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Soviet Nonfuel Minerals and Metals: Outlook for Production and Trade

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Errata

Notice to recipients of NFAC document: Soviet Nonfuel Minerals and Metals: Outlook for Production and Trade,
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The gold sales figures in the last paragraph on page 10 are in error. In 1980, the Soviets sold about 40 tons of gold--netting the USSR about \$800 million.

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An Intelligence Assessment

*Information available as of 26 June 1981
has been used in the preparation of this report.*

This assessment was prepared by [Redacted]
USSR–Eastern Europe Division, Office of Economic
Research. Comments and queries are welcome and
may be directed to the Chief, Industry and Resources
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This paper was coordinated with the Office of
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**Soviet Nonfuel Minerals
and Metals: Outlook for
Production and Trade**

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Key Judgments

The USSR is nearly self-sufficient in nonfuel minerals and enjoys far greater security of supply than do the Western industrialized countries. New mines and processing plants are coming on line, numerous projects are planned and under construction, and large investments are committed for geological prospecting and metallurgical development during the current five-year plan.

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The importance of the USSR as a supplier of nonfuel minerals and metals to the West has generally diminished over the last decade, stemming from such things as:

- The emergence of alternative suppliers in the case of manganese, nickel, and chromite.
- Changing technologies in the West that have lowered the need for Soviet minerals, most notably chromite.
- Sharply higher prices in world markets that allow the USSR to meet its hard currency needs with substantially lower export volume for gold and platinum-group metals.
- A slowdown or decline in domestic production of iron ore, chromite, and manganese.

These trends are expected to continue during the 1980s.

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The behavior of the USSR as a buyer of nonfuel minerals and metals in world markets during the 1970s has been marked by:

- Steady increases in purchases of steel products, tin, and bauxite/alumina.
- A constant volume of purchases of cobalt from Cuba and Africa.
- A reported sharp jump in imports of tungsten and molybdenum, for reasons we cannot fully explain.

Mainly because of increased steel purchases, the USSR is now a net importer of nonfuel minerals and metals from the West whereas it was a net exporter a decade ago.

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The USSR attaches considerable importance to self-sufficiency, both for reasons of national security and international prestige. Although Soviet resolve and ability to maintain a high degree of self-sufficiency is unlikely to weaken for the foreseeable future, Moscow is pragmatic and accepts some degree of import dependence when:

- Very high costs are encountered, as in the case of tin.
- High-quality domestic resources do not exist, as in the case of bauxite.
- Soviet industry cannot provide the quality or assortment of products needed, as in the case of steel.

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Imports of nonfuel minerals and metals from non-Communist countries are expected to continue during the 1980s. Purchases of cobalt and molybdenum could be reduced or eliminated, however, as a result of increased production in the USSR and in other Communist countries.

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Soviet dependence on imports of tin, bauxite/alumina, tungsten, and molybdenum is not a critical issue for the West; Soviet purchases generally are small in terms of world supply and do not threaten the security of Western supply. Nor does this limited dependence seem critical from Moscow's point of view, considering that the Soviets are self-sufficient or soon will be in strategic commodities such as platinum-group metals, chromite, titanium, manganese, and cobalt.

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Overall, the Soviets are likely to continue to run hard currency deficits with the West in nonfuel minerals and metals trade as the result of continued large purchases of steel products. The Soviets will still be able to reduce this deficit sharply, however, by resuming large gold sales to the West.

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Soviet Nonfuel Minerals and Metals: Outlook for Production and Trade

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Introduction

The near self-sufficiency of the USSR in nonfuel minerals and metals, coupled with the paucity of hard information on Soviet production and trade, has led to speculation in the West regarding Soviet motives in world metals trade. Some Western policymakers are worried that because of declining reserves, increasing costs, and a mounting inability to cope with production problems, Moscow has shifted from its longstanding policy of maximum self-sufficiency toward a policy of increased dependency on imports, especially from the mineral-rich countries of central and southern Africa. This view leads to concern that the USSR will soon be competing with the West for minerals, using political means, if necessary, to gain access to supplies, thus touching off a scramble in world markets.

This paper addresses that issue by assessing Soviet production and trade in key nonfuel minerals. Those commodities that are of greatest concern to the West (the platinum-group metals, chromite, cobalt, and manganese) receive special attention, both in the main paper and in an appendix. The West depends almost totally on imports for these minerals, and, except for cobalt, the USSR and the potentially politically unstable countries of central and southern Africa are the principal sources of supply. The paper begins with a discussion of the resource base for nonfuel minerals. It then examines production trends and closes with an analysis of the USSR's position in world trade in these minerals and metals.

Attention is given to trends in Soviet production and trade in steel products and to problems in the production of iron ore. Neither steel nor iron ore is presently a source of concern to Western policymakers, but they are examined because (a) sharply increased Soviet steel imports are the primary reason the Soviets have gone from a net exporter to a net importer in nonfuel minerals and metals with the West during the 1970s and (b) the widely reported problems in Soviet iron ore production seem characteristic of problems facing other ferrous and nonferrous extractive industries as well.

Soviet Resource Base

The Soviet Union's mineral reserves rank among the largest in the world. The Soviets claim to have the world's largest reserves of iron ore, manganese, nickel, lead, molybdenum, mercury, and antimony.¹ They also claim that reserves of chromite, gold, platinum-group metals, and copper are among the largest in the world and are sufficient to support Soviet mine production for many decades.² Western specialists generally accept the validity of these claims. There is a strong possibility, moreover, that the enormous undeveloped and virtually unexplored regions of the eastern USSR will provide many of the world's richest discoveries in the future. For example, the huge Aldan iron ore deposit in eastern Siberia probably contains sufficient reserves to support current Soviet produc-

tion for at least 30 years, and the Udokan copper deposit in East Siberia probably can support current Soviet production for at least 25 years.³ The Soviets claim that vast reserves of nickel and copper exist in northern Siberia in addition to the giant deposits already discovered near Noril'sk. Major reserves of tungsten and gold probably exist in the Bogutin region of southern Kazakhstan and in the Kyzylkum desert of Uzbekistan, respectively. There are indications that large deposits of tin exist near Yam-Alin in Khabarovsk Krai as well as large deposits of low-grade bauxite in the Kustanay Oblast in Kazakhstan.

