~~SECRET~~ Nº 3

Economic Intelligence Report

COPPER IN THE SINO-SOVIET BLOC

CIA/RR ER 61-16

April 1961

CENTRAL INTELLIGENCE AGENCY

Office of Research and Reports

~~SECRET~~

SECRET

Economic Intelligence Report

COPPER IN THE SINO-SOVIET BLOC

CIA/RR ER 61-16

WARNING

This material contains information affecting the National Defense of the United States within the meaning of the espionage laws, Title 18, USC, Secs. 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.

CENTRAL INTELLIGENCE AGENCY

Office of Research and Reports

SECRET

CONTENTS

Appendixes

Tables

Illustrations

COPPER IN THE SINO-SOVIET BLOC*

Summary and Conclusions

The copper industry of the Sino-Soviet Bloc is something of a paradox -- the chronic shortage of copper continues in spite of increased capacity, high production, a large stockpile, and extensive reserves. The copper reserves of the Bloc are estimated to have been about 60 million metric tons in 1960 and its production of refined copper about 615,000 tons.** For comparison, reserves in the Free World probably were about 120 million tons, and production probably was about 4.2 million tons. Nevertheless, the Bloc since its inception has been short of copper, and the USSR, by far the largest producer and consumer, has not satisfied its internal needs with domestic production since the early 1930's. Production of and trade in copper by the Sino-Soviet Bloc in 1959 are shown graphically in Figure 1.***

Two reasons can be offered for this paradox. First, the quality of the Bloc's copper resources has been decreasing gradually but steadily -- the metal content of the ore mined has declined, and a higher percentage of the ores in the newly developed deposits are oxides, which are more costly to process than sulfides. Second, the Bloc has not invested sufficient capital in its copper industry to compensate for the deterioration in its ore supply. As a result of the decline in the quality of copper ores and the industry's failure to mechanize adequately, production costs have risen.

Although precise data are not available, Bloc economic planners are believed to have been faced early in the postwar period with rising consumption requirements as the Bloc economy expanded. To bring the supply of copper into juxtaposition with the consumption of copper, the Bloc has increased production and retarded the rate of growth of consumption, both through denial of copper and through substitution of other materials; has withdrawn copper from stocks; and has imported copper from countries of the Free World.

Although, on the basis of limited available data, increased domestic production appears to be costly, the Sino-Soviet Bloc nevertheless increased considerably production of copper during the 1950's.

* The estimates and conclusions in this report represent the best judgment of this Office as of 1 March 1961.

** Tonnages are given in metric tons throughout this report.

*** Following p. 2. Complete data on the trade of individual countries in 1960 are not expected to be available until mid-1961. The general pattern of this trade, however, probably was similar to that in 1959.

Output of copper in 1960 was nearly 110 percent more than that in 1950, while output in the same period in the US increased about 23 percent. The USSR produces by far the largest share of the Bloc's output, accounting for nearly three-fourths of the total in 1960. Communist China is the second largest producer, accounting for nearly 15 percent of the total.

Along with the efforts to increase production of copper, the Sino-Soviet Bloc is attempting to slow down the rate of growth of the consumption of copper by encouraging the conservation of copper and pursuing a program of substitution. Whereas all of the Bloc countries can practice the conservation of copper, only a few of them -- primarily the industrialized ones -- can utilize substitutes on a very large scale. Among the measures being stressed at the present time is the substitution of aluminum for copper in a variety of applications. During 1959-65 in the USSR, for example, more than 1 million tons of aluminum are planned to be consumed by the wire and cable industry, partly as a substitute for lead and partly as a substitute for copper. The quantity of copper to be saved averages nearly 60,000 tons per year. Similar substitution efforts on a smaller scale probably will be attempted by some of the other countries of the Bloc.

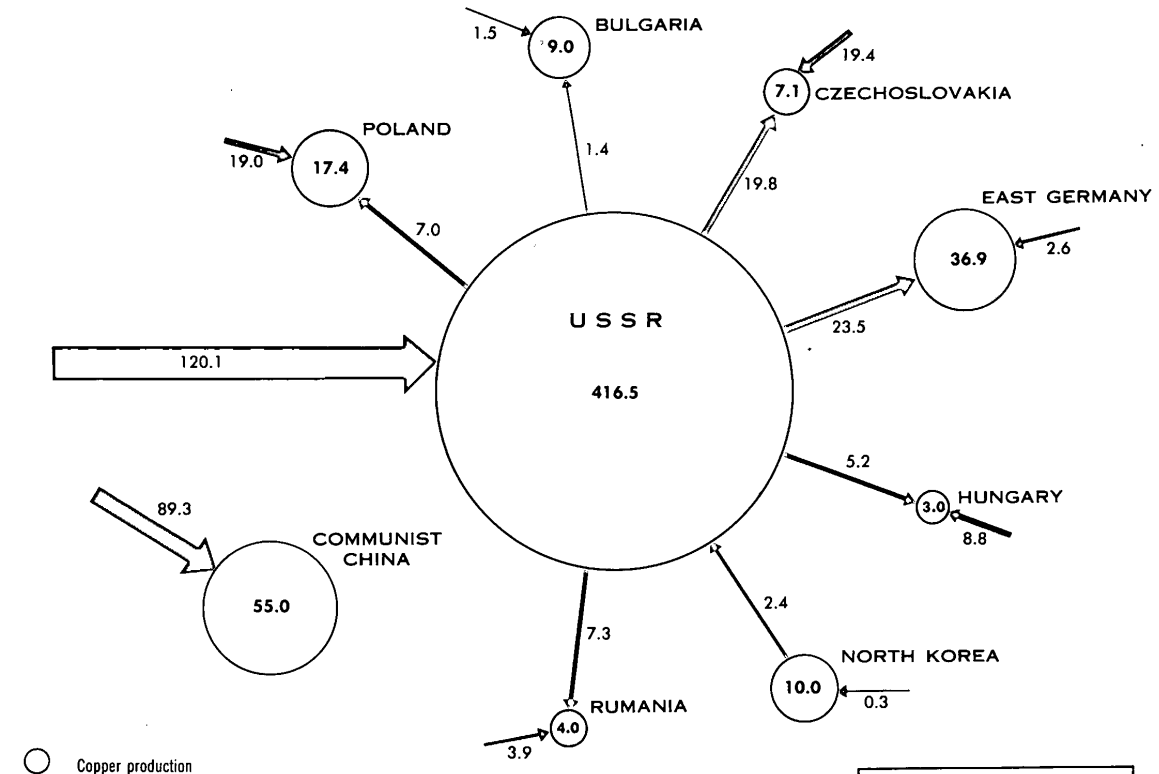
In addition to increasing domestic production and retarding the rate of growth of consumption by the utilization of substitutes, the Sino-Soviet Bloc has withdrawn some copper from stocks. The USSR in particular emerged from World War II with large stocks of copper that have been drawn upon from time to time. A stockpile that could be used in an emergency -- equivalent to perhaps a year's requirements -- probably constitutes a practical limit to the extent that stocks would be utilized.

Imports of copper from the Free World have been the principal, and apparently the least costly, way of supplementing domestic production to satisfy requirements for consumption. During the 10 years 1950-59, imports by the Sino-Soviet Bloc rose from 31,500 tons to 265,000 tons, and preliminary data indicate that imports in 1960 may have been less than in 1959. Whereas these imports provided one-tenth of the Bloc's new supply of copper in 1950, they provided nearly one-third in 1959 and perhaps 25 to 30 percent in 1960. Furthermore, copper is one of the most important nonferrous commodities imported by the Bloc, as illustrated by the fact that copper in 1959 accounted for 41 percent and 42 percent, respectively, of the value of all nonferrous metals and minerals imported by the USSR and Poland. Throughout the 1950's the USSR was the principal importer of copper from the Free World. Communist China has become a large importer and in 1959 rivaled the USSR in the share of the Bloc's total imports accounted for by the two countries -- the USSR imported 45 percent and Communist China 34 percent of the total.

Figure 1

50X1

SINO-SOVIET BLOC: Copper Production and Trade, 1959



29647 3-61

50X1

The policy of importing large quantities of copper from the Free World is consistent with other information about the copper industry of the Sino-Soviet Bloc and the relation of this industry to other industries. Some countries in the Free World have an economic advantage in production of copper, whereas the Bloc has an economic advantage in production of certain other commodities. The USSR, for example, can produce 1 ton of copper or about 58 tons of crude oil for approximately the same number of rubles. If it exchanges the crude oil for copper in the Free World, the USSR can obtain nearly 2 tons of copper compared with the 1 ton that it can produce.

By 1965, the last year for the long-range plans of most of the countries, the Sino-Soviet Bloc almost certainly will not be able to supply requirements for consumption from domestic production. Requirements in that year are estimated to be more than 1.4 million tons, and production is planned to be less than 1.1 million tons. Even if production goals were to be met, imports of nearly 300,000 tons would be necessary for the Bloc to continue to satisfy its copper requirements. To the extent that production goals are not met, imports might be much larger.

The Sino-Soviet Bloc has several reasons for maintaining a high level of imports. First, the Bloc probably will not fulfill production goals, because goals for the construction of new capacity probably will not be fulfilled. In all the 5-year plans of the USSR, for example, none of the goals for constructing new capacity in the copper industry has been achieved, and the construction stipulated in the Seven Year Plan (1959-65) is already behind schedule. Second, the importation of large tonnages of copper may represent a more rational use of resources than if enough copper were produced to satisfy all consumption requirements. Third, the Bloc can purchase its copper from underdeveloped or uncommitted countries and thus strengthen economic and/or political ties between the Bloc and these countries.

Several of the countries of the Sino-Soviet Bloc have planned fairly large expansion programs for their copper industries through 1965. In view of the advantages to the Bloc of purchasing copper in the Free World, the Bloc countries may decide to pursue the construction programs with less vigor than if imports were not available or if the world price of copper were to rise significantly. This decision would not negate the long-term goal of the Bloc to be more self-sufficient than it now is but would reduce the pressure for greatly increased capacity within the period of the Seven Year Plan.

I. Resources

A. General

As a general policy the countries of the Sino-Soviet Bloc do not release quantitative information on the size of their resources of any of the nonferrous metals. Nevertheless, sufficient information has been acquired on which to base an estimate of the size of their copper reserves. In 1960 the copper reserves of the Bloc are believed to have been about 60 million tons, or an amount sufficient to support production at the 1960 rate for about 100 years. For comparison, the copper reserves of the Free World in 1960 were about 120 million tons.

