic meters (U.S. Department of Energy, October 1998, Country analysis briefs—Russia, accessed April 25, 1999, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>). Most production came from reserves in the Arctic regions of West Siberia, with six fields in Tyumen oblast—the Urengoi, Yamburg, Zapolyarnoye, Medvezhye, Kharasavey, and Bovanenko—combined having more than three-fourths of the gas reserves in West Siberia. Gasfields in the Orenburg region in the Urals and in the Komi Republic in the European north of the country also provide for significant production (U. S. Central Intelligence Agency, 1985, p. 15).

**Production Status.**—As of 1997, Russia was the world's largest producer of natural gas (U.S. Department of Energy, 1999, p. 29-31). Russia's natural gas production was maintained at near the 1991 level. Three fields, Urengoi and Yamburg in West Siberia and Orenburg in the Urals, accounted for 80% of the country's natural gas production (U.S. Department of Energy, October 1998, Country analysis briefs—Russia, accessed April 25, 1999, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>). Natural gas production was largely under the control of Gazprom, a company in which the Russian Government maintained 40% ownership. Gazprom was a major factor in the Russian economy. In 1997, Gazprom's export

earnings of \$23 billion made it Russia's largest hard currency earning entity. Gazprom's existing tax payments accounted for 25% of the Federal Government's tax revenues, but Gazprom had been unable to make full tax payments because only about 15% of its domestic customers paid promptly and in cash. In July, Gazprom threatened to cut supplies to Russian power companies that were not paying their bills, but the Government forced Gazprom to desist from this plan because cutoffs in gas supply would have affected power generation in much of the country, bringing industries to a halt and further worsening the country's economic crisis. At the same time, Gazprom was threatening large foreign debtors in the FSU with cutoffs if they did not pay their bills (U.S. Department of Energy, September 1998, Russia—Energy situation update, accessed October 12, 1999, at URL <http://www.eia.doe.gov/emeu/cabs/russar.html>).

**Production Development.**—Plans called for increasing gas output from 30% to 50% by 2010 compared with the 1997 level (Kozlovskiy and Shchadov, 1999). Russia's economic crisis spurred the Government to adopt reforms in the gas sector that would enable Russia to comply with World Bank conditions for obtaining \$1.5 billion in additional funding. In June, Russia's Prime Minister and Central Bank Chairman signed an agreement to break up Gazprom into separate production, transmission, and distribution units. This would enable independent producers to obtain greater access into the pipeline system at the same transportation rates as Gazprom was charging its own marketing unit. These changes, along with a proposal to eliminate price controls on gas sold by independent producers, were to be introduced by July 1999. In addition, the World Bank was proposing that Gazprom stop work on its \$45 billion project to transport natural gas 2,500 miles from the Yamal Peninsula to Europe (U.S. Department of Energy, September 1998, Russia—Energy situation update, accessed October 12, 1999, at URL <http://www.eia.doe.gov/emeu/cabs/russar.html>).

### *Nickel*

**Reserves.**—The Norilsk region had 77.5% of the country's nickel reserves, which are in mixed sulfide ores (Kozlovskiy and Shchadov, 1999). Remaining reserves are in mixed sulfide ores on the Kola Peninsula and in laterite ores in the Urals.

**Production Status.**—In 1998, Russia remained the world's largest nickel producer (Kuck, 1999). The country's major producer was the Norilsk Nickel enterprise that mined deposits at Norilsk and on the Kola Peninsula and had metallurgical facilities at these locations. Approximately 85% of Norilsk's nickel reserves were in East Siberia, and the remaining reserves were on the Kola Peninsula (Tsvetnye Metally, 1996). The remaining nickel production was from enterprises in the Urals. In 1998, Norilsk Nickel increased production of nickel in concentrate by 4.2% compared with that of 1997, but production of refined nickel fell by 0.7% (Interfax Mining and Metals Report, 1999h). In 1998, at the Yuzhuralnikel enterprise in the Urals, nickel production decreased by 46.6% to 2,259 t compared with that of 1997 (Interfax Mining and Metals Report, 1999r).

At Norilsk, the Oktyabrskiy underground mine in East Siberia was producing about 55% of Norilsk's nickel mine output in

East Siberia, with Oktyabrskiy reportedly producing 105,000 t of nickel in ore in 1998, 101,308 t in 1997, and 98,450 t in 1996 (Piven', Konovalov, and Shtern, 1999). Almost all the remaining mine output of nickel at Norilsk came from two other underground mines—the Komsomolskiy, which produced about 25% of the remaining output, and the Taymirskiy, about 15% of output (Piven', Konovalov, and Shtern, 1999).

**Production Development.**—Nickel production has fallen by almost 40% from peak levels of the late 1980's. Problems existed with maintaining adequate reserves. The majority of reserves are in areas adjacent to existing deposits or at depths below existing reserves. There is potential depletion of reserves in coming decades unless new deposits are located (Kozlovskiy and Shchadov, 1999). At the Oktyabrskiy Mine, nickel-rich ores were being depleted, and plans called for production of nickel-rich ores to decrease from 4 Mt/yr in 1999 to 3.4 Mt/yr in 2002, and the production of cuprous ores at Oktyabrskiy will increase from 100,000 t/yr to 1.6 Mt/yr during this same period (Piven', Konovalov, and Shtern, 1999). The nickel-rich ores have almost five times as much nickel as do the cuprous ores (Natural Resources Canada, unpub. data, 1999). However, production of nickel at Norilsk should increase with the development of the Skalisty and later Gluboky mines, which reportedly have some of the highest grade nickel-rich ores at Norilsk (Fleming UCB Research, 1999).

### *Petroleum*

**Reserves.**—Proven oil reserves were reported by the U.S. Department of Energy to be about 6.8 billion metric tons (U.S. Department of Energy, October 1998, Country analysis briefs—Russia, accessed April 25, 1999, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>). Russian experts reported that approximately 70% of reserves were in large deposits considered favorable for development (Kozlovskiy and Shchadov, 1999). Russia's major reserves are in the West Siberian basin, which was the country's major production region. Prior to the development of West Siberia, the Volga-Urals region was the center of Soviet oil production and was still a major producing area. Offshore basins in the Kara and Barents Seas were considered to be promising areas for further development (U.S. Central Intelligence Agency, 1985, p. 14).

**Production Status.**—During the 1980's, the U.S.S.R. was the world's largest oil producer, with the Russian Republic producing more than 90% of the country total. In 1997, Russia was still the world's second largest oil producer (U.S. Department of Energy, 1999, p. 25-26). Russia's 1998 production was slightly more than one-half of Russia's 1989 production level. The fall in oil production was attributed to economic factors following the collapse of the Soviet Union rather than problems with the raw material base (Kozlovskiy and Shchadov, 1999). In mid-1998, following Russia's economic crisis, paradoxically, profits for some oil companies increased because of the ruble devaluation because most expenses for oil companies in Russia were ruble based. Prices for oil exports to world markets, however, were denominated in U.S. dollars, yielding a greater ratio of rubles to dollars (U.S. Department of

Energy, October 1998, Country analysis briefs—Russia, accessed April 25, 1999, at URL <http://www.eia.doe.gov/emeu/cabs/russia.html>).