With respect to claimed reserves, Soviet studies state that recoverable reserves of iron ore amount to about 60 billion tons—some 40 percent of the world's total. Reserves of manganese are estimated at 2.5 billion tons, enough to support current Soviet production for over two centuries. Reserves of chromite are placed at

¹ V. A. Boyarskiy, *Razvitiye otkrytoi dobychi rud*, Moscow: 1975, p. 14. See also N. P. Banny et al.; *Ekonomika cherno metallurgii SSSR*, Moscow: 1978, pp. 69-70.

² Sh. Yesenov, et al., *Nedra Kazakhstana*, Alma Ata: 1968, pp. 150-225.

³ See *Gorniy zhurnal*, no. 12, 1977, pp. 8-11. For details on Siberian iron ore deposits, see *Sovetskaya Rossiya*, 27 June 1979, p. 1; for details on Udokan, see *Izvestiya*, 16 September 1980, p. 2.

Table 1

USSR: Estimated Reserves of Selected Nonfuel Minerals ^a

	Size of Reserves ^b	Share of World Reserves (Percent)	Years to Exhaustion (At 1980 Production)
Iron ore	63.3 billion tons	40	250
Manganese	2.5 billion tons	40	250
Chromite	271.2 million tons	10	80
Copper	40.0 million tons ^c	7	28
Nickel	11.3 million tons ^d	18	48
Cobalt	100 million tons ^d	NA	17
Lead	17 million tons	11	28
Zinc	22 million tons	10	24
Gold	200 million troy ounces	35	20
Platinum-group metals	90 million troy ounces ^d	25	25
Tungsten	215 thousand tons ^e	11	24

^a Corresponding to Western concepts of proved, probable, and possible reserves, respectively.

^b Principal sources include: V.V. Strishkov, "The Mineral Industry of the USSR" (unpublished paper) 1981; A. Sutulov, *Mineral Resources and Economy of the USSR*, New York: 1973; V. A. Boyarskiy, *Razvitiye otkrytoi dobychi rud*, Moscow: 1975; V.N. Vinogradov, *Ekonomicheskaya otsenka kompleksnogo mineralnogo syr'ya*, Moscow: 1978.

^c Does not include an estimated 24 million tons of recoverable copper at the Udokan copper deposit. See Theodore Shabad, *Gateway to Siberian Resources*, Washington: 1977, p. 80.

^d Does not include recoverable reserves at the Talnakh deposit near Noril'sk.

^e Konrad Kundig, "The Tungsten Market—From Chaos to Stability," *Journal of Metals*, May 1981, p. 42.

about 270 million tons, about an 80-year supply.⁴ The bulk of these ferrous ores—located in relatively accessible regions of the western USSR and Kazakhstan—do not pose serious exploitation problems by Soviet standards in terms of climate or distances to industrial centers.

Data on reserves of nonferrous minerals are protected by the Soviet State Secrecy Decree. Nonetheless, studies by the US Bureau of Mines and other Western specialists indicate that, at a minimum, Soviet reserves of major nonferrous metals (such as copper, nickel, cobalt, gold, and platinum-group metals) are sufficient to support current Soviet production for at least 15 years—in the case of cobalt—to almost 50 years—in the case of nickel (table 1). As in the West, the Soviets have established prudent policies with respect to the reserve base that must be available to justify construction of minerals processing plants. New copper, nickel, aluminum, and lead/zinc plants

⁴ V. A. Boyarskiy, *op. cit.*, pp. 34-35.

must have a reserve base sufficient to support production for at least 30 years; tungsten and tin plants, 20 years; gold at least 10 years.⁵

Unlike the reserves of most ferrous ores, many of the largest Soviet nonferrous deposits are located in remote and climatically severe regions of the country. In some cases (nonbauxite ores, for example), the deposits would not be considered economically exploitable by Western standards. Major deposits of copper, nickel, cobalt, and platinum-group metals are located near Noril'sk where operating conditions are among the worst in the world in terms of climate, depth of mines, and distance from major industrialized centers. The bulk of the country's reserves of gold, tin, diamonds, tungsten, and molybdenum are located in the Far East economic region, where mining opera-

⁵ T. A. Slepneva, et al., *Ekonomika tsvetnoy metallurgii*, Moscow: 1976, p. 124. See also, S. Ya. Kaganovich, *Ekonomika mineralnogo syr'ya*, Moscow: 1975, p. 96; N. A. Bykhover, *Geologiya ekonomicheskkiye osnovy mineralnikh resursov*, Moscow: 1978, p. 204.

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tions are carried out at great cost and, in the case of gold and tin, only during part of the year. [redacted]

Despite difficult geographic conditions, the Soviets continued to develop and bring new mineral deposits into commercial production in the 1970s.⁶ The rich Talnakh deposit near Noril'sk—now being exploited after a 10-year development effort—has the potential to boost Soviet copper and nickel production dramatically, strengthen the USSR's already major role as an exporter of platinum-group metals, and eliminate dependence on imports of cobalt.⁷ Another new source of copper for the USSR and Eastern Europe is the Erdenets deposit in neighboring Mongolia, which is now being exploited after a six-year effort by the USSR, East Germany, and Czechoslovakia. A valuable byproduct of this development will be molybdenum, in short supply both in the USSR and Eastern Europe. Still another new development is the Vostok-2 tungsten combine in the Soviet Far East area of Primorskiy Kray. The combine went into operation in 1977 and has since been expanded to take advantage of additional deposits nearby. The Soviets also have begun to expand the ore base at Pevek in Magadan Oblast in the Soviet Far East for its tin, tungsten, gold, and silver. New underground gold and silver mines and concentrating plants were put into operation at Karamken and Dukat in Magadan Oblast, and major expansion continued at the huge Muruntau Gold Combine in Uzbekistan. During the 1970s, the Soviets also added about 1 million tons of new aluminum production capacity, mainly in Siberia, and completed the large Achinsk Alumina plant in eastern Siberia that now provides for about 15 percent of the USSR's annual alumina requirements.⁸ This plant processes a low-grade nonbauxite ore, nepheline syenite, which cannot be processed economically in the West. The Soviet decision to build the huge Achinsk plant to process this complex ore is another indication

⁶ The projects described represent only a sample of Soviet nonfuel minerals and metals projects completed during the 1970s. There are many other examples of older mines that were reconstructed and existing plants that were either modernized or expanded during the past decade. [redacted]

⁷ [redacted] the huge Nadezhda copper-nickel smelter, which will process ore from the Talnakh deposit, started initial operation in early 1981. See, for example, *Sotsialisticheskaya industriya*, 17 February 1981, p. 1. [redacted]