This estimate of reserves represents the total resources of the Bloc and does not reflect other considerations that ultimately determine the size of reserves which can be exploited economically. The richness of ores, the composition of deposits, the geographic and geological accessibility of deposits, and the existence of valuable recoverable associated minerals are among the conditions that influence the level of exploitable reserves. Much of the Bloc's ore is of fairly low grade and is difficult to process with existing technology and equipment. Unless new technology and equipment are introduced, the recovery rate from these ores will be low, and the reserves will be used up more rapidly than their total copper content would suggest.

B. USSR*

As the originator of the Bloc policy of secretiveness about copper reserves, the USSR has released little quantitative information on the results of its mineralogical explorations. The USSR has not announced the size of its copper reserves in quantitative terms since 1939, when it claimed to have reserves of 19.5 million tons. 2/ Since that time, Soviet exploration for copper has been intensified. In view of the vastness of the country and the large area of mineralogically favorable land, new reserves of copper undoubtedly have been discovered. Over the years, numerous vague and ambiguous announcements have been made about successes in increasing copper reserves. By analyzing these announcements, an estimate can be derived of Soviet reserves for 1960 of about 35 million tons. During the period of the Seven Year Plan (1959-65) the surveyed copper reserves are to be increased by 40 percent, so that by 1965 copper reserves are expected to be about 49 million tons, less the amount of copper produced during the plan period.

[redacted] 50X1
50X1

Most of the copper reserves of the USSR are located in four regions,* which possess about 90 percent of the total copper reserves of the country. The regional distribution, which is quite similar to that existing in 1937, is as follows:

Economic Region	Percent
V (Primarily Armenian SSR)	10
VIII (Urals)	15
Xa (Kazakh SSR)	50
Xb (Primarily Uzbek SSR)	15
Other	10
Total	100

Most of the copper deposits are in complex rock formations that have been subjected to considerable alteration and deformation. The ores generally are polymetallic and of relatively low grade. Some of the larger deposits contain large quantities of oxide ores, which must be processed with different techniques and equipment from those used to process sulfide ores. The USSR has been processing both types of ore with the same techniques, with the result that recovery of copper from oxide ores has been low.

The future of the copper industry in the USSR to a large extent lies in the exploitation of four large, relatively low-grade deposits in Kazakh and Uzbek SSR's. The largest single deposit of copper in the country, containing about one-fourth of the country's total reserves, is at Dzhezkazgan in Kazakh SSR. The ores in this deposit average about 1.5 percent copper. The Kal'makir deposit in the eastern part of Uzbek SSR probably is second only to Dzhezkazgan in the size of its coppers reserves. Most of the ore in this deposit averages considerably less than 1 percent. The Kounradskiy deposit in central Kazakh SSR also is one of the largest in the country. The ores in this porphyry deposit contain about 1.1 percent copper. Somewhat smaller is the Bozshakul' deposit in the northern part of Kazakh SSR, which also is a low-grade porphyry deposit, containing about 0.8 percent copper ores.

* The economic regions referred to in this report are those defined and numbered on the map, Figure 2, following p. 8.

C. European Satellites

Assessment of the quantity and quality of the copper resources of the European Satellites is difficult because of the paucity of information. In general, however, the reserves are small and the deposits scattered. As the desire to be more self-sufficient in copper has become stronger in the Satellite countries, they have made a greater effort, with the assistance of the USSR, to discover more deposits of copper. Little quantitative information about increases in reserves has been published by these countries, and judgments about the size of copper reserves are based largely on fragmentary information.

Copper reserves in Poland are estimated to be about 12 million tons. Most of the resources are located in the western part of the country near Wroclaw. The deposits consist primarily of sulfide minerals -- bornite, chalcocite, and chalcopyrite -- and the copper content of the ores ranges from 0.5 to 1.8 percent. 3/

The principal resources of copper ore in East Germany are in the Sangerhausen Basin and to a lesser extent the Mansfeld Basin, both of which are in the southwestern part of the country. The "copper slate" ores of both basins occur in thin layers in a sedimentary formation and are mined at depths of approximately 2,000 feet. In January 1960 the Sangerhausen Basin had about 45 million tons of ore with a copper content of 2 percent, thus indicating reserves amounting to nearly 1 million tons of copper. 4/ Geological exploration has not been completed, however, and additional reserves probably exist.

Copper reserves in Bulgaria, including the copper content of lead-zinc ores, are estimated to be about 1.3 million tons. 5/ The principal areas of known reserves are in the Strandzha Mountain Range near Burgas, in the Sredna Gora near Panagyurishte, and near Vratsa in the western part of the Balkan Mountains. The largest potential source of copper ore, with 80 percent of the country's reserves, is the newly discovered Medet deposit in the Panagyurishte area. The Medet ores are low in grade, averaging 0.45 percent copper, but because the deposit is quite large and is easy to exploit by open-pit methods, Bulgaria expects this deposit to become the foremost producer of copper in the country. Exploitation of the deposit is to be carried out with the cooperation of the Czechoslovak government. Construction of an open-pit mine in the Panagyurishte area was scheduled to begin in 1960, and the mine is to be operating at half capacity as early as 1962. All installations are scheduled to be completed by 1963.

The remaining European Satellite countries -- Albania, Czechoslovakia, Hungary, and Rumania -- do not have important copper reserves either in terms of size or in terms of richness of ore deposits.

Copper reserves in Albania, although not large in comparison with those of the USSR, probably could sustain a considerably expanded level of production. Czechoslovakia has several small deposits near Slovinky and Vernirovice, and the deposits of copper ore in Hungary are at Recsk in the Matra Mountain Range northeast of Budapest. 6/ Rumania, with the aid of Soviet technicians, is just beginning to prospect systematically for copper ore, but the chances for the discovery of large copper reserves are not favorable. 7/

D. Asian Bloc*

Of the countries of the Asian Bloc, only Communist China has significant copper reserves. In contrast to the pre-Communist situation, when copper resources were very limited, Communist China claims to possess very large reserves. From 1950 to the present, China has been engaged in an extensive geological prospecting and development program that is reported to have resulted both in large increases in the reserves of some previously well-known deposits, such as the T'ung-ch'uan deposit in Yunnan Province, and in the discovery of a large number of new deposits. 8/ In 1958, Liu Ching-fan, the Vice Minister of Geology, stated that China was sixth among the countries of the world in copper resources. 9/ On the basis of rough estimates of world copper resources, this claim would indicate a reserve in China of between 10 million and 20 million tons of copper metal. Subsequent to this announcement, the Chinese Communist press has claimed further large increases in copper resources, including a reported discovery of a very large deposit in Shao-hsing Hsien (county) of Chekiang Province as well as new deposits in Szechwan Province and in the Ch'i-lien Mountains of Tsinghai Province, all of which are said to be among the largest copper deposits in the world. 10/ Although the existence of very large copper resources has not been confirmed as yet, China is believed to possess sufficient resources to permit a great increase in production.

Copper deposits have been reported in almost every province of Communist China. At the National Conference on Copper Production, held in Peking in June 1958, the claim was made that copper deposits had been discovered in 680 hsiens -- about one-third of the total number of counties in China. 11/ The following provinces, in particular, have been named as possessing large and rich copper resources: Yunnan, Szechwan, Anhwei, Chekiang, Kansu, Kweichow, Hunan, Shensi, and Sinkiang.

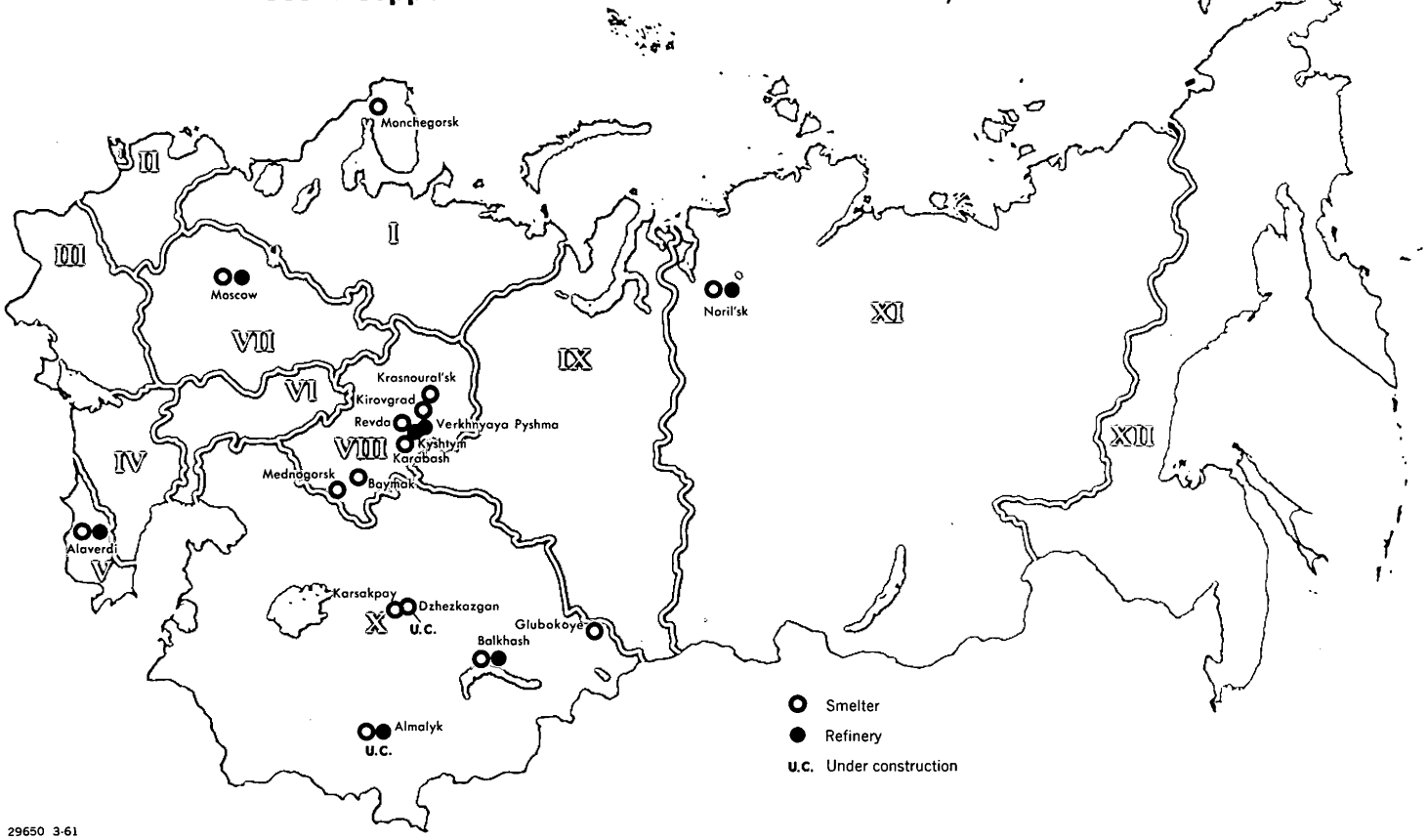
For many years the most important copper deposits in China were those of Manchuria and Yunnan Province, but the Manchurian deposits

* The term Asian Bloc as used throughout this report includes Communist China, North Korea, and North Vietnam.