**Production Development.**—Plans called for increasing oil production to between 370 and 400 Mt by 2010 (Kozlovskiy and Shchadov, 1999). Some foreign oil companies including Exxon Corp., Atlantic Richfield Co., Mobil Corp., and Marathon Oil Co. were proceeding with existing long-term projects in Russia despite the financial crisis. In July, Conoco Inc. announced that it had purchased a 15.7% stake in AGD, formerly the Russian state geological company. However, sales and mergers of several other oil firms were halted. The French company Elf Aquitaine Inc. withdrew from a planned alliance with the Russian company Sibneft, citing concerns with low world oil prices and ongoing Russian economic problems. Sibneft also canceled a proposed merger with the Russian firm Yukos, in part because of the economic crisis. In addition, Russia twice postponed its planned \$1.6 billion sale of the last major Government-owned oil company Rosneft because of a lack of bidders. Russia could experience difficulty in increasing oil exports to generate cash for tax payments because for some companies, their traditional export routes through Black Sea ports have been running at full capacity, leaving the Baltic ports and the Druzhba pipeline as alternatives. However, companies that were exporting through Black Sea ports stated that they could not increase exports through these other routes owing to transit fees charged along these routes and the fact that oil prices obtainable in Europe would not compensate for the extra costs. Increasing oil exports also would conflict with Russia's commitment to other key oil-exporting countries to reduce its oil exports by 100,000 barrels per day beginning July 1, 1988, in an effort to reduce global oil supplies and to raise world oil prices (U.S. Department of Energy, September 1998, Russia—Energy situation update, accessed October 12, 1999, at URL <http://www.eia.doe.gov/emeu/cabs/russar.html>).

### **Phosphate Rock**

**Reserves.**—The major source of phosphate raw material is the Khibiny apatite-nepheline deposit on the Kola Peninsula. Apatite is also mined with iron ore at the Kovdor deposit on the Kola Peninsula. The Kola Peninsula produced more than 90% of country's output. There were reportedly more than 3.2 billion metric tons of reserves of apatite ore on the Kola Peninsula averaging 14% P<sub>2</sub>O<sub>5</sub> (Gornaya Entsiklopediya, 1984, p. 135; Gabrilelyants and others, 1991, p. 69). Phosphate rock was also produced at a number of sedimentary deposits containing lower grade phosphate rock.

**Production Status.**—In 1998, Russia ranked fourth in the world in phosphate rock production (Jasinski, 1999). Production from the Khibiny Apatit enterprise on the Kola Peninsula yielded a high-grade apatite concentrate averaging more than 35% P<sub>2</sub>O<sub>5</sub>. In 1998, production at Khibiny decreased to 8.034 Mt of apatite concentrate, which was 183,000 t less than that produced in 1997 (Interfax Mining and Metals Report, 1999g). All phosphate raw material exports from Russia were apatite concentrate from the Kola Peninsula, and exports have

been about one-third of total apatite concentrate production (Louis, 1998, p. 35).

**Production Development.**—The Kola Peninsula will remain the main source of phosphate raw material production. However, mining conditions on Kola are worsening. Although 60% of production was from open pits, in 1997, underground mining will become predominant because 80% of enterprise reserves on Kola require underground extraction. To maintain future output, it will be necessary to develop new mines at the Khibiny deposit; new deposits on Kola, including the Beloziminskoye apatite-rare earths and Seligdarskoye apatite deposits; and low-grade phosphate rock deposits in the European part of the country (Kozlovskiy and Shchadov, 1999). A development program drafted by Khibiny to 2005 called for increasing apatite concentrate production to about 9 Mt/yr by increasing output at existing mines through upgrading production technology (Interfax Mining and Metals Report, 1999b).

### **Platinum-Group Metals**

**Reserves.**—Almost all reserves are in mixed sulfide ores at the Norilsk complex in East Siberia (Tsvetnye Metally, 1996).

**Production Status.**—In 1998, Russia was the world's second largest producer of platinum-group metals (PGM) after South Africa (Hilliard, 1999). There is a higher ratio of palladium to platinum in Russian ores than in South African ores. In 1998, the Norilsk complex reported that physical output of PGM increased by 14.2% compared with that of 1997 (Interfax Mining and Metals Report, 1999h). Johnson Matthey reported that Russian palladium exports increased by 21% in 1998 in comparison with those of 1997 (Interfax Mining and Metals Report, 1999k). The Oktyabrskiy Mine at the Norilsk complex was the largest producer of PGM, accounting for almost 60% of the country's PGM extraction. At Norilsk, the Komsomolskiy underground mine was the country's next largest producer, accounting for more than 15% of PGM production. It was followed by the Taymirskiy underground mine accounting for more than 10% and the Zapolyarniy underground mine accounting for more than 7% (Piven', Konovalov, and Shtern, 1999).

**Production Development.**—Production depends on adequate reserves at the Norilsk complex where PGM are a byproduct of nickel-copper mining. Despite an expected decrease in the mining of nickel-rich ores at the Oktyabrskiy mine, mine output is projected to increase, particularly for cuprous ores (Piven', Konovalov, and Shtern, 1999). Plans call for production of nickel-rich ores at Oktyabrskiy to decrease from 4 Mt/yr in 1999 to 3.4 Mt/yr in 2002, and the production of cuprous ores at Oktyabrskiy will increase from 100,000 t/yr to 1.6 Mt/yr during this same period (Piven', Konovalov, and Shtern, 1999). The nickel-rich ores have almost five times as much PGM as do the cuprous ores (Natural Resources Canada, unpub. data, 1999). However, production of PGM at Norilsk should increase with the development of the 2-Mt/yr ore-capacity Skalisty Mine that contains nickel-rich ore with a high PGM content and with the expansion of production of disseminated ores with a PGM content that is more than four times greater than that of the

cuprous ores (Fleming UCB Research, 2000; Natural Resources of Canada, unpub. data, 1999).

### **Potash**

**Reserves.**—All potash production was from the Verkhne Kamsk deposit in the Urals. Russian reserves were reported to be about 1.8 billion metric tons K<sub>2</sub>O (Searls, 1999). Verkhne Kamsk sylvinite ore is hosted by a large halite zone with carnallite zones and sylvinite zones (Troitsky, Petrov, and Grishaev, 1999, p. 101).

**Production Status.**—In 1998, Russia was thought to be the world's second largest potash producer (U.S. Geological Survey, unpub. data, 1999). All production came from two enterprises, the Uralkaliy and the Silvinit, which mine the Verkhne Kamsk deposit. Production began increasing in 1996 and recovered to 1992 production levels in 1998.

**Production Development.**—Growth in production was based on growth of exports because domestic demand remained quite low. The goal of increasing exports was being facilitated by improvements at Latvia's Baltic seaport facilities at Ventspil and Riga and in Black Sea facilities at Illichiv'sk in Ukraine, which were the major shipping ports for Russian potash (Louis, 1998).

### **Tin**

**Reserves.**—According to Russian assessments, Russia ranked third in the world in tin reserves on the basis of the Soviet system of reserve classification. Russian ores were lower grade than those of other tin-producing countries, averaging 0.4% tin. Only the Khinganskiy deposit had higher-grade ore averaging 0.8% tin (Vorob'yev, 1999). Mining took place at lode and placer deposits in the eastern part of country (Novikov and Yastrzhembskiy, 1999; Vorob'yev, 1999).

**Production Status.**—In 1998, Russia was thought to rank eighth in the world in mine output of tin (U.S. Geological Survey, unpub. data, 1999). From 1990 to 1995, Russian tin production fell by 40% and continued to decline (Kozlovskiy and Shchadov, 1999). In 1998, there was a dramatic decline in tin production compared with that of 1997 as production of tin concentrate fell by 31% and tin metal, including secondary, by 55.3% (Interfax Mining and Metals Report, 1999q). One of the highest grade tin deposits, the Goryevskiy, sharply curtailed output (Vorob'yev, 1999).

**Production Development.**—At current levels of production, Russian tin reserves are adequate for 30 years; however, tin reserves at existing enterprises are adequate for only 10 years (Vorob'yev, 1999). Mining conditions are deteriorating at existing enterprises. Domestic tin demand now exceeds domestic tin production by one-third. To maintain production, plans call for developing mines at the Pravo-Urmiyskoye and Sobolinskoye deposits and continuing construction of a processing plant at the Solnechnyy mining and beneficiation complex (Novikov and Yastrzhembskiy, 1999).

### **Titanium**

**Reserves.**—There was almost no domestic mining of titanium raw materials. The Ukrainian republic had supplied 93% of the Soviet Union's titanium raw materials, and Ukraine continued as the major ore supplier.