⁸ Alumina is the intermediate product in the production of primary aluminum. [redacted]

of Soviet determination to limit import dependence, even when some dependence is unavoidable.⁹ The Soviets also commissioned the first stage of the Nikolayev alumina plant in the Ukraine to process imported bauxite from Guinea. More recently, the Soviets announced commissioning of a new chromite mine at Molodezhnaya in Kazakhstan and have also announced the startup of a large manganese mine in the Georgian SSR.¹⁰ [redacted]

In the current five-year plan, the Soviets have substantially increased funds for intensifying geological exploration for a variety of nonfuel minerals both in Siberia and in the western USSR. Because of the long leadtimes involved in bringing new deposits into commercial operation (10 to 15 years), present Soviet efforts are aimed at providing adequate nonfuel minerals supply during the 1990s and beyond. The actions already taken to develop new reserves and expand ore-processing capacity, along with the continuing commitment to exploration, throw considerable doubt on the notion that the USSR is backing away from its goal of maximum self-sufficiency and that it plans to accept (or will be forced to accept) any significant degree of import dependence for nonfuel minerals and metals in the foreseeable future. [redacted]

Soviet Nonfuel Minerals Production

Development of a large ferrous and nonferrous metals industry has been a priority of Soviet planners for over half a century. The Soviets are acutely aware that a strong metallurgical sector is vital in supporting almost the entire range of military and industrial programs and—in the case of gold, platinum-group metals, and diamonds—a major source of hard currency earnings. After years of sustained effort and billions of rubles in capital investment, the Soviets have developed the largest complex of metallurgical industries in the world. The USSR is the world's largest producer of iron ore, crude steel, manganese, nickel, lead/zinc, titanium, tungsten, platinum-group metals, and a raft of minor metals as well. It is second only to South Africa in production of chromite and

⁹ The Soviets have also completed the Kirovabad alumina plant in Azerbaydzhan to process a nonbauxite ore called alunite. This plan has not lived up to expectations, however, and part of the facility was converted to process bauxite in the mid-1970s. [redacted]

¹⁰ See, for example, *Pravda vostoka*, 12 November 1980, p. 2; *Kazakhstanskaya pravda*, 27 November 1980; and *BBC Summary of World Broadcasts*, 18 July 1980. [redacted]

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Table 2

USSR: Production of Nonfuel Minerals and Metals ^a

	1970	1973	1974	1975	1976	1977	1978	1979	1980
Crude steel (<i>million tons</i>)	115.9	131.5	135.2	141.3	144.7	146.7	151.5	149.0	148.0
Iron ore (<i>million tons</i>)	197	216	225	234	241	242	246	242	245.0
Manganese ore (<i>million tons</i>)	6.8	8.2	8.2	8.5	8.6	8.6	9.1	10.2	10.0
Tungsten ore (<i>contained metal; thousand tons</i>)	6.9	7.6	7.8	8.1	8.3	8.5	8.8	9.0	9.2
Chromite (<i>million tons</i>)	3.0	3.3	3.4	3.5	3.5	3.4	3.3	3.2	3.4
Molybdenum (<i>contained metal; thousand tons</i>)	9.5	10.0	10.3	10.5	10.7	11.0	11.3	11.6	12.0
Bauxite (<i>million tons</i>)	6.7	7.5	7.8	8.0	8.2	8.5	8.8	9.0	9.1
Aluminum (<i>thousand tons</i>)	1,490	1,890	2,020	2,130	2,220	2,270	2,330	2,410	2,530
Copper (<i>thousand tons</i>)	1,015	1,200	1,250	1,320	1,350	1,400	1,460	1,500	1,520
Lead (<i>thousand tons</i>)	470	510	530	540	560	575	580	585	600
Zinc (<i>thousand tons</i>)	690	780	790	820	840	860	875	890	900
Tin (<i>thousand tons</i>)	21.0	23.0	24.0	25.0	26.5	28.5	30.0	32.5	32.5
Nickel (<i>thousand tons</i>)	137	170	180	195	215	220	230	235	235
Cobalt (<i>thousand tons</i>)	3.7	4.5	4.8	5.0	5.2	5.4	5.6	5.8	6.0
Titanium (<i>thousand tons</i>)	31.6	38.0	43.0	47.4	48.5	50.0	51.3	53.0	56.0
Gold (<i>million troy ounces</i>)	7.0	8.0	8.4	8.3	8.9	9.2	9.5	9.9	10.2
Platinum-group metals (<i>million troy ounces</i>)	2.5	3.0	3.2	3.3	3.4	3.4	3.5	3.6	3.7

^a [redacted] Data for crude steel, iron ore, manganese ore, and chromite are based on official Soviet statistics. Data for all other commodities are estimated.

[redacted]

gold; second only to the United States in primary aluminum, refined copper, and magnesium; and, even though partially dependent on imports, second only to Zaire in cobalt; in third place among world producers of tin; and in fourth place among world producers of bauxite (table 2). [redacted]

Despite its impressive size and great strength, the Soviet nonfuel minerals industry is facing a series of mounting problems that in the late 1970s caused a substantial slowdown in the growth of output of some commodities and declines in others. Growth of ferrous metals production slowed to about 1 percent a year during 1976-80, compared with 4 percent during 1971-75. Over the same periods, growth of nonferrous production slipped to about 2.5 percent a year from

5.5 percent a year. Some of the problems, notably increasing depletion of easily accessible reserves and rising costs of production, are common to all Soviet extractive industries. Others—shortages of investment and labor and transportation difficulties—are typical of the economy as a whole. None can be solved easily. [redacted]

The most serious problems were experienced in ferrous metals, both in the mining of the iron, chromite, and manganese ores and in the manufacture of iron and steel products. Production of crude steel and rolled steel products fell slightly in 1979 and again in 1980, marking the first absolute decline in Soviet steel production since World War II. Soviet crude steel

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production of about 148 million tons in 1980 was almost 11 percent short of the original plan goal. Production of iron ore amounted to 245 million tons in 1980, about the same level as 1978, and 30 million tons short of the 1980 goal. Production of chromite slipped to about 3.4 million tons in 1980, down slightly from the 1975-76 peak of 3.5 million tons and well short of the 4.2 million tons originally planned. Output of manganese stagnated at about 8.5 million tons per annum during 1975-77 but rebounded to about 10 million tons in 1979-80, the result of the commissioning of new mines in the Georgian SSR. []