50X1

Figure 2

USSR: Copper Resources and Production Facilities, 1960



29650 3-61

50X1

now have been depleted to a large extent. Yunnan Province, in which a number of new discoveries have been reported, probably is now the most important single potential producing area in Communist China. 12/

With two or three exceptions, no information is available regarding the quality of the ores in various deposits in Communist China. The ores produced at some of the old Manchurian mines contain 1.5 percent copper. 13/ The copper ores at T'ung-ch'uan in Yunnan Province have been estimated to average 5 percent copper, and the ores in the newly discovered deposit in Chekiang Province are reported to contain from 2 to 9 percent copper. 14/

Copper deposits are negligible in North Vietnam, and although deposits are widespread throughout North Korea, they probably do not contain large reserves of copper. In 1958 a new deposit containing 10 million tons of ore was reported to have been discovered in P'yongan-Pukto Province. The grade of the ore in this deposit was not reported.

II. Production

A. General

Production of refined copper in the Sino-Soviet Bloc rose rather sharply during 1950-60, from about 295,000 tons in 1950 to 615,000 tons in 1960, an increase of nearly 110 percent. Output in 1960 was less than one-sixth of the approximately 4.2 million tons produced by the Free World in that year.*

Output of refined copper by the Bloc is expected to continue to increase at least through 1965. If the goals of most of the Bloc countries for production of copper in 1965 are fulfilled, output of refined copper will be about 75 percent larger than in 1960. Although these goals probably will not be reached, production of copper in 1965 is expected to be significantly higher than in 1960. See Table 1** for production of refined copper in each of the countries of the Sino-Soviet Bloc in 1950 and 1955-60 and that planned for 1965.

An increase in production of copper in the Sino-Soviet Bloc to the level estimated for 1965 will require a substantial expansion of capacity in all sectors of the copper industry. Probably the greatest expansion will occur in the mining and concentrating sector, which has been lagging behind the metallurgical sector for a number of years. Very little quantitative data have been published by any of the Bloc

* Derived from preliminary data on the first three quarters of 1960. 15/

** Table 1 follows on p. 10.

Table 1

Production of Refined Copper in the Sino-Soviet Bloc a/
1950, 1955-60, and 1965 Plan

Thousand Metric Tons

	1950	1955	1956	1957	1958	1959	1960	1965 Plan
USSR	246.6	377.3	386.7	396.4	406.3	416.5	426.9 b/	772
European Satellites c/	40.1	68.2	72.4	72.2	69.6	77.4	87.8 d/	137
Bulgaria e/	0.1	3.8	4.6	5.1	6.1	9.0	13.3	28
Czechoslovakia	1.0	5.1	5.6	6.1	6.6	7.1	7.6	16
East Germany	27.8	33.3	32.8	32.8	32.5	36.9	37.9	46 f/
Hungary	N.A.	7.8	6.1	4.3	3.0	3.0	3.0 g/	3 g/
Poland	10.5	15.7	20.3	19.9	17.4	17.4	22.0	28
Rumania	0.7	2.5	3.0	4.0	4.0	4.0	4.0	16 h/
Asian Bloc	6.9	16.8	16.4	17.2	38.9	65.0	100.0	175
Communist China	5.3	15.0	14.0	14.0	34.0	55.0	90.0 i/	165 i/
North Korea	1.6	1.8	2.4	3.2	4.9	10.0	10.0 g/	10 g/
Total Sino-Soviet Bloc	293.6	462.3	475.5	485.8	514.8	558.9	614.7	1,084

b. Output in 1960 is estimated to have been 2.5 percent larger than in 1959.
c. Albania produces about 1,000 tons of blister copper annually, which is exported to other Bloc countries. It has been assumed that the output of refined copper of these other countries reflects the blister copper produced by Albania.
d. See Table 3, p. 17, below.
e. Figures through 1958 are for blister copper, which was refined by other countries in the Bloc and returned to Bulgaria.
f. 17/
g. Assumed to be the same as in 1959.
h. Output in 1965 is scheduled to be more than four times as large as in 1959. 18/
i. 19/

50X1

countries, either about the size of expansions or about the capital to be invested in expansions. Consequently, an analysis of construction and investment in the copper industry of the Bloc must be based largely on fragmentary information.

B. USSR

The USSR produces more refined copper than any other country in the world except the US. The Soviet output of this metal in 1960 is estimated to have been about 426,900 tons. This figure was about 4 percent larger than output in Northern Rhodesia, the second largest producer in the Free World, and about one-fourth as much as was produced in the US.* The quantity produced by the USSR represented nearly 70 percent of the refined copper produced in the Sino-Soviet Bloc in that year. Soviet production of copper increased by about 73 percent from 1950 to 1960 -- from 246,600 tons to 426,900 tons -- while production in the US increased about 23 percent -- from 1.3 million tons in 1950 to 1.6 million tons in 1960.

The USSR has announced that production of refined copper in 1965 is to be 90 percent larger than in 1958. Thus the goal for production is estimated to be 772,000 tons, or about 71 percent of output by the Bloc in that year. The large increase planned by the USSR probably reflects the failure of its copper industry to increase production in the first 3 years of the original Sixth Five Year Plan (1956-60) by anything like the quantities called for in that plan. Whereas production was scheduled to grow by 9.9 percent annually during 1956-60, it is estimated to have grown only by about 2.5 percent annually during that period. The major reason for the failure to meet the goals for production of copper in the early years of the Sixth Five Year Plan, as well as the goal of the Fifth Five Year Plan (1951-55), was the failure by the USSR to fulfill construction goals for various enterprises of the copper industry, particularly in the mining and concentrating sectors.

An increase in production of copper in the USSR by the 90 percent called for in the Seven Year Plan will require a substantial expansion of capacity in all sectors of the copper industry. The greatest expansion probably will occur in mining and concentrating, which have been lagging behind the metallurgical sector for at least several years. To produce in 1965 about 365,000 more tons of refined copper than was produced in 1958, the USSR would have to mine and concentrate perhaps 40 million more tons of ore than was processed in 1958, assuming no

* Based on the assumption that production in Northern Rhodesia and the US in the fourth quarter of 1960 was at the same rate as in the first three quarters. 20/

change in the grade of ore and in the over-all rate of recovery. New mines will have to be developed and new concentrating plants built to process most of the additional ore. Facilities for smelting may need to be increased by about 365,000 tons and for refining by about 265,000 tons, there being in existence perhaps 100,000 tons of refining capacity in excess of smelting capacity.

The capital investment required for the expansion of the Soviet copper industry in the Seven Year Plan is estimated to amount to about 9.5 billion rubles.* 21/ A large share of this investment, perhaps 75 percent, probably will be used to construct new plants and the remainder to modernize existing plants. Of the total investment, nearly 350 million rubles may be expended to achieve an increase of 265,000 tons in new capacity for refining copper. Facilities for smelting probably will receive a larger amount. On the assumption that smelting capacity amounting to 365,000 tons must be constructed, the investment would be about 1.65 billion rubles. The remainder of the 9.5 billion rubles to be invested in the copper industry -- that is, 7.5 billion rubles -- would be for exploration, mining, and concentrating. Much of this investment may be used for facilities to process oxide ores by methods different from those used for sulfide ores. Table 5** gives some indication of the emphasis to be placed on the development of the mining and concentrating sectors of the Soviet copper industry, compared with the smelting and refining sectors, and also of the regional location of the principal new facilities of the copper industry.

Approximately three-fourths of the blister and refined copper of the USSR is currently produced in the Urals and Kazakh SSR. Kazakh SSR produces nearly 50 percent of the country's blister copper and about 25 percent of its refined copper, whereas the Urals produces about 25 percent of the blister and 50 percent of the refined. These percentages reflect the distribution of copper resources on the one hand -- Kazakh SSR possesses about one-half of the country's copper resources -- and the historical location in the Urals of copper refineries near their consuming industries on the other. Production of copper ore, blister copper, and refined copper, by plant, in 1960 is shown in Table 2.***

Currently the refining capacity of the USSR totals about 530,000 tons, installed in six refineries. About 70 percent of the

* Ruble values in this report are given in pre-1961 current rubles and may be converted to US dollars at a rate of exchange of 4 rubles to US $1. This rate does not necessarily reflect the value of rubles in terms of dollars.

** Appendix A, p. 36, below.

*** Table 2 follows on p. 13.

Table 2

Production of Copper Ore, Blister Copper, and Refined Copper in the USSR, by Plant
1960

Thousand Metric Tons

Mining and Concentrating		Smelting		Refining	
Plant	Production of Copper Ore	Plant	Production of Blister Copper a/	Plant	Production of Refined Copper
Akhtala-Shamlug Dastakert Kadzharan Kafan	2,200	Alaverdi	17.2	Alaverdi	17.2
Dzhezkazgan East Kazakhstan Kounradskiy	27,700	Karsakpay Glubokoye Balkhash	202.6	Balkhash b/	112.0
Blyava-Mednogorsk Karabash Monchegorsk Sibay	4,600	Mednogorsk Karabash Monchegorsk Baymak	35.9	Kyshtym	32.2
Degtyarsk Kirovgrad Krasnotur'insk Krasnoural'sk Tuim	5,700	Kirovgrad Krasnoural'sk Revda	91.2	Verkhnyaya Pyshma b/	185.5
Noril'sk	10,200	Noril'sk Moscow c/	49.2 30.8	Noril'sk Moscow c/	49.2 30.8
Total	50,400		426.9		426.9

a. Given in terms of refined copper.
b. The excess of blister copper over refined copper in Kazakh SSR is sent to Verkhnyaya Pyshma for refining.
c. Production at this plant is based primarily on scrap metal.

total capacity is in the two refineries at Verkhnyaya Pyshma and Balkhash. In 1941, only three refineries in the USSR produced electrolytic copper. These were at Verkhnyaya Pyshma, Kyshtym, and Moscow, with the last mentioned utilizing scrap as raw material. Since then, three additional electrolytic refineries have been put into operation, at Alaverdi, Balkhash, and Noril'sk. Originally the Balkhash plant fire-refined all its copper, but in 1952 electrolytic refining equipment was installed. Since then the refinery has been expanded and now is the largest electrolytic copper refinery east of the Ural Mountains, and it is an important factor in the development of the copper resources of Kazakh SSR. The copper refineries in the USSR are listed in Table 6* and are shown on the map, Figure 2.**