**Production Status.**—In 1998, Russia remained the world's second largest producer of titanium sponge as production increased by 5.6% to 22,000 t compared with that of 1997 (Gambogi, 1999; Interfax Mining and Metals Report, 1999q). In 1997, sponge production increased by 30.5% compared with that of 1996. Still, 1998 titanium sponge production was more than one-third below peak levels of the 1980's when large amounts were consumed by the Soviet defense industry (Mining Journal, 1998). The largest markets for Russian titanium sponge in 1998 were the Verkhknaya Salda Metallurgical Production Association in Russia; the U.S. firms RMI Titanium Company, Allegheny Teledyne Inc., Titanium Metals Corp., and Howmet Corp.; and firms in Japan and Europe (Interfax Mining and Metals Report, 1999d). The Russian titanium industry supplied some of the world's leading aircraft manufacturers.

**Production Development.**—Plans call for developing mining titanium raw materials at the Tuganskoye and Tarskoye deposits and for renovating the Berezniki titanium-magnesium plant that produces sponge (Kozlovskiy and Shchadov, 1999).

### **Tungsten**

**Reserves.**—Tungsten reserves are geographically distributed as follows: North Caucasus (46%), East Siberia (29%), and Russian Far East (24%). The tungsten trioxide content of reserves was, on average, 2.2 times lower than in deposits under development in other countries (Novikov and Yastrzhembskiy, 1999). The Tyrnyauz tungsten and molybdenum mining and processing complex in the Kabardino-Balkaria Republic in the North Caucasus, which had been the country's largest tungsten producer, reportedly had proven commercial tungsten reserves of 374.1 Mt of ore in categories A, B, and C<sub>1</sub>, of which 264.1 Mt was suitable for underground mining and 110 Mt suitable for surface development (Levine, 1995). Despite its large reserves, the ore grades at Tyrnyauz were considerably lower than at foreign operations (Levine, 1995).

**Production Status.**—Despite plummeting production since the dissolution of the U.S.S.R. in 1998, Russia was thought to be the world's second largest producer of tungsten in ore (Shedd, 1999). Tungsten production had fallen by 56% since 1995 when world tungsten producers suffered a severe setback as Russia flooded the market with stockpiled material. Also, this flooding of the market forced a number of Russian tungsten mines to close. The two major tungsten producers in the Russian Far East, the Primorskiy and Lermontov mining and beneficiation complexes, exported 100% and 50%, respectively, of their concentrate production (Interfax Mining and Metals Report, 1999m).

**Production Development.**—Reserves are decreasing. In 10 to 15 years, reserves will be depleted at one-half of the tungsten mining enterprises. Production can be maintained by expanding capacity for mining tungsten ore at the Tyrnyauz and Dzhida

complexes and also by developing reserves at the Ktiteberdinskoye deposit in the North Caucasus, the Agylkinskoye deposit in the Yakut-Sakha Republic, and a number of other small deposits with rich ore (Kozlovskiy and Shchadov, 1999).

Russia plans to increase tungsten production, with output projected to increase at the Lermontov and Primorye mining and beneficiation complexes and at the Tyrnyauz tungsten and molybdenum mining complex (Interfax Mining and Metals Report, 1999m).

## Uranium

**Reserves.**—According to data from the London Uranium Institute, explored uranium reserves in the FSU valued at \$80 per kilogram or less totaled 787,000 t, of which Russia possessed 127,000 t. This does not include Russia's large uranium stockpile, which, following the breakup of the Soviet Union, totaled between 200,000 and 250,000 t (Kozlovskiy and Shchadov, 1999).

**Production Status.**—Russia had only one uranium mining enterprise that mined the Streltsovskoye deposit: the Priargunskiy. After 30 years of operation, the rich ores suitable for open pit mining have been depleted. Since 1992, the Priargunskiy enterprise has not shown profits. Russia had nine nuclear electric powerplants with an installed capacity of more than 21.2 million kilowatts, which generated about 110 billion kilowatt-hours of electricity or 13.5% of the country's total electricity generation (Lopatin, Kamnev, and Ivanov, 1999).

**Production Development.**—The Russian Ministry of Atomic Energy had drawn up a plan entitled "Conception for development of the uranium mining sector in the Russian Federation up to the year 2010" that calls for a reevaluation of reserves at the Streltsovskoye deposit to determine which portions of the reserves classified under the Soviet system are now economic, to bring in new technology to increase productivity at the Priargunskiy enterprise, and to introduce cost-cutting measures. Plans also call for exploring for new reserves (Lopatin, Kamnev, and Ivanov, 1999).

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TABLE 1  
RUSSIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