In the case of nonferrous metals, overall performance was mixed. The Soviets continued to post impressive gains in production of titanium/magnesium and nickel, but output of aluminum and copper fell considerably short of hoped-for levels and only small increases were achieved in boosting production of lead and zinc. []

The Soviets advance a number of reasons for the slowdown in production of nonfuel minerals. A major difficulty in steel production has been the inability of the industry to meet the growing needs of the economy for a broader assortment of high-quality steel products. Projects to add capacity have raised capital costs, overtaxed equipment manufacturers, and forced increased reliance on foreign steel. Ferrous metals production has also been hurt by the spot shortages of coking coal and transportation bottlenecks that became more severe in the late 1970s. Shortages of labor and capital, together with declining growth in labor productivity, hampered ferrous metals along with other Soviet industries across the board. []

As in Soviet extractive industries, delays in commissioning new mine capacity and accelerating mine depletion¹¹ are also holding back production of nonfuel minerals. Gross annual commissionings of new iron ore capacity, for example, remained unchanged at about 26 million tons during the 1970s. At the same time, annual depletion rose to about 24 million tons during 1976-79, compared with about 19 million tons in 1971-75. Looked at in a different way, the Soviet

¹¹ We are defining depletion as the amount of capacity lost due to mine exhaustion and the lower productivity of older mines that are still operating. []

data suggest that about 90 percent of gross annual commissionings during 1976-79 were simply to offset depletion. Timelags in bringing new mines up to rated capacity and unusually large commissionings can introduce aberrations in annual comparisons, but over time there is little question that growing shares of new commissionings are needed to offset depletion. Fragmentary information suggests that chromite deposits were depleting at about 100,000 tons a year in 1971-75, and this rate probably increased during the latter part of the 1970s. []

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Another long-term problem is the continuing decline in the average grade of the ores being mined. This is certainly true in the case of iron ore and some nonferrous ores, and apparently true for chromite and manganese.¹² For example, almost 87 percent of the USSR's output of iron ore in the late 1970s required concentration, compared with only 37 percent in 1950. Moreover, only 50 percent of raw iron ore output in 1980 was usable, compared with 64 percent in 1965 and 82 percent in 1950. As a result, the Soviets have had to devote increasing investments in ore-beneficiating facilities—raising production costs and capital investment requirements. According to Soviet studies, real capital investment per ton of raw ore rose steadily from about 20 rubles per ton in 1965 to almost 25 rubles per ton in 1980.¹³ The Soviets have reported that the average grade of copper and zinc ores has dropped by about 50 percent since the mid-1960s; the average grade of lead ore fell by about 40 percent during the same period.¹⁴ Ore grades at chromite deposits are declining as well, forcing the Soviets to utilize more expensive underground mining techniques. Because of the steady drop in the average grade of gold at surface mines in Magadan Oblast, the Soviets have had to construct underground mines and processing plants to process the more complex ores. The Soviets have reported that the amount of ore

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¹² The average iron contents at Soviet deposits declined as follows: 1950—50.0 percent; 1960—44.5 percent; 1970—37.3 percent; 1980—35.1 percent. For details see *Politicheskoye samoobrazovaniye*, no. 4, 1981, p. 13, and *Gorniy zhurnal*, no. 1, 1981, pp. 3-7. []

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¹⁴ A. Bunyni, *Tekhniko ekonomicheskaya otsenka dobychi i izpolzovaniya rud*, Moscow: 1978, p. 179. See also S. Ya. Kaganovich, op. cit., p. 151, for additional details. []

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that must be processed to obtain an ounce of gold in the Kolyma and Chukotka regions of Magadan Oblast has been increased by about 33 percent since 1976 alone.¹⁵ Depending on a variety of factors, production costs at underground mines can be as much as three to four times greater than surface operations.¹⁶ []

As in many other industries, delays in bringing new capacity on stream resulted in a sharp rise in the backlog of unfinished construction. The value of the backlog in ferrous metals rose to about 5 billion rubles in 1979, more than double the value of the backlog in 1970. Despite repeated urging by top Soviet officials, the industry continues to spread investments over too many new projects instead of concentrating on completing those already under construction. As a result, the backlog of unfinished construction is likely to get worse before it gets better. Although data are not available, it is reasonable to assume that the problem of unfinished construction also plagues the Soviet nonferrous metals industry. []

Outlook for Production. Mounting difficulties in nonfuel minerals production are reflected in the comparatively modest goals set for the industry during 1981-85. Output of rolled steel is scheduled to increase to a range of 117-120 million tons by 1985—equivalent to about 165-170 million tons of crude steel in that year. The Soviets had planned to produce this amount of crude steel in 1980. Despite current problems, achievement of at least the lower end of the range for crude steel production does not appear beyond reach given the long-term Soviet track record.¹⁷ Of course, the Soviets would have to break the current logjam in production and take tough measures to assure that the industry has adequate amounts of coking coal, fuel, iron ore, and labor for relatively trouble-free operation. Failure in any one of these areas probably would bring 1985 production below the range we are presently projecting. Production of chromite will increase to about 3.8 million tons by 1985, as a result of the commissioning of a new mine

¹⁵ *Sotsialisticheskaya industriya*, 2 October 1979, p. 2 []

¹⁶ T. A. Slepneva, op. cit., p. 243 []

¹⁷ The Soviets would have to boost annual steel production by about 4 million tons per year during 1981-85 to meet the goal, not an unrealistic expectation considering that annual gains in output averaged 5 million tons during 1960-77. []

in Kazakhstan. Production of manganese will increase to about 12 million tons by 1985 (see the appendix for details). []

During 1981-85, aluminum output is scheduled to increase by 15 to 20 percent and copper output by 25 to 30 percent, a somewhat slower pace than in the previous five-year plan.¹⁸ These goals also appear reasonable in view of the steady progress the Soviets are making in adding aluminum capacity in Siberia and the big increase in copper production that will result from the new copper-nickel smelter near Noril'sk. Small increases are likely for lead and zinc, tin, tungsten, and molybdenum, but details are not available. []

Rapid expansion is foreseen for several of the metals during the 1980s. The Soviets are planning to increase the production of nickel and cobalt by at least 30 percent, all of which will be attributable to increased output from Noril'sk. We believe that these goals will be met and possibly overfulfilled by a wide margin. Perhaps as early as 1985 and probably no later than 1990:

- Soviet nickel production will increase to about 350,000 tons a year, compared with 235,000 tons in 1980.
- Cobalt production will about double to 13,000 to 14,000 tons, compared with 6,000 to 7,000 tons in 1980.
- Platinum-group metals production (mainly palladium), could jump to a range of 4.5 to 5.0 million troy ounces compared with 3.7 million ounces in 1980. []

Production of titanium probably will continue to increase rapidly as a result of additions to capacity at the titanium-magnesium combines at Ust'-Kamenogorsk and Berezniiki. Completion of new capacity of these plants could increase annual titanium production to about 75,000 tons by 1985, compared with 56,000 tons in 1980. Similarly, major increases in gold production are likely as a result of the completion of plants at Muruntau and Mardzhambulak in Uzbekistan, the Zod/Ararat Combine in Armenia, and the Darasun-Aginskoye plant in Chita Oblast. []

¹⁸ See *Tsvetnye metaly*, no. 3, 1981, p. 1. []

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Table 3

Percent

Non-Communist Dependence on the USSR for Selected Nonfuel Minerals

	1970	1975	1976	1977	1978	1979	1980
Platinum-group metals ^a	58	55	54	53	54	51	50
Diamonds ^a	19	16	16	16	14	13	NA
Chrome ore ^a	25	20	16	9	16	8	NA
Nickel ^b	3	4	2	2	4	4	5
Manganese ^a	2	2	1	2	0	0	0
Iron ore ^a	2	2	2	1	1	1	NA
Aluminum ^b	1	2	1	2	2	1	1
Copper ^b	3	1	1	1	NEGL	NEGL	NEGL

^a USSR as a percent of total non-Communist imports.^b USSR as a percent of non-Communist apparent consumption.**Soviet Nonfuel Minerals and Metals Trade**

The Soviets are major exporters and importers of many nonfuel minerals and metals. But the bulk of Soviet exports—with the exception of gold, platinum-group metals, and diamonds—go to other Communist countries, primarily East Germany, Poland, and Czechoslovakia. During the 1970s, the relative importance of the USSR as a supplier of nonfuel minerals and metals to the West either remained constant or declined slightly (table 3). The Soviets maintained a large share of the platinum-group metals moving in world trade, but their share of world chromite trade dropped from 25 percent in 1970 to 8 percent in 1979. In all other cases, the Soviet share of nonfuel minerals trade remained comparatively small. With the exception of platinum-group metals, the West presently depends on the USSR for only a small part of its nonfuel minerals and metals requirements. Expansion projects now under way in non-Communist countries—especially for chromite and nickel—suggest that Western dependence on the USSR will continue to diminish during the 1980s.

Critical Nonferrous Metal. With respect to metals trade in those commodities of greatest concern to Western policymakers—platinum-group metals, chromite, cobalt, manganese, nickel, titanium—the USSR is a net exporter by a wide margin. Earnings from platinum-group metals, nickel, chromite, and titan-

ium netted the USSR about \$750 million in 1980, with platinum-group metals accounting for about two-thirds of these earnings. Cobalt imports were comparatively minor—about \$30 million in 1980. Given major increases in Soviet production, the USSR will continue to run a large exportable surplus in its trade of these metals during the 1980s.

Soviet exports of chromite fell from about 1.2 million tons in 1970 to about 700,000 tons in 1980. Exports to Eastern Europe were maintained at about 400,000 tons, while sales to the West dropped from about 800,000 tons to 300,000 tons. Exports of manganese were held at an average of 1.3 million tons per annum during the 1970s, but exports to the West ceased completely in the late 1970s, the result of increased availability of manganese from Africa. During the 1980s, Soviet exports of chromite to the West probably will continue to fall and we expect no resumption in manganese sales (see the appendix for details).

During the 1970s, the Soviets maintained a strong export position in some nonfuel minerals. Combined sales of gold, platinum-group metals, and diamonds earned the USSR over \$20 billion during the 1970s, and in 1976-78 when sales were heavy accounted for as much as 15 percent of total annual Soviet hard currency earnings. If Soviet production of gold and

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platinum-group metals increases as we expect, potential earnings could be as much as \$6-7 billion per annum by the mid-1980s.¹⁹ [redacted]

In other nonfuel minerals, Soviet trade varied during the past decade, with no clearly defined trend emerging. The available trade data do not support the view that there has been an across-the-board cut in Soviet exports and surge in Soviet imports (table 4). [redacted]

Increased internal needs—including substantial amounts for the titanium submarine program—as well as weak demand in the West apparently caused a drop-off in Soviet titanium exports in the latter part of the 1970s. [redacted]

[redacted] titanium-hulled submarines, each requiring several thousand tons of special alloy, high-purity metal that can be produced only from high-quality titanium sponge.²⁰ Soviet exports of high-quality titanium sponge needed to produce this high-purity metal have virtually ceased since the mid-1970s. In recent years, the bulk of Soviet exports has consisted of titanium scrap and other waste products. We believe that the commitment to titanium submarines will continue and possibly accelerate during the 1980s. The Soviets are expanding both domestic titanium sponge production capacity and metal fabricating capacity substantially, but it seems that most of the increase is earmarked for domestic use. [redacted]

Aluminum, Nickel, Lead, and Zinc. Exports of aluminum reached annual levels of about 600,000 tons in the late 1970s, about on a par with that of Canada and Norway, two other major producers geared to the export market. Steady increases in exports are likely as the industry expands, but the bulk of Soviet sales will continue to go to Eastern Europe. [redacted]

¹⁹ This estimate assumes that the Soviets sell 330 tons of gold at \$500 per troy ounce and 4 million ounces of platinum-group metals at \$400 per troy ounce. To convert metric tons to troy ounces, multiply by 32,151. [redacted]

²⁰ Titanium sponge is the intermediate product in the production of titanium metal. [redacted]

²¹ *Metals Week*, 6 April 1981, p. 1, and 22 June 1981, p. 8; and *Journal of Metals*, June 1981, p. 7. [redacted]

Although domestic production accounts for over one-half of domestic requirements, the USSR is a major importer of bauxite and alumina. Its dependence on imports continued to increase steadily during the 1970s, and, in 1980, imports amounted to about 4 million tons of bauxite equivalent, with Guinea supplying about half. Because of the rapid depletion of its reserves of high-quality bauxite and less than hoped-for gains in the exploitation of nonbauxite ores, the USSR will continue to import large amounts of bauxite and alumina. [redacted]