The total copper-smelting capacity in the USSR is about 529,000 tons, installed in 12 smelters that process copper ore and concentrate and 1 smelter that utilizes copper scrap as the primary charge. The smelter at Balkhash, with a capacity of about 200,000 tons, currently produces about 30 percent of the country's blister copper. On the basis of the very large copper deposits of the Dzhezkazgan area of Kazakhstan, a smelter is to be constructed there during the Seven Year Plan period. When completed, the capacity of this plant probably will be as large as the plant at Balkhash. As early as 1941, a copper-smelting plant with a capacity of about 150,000 tons had been planned at Almalyk in Uzbek SSR. The ores at Almalyk, however, are badly oxidized, and methods of enrichment used at other plants in the USSR were not adaptable to the Almalyk ores. A new technique had to be developed, therefore, before production of copper could be achieved. Inasmuch as Uzbek SSR reportedly plans to smelt copper during the Seven Year Plan period, a satisfactory technique probably has been developed, and construction of a smelter probably will be undertaken. The copper smelters in the USSR are listed in Table 6* and are shown on the map, Figure 2.**

Kazakh SSR produces more copper ore than any other region in the USSR, or about 55 percent of the country's total in 1960. The open-pit mine at Kounradskiy, north of Balkhash, is the largest copper-mining operation in the USSR and compares favorably in size with some of the open-pit mines in the US. The Dzhezkazgan area, which is in a semidesert region where an adequate supply of water for processing is a serious problem, is the second largest producing area in Kazakh SSR. The Zlatoust-Belovskiy open-pit mine of Dzhezkazgan, which presently is being developed, reportedly will produce nearly as much ore as Kounradskiy now does. For the first few years the new mine will produce only oxidized and mixed ores, which are to be processed in a concentrating plant specifically built for such ores. In East Kazakhstan,

* Appendix A, p. 37, below.
** Following p. 8, above.

polymetallic ores are mined and concentrated primarily for their lead and zinc but also for valuable quantities of copper. Large new mining and concentrating operations are to be undertaken in Kazakh SSR during the Seven Year Plan period at Bozshakul', Chetyr-Kul'sk, and Nikolayevsk.

One of the largest mining-metallurgical combines in the USSR is at Noril'sk in Krasnoyarskiy Kray. The Noril'sk ore is different from the other copper ores in the USSR in that it resembles the nickel-copper ore of the Sudbury district in Ontario, Canada. During the Seven Year Plan, production at Noril'sk is to double, although output of copper probably will increase much less than this.

In the Urals, where copper has been mined for many centuries, the principal mines are at Krasnoural'sk, Kirovgrad, Degtyarsk, Karabash, Sibay, and Blyava. In general, copper is obtained from underground mines in the Central Urals and from open-pit mines in the Southern Urals. The trend is to increase the percentage of copper mined by open-pit methods because production costs generally are lower than for underground methods. Each of the mines in the Urals has its own concentrating plant except Degtyarsk, which ships its ore a few miles northward to a concentrating plant at Revda. Either construction or operation of mines and concentrating plants has begun at Volkov, Uchaly, and Gay, and all are scheduled to be operating by the end of the Seven Year Plan.

In the Armenian SSR, copper ore is mined and concentrated at four localities -- Akhtala-Shamlug, Dastakert, Kadzharan, and Kafan. At present, each of these operations is relatively small in scale. During the Seven Year Plan a large porphyry copper deposit at Agarak is to be developed for open-pit exploitation, and a concentrating plant of commensurate size is to be constructed in the vicinity.

Development of the copper resources of Uzbek SSR was undertaken before World War II. Not until after the Fifth Five Year Plan period, however, did the project receive very much attention. So-called industrial ores -- that is, those containing more than 0.5 percent copper -- are to be transported to a concentrating plant about 7 miles away, while the poorer ores are to be dumped nearly 6 miles from the mine for future heap-lixiviation. For the first 5 or 6 years of operation the plant will process only oxidized copper ores.

C. European Satellites

1. General

The European Satellites do not produce large quantities of copper. In 1960 these countries produced a total of only about

87,800 tons of refined copper, which accounted for only 14 percent of the Bloc's total output. Plans for production of copper in 1965 are available for most of the European Satellites, and these indicate an output of about 137,000 tons of refined copper for the group in 1965. Even if these plans are achieved, the role of the European Satellites in the Bloc's supply of copper will continue to be relatively minor -- production will account for only about 13 percent of the Bloc's output of copper in 1965.

Production of refined copper in the European Satellites is based partly on imported blister copper, partly on scrap, and partly on indigenous ore. The Satellite output of 87,800 tons of refined copper in 1960, for example, is believed to have been obtained from 83,400 tons of blister copper that had been produced domestically and about 6,000 tons of blister that had been imported by Poland. About two-thirds of the blister copper produced by the Satellites in 1960 was derived from about 5.6 million tons of domestically produced ore and the remainder from scrap. East Germany and Poland mined the largest quantities of copper ore in the European Satellites, more than 1.5 million tons each. Production, by country, of copper ore, blister copper, and refined copper in 1960 is shown in Table 3.* The principal facilities producing copper in the European Satellites are listed in Table 6** and are shown on the map, Figure 3.***

East Germany is the only Satellite for which any quantitative information about costs of production of copper is available. In that country, copper is produced at a substantial financial loss; whereas the price is about 10,000 DME† per ton, the production cost has been reported to be about 17,000 DME per ton. 22/ The subsidy paid by the East German government is equivalent to about $1.44 per pound, at the official rate of exchange,†† compared with an average total price for electrolytically refined copper in the US in 1960 of almost $0.33 per pound.†††

The high cost of producing copper in East Germany can be largely attributed to several factors. The ores have a very low copper content, are difficult to process, and are found in deposits that are costly to exploit because of their location at great depths in

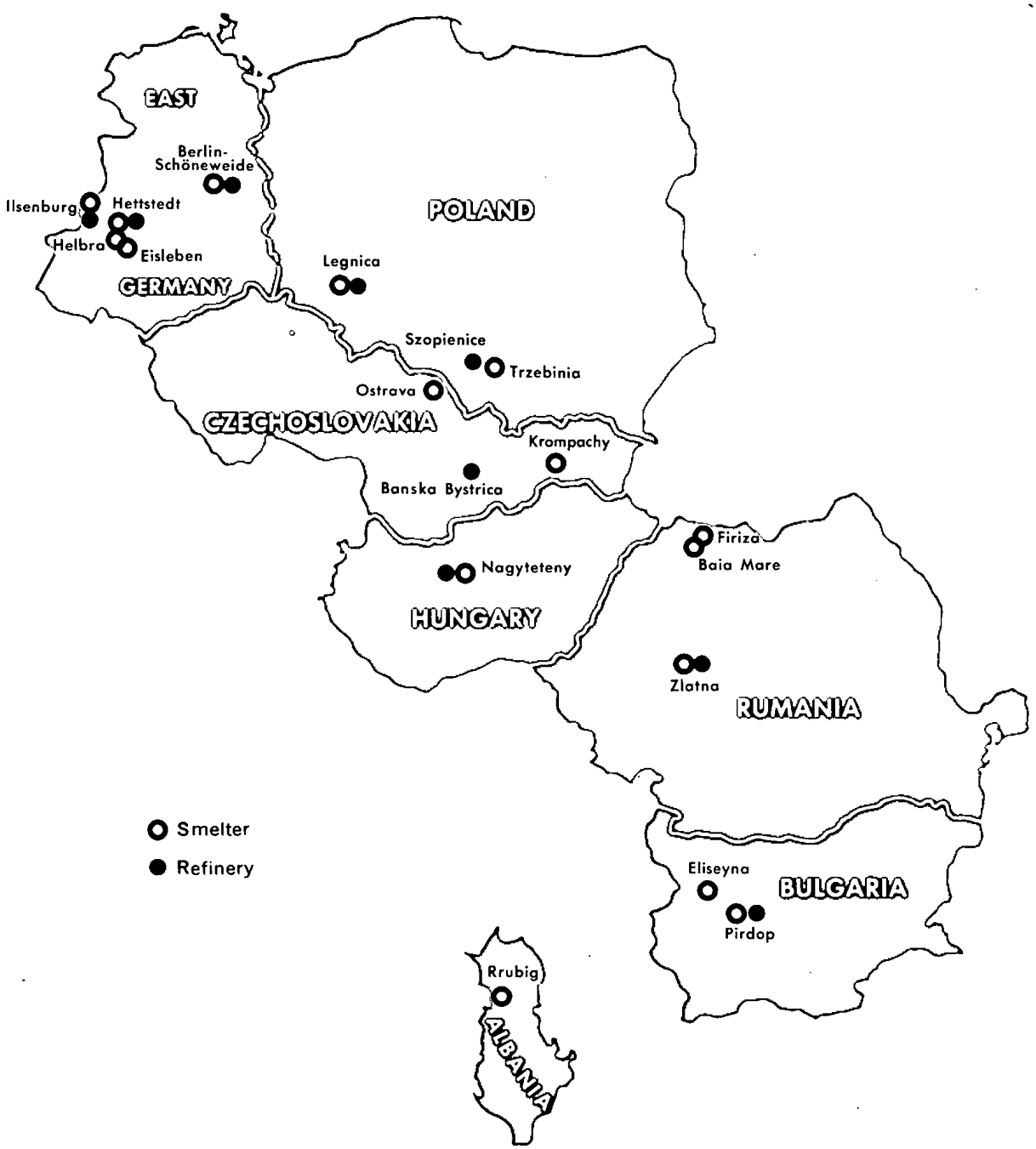
---

* Table 3 follows on p. 17.
** Appendix A, p. 37, below.
*** Following p. 16.
† Deutsche Mark East (East German marks).
†† The official rate of exchange was 2.22 DME to US $1.
††† Based on average monthly prices for the first 11 months of the year. 23/