| Commodity  | 1994              | 1995              | 1996              | 1997              | 1998 e/        |
|--|-------------------|-------------------|-------------------|-------------------|----------------|
| METALS   |                   |                   |                   |                   |                |
| Aluminium:   |                   |                   |                   |                   |                |
| Ore and concentrate:                               |                   |                   |                   |                   |                |
| Alumina  | 2,254,000         | 2,300,000 e/      | 2,105,000         | 2,400,000 r/      | 2,465,000 2/   |
| Bauxite, 26% to 57% alumina e/                     | 3,000,000         | 3,100,000         | 3,300,000         | 3,350,000         | 3,450,000      |
| Nepheline concentrate, 25% to 30% e/               | 1,300,000         | 1,400,000         | 1,300,000         | 940,000 r/        | 888,800 2/     |
| Metal, smelter, primary                            | 2,670,496         | 2,724,378         | 2,874,236         | 2,906,020         | 3,004,728 2/   |
| Antimony, mine output, Sb content (recoverable) e/ | 7,000 2/          | 6,000             | 6,000             | 6,000             | 4,000          |
| Arsenic, white e/                                  | 1,500             | 1,500             | 1,500             | 1,500             | 1,500          |
| Beryllium, beryl, cobbled, 10% to 20% BeO e/       | 1,000             | 1,000             | 1,000             | 1,000             | 1,000          |
| Bismuth, mine output, Bi content e/                | 40                | 50                | 50                | 50                | 35             |
| Cadmium metal, smelter                             | 600               | 725               | 730               | 790 e/            | 800            |
| Chromium, chrome ore, marketable                   | 143,000           | 151,400           | 96,700            | 150,000 e/        | 130,000        |
| Cobalt: e/   |                   |                   |                   |                   |                |
| Mine output, recoverable Co content                | 3,000             | 3,500             | 3,300             | 3,300             | 3,200          |
| Metal, refined                                     | 4,340             | 4,450             | 4,200             | 4,100             | 3,500          |
| Copper:  |                   |                   |                   |                   |                |
| Ore, Cu content, recoverable                       | 573,300           | 525,000           | 520,000 e/        | 505,000 e/        | 515,000        |
| Metal:   |                   |                   |                   |                   |                |
| Blister: e/  |                   |                   |                   |                   |                |
| Primary  | 514,000           | 525,000           | 550,000           | 575,000           | 585,000        |
| Secondary  | 10,000            | 20,000            | 20,000            | 25,000            | 25,000         |
| Refined:   |                   |                   |                   |                   |                |
| Primary  | 452,000           | 504,000           | 513,000           | 550,000 e/        | 565,000        |
| Secondary  | 50,000            | 56,000            | 57,000            | 60,000 e/         | 60,000         |
| Total  | 1,026,000         | 1,105,000         | 1,140,000         | 1,210,000         | 1,235,000      |
| Gold, mine output, Au content kilograms            | 146,600           | 132,170           | 123,000           | 115,000           | 103,700 2/     |
| Iron and steel:                                    |                   |                   |                   |                   |                |
| Iron ore, 55% to 63% Fe                            | 73,300,000        | 75,900,000        | 69,600,000        | 70,800,000 e/     | 72,300,000     |
| Metal:   |                   |                   |                   |                   |                |
| Pig iron   | 36,116,000        | 39,762,000        | 36,061,000        | 37,327,000        | 34,800,000     |
| Direct-reduced iron                                | 1,710,000         | 1,680,000         | 1,500,000         | 1,730,000 e/      | 1,550,000      |
| Ferroalloys: e/                                    |                   |                   |                   |                   |                |
| Blast furnace:                                     |                   |                   |                   |                   |                |
| Ferromanganese                                     | 80,000 r/         | 82,500 r/ 2/      | 67,000 r/ 2/      | 47,100 r/ 2/      | 45,000 2/      |
| Ferrophosphorus                                    | 2,000 r/          | -- r/ 2/          | 2,300 r/ 2/       | 3,600 r/ 2/       | 3,500          |
| Spiegeleisen                                       | 7,000             | 7,000             | 7,000             | 7,000             | 7,000          |
| Electric furnace:                                  |                   |                   |                   |                   |                |
| Ferrochromium                                      | 265,525 2/        | 290,000           | 135,000           | 247,000           | 203,000 2/     |
| Ferrochromiumsilicon                               | 40,000            | 30,000            | 5,000             | 5,000             | 4,000          |
| Ferronickel  | 59,000            | 77,000 2/         | 75,000 2/         | 40,000            | 30,000         |
| Ferrosilicon                                       | 350,000           | 350,000           | 460,000           | 510,000 r/        | 496,000 2/     |
| Silicomanganese                                    | --                | 700               | --                | --                | --             |
| Silicon metal                                      | 40,000            | 40,000            | 40,000            | 40,000            | 40,000         |
| Other  | 40,000            | 40,000            | 40,000            | 40,000            | 40,000         |
| Total  | 44,936,005,114 r/ | 46,348,871,495 r/ | 44,787,513,996 r/ | 44,255,041,297 r/ | 42,434,621,398 |
| Steel:   |                   |                   |                   |                   |                |
| Crude  | 48,812,000        | 51,300,000        | 49,193,000        | 48,499,300 r/     | 43,821,800 2/  |
| Finished   | 35,900,000        | 39,100,000        | 39,000,000        | 37,800,000        | 35,134,000 2/  |
| Pipe   | 3,600,000         | 3,700,000         | 3,600,000         | 3,500,000         | 2,816,000 2/   |
| Lead:  |                   |                   |                   |                   |                |
| Mine output, recoverable Pb content                | 25,000            | 23,000            | 18,000            | 19,500 e/         | 18,500         |
| Metal, refined, primary and secondary e/           | 34,000            | 30,000            | 30,000            | 52,000            | 50,000         |
| Magnesium: e/                                      |                   |                   |                   |                   |                |
| Magnesite  | 1,000,000         | 1,000,000         | 1,000,000         | 1,040,000         | 851,845 2/     |
| Metal, including secondary                         | 35,400            | 37,500            | 35,000            | 39,500            | 41,500         |
| Manganese, mine output, Mn content e/              | --                | --                | 10,000            | 21,000            | 21,000         |
| Mercury e/   | 50                | 50                | 50                | 50                | 50             |
| Molybdenum e/                                      | 4,000 r/          | 3,000 r/          | 2,000 r/          | 2,000 r/          | 2,000          |
| Nickel: e/   |                   |                   |                   |                   |                |
| Mine output, recoverable Ni content                | 240,000           | 251,000           | 230,000           | 260,000           | 250,000        |
| Nickel products, including ferronickel             | 180,900           | 201,100           | 190,000           | 230,000           | 230,000        |
| Platinum-group metals: e/                          |                   |                   |                   |                   |                |
| Platinum   | 22,500 r/         | 27,000 r/         | 25,000 r/         | 25,000 r/         | 25,000         |
| Palladium  | 70,000 r/         | 85,000 r/         | 80,000 r/         | 80,000 r/         | 80,000         |
| Other  | 3,000             | 3,600             | 3,500             | 3,500             | 3,500          |
| Total  | 95,500            | 115,600           | 108,500           | 108,500           | 108,500        |
| Silver e/  | 600,000 r/        | 600,000 r/        | 400,000 r/        | 400,000 r/        | 350,000        |
| Tin: e/  |                   |                   |                   |                   |                |
| Mine output, recoverable Sn content                | 10,460 2/         | 9,000             | 8,000             | 7,500             | 4,500          |
| Metal, smelter:                                    |                   |                   |                   |                   |                |
| Primary  | 11,500            | 9,500             | 9,000             | 6,700             | 3,000          |
| Secondary  | 1,000             | 1,000             | 1,000             | 1,000             | 500            |
| Total  | 12,500            | 10,500            | 10,000            | 7,700             | 3,500          |
| Titanium sponge e/                                 | 12,000            | 14,000            | 20,000            | 21,000            | 22,000         |
| Tungsten concentrate, W content e/                 | 4,000             | 5,400             | 3,000             | 3,000             | 3,000          |
| Vanadium metal                                     | 11,900            | 11,000            | 11,000            | 9,000 r/          | 9,000          |
| Zinc:  |                   |                   |                   |                   |                |
| Mine output, recoverable Zn content                | 147,000           | 131,000           | 126,000           | 121,000 e/        | 115,000        |
| Metal, smelter, primary and secondary e/           | 137,800           | 166,000           | 172,000           | 189,000 r/        | 196,000        |
| INDUSTRIAL MINERALS                                |                   |                   |                   |                   |                |
| Asbestos, grades I-VI e/                           | 700,000 r/        | 680,000 r/        | 615,000 r/        | 710,000 r/        | 650,000        |
| Barite e/  | 70,000            | 70,000            | 70,000            | 60,000 r/         | 60,000         |
| Cement, hydraulic                                  | 37,200,000        | 36,500,000        | 27,800,000        | 26,600,000        | 26,726,000     |
| Clays: Kaolin including china clay                 | NA                | NA                | NA                | NA                | NA             |
| Corundum, natural                                  | NA                | NA                | NA                | NA                | NA             |
| Diamond: e/  |                   |                   |                   |                   |                |
| Gem carats   | 10,000,000 r/     | 10,500,000 r/     | 10,500,000 r/     | 10,500,000 r/     | 10,500,000     |
| Industrial do.                                     | 10,000,000 r/     | 10,500,000 r/     | 10,500,000 r/     | 10,500,000 r/     | 10,500,000     |
| Synthetic do.                                      | 80,000,000        | 80,000,000        | 80,000,000        | 80,000,000        | 80,000,000     |
| Total do.  | 100,000,000 r/    | 101,000,000 r/    | 101,000,000 r/    | 101,000,000 r/    | 101,000,000    |
| Diatomite  | 50,000            | 50,000            | 50,000            | 50,000            | NA             |
| Feldspar e/  | 55,000            | 55,000            | 45,000            | 45,000            | 40,000         |
| Fluorspar, concentrate 55% to 96.4% CaF2 e/        | 250,000 2/        | 250,000           | 250,000           | 250,000           | 250,000        |
| Graphite e/  | 8,000             | 8,000             | 6,000             | 6,000             | 6,000          |