Exports of nickel dropped from a peak of 28,000 tons in 1974 to about 11,000 tons in 1977, then rebounded to about 22,000 tons in 1980 and are continuing at high rates in 1981. The USSR should have an annual exportable surplus of 60,000 to 80,000 tons of nickel by the mid-to-late 1980s—some \$500-700 million in potential hard currency earnings at present market prices. [redacted]

The USSR has both exported and imported lead and zinc during the 1970s. Since the mid-1970s, however, the Soviets have become net importers because of lags in bringing new capacity onstream and a continuing drop in the average grade of ores being mined. Zinc exports have been trimmed to meet rising domestic needs, while lead imports have risen, in part, to meet rising needs in Eastern Europe. Net Soviet imports of lead from Canada, Peru, and Yugoslavia peaked at about 67,000 tons in 1979, falling to about 20,000 tons in 1980. Net imports of zinc have remained steady at about 20,000 tons per annum since 1976. The Soviets are continuing to buy zinc concentrates primarily in Western Europe but have almost stopped importing lead. The USSR probably will continue to be in and out of the lead and zinc markets during the 1980s, but their purchases are not expected to be more than a small fraction of world trade. [redacted]

Tin, Tungsten, and Molybdenum. Despite being the world's third largest producer of tin, the USSR will remain a large importer of tin for the foreseeable future. The Soviets have been importing tin for over a quarter of a century, primarily from Malaysia, Bolivia, and Singapore. Imports averaged about 8,000 tons annually during the 1970s, generally accounting

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Table 4

USSR: Net Trade in Selected Minerals and Metals

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980 ^a
Net exports											
Chrome ore (thousand tons) ^b	1,200	1,100	1,112	1,210	1,139	1,171	975	673	738	775	700
Manganese ore (thousand tons) ^b	1,200	1,400	1,300	1,300	1,482	1,411	1,342	1,352	1,186	1,317	1,300
Platinum-group metals (thousand troy ounces) ^c	1,535	1,704	2,634	2,947	2,613	1,361	2,036	1,954	1,878	2,145	2,000
Titanium (tons) ^d	4.3	3.6	2.1	5.3	7.7	5.2	2.5	2.9	3.0	4.0	4.0
Aluminum (thousand tons)^e											
Total	368.9	405.6	455.4	518.3	528.7	502.4	530.0	550.0	500.0	600.0	600.0
OECD	75.8	69.8	93.6	106.8	108.9	96.4	156.6	182.4	210.8	154.5	175.0
Nickel (thousand tons) ^f	18.6	21.8	11.7	19.3	28.0	12.5	11.4	11.1	22.1	26.1	22.2
Lead (thousand tons) ^g	53.6	50.2	42.2	37.7	18.3	42.2	25.0	0	0	0	0
Zinc (thousand tons) ^g	41.8	87.2	82.4	101.6	102.2	56.1	21.0	0	0	0	0
Iron ore (million tons) ^h	36.1	36.5	38.4	41.4	43.3	43.6	43.1	40.9	40.6	39.0	40.0
Asbestos (thousand tons) ⁱ	199.3	228.7	210.3	215.8	282.7	322.0	311.2	313.4	176.8	132.4	NA
Net imports											
Bauxite and alumina (thousand tons) ^j	2,065.3	2,168.5	2,412.6	2,375.6	2,509.4	4,505.8	4,204.6	4,363.9	3,984.5	4,224.4	4,300.0
Tin (thousand tons) ^k	8.3	4.4	4.2	4.0	5.2	9.7	10.0	9.6	14.1	13.3	11.5
Lead (million tons) ^l	0	0	0	0	0	0	0	32.5	59.2	67.1	20.0
Zinc (million tons) ^l	0	0	0	0	0	0	0	23.5	16.6	18.3	21.0
Cobalt (tons) ^m	500	500	500	500	500	500	475	480	480	503	483

^a Preliminary.^b *Vneshnyaya trgovlya* (annual issues). Data for 1980 are estimated.^c Based on official import statistics of Japan, West Germany, and the United States. These countries normally account for 90 percent of total Soviet exports.^d UN trade data for OECD. Includes titanium sponge, waste, and scrap. The total is probably understated because of lack of data for Sweden, Belgium, and Italy.^e Data for 1970-75 taken from annual issues of *Vneshnyaya trgovlya*. Data for 1976-80 taken from *World Metals Statistics*, January 1981, p. 14.^f UN trade data for OECD and *World Metal Statistics*, January 1981, p. 88.^g Data for 1970-75 taken from *Vneshnyaya trgovlya*. Data for 1976-77 from *Lead and Zinc Statistics*, December 1980. Data for 1976-80 are understated because they do not include Soviet exports to other Communist countries.^h *Vneshnyaya trgovlya* (annual issues). Does not include exports of pellets.ⁱ UN trade data for OECD.^j Data for 1970-75 taken from annual issues of *Vneshnyaya trgovlya*. Data for 1976-79 taken from UN trade data and Hungarian export statistics, and include 2.5 million tons of bauxite imported from Guinea under a long-term agreement. Data for 1980 are estimated.^k Data for 1970-75 taken from annual issues of *Vneshnyaya trgovlya*. Data for 1976-79 taken from UN trade tapes and *The Monthly Statistical Bulletin* of the International Tin Council. Data for 1980 estimate based on first-quarter statistics.^l Based on *Lead and Zinc Statistics*, monthly bulletin of the International Lead and Zinc Study Group.^m Estimated. Does not include imports of cobalt concentrate from Cuba.

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for about one-fourth of Soviet requirements. The Soviets have recently stepped up joint development efforts with Bolivia to assure future supplies. [redacted]

Soviet purchases of tungsten and molybdenum averaged some 3,000 to 4,000 tons per annum, respectively, during 1970-78.²² [redacted]

[redacted] Soviet imports of tungsten jumped to 5,800 tons in 1979 and about 14,500 tons in 1980. Similarly, imports of molybdenum rose to about 5,000 tons in 1979 and slightly more than 13,000 tons in 1980. The Soviets were buying tungsten through East European countries, some directly from China, and some through Western metals dealers. More recently, the Soviets have attempted to buy substantial amounts of tungsten concentrate from Bolivia. The Soviets purchased molybdenum mainly from the United States and some from Western Europe. [redacted]