Figure 3 50X1

EUROPEAN SATELLITES

Copper Resources and Production Facilities, 1960



29649 3-61

50X1

Table 3

Production of Copper in the European Satellites
1960

Thousand Metric Tons

Country	Ore	Blister	Refined
Albania	95 a/	1.6 b/	0
Bulgaria	1,230 c/	13.3 d/	13.3 e/
Czechoslovakia	400 f/	7.6 g/	7.6 h/
East Germany	1,600 i/	37.9 j/	37.9 k/
Hungary	10 l/	3.0 m/	3.0 n/
Poland	1,700 o/	16.0 p/	22.0 q/
Rumania	550 r/	4.0 s/	4.0 t/
Total	5,585	83.4	87.8

a. Production in 1960 was 286 percent larger than in 1955. 24/
b. Production in 1960 was scheduled to be 55 percent larger than in 1959, when production was 9.3 percent larger than in 1958. 25/
c. Planned production. 26/
d. Assumed to be the same as production of refined copper.
e. Based on the assumption that production in the fourth quarter of 1960 was at the same rate as in the first three quarters, when it was 10,000 tons. 27/
f. Estimated on the basis that about one-half of the blister copper is produced from scrap and the remainder from ore containing about 1 percent copper.
g. Assumed to be the same as production of refined copper.
h. Planned production. 28/
i. In 1959, East Germany produced 36,900 tons of copper from scrap and from 1,572,000 tons of ore. 29/ Planned production of 37,900 tons of copper in 1960 probably would require about 1.6 million tons of ore.
j. Assumed to be the same as production of refined copper.
k. Planned production. 30/
l. Estimated to be the same as in 1959. 31/
m. Estimated to be the same as in 1959. 32/
n. Estimated to be the same as in 1959. 33/
o. Based on production in the first three quarters of 1960. 34/
p. Poland planned to import 6,000 tons of blister copper in 1960. It is estimated that the difference between imported blister copper and the total output of refined copper represents domestically produced blister copper.
q. Based on production in the first three quarters of 1960. 35/
r. Assumed to be the same as in 1959. [redacted] 36/.
s. Assumed to be the same as production of refined copper.
t. Assumed to be the same as in 1959. 37/

50X1
50X1

the ground. At present, copper ores are concentrated almost entirely by hand-sorting. In recent years, several attempts were made to concentrate ores by mechanical methods. One of these, heavy media separation, was found to be usable for preliminary concentration of a small proportion of the ores mined in the Mansfeld Basin. No mechanical method of concentration has been successfully developed, however, for most of the ore mined in East Germany.

In view of the relatively high cost of producing copper in East Germany, the continued production by that country must be explained by noneconomic considerations. The continued production of copper probably reflects a nationalistic desire to have a domestic copper industry, a distrust of the West along with a corresponding reluctance about being too dependent on Free World countries, and a limited availability of foreign exchange for buying copper in the Free World. Although the other European Satellites may not have to pay as large a subsidy for production of copper as does East Germany, they probably have high costs of production and foster a domestic copper industry for essentially the same reasons as does East Germany.

2. East Germany

In 1960, East Germany produced about 38,000 tons of refined copper, or nearly one-half of the amount produced by the European Satellites. Production in 1965 is planned to be 45,650 tons. Almost one-third of the refined copper produced in East Germany in 1960 was derived from scrap. Most of the increased production planned for 1965 is to be obtained from domestic ores, and production from scrap apparently will remain at about the same level as in 1960.

Copper mines in East Germany are a part of the VEB (Volkseigenebetriebe) Mansfeld-Huetten-Kombinat Wilhelm Pieck, with headquarters at Eisleben, an organization that encompasses practically all the installations involved in production of primary copper, from mine through refinery. Until 1951 the Mansfeld Basin in the southwestern part of East Germany was the only source of copper ore being exploited. Since that time, deposits in the Sangerhausen Basin, southwest of Mansfeld, have been developed and exploited. At present, four shaft mines are operating in the Mansfeld Basin and two in the Sangerhausen Basin. By 1965 the Sangerhausen Basin is to supply 65 percent of East Germany's output. 38/

East Germany has undertaken a substantial program of construction and modernization in the copper industry. Central to the program is the development of the Sangerhausen Basin, which is to provide the bulk of the planned increase in production of domestic ores. Continued enlargement of the two mines in this basin -- the

Thomas Muenzer mine, which began production in 1951, and the Niederroeblingen mine, which began production in 1958 -- are important tasks under the Seven Year Plan (1959-65). The Niederroeblingen mine is to have an annual capacity equivalent to 14,000 tons of copper in 1965. 39/ An increase of smelting capacity is to be obtained by reconstructing the August Bebel smelter and installing equipment for automation and mechanization.

According to a statement made in 1958, East Germany allocated a total of 260 million DME, or about $117 million, for expanding the copper industry up to 1965. 40/ About two-thirds of this amount is for investment in mines, especially the new Niederroeblingen mine in the Sangerhausen Basin.* Most of the remainder probably will be expended on other sectors of the copper industry.

3. Poland

Production of refined copper in Poland is a recent development, having begun in about 1948. Before the Communists took control, Poland produced a small quantity of secondary copper but relied on imports for its supply of primary copper. During the past 6 years, however, Poland has been producing primary copper at an average annual rate of less than 19,000 tons. By 1965, production of refined copper is planned to be about 28,000 tons.

Like East Germany, Poland currently is unable to rely only on indigenous ores, which are mined and concentrated near Wroclaw, to produce refined copper. To produce about 22,000 tons of refined copper in 1960, Poland probably imported about 6,000 tons of blister copper. By 1965, smelting and refining capacities may be about in balance, so that imports of blister copper no longer will be necessary. Production of concentrates, however, may be insufficient to supply smelting capacity and may have to be imported.

Copper now is both smelted and refined at the new copper plant at Legnica. Construction of the first phase of this plant started several years ago with Soviet technical and possibly financial assistance, but this phase has been completed only recently. Although the refinery is believed to have been operating since 1956, the smelter probably did not start producing until late in 1959. The plant currently is producing at the annual rate of 10,000 tons, although capacity has been reported to be 12,500 tons.

* Workers of the Mansfeld mines -- which include the Max Lademann, Fortschritt, Ernst Thaelmann, and Otto Brosowski mines in the Mansfeld Basin and the two mines in the Sangerhausen Basin -- adopted a resolution in April 1959 to return to the government as a profit by 1965 the 165 million DME allocated for development of the Niederroeblingen mine. 41/

Expansion of copper-producing facilities in Poland includes the completion of the second stage of the Legnica plant and the development of a rather large area containing copper deposits. The capacity of the refinery at Legnica is to be increased to 25,000 tons annually from the present level of about 12,500 tons, and the capacity of the smelter probably will be increased correspondingly. Development of the copper deposits in the Glogow-Lublin area will require large investments -- 10 billion zlotys* reportedly will be invested during the decade of the 1960's. 42/ The USSR and East Germany are to furnish technical assistance, and Czechoslovakia (and perhaps the USSR as well) is scheduled to supply mining machinery and equipment to Poland for this project.

4. Bulgaria

Only recently has Bulgaria become a factor in the Bloc's supply of copper. From about 100 tons in 1950, production of copper was increased to about 13,000 tons in 1960. By 1965, production of refined copper is planned to be about 28,000 tons. Until 1959, Bulgaria did not have a copper refinery and produced only blister copper. The copper was shipped to the Mansfeld Combine in East Germany for electrolytic refining, after which it was returned to Bulgaria for processing into wire and other items. Ore is mined chiefly in the Strandzha Mountain Range near Burgas, in the Sredna Gora near Panagyurishte, and near Vratsa in the western part of the Balkan Mountains. Construction of an open-pit mine for exploiting the Medet deposit was scheduled to begin in 1960 and to reach full capacity in 1963. The present annual capacity for concentrating ore is about 2 million tons, and in the near future a plant with a capacity of about 3 million tons annually is to be constructed at the Medet deposit. 43/

5. Other European Satellites

Production of copper by the other European Satellite countries -- Albania, Czechoslovakia, Hungary, and Rumania -- is so small as to be almost insignificant in the supply of copper of the Sino-Soviet Bloc at the present time. The total output of refined copper by these countries represented only about 2 percent of the amount produced by the entire Bloc in 1960.

Albania currently produces no refined copper but does produce a little more than 1,000 tons of blister copper annually at the Rrubig smelter from about 100,000 tons of copper ore. The capacity

* This amount might be equivalent to US $250 million to $2.5 billion, depending on the rate of exchange used. The official rate of exchange is 4 zlotys to US $1. This rate does not necessarily reflect the value of zlotys in terms of dollars.

for production of blister copper may be increased to about 2,000 tons by 1965. Most of the ore is produced from the new Kurbnesh mine; mining operations at Rrubig probably are being curtailed because costs are too high to justify continued operations. Refined copper is produced in Czechoslovakia from domestic ore, mined primarily near Slovinky and Vernirovice, and from scrap. The small output of refined copper in Hungary also is produced from scrap and from ore that is mined at Recsk in the Matra Mountain Range northeast of Budapest. Most of the refined copper produced in Rumania is derived from ore mined near Baia-Mare. By 1965, output of refined copper is to be more than four times the level in 1959.

D. Asian Bloc

1. General

Only Communist China and North Korea of the countries of the Asian Bloc produce copper, and they accounted for about 16 percent of the output of the Sino-Soviet Bloc in 1960. China produced 90,000 tons and North Korea 10,000 tons in that year. By 1965, output in Communist China is expected to rise to about 165,000 tons, but output in North Korea probably will remain at the 1960 level. These two countries together may account for about 16 percent of the amount to be produced by the Sino-Soviet Bloc in 1965. The principal facilities producing copper in the Asian Bloc are listed in Table 6* and are shown on the map, Figure 4.**

Neither North Korea nor Communist China has published information about prices or costs of production of copper. Some evidence exists to suggest that in 1955 the price for copper wire produced in Communist China may have been about three times as high as the price in the Free World. Whatever the actual level of production costs in China, it may be reasonably expected to be relatively high in view of the primitive techniques and equipment used to process the relatively low-grade ores.

2. Communist China

Although copper has been produced in China for many years, output has been very small until recently and is still inadequate to supply the requirements of the country. After the Communists took control of China, they made a vigorous effort to increase production of copper. From 1950 through 1957 the success of these efforts was limited. Thereafter, output increased considerably, and Communist China by 1958 was the second largest producer of refined copper in the Sino-Soviet Bloc.

---

* Appendix A, p. 37, below.
** Following p. 22.