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

| Commodity   | 1994           | 1995           | 1996           | 1997           | 1998 e/        |
|---|----------------|----------------|----------------|----------------|----------------|
| <b>INDUSTRIAL MINERALS--Continued</b>                           |                |                |                |                |                |
| Gypsum  | 1,200,000 e/   | 697,000 r/     | 1,534,000 r/   | 559,000 r/     | 500,000        |
| Lime, industrial and construction                               | 9,000,000 e/   | 9,263,000      | 7,822,000      | 7,626,000      | 7,000,000      |
| Lithium minerals, not further specified e/                      | 2,000          | 2,000          | 2,000          | 2,000          | 2,000          |
| Mica e/   | 100,000        | 100,000        | 100,000        | 100,000        | 100,000        |
| Nitrogen, N content of ammonia                                  | 7,300,000      | 7,900,000      | 7,900,000      | 7,150,000      | 6,500,000      |
| Phosphate rock: e/  |                |                |                |                |                |
| Apatite concentrate, 37% to 39.6% P <sub>2</sub> O <sub>5</sub> | 7,700,000      | 8,700,000 r/   | 8,200,000      | 9,600,000 r/   | 9,500,000      |
| Sedimentary rock, 19% to 30% P <sub>2</sub> O <sub>5</sub>      | 300,000        | 300,000        | 300,000        | 300,000        | 300,000        |
| Total   | 8,000,000      | 9,000,000 r/   | 8,500,000      | 9,900,000 r/   | 9,800,000      |
| Potash, marketable, K <sub>2</sub> O equivalent                 | 2,498,000      | 2,800,000      | 2,618,000 e/   | 3,400,000 e/   | 3,500,000      |
| Pyrite, gross weight  | NA             | NA             | NA             | NA             | NA             |
| Salt, all types   | 4,000,000 r/   | 3,100,000 r/   | 2,100,000 r/   | 2,100,000 r/   | 2,000,000      |
| Sodium compounds, n.e.s., carbonate                             | 1,585,000      | 1,823,000      | 1,500,000      | 1,700,000      | 1,600,000      |
| Sulfur: e/  |                |                |                |                |                |
| Native  | 80,000         | 80,000         | 70,000         | 50,000         | 50,000         |
| Pyrites   | 700,000        | 450,000        | 400,000        | 400,000        | 400,000        |
| Byproduct, natural gas  | 2,550,000      | 2,970,000      | 3,000,000      | 2,950,000      | 3,700,000      |
| Other   | 320,000        | 335,000        | 325,000        | 350,000        | 325,000        |
| Total   | 3,650,000      | 3,835,000      | 3,795,000      | 3,750,000      | 4,475,000      |
| Sulfuric acid   | 6,334,000      | 6,946,000      | 5,650,000 e/   | 6,100,000      | 5,600,000      |
| Talc e/   | 100,000        | 100,000        | 100,000        | 90,000 r/      | 90,000         |
| Vermiculite e/  | 40,000         | 40,000         | 30,000         | 25,000         | 25,000         |
| <b>MINERAL FUELS AND RELATED MATERIALS</b>                      |                |                |                |                |                |
| Coal: e/  |                |                |                |                |                |
| Anthracite  | 20,300,000     | 19,700,000     | 19,100,000     | 18,300,000     | 17,500,000     |
| Bituminous  | 168,000,000    | 163,000,000    | 167,000,000    | 160,000,000    | 152,500,000    |
| Lignite   | 102,000,000    | 98,000,000     | 90,000,000     | 83,000,000     | 77,000,000     |
| Total   | 290,000,000 r/ | 281,000,000 r/ | 276,000,000 r/ | 261,000,000 r/ | 247,000,000    |
| Coke, 6% moisture content                                       | 25,400,000     | 27,600,000     | 25,300,000 r/  | 25,600,000     | 23,700,000     |
| Gas, natural, marketed million cubic meters                     | 607,000        | 595,000        | 601,000        | 571,000        | 591,014,600 2/ |
| Oil shale   | 3,300,000      | 2,300,000      | 2,000,000 e/   | 2,000,000 e/   | 1,800,000      |
| Peat, fuel use  | 2,900,000      | 4,400,000 r/   | 4,100,000 r/   | 3,300,000 r/   | 3,000,000      |
| Petroleum:  |                |                |                |                |                |
| Crude in:   |                |                |                |                |                |
| Gravimetric units   | 305,000,000 r/ | 298,000,000 r/ | 291,000,000 r/ | 294,000,000 r/ | 293,933,000 2/ |
| Volumetric units e/ thousand 42-gallon barrels                  | 2,240,000 r/   | 2,190,000 r/   | 2,140,000 r/   | 2,161,000 r/   | 2,160,000      |
| Refinery products 3/  | 186,000,000    | 183,000,000    | 183,000,000 r/ | 178,000,000    | 163,676,000 2/ |
| Uranium concentrate, U content e/                               | 2,968          | 2,250          | 2,000          | 2,000          | 2,000          |

e/ Estimated. r/ Revised. NA Not available.

1/ Table formatted by Glenn J. Wallace, International Data Unit; includes data available through August 18, 1999.

2/ Reported figure.

3/ Not distributed by type and therefore not suitable for conversion to volumetric units. Data include all energy and nonenergy products, but exclude losses.

TABLE 2  
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Metric tons unless otherwise specified)

| Commodity   | Major operating facilities                   | Location                        | Annual capacity e/    |
|---|--|---------------------------------|-----------------------|
| Alumina   | Achinsk                                      | Achinsk in East Siberia         | 900,000.              |
| Do.   | Bogoslovsk                                   | Urals                           | 1,050,000.            |
| Do.   | Boksitogorsk                                 | European north                  | 200,000.              |
| Do.   | Nadvoitsy                                    | Nadvoitsy in Karelia            | 266,000.              |
| Do.   | Uralsk                                       | Kamensk region                  | 536,000.              |
| Do.   | Volkhov                                      | Volkhov, east of St. Petersburg | 45,000.               |
| Aluminum, primary   | Volkhov smelter                              | do.                             | 20,000.               |
| Do.   | Uralsk smelter                               | Kamensk                         | 70,000.               |
| Do.   | Bogoslovsk smelter                           | Krasnoturinsk                   | 162,000.              |
| Do.   | Novokuznetsk smelter                         | Novokuznetsk                    | 284,000.              |
| Do.   | Kandalaksha smelter                          | Kola Peninsula                  | 62,500.               |
| Do.   | Nadvoitsy smelter                            | Nadvoitsy in Karelia            | 68,000.               |
| Do.   | Volgograd smelter                            | Volgograd                       | 168,000.              |
| Do.   | Irkutsk smelter                              | Sherekov, near Irkutsk          | 262,000.              |
| Do.   | Krasnoyarsk smelter                          | Krasnoyarsk                     | 755,000.              |
| Do.   | Bratsk smelter                               | Bratsk                          | 843,800.              |
| Do.   | Sayansk smelter                              | Sayanogorsk                     | 274,000.              |
| Apatite, concentrate  | Khibiny apatit association                   | Kola Peninsula                  | 15,000,000.           |
| Do.   | Kovdor iron ore mining association           | do.                             | 700,000.              |
| Asbestos  | Kiyembay                                     | Orenburg Oblast                 | 500,000.              |
| Do.   | Tuvaasbest                                   | Tuva Republic                   | 250,000.              |
| Do.   | Uralasbest                                   | Central Urals                   | 1,100,000.            |
| Bauxite   | North-Urals mining company                   | Severouralsk region             | NA.                   |
| Do.   | South-Urals mining company                   | South Urals region              | NA.                   |
| Do.   | Severnaya Onega Mine                         | Northwest region                | 800,000.              |
| Boron   | Bor Association                              | Maritime region                 | 140,000 (boric acid). |
| Do.   | Amur River complex                           | Far East                        | 8,000 (boric acid).   |
| Do.   | Alga River chemical complex                  | do.                             | 12,000 (boric acid).  |
| Chromite  | Saranov complex                              | Saranov                         | 200,000.              |
| Coal  | Donets basin (east)                          | Rostov Oblast                   | 30,000,000.           |
| Do.   | Kansk Achinsk basin                          | East Siberia                    | 50,000,000.           |
| Do.   | Kuznetsk basin                               | West Siberia                    | 160,000,000.          |
| Do.   | Moscow basin                                 | Moscow region                   | 15,000,000.           |
| Do.   | Neryungri basin                              | Yakut-Sakha Republic            | 15,000,000.           |
| Do.   | Pechora basin                                | Komi Republic                   | 30,000,000.           |
| Do.   | South Yakutia basin                          | Yakut-Sakha Republic            | 17,000,000.           |
| Cobalt  | Norilsk Nickel                               | Norilsk, Kola Peninsula         | 4,000.                |
| Do.   | Rezh, Ufaleynikel, Yuzhuralnikel enterprises | Southern Urals                  | 4,000 (total).        |
| Do.   | Tuva cobalt                                  | Khovu-Aksy in Tuva Republic     | NA.                   |
| Copper, mining and beneficiation complexes (Cu content of concentrates) | Buribai enterprise                           | Buribai region                  | 5,000.                |
| Do.   | Gai complex                                  | Gai region                      | 4,000.                |
| Do.   | Kirovgrad complex                            | Kirovgrad region                | 12,000.               |
| Do.   | Krasnouralsk complex                         | Krasnouralsk region             | 12,000.               |

See footnotes at end of table.