The reason for the reported sharp rise in Soviet purchases of tungsten and molybdenum is unknown. Soviet domestic production may be stagnating, but [redacted] output is continuing to rise. In the case of tungsten, we know of no new military or civilian programs that would require abnormally large amounts. Increased requirements for oil drilling (tungsten carbide drill bits) and armaments programs might increase tungsten imports, but by only 2,000 to 4,000 tons per year. The Soviets could be adding to strategic reserves. Increased Soviet purchases of molybdenum could be tied to the construction of natural gas pipelines from Siberia to Western Europe. The building of a dual pipeline would need about 7 million tons of steel pipe. Assuming a 1-percent molybdenum content in the pipe, this would require about 70,000 tons of molybdenum to complete the project. [redacted]

We do not know if Soviet purchases of tungsten will continue at present high rates or if they will fall back to the levels prevailing through most of the 1970s. In the case of molybdenum, the Soviets have taken steps to acquire new supplies from Mongolia and may

²² Tungsten is a critical alloying element in the manufacture of drilling equipment, armaments, and superhard steels. Among other applications, molybdenum is essential in the manufacture of large-diameter steel pipe suitable for use in Arctic conditions. [redacted]

ultimately be able to reduce or eliminate their dependence on the West. [redacted]

Steel Products. In terms of the hard currency value of its total nonfuel minerals and metals trade with the West, the USSR switched from a net export position to a net import position in the mid-1970s. We estimate that the USSR ran a deficit of about \$3 billion in total nonfuel mineral trade with the West in 1980. [redacted]

[redacted] the turnaround in the Soviet trade position stems from an across-the-board surge in Soviet imports of nonfuel minerals and metals. This view is inaccurate. The change in the Soviet trade position with the West from being a net exporter to a net importer is directly attributable to the sharp rise in Soviet imports of steel products from the West. In 1970, the USSR was a net exporter of steel, but by the late 1970s imports and exports volume were roughly in balance at about 7 million tons on each side. As a result of buying comparatively expensive types of steel from the West and selling less expensive types to other Communist countries and the LDCs, the USSR's annual steel import bills rose from about \$2.5 billion during 1974-78 to about \$4.5 billion in 1979-80. Soviet imports of all other nonfuel minerals amounted to about \$1 billion in 1980. During the 1980s, Moscow will need large quantities of large-diameter steel pipe for its ambitious gas pipeline program and for the proposed Siberia to Europe line. Continuing problems in the domestic steel industry will also lead to large imports of other steel products. [redacted]

Outlook. Soviet planners probably were not unduly concerned with the emergence of a hard currency deficit in nonfuel minerals trade. The USSR ran a hard currency current account surplus of about \$2.5 billion in 1980, largely as a result of higher prices for exported oil and large arms sales. The Soviets could have sharply reduced the hard currency deficit in nonfuel minerals trade with the West had there been any overriding reason to do so. Moscow could simply have sold substantially more gold. In 1980, Soviet gold sales to the West amounted to about 60 tons—the lowest level in almost a decade—netting the USSR about \$600 million. The USSR presently can

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Table 5**USSR: Outlook for Nonfuel Mineral Trade in 1981-85**

Exports		Imports	
Increasing	Decreasing	Increasing	Decreasing
Nickel	Chromite	Steel	Cobalt
Copper	Lead and zinc	Tin	Molybdenum
Gold	Manganese	Bauxite-alumina	
Platinum-group metals			
Aluminum			

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sell about 275 tons of gold per annum—about \$4.4 billion at \$500 per troy ounce—without drawing down its gold reserves. By 1985, Moscow will be able to sell about 330 tons of gold per annum and not have to draw down stocks. []

On balance, therefore, the broad pattern of Soviet trade in nonfuel minerals during the 1970s does not reflect a fundamental weakening of the Soviet commitment to self-sufficiency. The Soviet dependence on imports of steel, tin, bauxite, tungsten, and molybdenum does not appear to be a critical issue for the West; these purchases generally are small in terms of world supply and do not threaten the security of Western supply. Nor does this limited dependence seem critical from Moscow's point of view considering that the Soviets are self-sufficient or soon will be in strategic commodities, such as platinum-group metals, chromite, titanium, manganese, and cobalt. []

We expect that during the 1980s Soviet capability to export gold, platinum-group metals, nickel, copper, and aluminum will increase. At the same time, exports of chromite, manganese, and lead and zinc will at best remain steady but more than likely fall. On the import side, Soviet purchases of steel, tin, bauxite, and alumina will continue to increase, and large purchases of tungsten are possible as well. Imports of cobalt from African sources could be eliminated, but some small purchases could continue as a result of long-term agreements or simply Soviet intent to maintain an economic foothold in African countries. Im-

ports of molybdenum from the West probably will be reduced or eliminated entirely (table 5). [] 25X1

In terms of hard currency trade for nonfuel minerals, the USSR may continue to run deficits with the West: the result of continued large purchases of steel products. The Soviets will, however, continue to have the capability to reduce these deficits, the major swing factor being the future of Soviet exports of gold, and, to a lesser extent, platinum-group metals. Moscow also has the option over the next few years of relying somewhat more on imports to avoid the high marginal costs of extracting and transporting some minerals. We believe, however, that a deteriorating energy position will deprive the USSR by the mid-1980s of the hard currency necessary to adopt such a policy on a wide scale. [] 25X1

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Appendix

Review of Selected Nonfuel Minerals

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Platinum-Group Metals

The USSR produced about half of the world's platinum-group metals during the 1970s, South Africa about 40 percent, and Canada most of the remainder. Soviet production of these metals is estimated at 3.7 million troy ounces in 1980, compared with South African production of about 3.1 million ounces that year. []

The USSR obtains virtually all of its platinum-group metals as a byproduct from the exploitation of copper-nickel ores. Soviet production consists mainly of palladium—three times as much palladium as platinum—whereas South African production is mainly platinum.²³ In most industrial uses, platinum and palladium are not readily substitutable. []

The USSR exports most of its output of platinum-group metals. In terms of volume, Soviet exports to non-Communist countries during 1970-80 amounted to almost 23 million ounces, or about three-fourths of total estimated Soviet production during that period. Some additional, although small, amounts probably were exported to other Communist countries. During 1970-80, Soviet exports normally accounted for 50 to 60 percent of the platinum-group metals moving in annual world trade. []

Annual exports peaked during 1972-74, averaging over 2.7 million ounces annually, then declined to about 2 million ounces in 1976-80. The heavy sales of the early 1970s may have been supported by a drawdown of stocks. Although we have no evidence with respect to platinum-group metals, we know that, in the case of gold, Soviet planners were concerned that stocks had fallen to uncomfortably low levels following heavy gold sales in the mid-1970s, and that they took steps to rebuild stocks in the subsequent period. Moreover, sharply higher prices in world