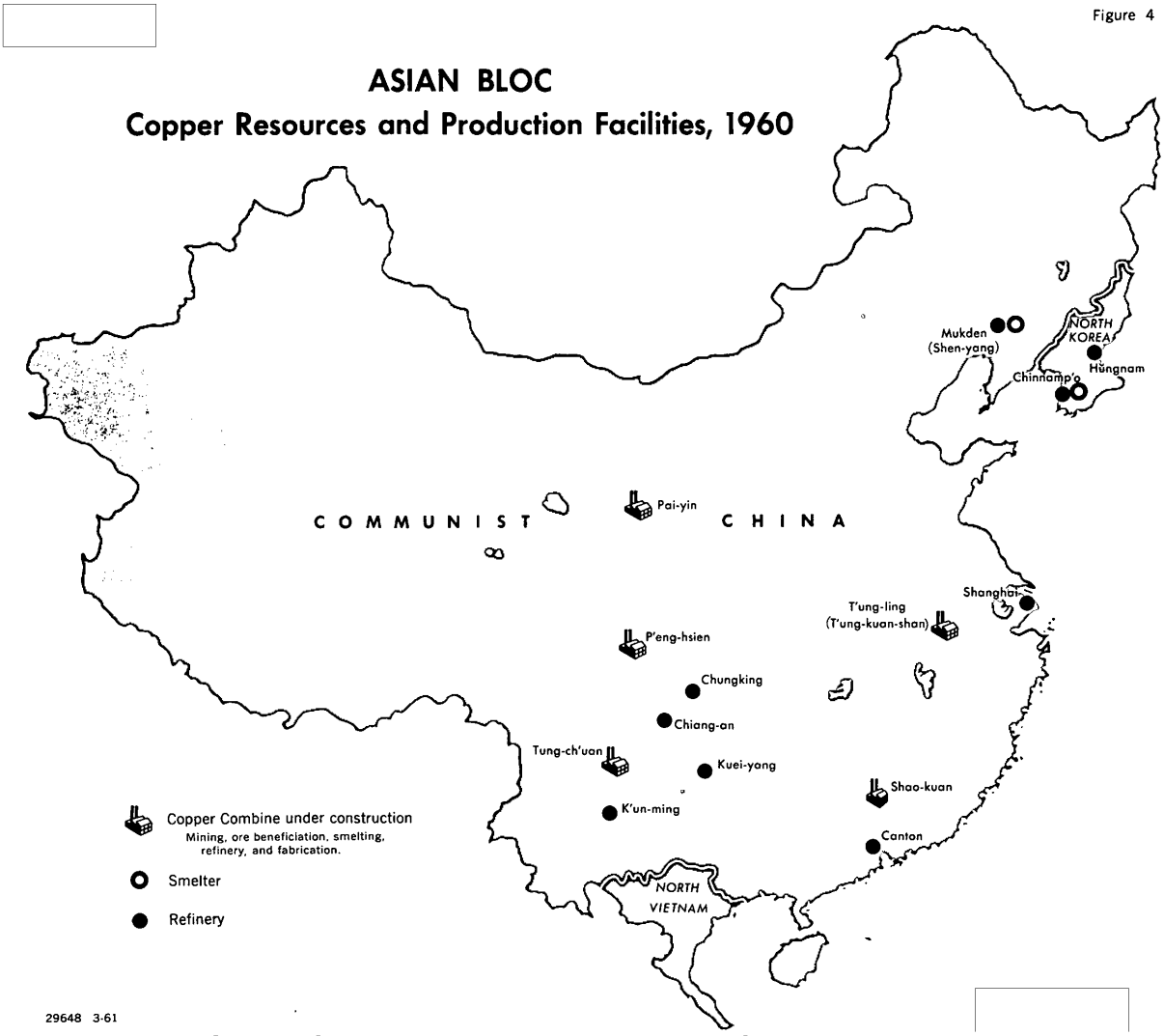
The key to the success of Communist China in raising output of copper so much was the "local industry" plan of the "leap forward" program. Basically this program envisaged the utilization of labor instead of capital for a few years to achieve a large increase in output of copper. The Chinese Communists recognized the shortcomings in such an approach and adopted the program only as a matter of expediency. 44/ Although announcements of the original goals of this program indicated that Chinese plans were too grandiose, the program, nevertheless, has been instrumental in increasing production of copper. Output in 1950 is estimated to have been about 5,300 tons, which was equal to the maximum output in the 1930's. By 1957, production had risen somewhat but was only about 14,000 tons. In 1958, however, production rose to 34,000 tons, and in both 1959 and 1960 it again increased considerably, probably reaching about 90,000 tons in 1960.

Production of copper in Communist China through 1957 was based to a large extent on copper scrap. 45/ The remainder that was produced was derived from low-grade ores obtained primarily from the old and small Manchurian mines. 46/ By 1957, however, copper scrap was becoming increasingly difficult to find, and many of the old Manchurian mines were approaching exhaustion. 47/ As a direct result of the shortage of raw materials, output of copper failed to meet the planned goal in that year. Thus, at a time when the demand for copper was rising, the immediate outlook for production of copper, based on the sources of raw material in use in 1957, was not bright.

In 1958, however, the outlook for the copper industry in Communist China changed drastically. The extensive search, which had begun in 1950, for new copper resources resulted in the discovery of a large number of deposits, particularly in the relatively remote areas of western and southwestern China. Normally, however, development work and the establishment of processing facilities require a considerable expenditure of both time and capital before copper can be obtained from newly discovered deposits. 48/ To reduce the time and capital requirements to a minimum, Communist China undertook a new, labor-intensive "local industry" program of constructing a very large number of small, handicraft-type mines and smelting plants. By the end of October 1958, in Szechwan Province more than 1,300 and in Yunnan Province more than 31,000 of the small furnaces had been constructed and were operating. 49/ Reports of the existence of large numbers of furnaces have been received from other provinces, including Kweichow, Hunan, Honan, Kwangsi, Inner Mongolia, Tsinghai, and Sinkiang. 50/ These primitive installations, although inherently wasteful in operation, began producing copper in a very short time.

Figure 4

50X1



29648 3-61

50X1

Although most of the capacity for refining copper was constructed to process scrap, much of it now processes blister copper produced in the native smelters. The Mukden (Shen-yang) refinery processes both scrap and blister copper from the adjoining smelter. The K'un-ming plant refines blister copper produced in the small smelters of the T'ung-ch'uan area of Yunnan Province, and most of the other refineries are believed to process native blister produced in nearby furnaces.

With Soviet aid and technical guidance, Communist China is moving ahead with long-term plans to replace the facilities developed under the "leap forward" program. Construction of five integrated copper combines is estimated to be completed by 1962. When completed, these combines should permit China to reduce sharply its production of copper from many of the wasteful, high-cost handicraft-type mines and smelters. Furthermore, the refining capacity of China, which probably is more of a physical bottleneck to increased production than is mining, concentrating, or smelting, would be increased greatly above the present capacity of about 90,000 tons. In the meantime, some of the more productive and promising native operations are to be combined, and more modern facilities are to be constructed. Information about the cost of constructing these various plants has not been released by the Chinese.

3. North Korea

North Korea produces only a small fraction of the refined copper in the Sino-Soviet Bloc. Output of 10,000 tons in 1960 was about the same as in 1959 and represented less than 2 percent of the total produced in the Bloc. As a result of putting into operation a new refinery, output in 1959 was more than twice that in 1958.

III. Trade

A. General

Both external and internal trade in copper are significant for the Sino-Soviet Bloc. Trade with the Free World consists almost entirely of imports by the Bloc and is important because of the chronic shortage of copper in the Bloc and the resulting dependence on supplies from the Free World. During the 1950's, imports from the Free World increased from one-tenth to nearly one-third of the supply of copper of the Bloc, and there is little or no reason to believe that the level of trade with the Free World will decline by 1965. Trade within the Bloc consists primarily of exports by the USSR to nearly all of the other countries and is important to these countries because the Soviet exports constitute a sizable share of the supply of copper in the other

Bloc countries. Trade in copper in the Sino-Soviet Bloc in 1959, both external and internal, is shown in Table 7.*

In 1948, as a result of a National Security Council decision, the US instituted export controls over the shipment of strategic materials to the Soviet Bloc. The US also urged other countries to follow suit, and in the latter half of 1949 a Consultative Group was formed, with representation from the US and several Western European countries. In 1950 the Consultative Group established a permanent Coordinating Committee (COCOM) in Paris as the working unit of the Consultative Group.**

In May 1951, copper in the form of ore, concentrate, scrap and old metal, and primary metal was placed under international control for the first time. Semifinished forms such as plate, sheet, and bare wire were placed under control in October 1951. All such forms of copper remained embargoed to the Sino-Soviet Bloc until mid-August 1954, at which time bare copper wire, 6 millimeters (mm) and less in diameter, was removed from the Embargo List (IL-I) for the Soviet Bloc and placed on the Watch List (IL-III). The control status of the other forms of copper for shipment to the Soviet Bloc remained unchanged, and all forms of copper continued to be embargoed to Communist China. In August 1958, COCOM removed all export controls from all forms of copper.

The form of copper purchased by the Sino-Soviet Bloc varied during the 1950's according to the export controls exercised by countries of the Free World over shipments to the Bloc. During 1951-54, when all copper shipments to the Sino-Soviet Bloc from the major Western producers were embargoed, a lively illegal trade in unwrought copper developed. After the removal of copper wire from IL-I in 1954, the Soviet Bloc could purchase wire in the world market at competitive prices, and, as a result, most of the copper trade consisted of legal shipments of wire. In 1955, copper wire, 6 mm and less in diameter, constituted about 80 percent of the total imports of copper by the Bloc. During the next 3 years, wire continued to be the principal form of copper imported by the Bloc, making up more than 80 percent of the total in each year. In 1959, the first year since 1950 that all controls over exports of copper from the Free World were removed, wire constituted no more than about 62 percent of the total imports by the Bloc.

---

* Appendix A, p. 40, below. Complete data on the trade of individual Bloc countries in 1960 is not expected to be available until mid-1961.

** The members of COCOM are Belgium, Canada, Denmark, France, Greece, Iceland, Italy, Japan, Luxembourg, the Netherlands, Norway, Portugal, Turkey, the UK, the US, and West Germany.

Imports of copper from the Free World have been accounting for a generally increasing share of the total new supply of copper in the Sino-Soviet Bloc since 1950. The quantity of copper, including unwrought copper and bare copper wire but excluding covered wire and cable, imported by the Bloc from the Free World in selected years and the percent of the new supply of copper in the Bloc accounted for by such imports are shown by the following figures:

Year	Quantity* (Thousand Tons)	New Supply** (Percent)
1950	31.5	10
1955	84.6	15
1956	117.4	20
1957	84.7	15
1958	207.9	29
1959	265.0	32
1960	200 to 250***	25 to 30

The decline in 1957 was principally the result of a sharp drop in imports by Communist China. In that year, China's imports declined to 3,000 tons from 27,000 tons in the previous year. A shortage of foreign exchange is believed to have been the reason for this decline.