TABLE 2--Continued  
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Metric tons unless otherwise specified)

| Commodity  |                      | Major operating facilities  | Location  | Annual capacity e/                           |
|--|----------------------|---|---|--|
| Copper, mining and beneficiation complexes<br>(Cu content of concentrates)--Continued: |                      | Norilsk complex   | Norilsk region  | 400,000.                                     |
| Do.  |                      | Sredneuralsk complex  | Ekaterinenburg region                                       | 12,000.                                      |
| Do.  |                      | Uchali complex  | Uchali region   | 40,000.                                      |
| Do.  |                      | Urap complex  | Stavropol region  | 7,000.                                       |
| Copper, metal (smelting and refining complexes)  |                      | Kirovgrad (smelting)  | Kirovgrad   | 150,000.                                     |
| Do.  |                      | Krasnouralsk (smelting)   | Krasnouralsk  | 60,000.                                      |
| Do.  |                      | Kyshtym (refining)  | Kyshtym   | 70,000.                                      |
| Do.  |                      | Mednogorsk (smelting)   | Mednogorsk  | 40,000.                                      |
| Do.  |                      | Norilsk (smelting and refining)   | Norilsk   | 500,000.                                     |
| Do.  |                      | Pyshma (refining)   | Pyshma  | 350,000.                                     |
| Do.  |                      | Severonikel (smelting)  | Monchegorsk   | 20,000.                                      |
| Do.  |                      | Sredneuralsk (smelting)   | Revda   | 140,000.                                     |
| Diamonds   | thousand carats      | Almazy Rossii-Sakha Association   | Aykhal, Mirnyy, Udachnaya areas of the Yakut-Sakha Republic | 10,000 gem,<br>10,000 industrial.            |
| Feldspar   |                      | Lupikko deposit   | Karelia   | NA.  |
| Do.  |                      | Kheto-Lanbino deposit   | do.   | NA.  |
| Ferroalloys  |                      | Kosaya Gora iron works  | Kosaya Gora   | 200,000.                                     |
| Do.  |                      | Kuznetsk ferroalloy plant   | Novokuznetsk  | 400,000.                                     |
| Do.  |                      | Lipetsk iron and steel works  | Lipetsk   | NA.  |
| Do.  |                      | Serov ferroalloy plant  | Serov   | NA.  |
| Do.  |                      | Tulachermet Scientific and Industrial Association   | Tula  | NA.  |
| Do.  |                      | Chelyabinsk electrometallurgical plant  | Chelyabinsk   | 350,000.                                     |
| Do.  |                      | Chusovoy iron and steel plant   | Chusovoy  | NA.  |
| Do.  |                      | Klyuchevsk ferroalloy plant   | Dvurechinsk   | 160,000.                                     |
| Fluorspar  |                      | Abagaytuy mining and beneficiation complex  | trans-Baikal  | NA.  |
| Do.  |                      | Kalanguy mining and beneficiation complex   | do.   | NA.  |
| Do.  |                      | Kyakhinsky mining and beneficiation complex   | do.   | NA.  |
| Do.  |                      | Usugli mining and beneficiation complex   | do.   | NA.  |
| Do.  |                      | Yaroslavsky mining and beneficiation complex  | Far East  | NA.  |
| Gold   | kilograms            | Gold mining regions:<br>Yakut-Sakha   | Yakut-Sakha Republic  | 200,000 (total gold).                        |
| Do.  | do.                  | Buryat  | Buryat Republic   |  |
| Do.  | do.                  | Magadan   | Magadan Oblast  |  |
| Do.  | do.                  | Krasnoyarsk   | Krasnoyarsk region  |  |
| Do.  | do.                  | Maritime  | Maritime region   |  |
| Do.  | do.                  | Tuva  | Tuva Republic   |  |
| Iron ore   |                      | Mining areas:<br>Kursk Magnetic Anomaly (KMA)<br>containing the following enterprises:<br>Mikhailovka | Zheleznogorsk   | 50,000,000<br>(total KMA).                   |
| Do.  |                      | Lebedi  | Gubkin  |  |
| Do.  |                      | Stoilo  | do.   |  |
| Do.  |                      | Northwest containing the following enterprises:<br>Olenegorsk   | Olenegorsk  | 22,000,000 (total<br>Northwest).             |
| Do.  |                      | Kostomuksha   | Kostomuksha   |  |
| Do.  |                      | Kovdor  | Kola Peninsula  |  |
| Do.  |                      | Siberia (east) containing the following mining enterprises:<br>Korshunovo                             | Zheleznogorsk   | 18,000,000 (total<br>Siberia east and west). |
| Do.  |                      | Rudnogorsk  | Rudnogorsk  |  |
| Do.  |                      | Siberia (west) including the following mining enterprises:<br>Abakan                                  | Abaza   |  |
| Do.  |                      | Sheregesh   | Sheregesh   |  |
| Do.  |                      | Tashtagol   | Tashtagol   |  |
| Do.  |                      | Teya  | Vershina Tei  |  |
| Do.  |                      | Urals containing the following mining enterprises:<br>Akkermanovka                                    | Novotroitsk   | 22,000,000 (total<br>Urals).                 |
| Do.  |                      | Bakal   | Bakal   |  |
| Do.  |                      | Goroblagodat  | Kushva  |  |
| Do.  |                      | Kachkanar   | Kachkanar   |  |
| Do.  |                      | Magnitogorsk  | Magnitogorsk  |  |
| Do.  |                      | Peshchanka  | Rudnichny   |  |
| Lead-zinc (recoverable metal content of ore)   |                      | Altay mining and beneficiation complex  | Altay mountains region, South Siberia                       | 2,000 lead (Pb),<br>1,000 zinc (Zn).         |
| Do.  |                      | Dalpolymetal mining and beneficiation complex   | Maritime region   | 20,000Pb, 25,000 Zn.                         |
| Do.  |                      | Nerchinsk polymetallic complex  | Chita Oblast  | 7,000 Pb, 12,500 Zn.                         |
| Do.  |                      | Sadon lead-zinc complex   | Severo-Osetiya  | 5,000 Pb, 14,000 Zn.                         |
| Do.  |                      | Salair mining and beneficiation complex   | Kemerovo Oblast   | 2,000 Pb, 10,500 Zn.                         |
| Lead, metal  |                      | Dalpolymetal lead smelter   | Rudnaya in the Maritime District                            | 20,000.                                      |
| Do.  |                      | Elektrozinc lead smelter  | Vladikavkaz in North Caucasus                               | 30,000.                                      |
| Magnesite  |                      | Satka deposit   | Chelyabinsk Oblast  | 3,800,000.                                   |
| Magnesium, metal (for sale)  |                      | Avisma plant  | Berezniki   | 22,000.                                      |
| Do.  |                      | Solikamsk plant   | Solikamsk   | 21,500.                                      |
| Mica   |                      | Aldan mining complex  | Yakut-Sakha Republic  | NA.  |
| Do.  |                      | Karel mining complex  | Karelia   | NA.  |
| Do.  |                      | Kovdor mining complex   | Kola Peninsula  | NA.  |
| Do.  |                      | Mam mining complex  | Irkutsk complex   | NA.  |
| Molybdenum   |                      | Dzhida tungsten-molybdenum mine   | West trans-Baikal   | NA.  |
| Do.  |                      | Sorsk molybdenum mining enterprise  | Sorsk region  | NA.  |
| Do.  |                      | Tymnauz tungsten-molybdenum mining enterprise   | North Caucasus  | NA.  |
| Do.  |                      | Shakhtaminskoye molybdenum mining enterprise  | Chita Oblast  | NA.  |
| Natural gas  | billion cubic meters | Komi Republic region  | Komi Republic   | 8.0.   |
| Do.  | do.                  | Norilsk area  | Norilsk area  | 5.5.   |
| Do.  | do.                  | North Caucasus region   | North Caucasus  | 6.0.   |
| Do.  | do.                  | Sakhalin region   | Far East  | 2.0.   |
| Do.  | do.                  | Tomsk Oblast region   | West Siberia  | 0.5.   |
| Do.  | do.                  | Tyumen Oblast region including:<br>Medvezhye field  | do.   | 575.   |
| Do.  | do.                  | Urengoi field   | West Siberia  | 75.  |
| Do.  | do.                  | Vyngapur field  | do.   | 300.   |
| Do.  | do.                  | Yamburg field   | do.   | 17.  |
| Do.  | do.                  | Urals region  | Urals   | 170.   |
| Do.  | do.                  | Volga region  | Volga region  | 45.  |
| Do.  | do.                  | Yakut-Sakha region  | Yakut-Sakha Republic  | 6.   |
|  |                      |   |   | 1.5.   |

See footnotes at end of table.