²³ This estimate is based on the pattern of Soviet platinum-group metals exports to the West along with Soviet geological studies on the composition of ores at major Soviet platinum-group metals deposits. See, for example, V. I. Smirnov, *Rudniye mestorozhdeniya SSSR*, Vol. 3, Moscow: 1978, pp. 95-99. []

markets reduced the need for Moscow to sell the volumes it had sold in the past in order to achieve its hard currency objectives. For example, the peak sales of 2.9 million ounces in 1973 netted the USSR about \$380 million; sales of about 2 million ounces in 1980 earned roughly \$600 million. []

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The USSR is assured of large increases in production of platinum-group metals in the 1980s as progress is made to expand production of copper and nickel in northern Siberia. Soviet production of these metals (mainly palladium) could easily increase to about 4.5 million ounces by 1985 and as much as 5 million ounces by 1990, of which perhaps 4 million ounces would be available for export. []

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Chromite

The USSR is the world's second largest producer of chromite after South Africa. Soviet production peaked at 3.5 million tons a year in 1975-76, declined to about 3.2 million tons in 1979, and rebounded to 3.4 million tons in 1980. Output in 1980 was, however, about 20 percent short of the 4.2 million-ton target for that year—the largest percentage shortfall known for any Soviet extractive industry. []

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The stagnation in production is due primarily to the rapid depletion of easily accessible open-pit deposits and the slow pace of construction and commissioning new underground capacity. Many of the southern Ural deposits are depleted of economically recoverable reserves, and several of the open-pit mines in the Donskoye deposits of Kazakhstan are being converted to underground operations. []

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[] annual chromite mine depletion was running at about 100,000 tons per year in the early 1970s and may have increased in the last half of the 1970s. The Soviets recently announced the commissioning of a new 800,000-ton-per-year mine at Molodezhnaya in Kazakhstan. We believe that this mine will not reach its rated capacity until 1985. If our estimate of mine

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depletion is reasonably accurate, Soviet chromite production could, at most, reach about 3.8 million tons by 1985. []

Domestic production problems, increased availability from other sources (southern Africa), and the effects of recession on Western demand have contributed to weakening of Soviet chromite exports in the past few years. Total Soviet exports of chromite have declined substantially, from 1.2 million tons in 1970 to 775,000 tons in 1979. Exports to other Communist countries remained stable at about 400,000 to 500,000 tons per annum during the decade. Exports to the West fell from a peak of 775,000 tons in 1970 to 300,000 tons in 1980—a drop of about 60 percent (see table 4). The Soviet share of total Western chromite supply fell from about 25 percent in 1970 to about 8 percent in 1979. Chromite exports to the West have never been a significant factor in terms of Soviet hard currency earnings. Peak Soviet sales to the West of about 775,000 tons in 1970 earned about \$25 million—less than 1 percent of total Soviet hard currency earnings in that year. []

The outlook for Soviet exports of chromite in the 1980s is uncertain. Although the quality of the ore exported has decreased in recent years, the USSR still exports primarily high-grade chromite. However, recent technological advances have weakened market preference for high-grade Soviet ore. New processes in the manufacture of stainless steel permit greater use of less expensive, high-carbon ferrochrome, which can be produced from abundant low-grade chromite. []

Another uncertainty is whether the USSR, even with adequate production, will continue to export chromite. The Soviets have given strong indications that they may seek to enhance the value of their exports by shifting to ferrochrome as others with chromite resources are doing. The Soviets have shown interest in obtaining Western participation in ventures to produce ferrochrome, but, as yet, no such arrangements have been made. []

Cobalt

Soviet cobalt is obtained as a byproduct in nickel production. Soviet production, about 6,000 tons in 1980, ranks second only to that of Zaire. Although the USSR has exported some cobalt in the past, Soviet production has not kept pace with domestic demand, and Moscow has been a net importer for the last 10 years. The Soviets have been importing about 1,000 tons of cobalt equivalent from Cuba since 1970 and will continue purchasing cobalt from Cuba for some time. Whether the Soviets use the Cuban cobalt domestically or export it to Eastern Europe is not known. []

The Soviets have been buying some cobalt from Zaire and small amounts from Zambia. Cobalt is the only strategic mineral that the Soviets import from Africa. These purchases have ranged between 475 and 500 tons annually since 1975. There is no basis to widely reported charges that the Soviets sharply increased cobalt purchases immediately prior to the May 1978 invasion of Shaba Province (Zaire) and have been buying unusually large amounts since. []

[] total annual Soviet imports of cobalt from all African sources averaged about 500 tons since 1975. Moreover, the plunge in world cobalt prices on the spot market from a peak of about \$50 a pound in 1978 to about \$18 in 1981 and the mounting glut of unsold producer inventories make it extremely difficult to believe that recent Soviet cobalt purchases could be inordinately large. []

The Soviets are assured of a huge jump in domestic cobalt production during the 1980s as new processing facilities near Noril'sk are completed. Noril'sk will account for all of the increase in Soviet cobalt during the 1980s; its projected capacity is equivalent to roughly 40 percent of total world output in 1979. []

The Soviets probably will have to continue importing cobalt from Africa for several more years. When the Noril'sk plant is completed, total Soviet cobalt production will increase to a range of 13,000 to 14,000 tons per annum. This amount should be more than adequate to meet Soviet domestic needs and provide a comfortable exportable surplus. []

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Manganese

The USSR is the world's largest producer of manganese. Production amounted to about 10 million tons in 1980, roughly double the output of South Africa, the world's second largest producer.

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The Soviets have exported manganese for many years but never have sent significant amounts to the West. Annual Soviet exports averaged about 1.3 million tons during the 1970s. Sales to non-Communist countries fell from about 375,000 tons in 1970 to about 100,000 tons in 1977 and have been eliminated completely since. In no year have the Soviets ever accounted for more than 2 percent of non-Communist countries' imports of manganese. Moreover, non-Communist demand for Soviet manganese weakened during the 1970s because of sharply increased availability of the metal at more attractive prices, most notably from South Africa and, to a lesser extent, Gabon.

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A recently commissioned manganese mine in the Georgian SSR is slated to reach full capacity of 2 million tons per year by 1985, and another manganese mine was recently commissioned near Zaporozh'ye. Soviet output probably will increase to at least 12 million tons by the mid-1980s, an amount that should be adequate to meet domestic needs and provide for growing exports to Eastern Europe.

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