In the absence of strategic trade controls on copper, and for as long as the capacity for producing copper in the Free World exceeds demand, the Bloc will be able to make its copper-buying activities coincide with its political objectives. For example, before mid-1958, when COCOM removed the embargo on copper, the USSR imported most of its copper from Western Europe. It was here that the USSR could purchase the embargo-free wire that generally is produced by industrialized countries. After all forms of copper were removed from the embargo lists, the USSR purchased large quantities of unwrought copper (which generally is the product of less industrialized countries) from the Federation of Rhodesia and Nyasaland.

* See Table 8, Appendix A, p. 42, below.
** Imports as a percent of production plus imports, from Table 8.
*** Preliminary estimate. Available evidence on copper trade in 1960, although incomplete, indicates that the level of imports in that year may have been lower than in the preceding year.

B. Between the USSR and the Free World

The USSR has been a net importer of copper for many years. In the years immediately preceding World War II, Soviet imports of copper probably were nearly equal to domestic production. Imports of copper by the USSR from the US alone in 1940 amounted to more than 50,000 tons, and from mid-1941 through mid-1945 the USSR imported about 400,000 tons of electrolytic copper, tubes, sheets, copper-base alloys, and copper wire and cable from the US under Lend-Lease Agreements. Information on imports of copper from the rest of the world during 1940-45 is not available.

In the years immediately following World War II, imports of copper by the USSR from the West were very small, but they have increased considerably since 1950. Currently they represent a large share of both the total imports of copper by the Sino-Soviet Bloc and the total new supply of copper in the USSR. Soviet imports of copper were about 120,000 tons in 1959, which was 45 percent of the total imported by the Bloc. In terms of value, imports of copper amounted to 41 percent of Soviet imports of all nonferrous metals and minerals in 1959.*

The principal factor influencing the level of Soviet imports of copper probably has been and will continue to be the alternative costs to the USSR of increasing domestic production of copper or purchasing such copper from other countries. To increase production of copper as much as would have been required to eliminate imports, the USSR would have had to make large investments in new production capacity. Rather than use so much of the nation's resources for such expansion, the USSR appears to have chosen the second alternative, that of purchasing copper from other countries. The economic advantage to the USSR of producing and exporting other commodities and importing copper is illustrated by the following tabulation of internal prices (which presumably reflect costs) of copper and crude oil in the USSR and the Free World (as represented by prices in the US) for 1959**:

* See Table 9, Appendix A, p. 43, below.

** Comparable figures for the cost of production for copper and crude oil in the USSR and the US are not available; figures on internal prices, however, are available, with the exception of crude oil in the USSR. The figure for Soviet crude oil is for the national average cost of production. Neither the use of price data to reflect costs nor the fact that prices in the two economies reflect different considerations is believed to affect greatly the conclusions suggested above. Whereas the market price in the US tends to reflect the cost of the last unit of production in the economy, price in the USSR tends to reflect the average cost of all firms in the industry. [footnote continued on p. 27]

	USSR (Rubles per Ton)	US (US $ per Ton)
Copper	6,600*	680 52/
Crude oil	114 53/	21 54/

On the basis of the figures in the tabulation above, the cost in the USSR of producing 1 ton of copper is equivalent to the cost of producing 58 tons of crude oil, whereas in the Free World it is equivalent to 32 tons of crude oil. Thus for a given ruble expenditure the USSR obtains nearly twice as much copper by exchanging Soviet crude oil for copper in the Free World as it could obtain if it produced more copper and less crude oil.

C. Between Communist China and the Free World

Only one Bloc country, the USSR itself, imported more copper from the Free World in 1959 than Communist China. Chinese imports in that year amounted to about 89,300 tons and made up 34 percent of the total imported by the Bloc. Imports from the Free World provided an even larger share of the supply of copper in Communist China than they did in the USSR in both 1958 and 1959 -- approximately 62 percent in each year. Furthermore, in terms of value, imports of copper in 1959 represented about three-fourths of the value of all nonferrous metals and minerals imported. Virtually all of the copper imported by China is refined copper, and most, probably more than 75 percent in 1959, is in the form of wire.

D. Between the European Satellites and the Free World

The European Satellites imported 55,300 tons of copper from the Free World in 1959, or about 21 percent of the total imports by the Bloc. These imports provided about 29 percent of the new supply of copper in the European Satellites. Czechoslovakia and Poland imported the largest quantities from the Free World in 1959, about 19,000 tons each. As in the USSR and Communist China, imports of

---

Thus the price of these commodities in the USSR is lower than it would be if it were based on the costs of the marginal producer. In the above example this would make no difference, however, if the prices of copper and crude oil in the USSR are lower by the same percentage.

* The figure is for 1955, but it is believed to have been about the same in 1959. 51/

copper constitute a large part of the imports of all nonferrous metals and minerals -- for example, in 1959 about 42 percent of the value of Polish imports of nonferrous commodities was represented by copper. Most of the copper imported by the European Satellites, like that imported by the rest of the Bloc, is refined copper.

E. Within the Sino-Soviet Bloc

Trade in copper within the Sino-Soviet Bloc consists primarily of the export of refined copper from the USSR to most of the other countries of the Bloc. During 1955-59 the USSR exported a total of nearly 300,000 tons of copper to the rest of the Bloc. Czechoslovakia and East Germany have received the largest share of Soviet copper exports, together accounting for nearly two-thirds of the total. Other shipments of copper within the Bloc are negligible -- Albania exports about 1,000 tons of blister copper, and North Korea exports a few hundred tons, probably refined copper.

The copper received from the USSR in 1959 represented 34 percent of the new supply of copper of the European Satellites. These imports were approximately equal to the imports received by the Satellites from the Free World. The relationship of Soviet exports of copper to both the total imports and the total new supply of copper in the Satellites in 1959 is shown by the following percentages:

	Imports of Refined Copper from the USSR	
Importing Country	As a Percent of Total Imports of Copper*	As a Percent of Total New Supply of Copper**
Albania	100	100
Bulgaria	49	12
Czechoslovakia	51	43
East Germany	90	37
Hungary	37	31
Poland***	27	19
Rumania	65	48

* From data in Table 7, Appendix A, p. 40, below.

** From data on production in Table 1, p. 10, above, and from data on trade in Table 7.

*** Poland did not import refined copper from the USSR but did import 7,000 tons of blister copper, which probably is reflected in the figure for production of refined copper in Poland. The figure indicating imports from the USSR as a percent of total imports has been calculated on the basis of imports of blister and [footnote continued on p. 29]

IV. Supply-Consumption Relationship

With the exception of Bulgaria, the countries of the Sino-Soviet Bloc have not published figures for any recent year on consumption of copper in each country as a whole or on the amount consumed by any major industry. In the absence of such figures, resort to indirect methodologies is necessary to estimate consumption.

One methodology assumes that over a period of years consumption is about equal to production plus imports minus exports. This equation would represent actual consumption provided no withdrawals from or additions to stocks were made. Although there is no information on changes in the levels of stocks of copper in the Bloc, they are believed to have declined, mainly in the USSR, in the postwar period. This belief is based on two considerations. First, the USSR is known to have emerged from World War II with an exceptionally large stockpile of copper. Second, abundant evidence is available that the copper needs of a variety of industries and plants have not always been satisfied. With a large stockpile of copper on hand, it is reasonable to assume that the USSR withdrew some quantities from time to time. In view of these conditions, estimates of consumption based on the equation "production plus imports minus exports," and shown in Table 4* as "Minimum Consumption," probably somewhat understate actual consumption.

Another methodology can be used to estimate actual consumption of copper in the Bloc. In the US, there is an observable direct relationship between the consumption of steel and copper.** The relationship is explained by the specific properties of copper that make it complementary to steel rather than competitive, as copper is with aluminum. Several statistical methods, including correlation analysis, were used to evaluate the significance of the relationship between production of steel*** and consumption of copper. As a result of the findings for other industrialized countries, it was concluded that in a large industrial country such as the USSR production of crude steel could be used as a basis for estimating consumption of copper. Similarly the total production of crude steel in all other countries of the Sino-Soviet Bloc is considered to be an acceptable basis for

---

refined copper, but the figure indicating imports from the USSR as a percent of new supply has been calculated on the basis of production plus imports of refined copper only.

* Table 4 follows on p. 31. See also the chart, Figure 5, following p. 32.

50X1

*** Estimated to be virtually equivalent to consumption for most industrialized countries.

estimating consumption of copper in these countries.* Based on its relationship to production of steel, consumption of copper in the Sino-Soviet Bloc in 1950 and 1955-60 would have been as shown in Table 4.

Whereas the computation "production plus imports minus exports" probably understates the actual consumption of copper in the Bloc, the use of the rate of increase in production of crude steel is believed to overstate consumption of copper. As can be inferred from the data in Table 4, satisfying the consumption estimated on the basis of production of crude steel would have been possible only by withdrawing annually significant tonnages of copper from the stockpile. During 1950-60, such withdrawals probably would have reduced the stockpile below what is considered to be a minimum level of about 1 year's consumption requirements. The conclusion that can be drawn from these two approaches is that the actual consumption of copper in the Bloc over the period 1950-60 was somewhere between the figures yielded by the two methods. With the exceptions of 1957, when Communist China reduced sharply its purchases of copper from the Free World because of a shortage of exchange, and 1960, which is only a preliminary estimate, imports of copper by the Bloc were such as to bring the total new supply within 91 to 97 percent of the consumption estimate derived from production of steel. Allowing for some withdrawals from stocks during the period, an estimate that about 95 percent of this amount was actually consumed appears to be reasonable.

---

* To obtain some idea of the reasonableness of this conclusion, data on production of crude steel and estimates (believed to be reasonably good) of consumption of copper in East Germany, the only Bloc country for which such data were available, were analyzed for the 9-year period 1950-58. The coefficient of correlation, r, for these data was 0.99, and the coefficient of determination, r^2, was 0.98. Using the production of steel as the independent variable, X, and the consumption of copper as the dependent variable, Y, the equation for the regression line was as follows:

$$Yc = a + bX$$

where

$$a = 20.81$$

and

$$b = 0.00815$$

The statistical relationship between the two sets of data justifies the use of figures on production of steel to estimate consumption of copper.

Table 4

Estimated Relationship Between Supply and Consumption of Copper in the Sino-Soviet Bloc a/
1950, 1955-60, and 1965 Plan

Thousand Metric Tons

Year	Domestic Production b/	Imports from the Free World c/	Total New Supply d/ (Minimum Consumption)	Consumption Based on Copper/Steel Ratio e/	Minimum Consumption as a Percent of Consumption Based on Copper/Steel Ratio
1950	294	32	326	360	91
1955	462	85	547	580	94
1956	476	117	593	635	93
1957	486	85	571	674	85
1958	515	208	723	748	97
1959	559	265	824	863	95
1960	615	225 f/	840	974	87
1965 Plan	1,084	N.A.	N.A.	1,433	N.A.

a. See also the chart, Figure 5, following p. 32.
b. From Table 1, p. 10, above.
c. From Table 8, Appendix A, p. 42, below.
d. Sum of production and imports.
e. From Table 10, Appendix A, p. 44, below.
f. Midpoint of range.