TABLE 2--Continued  
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Metric tons unless otherwise specified)

| Commodity                                       | Major operating facilities                                   | Location                                | Annual capacity e/   |
|---|--|---|--|
| Nepheline syenite                               | Apatite complex  | Kola Peninsula                          | 1,500,000.   |
| Do.   | Kiya-Shaltyr Mine  | Goryachegorsk region, eastern Siberia   | NA.  |
| Nickel, mining enterprise (Ni in ore)           | Norilsk Nikel Association                                    | Norilsk region and Kola Peninsula       | 300,000.   |
| Do.   | Yuzhuralnikel company  | Southern Urals                          | 20,000 total southern Urals).                              |
| Do.   | Ufaleynikel company  | do.                                     |  |
| Nickel, metal (smelting and refining complexes) | Norilsk Nikel (smelting and refining)                        | Norilsk                                 | 160,000 (smelting),<br>100,000 (refining).                 |
| Do.   | do.  | Pechenga                                | 50,000 (smelting).   |
| Do.   | do.  | Monchegorsk                             | 50,000 (smelting),<br>140,000 (refining).                  |
| Do.   | Rezh, Ufaleynikel, and Yuzhuralnikel enterprises             | Southern Urals                          | 65,000 (total, nickel products and nickel in ferronickel). |
| Oil shale                                       | Leningradlanets Association                                  | Slantsy region                          | 5,000,000.   |
| Petroleum                                       | European Russia production region:                           |   |  |
|   | Astrakhan  | Northern Caspian Sea Basin              | 700,000.   |
| Do.   | Bashkortostan  | Urals                                   | 28,000,000.  |
| Do.   | Checheno-Ingush Republic                                     | Southern Caucasus                       | 4,500,000.   |
| Do.   | Dagestan   | North Caucasus                          | 700,000.   |
| Do.   | Kaliningrad Oblast   | Baltic coast                            | 1,800,000.   |
| Do.   | Komi Republic  | Northwest                               | 15,000,000.  |
| Do.   | Krasnodar Krai   | North Caucasus                          | 2,000,000.   |
| Do.   | Orenburg Oblast  | Urals                                   | 13,000,000.  |
| Do.   | Perm Oblast  | do.                                     | 12,000,000.  |
| Do.   | Samara   | Volga region                            | 16,000,000.  |
| Do.   | Saratov Oblast   | do.                                     | 1,500,000.   |
| Do.   | Stavropol Krai   | North Caucasus                          | 2,000,000.   |
| Do.   | Tatarstan  | Volga region                            | 40,000,000.  |
| Do.   | Udmurt Republic  | Urals                                   | 9,000,000.   |
| Do.   | East Siberian production region: Tomsk Oblast                | Tomsk Oblast                            | 11,000,000.  |
| Do.   | West Siberian production region:                             |   |  |
|   | Tyumen Oblast:   | Tyumen Oblast                           | 300,000,000.   |
| Do.   | Kogolym field  | do.                                     | 34,000,000.  |
| Do.   | Krasnoleninskiy field  | do.                                     | 12,000,000.  |
| Do.   | Langepas field   | do.                                     | 30,000,000.  |
| Do.   | Megion field   | do.                                     | 18,000,000.  |
| Do.   | Nizhneartovsk field  | do.                                     | 70,000,000.  |
| Do.   | Noyabrsk field   | do.                                     | 37,000,000.  |
| Do.   | Purneftegaz field  | do.                                     | 12,000,000.  |
| Do.   | Surgut field   | do.                                     | 48,000,000.  |
| Do.   | Uray field   | do.                                     | 8,000,000.   |
| Do.   | Varegan field  | do.                                     | 10,000,000.  |
| Do.   | Sakhalin Island production region                            | Sakhalin Island                         | 2,500,000.   |
| Phosphate rock                                  | Khibiny Apatit Association                                   | Kola Peninsula                          | 20,000,000 (apatite concentrate).                          |
| Do.   | Kovdor iron ore mining complex                               | do.                                     | 700,000 (apatite concentrate).                             |
| Do.   | Kingisepp complex  | Leningrad Oblast                        | NA.  |
| Do.   | Lopatino, Yegorevsk deposits                                 | Moscow Oblast                           | NA.  |
| Do.   | Polpinskoye deposit  | Bryansk Oblast                          | NA.  |
| Do.   | Verkhnekamsk deposit   | Urals                                   | NA.  |
| Platinum-group metals:                          |  |   | 130 (total metal).   |
| Ore   | Norilsk Nikel Association                                    | Norilsk region                          |  |
| Metals  | Krasnoyarsk refinery   | Krasnoyarsk                             |  |
| Potash, K <sub>2</sub> O                        | Uralkaliy  | Verkhne Kamsk deposit                   | 3,000,000.   |
| Do.   | Silvinit   | Solikamsk-Berezniki region of the Urals | 2,000,000.   |
| Silver  | Dukat Mine   | Magadan Oblast                          | 1,000 (total silver).                                      |
| Do.   | Coproduct and byproduct of gold and nonferrous metals mining |   |  |
| Soda ash  | Achinsk plant  | East Siberia                            | 595.   |
| Do.   | Berezniki plant  | Urals                                   | 1,080.   |
| Do.   | Pikalevo plant   | Leningrad Oblast                        | 200.   |
| Do.   | Sterlitamak plant  | Sterlitamak                             | 2,135.   |
| Do.   | Volkhov plant  | Leningrad Oblast                        | 20.  |
| Steel, crude                                    | Amurstal   | Komsomolsk na Amur                      | 1,600,000.   |
| Do.   | Asha   | Asha                                    | 450,000.   |
| Do.   | Beloretsk  | Bashkir Republic                        | 380,000.   |
| Do.   | Cherepovets  | Cherepovets                             | 14,000,000.  |
| Do.   | Chusovoy   | Chusovoy                                | 570,000.   |
| Do.   | Elektrostal  | Moscow                                  | 314,000.   |
| Do.   | Gorky  | Nizhniy-Novgorod                        | 78,000.  |
| Do.   | Guryevsk   | Guryevsk                                | 160,000.   |
| Do.   | Karaganda  | Karaganda                               | 6,300,000.   |
| Do.   | Kuznetsk   | Novokuznetsk                            | 4,700,000.   |
| Do.   | Lipetsk  | Lipetsk                                 | 9,900,000.   |
| Do.   | Lysva  | Lysva                                   | 350,000.   |
| Do.   | Magnitogorsk   | Magnitogorsk                            | 16,200,000.  |
| Do.   | Mechel (Chelyabinsk)   | Chelyabinsk                             | 7,000,000.   |
| Do.   | Nizhniy Tagil  | Nizhniy Tagil                           | 8,000,000.   |
| Do.   | Nizhniy Sergi  | Nizhniy Sergi                           | 300,000.   |
| Do.   | Nosta (Orsk-Khalilovo)                                       | Novotroitsk in Orenburg Oblast          | 4,600,000.   |
| Do.   | Novosibirsk  | Novosibirsk                             | 1,100,000.   |
| Do.   | Omutninsk  | Omutninsk                               | 210,000.   |
| Do.   | Oskol Electric Steel   | Stary Oskol                             | 1,450,000.   |
| Do.   | Petrovsk-Zabaikalskiy  | Petrovsk-Zabaikalskiy                   | 426,000.   |
| Do.   | Revda  | Revda                                   | 281,000.   |
| Do.   | Salda  | Sverdlovsk Oblast                       | 1,900.   |
| Do.   | Serov A.K.   | Serov                                   | 1,000,000.   |
| Do.   | Serp i Molot   | Moscow                                  | 70,000.  |
| Do.   | Severskiy  | Polevskoy in Sverdlovsk Oblast          | 825,000.   |
| Do.   | Sibelektrostal   | Krasnoyarsk                             | 110,000.   |
| Do.   | Sulin  | Sulin                                   | 280,000.   |
| Do.   | Taganrog   | Taganrog                                | 925,000.   |
| Do.   | Tulachermet-Scientific and Industrial Association            | Tula                                    | 18,400.  |
| Do.   | Verkh-Isetskii   | Ekaterinburg                            | 132,000.   |

See footnotes at end of table.

TABLE 2--Continued  
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Metric tons unless otherwise specified)

| Commodity   | Major operating facilities                          | Location                         | Annual capacity e/    |
|---|---|----------------------------------|-----------------------|
| Steel, crude--Continued:  | Volgograd   | Volgograd                        | 2,000,000.            |
| Do.   | Vyksa   | Vyksa                            | 540,000.              |
| Do.   | West Siberian                                       | Novokuznetsk                     | 6,900,000.            |
| Do.   | Zlatoust  | Zlatoust in Chelyabinsk Oblast   | 1,200,000.            |
| Talc  | Onotsk deposit                                      | Irkutsk Oblast                   | NA.                   |
| Do.   | Kirgiteysk deposit                                  | Krasnoyarsk Kray                 | NA.                   |
| Do.   | Miass deposit                                       | Chelyabinsk Oblast               | NA.                   |
| Do.   | Shabrovsk deposit                                   | Sverdlovsk Oblast                | NA.                   |
| Tin, mining and beneficiation complexes                                     | Khingang  | Khabarovsk Kray                  | NA.                   |
| Do.   | Solnechnyy  | do.                              | NA.                   |
| Do.   | Iul'itn   | Magadan Oblast                   | NA.                   |
| Do.   | Khrustal'nyy  | Maritime region                  | NA.                   |
| Do.   | Deputatskiy   | Yakut-Sakha Republic             | NA.                   |
| Do.   | Pevek   | Magadan Oblast                   | NA.                   |
| Tin, smelters   | Novosibirsk   | Novosibirsk                      | NA.                   |
| Do.   | Podolsk   | Podolsk                          | NA.                   |
| Do.   | Ryazan  | Ryazan                           | NA.                   |
| Titanium, metal   | Berezniki plant                                     | Berezniki                        | 40,000.               |
| Do.   | Moscow plant  | Moscow                           | NA.                   |
| Do.   | Podolsk plant                                       | Podolsk                          | NA.                   |
| Tungsten, mining and beneficiation complexes<br>(W content of concentrates) | Antonovogorsk                                       | East Transbaikal                 | NA.                   |
| Do.   | Balkan  | Urals, northeast of Magnitogorsk | NA.                   |
| Do.   | Belukha   | East trans-Baikal                | NA.                   |
| Do.   | Bom-Gorkhom   | West trans-Baikal                | NA.                   |
| Do.   | Dzhida  | do.                              | NA.                   |
| Do.   | Iul'itn   | Magadan Oblast                   | NA.                   |
| Do.   | Lermontov   | Maritime region                  | NA.                   |
| Do.   | Solnechnyy  | Southern Khabarovsk region       | NA.                   |
| Do.   | Tyrnyauz  | North Caucasus                   | NA.                   |
| Do.   | Primorye  | Maritime region                  | NA.                   |
| Tungsten, metal   | Nalchik plant                                       | Caucasus                         | NA.                   |
| Uranium, U content  | Priargunskiy mining and chemical enterprise         | Krasnokamensk                    | 3,000.                |
| Vanadium  |   |                                  | 17,000 (total metal). |
| Metallurgical processing facilities   | Chusovoy and Nizhniy Tagil plants                   | Urals                            |                       |
| Ore   | Kachkanar iron ore mining complex                   | do.                              |                       |
| Zinc (nonassociated with lead), metal content of ore                        | Bashkir copper-zinc complex                         | Sibai in southern Urals          | 5,000.                |
| Do.   | Buribai copper-zinc mining complex                  | Buribai in southern Urals        | 1,500.                |
| Do.   | Gai copper-zinc mining and beneficiation complex    | Gai in Southern Urals            | 25,000.               |
| Do.   | Kirovgrad copper enterprise                         | Kirovgrad in central Urals       | 1,200.                |
| Do.   | Sredneuralsk copper complex                         | Revda in central Urals           | 5,000.                |
| Do.   | Uchali copper-zinc mining and beneficiation complex | Uchali in southern Urals         | 90,000.               |
| Zinc, metal   | Chelyabinsk electrolytic zinc plant                 | Chelyabinsk                      | 190,000.              |
| Do.   | Elektrozink plant                                   | Vladikavkaz in North Caucasus    | 100,000.              |

e/ Estimated. NA Not available.

TABLE 3  
SELECT RUSSIAN EXPORTS

(Thousand metric tons, unless otherwise specified)

| Commodity                   | 1995    | 1996    | 1997    | 1998    |
|-----------------------------|---------|---------|---------|---------|
| Aluminum, primary           | 2,250   | 2,619   | 2,710   | 2,795   |
| to non-CIS countries        | 2,253   | 2,617   | 2,707   | 2,790   |
| to CIS countries            | 4       | 2       | 3       | 5       |
| Coal, hard                  | 30,360  | 26,259  | 23,093  | 23,478  |
| to non-CIS countries        | 21,243  | 20,866  | 19,703  | 18,224  |
| to CIS countries            | 9,117   | 5,393   | 3,390   | 5,254   |
| Copper, refined             | 471     | 530     | 535     | 551     |
| to non-CIS countries        | 467     | 527     | 534     | 550     |
| to CIS countries            | 4       | 2       | 1       | 1       |
| Ferroalloys                 | 497     | 286     | 343     | 336     |
| to non-CIS countries        | 479     | 274     | 334     | 322     |
| to CIS countries            | 18      | 11      | 9       | 13      |
| Iron ore and concentrates   | 13,834  | 11,257  | 11,773  | 13,828  |
| to non-CIS countries        | 11,370  | 7,891   | 8,393   | 10,145  |
| to CIS countries            | 2,514   | 3,366   | 3,380   | 3,683   |
| Natural gas                 | 192,193 | 198,514 | 200,858 | 200,618 |
| to non-CIS countries        | 121,882 | 128,028 | 120,871 | 125,044 |
| to CIS countries            | 70,311  | 70,486  | 79,987  | 75,574  |
| Nickel                      | 153     | 167     | 222     | 214     |
| to non-CIS countries        | 153     | 167     | 222     | 214     |
| to CIS countries            | --      | --      | --      | --      |
| Petroleum, crude            | 122,336 | 125,953 | 126,847 | 137,108 |
| to non-CIS countries        | 96,209  | 105,377 | 109,755 | 117,934 |
| to CIS countries            | 26,127  | 20,576  | 17,094  | 19,174  |
| Petroleum refinery products | 47,075  | 57,006  | 61,308  | 53,797  |
| to non-CIS countries        | 96,209  | 54,876  | 59,102  | 51,187  |
| to CIS countries            | 3,528   | 1,606   | 2,206   | 2,610   |
| Pig iron                    | 2,888   | 2,109   | 2,455   | 2,540   |
| to non-CIS countries        | 2,830   | 2,043   | 2,397   | 2,451   |
| to CIS countries            | 59      | 66      | 58      | 89      |