The data in Table 4 also suggest that the Sino-Soviet Bloc will continue to import copper from the Free World at least through 1965. Planned output in that year is to be about 1.08 million tons, which is about 350,000 tons less than the estimate of consumption based on production of steel. If the Bloc continues to consume about 95 percent of the amount estimated from production of steel, and if all the production goals were achieved, imports of copper from the Free World in 1965 would be about 280,000 tons.

If Bloc imports of copper are not to rise significantly above the 1959 level during the next 5 years, production plans will have to be met. Adequate copper resources are believed to have been discovered within the Bloc to support an annual production of more than 1 million tons of copper, but such a level of output will require an expansion of capacity in all sectors of the copper industry, perhaps to nearly double that currently in existence. However, whether the Bloc can provide sufficient capital and physical resources to achieve this doubling in such a short period of time is problematical. In the past, such plans have failed repeatedly, and in the first 2 years of the present plan construction is reported to be lagging.

Although the Bloc has been able to satisfy most of its more pressing needs for copper with imports from the Free World, various Bloc leaders have expressed displeasure at having to spend such large quantities of foreign exchange to do so. Typical of this sentiment was a speech by Khrushchev in June 1959 in which he complained that the USSR spends considerable gold to purchase badly needed copper. He charged that copper is wasted in production of nonessential items and that aluminum and plastics ought to be used wherever possible.

The attempt to find substitutes for copper is being taken seriously, as indicated by the fact that during 1959-65 more than 1 million tons of aluminum are to be used in the electrical networks of the USSR, partly as a substitute for copper as a conductor and partly as a substitute for lead as a sheathing material. Some indication of the importance of this substitution may be inferred from a Soviet statement that the utilization of aluminum and plastics in production of cable will save up to 10 billion rubles and will conserve more than 400,000 tons of lead and more than 400,000 tons of copper during the Seven Year Plan. Furthermore, the USSR appears to be willing to expend the effort necessary to obtain this aluminum. Whereas production of copper during 1959-65 is to be increased by 90 percent, production of aluminum is to be increased by 180 to 200 percent. Moreover, the investment in the aluminum industry is estimated to be about 20 billion rubles, or about twice that in the copper industry. The reason for the relatively greater emphasis being given to the aluminum industry is the lower cost of producing aluminum.

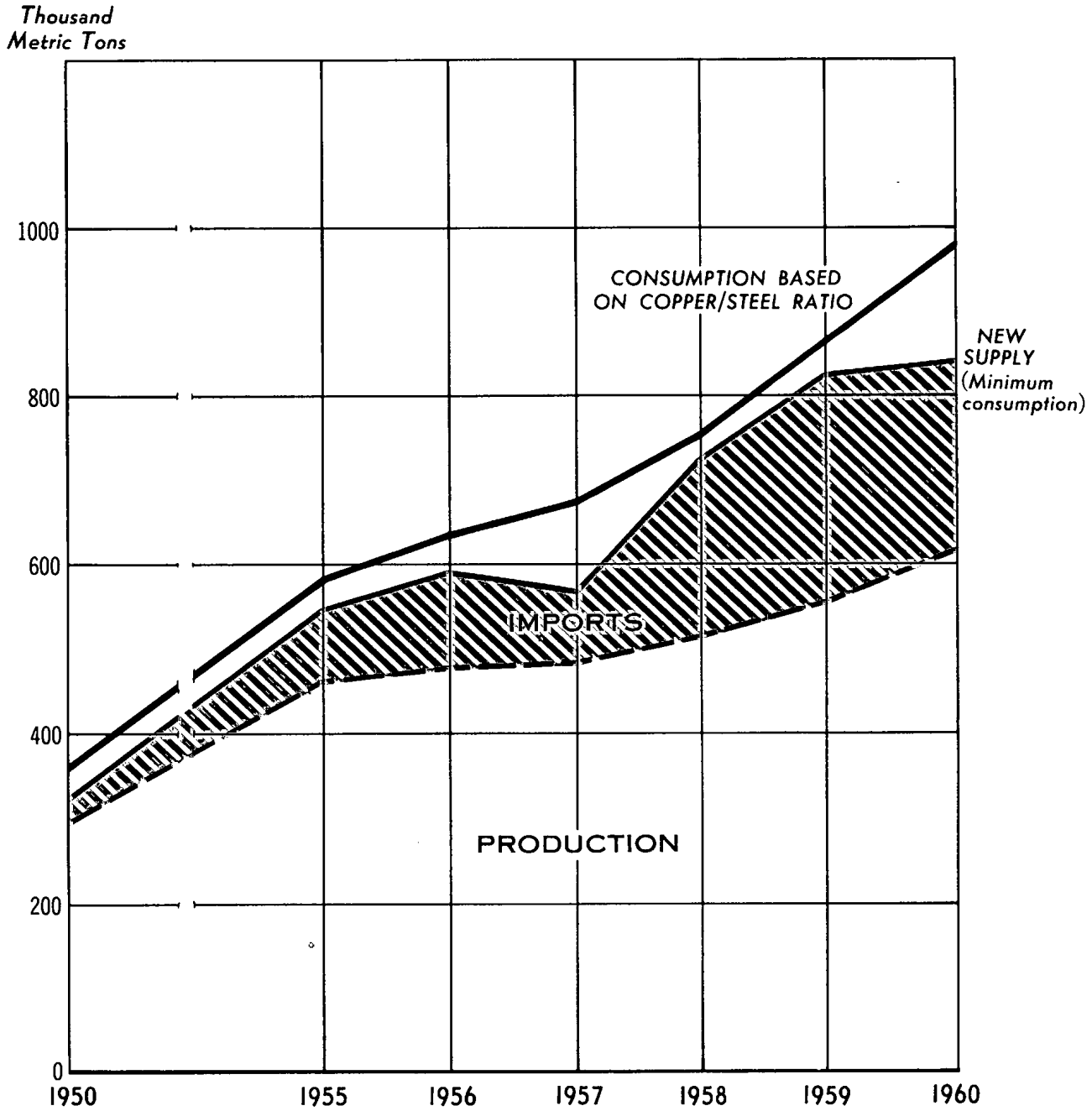
50X1

Figure 5 50X1

SINO-SOVIET BLOC

ESTIMATED RELATIONSHIP BETWEEN SUPPLY AND CONSUMPTION OF COPPER

1950 AND 1955-60



29651 3-61

50X1

[redacted] the cost of producing copper in the USSR is higher than the cost of producing aluminum -- for example, the cost of copper has been reported [redacted] to be 11 to 14 percent higher than the cost of aluminum. 56/ The advantage of aluminum over copper becomes even more pronounced when it is considered that in some applications -- for example, in electrical wire -- 1 ton of aluminum replaces nearly 2 tons of copper. 50X1 50X1

APPENDIX A

STATISTICAL TABLES

Table 5

Expansion of the Copper Industry of the USSR During the Seven Year Plan 1959-65

Area and Location	Mining and Concentrating	Smelting	Refining
Armenian SSR			
Agarak	Construction of combine to be completed		
Akhtala	Concentrating plant to begin operating		
Alaverdi		Probably will expand capacity	To increase capacity by 80,000 tons above present capacity of 20,000 tons
Dastakert	Combine to be expanded		
Kadzharan	Capacity of concentrating plant to be increased by 50 percent		
Urals			
Bashkir	Second and third sections of concentrating plant to be completed		
Gay	Concentrating plant under construction		
Mednogorsk	Combine to be reconstructed		
Uchaly	Combine to be expanded		
Volkov	Combine to be constructed		
Kazakh SSR			
Balkhash	Capacity of the entire plant to be increased by 50 percent		
Bozshakul'	Mining-concentrating combine to be completed		
Chetyr-Kul'sk	Combine to be constructed		
Dzhezkazgan	Existing concentrating plant to be reconstructed and a new concentrating plant to be built	Smelter to be constructed	
Nikolayevsk	Combine to be constructed		
Uzbek SSR			
Almalyk	Combine for mining, concentrating, smelting, and refining to be constructed		
Kola Peninsula	None	None	None
Moscow	None	None	None
Krasnoyarskiy Kray			
Noril'sk	Capacity of combine to be doubled; copper expansion unknown but perhaps about 30 percent		

Table 6

Copper Smelters and Refineries in the Sino-Soviet Bloc
1960

Name and Location	Type of Facility and Estimated Capacity (Thousand Metric Tons) Smelter	Refinery	Remarks
USSR			
Alaverdi Copper and Chemical Combine	20	20	
Almalyk Metallurgical Combine (	N.A.	N.A.	Combine under construction
Balkhash Mining and Metallurgical Combine	200	180	
Bashkir Copper-Sulfur Combine at Baymak	4		
Dzhezkazgan Mining-Metallurgical Combine	N.A.		Smelter under construction
Irtysh Polymetallic Combine at Glubokoye	25		
Karabash Mining-Metallurgical Combine	15		
Karsakpay Copper Smelter	50		
Kirovgrad Copper-Chemical Combine	25		
Krasnoural'sk Copper Smelting Combine	35		
Kyshtym Electrolytic Copper Plant		50	
Mednogorsk Copper-Sulfur Combine	15		
Monchegorsk Nickel-Copper Combine	10		
Moscow Copper Smelting and Electrolytic Plant imeni Molotova	50	50	Operations based primarily on scrap
Noril'sk Mining and Metallurgical Combine	50	50	
Pyshma Electrolytic Copper Plant at Verkhnyaya Pyshma		180	
Sredne Ural'sk Copper-Smelting Plant at Revda	30		
Total capacity of the USSR	529	530	
European Satellites			
Albania			
Rrubig Copper Smelter	1		Capacity may be doubled by 1965
Bulgaria			
Eliseyna Copper Foundry	6		
Copper Smelter and Refinery "Georgi Damyanov" at Pirdop	15	15	Capacity to be doubled by 1965

50X1

Table 6

Copper Smelters and Refineries in the Sino-Soviet Bloc
1960
(Continued)

Name and Location	Type of Facility and Estimated Capacity (Thousand Metric Tons) Smelter	Refinery	Remarks	
European Satellites (Continued)				
Czechoslovakia				
Banska Bystrica Copper Plant		8		50X1
Krompachy Copper Smelter	4		Operations based on scrap and ore	
Ostrava Copper Smelter	4		Operations based on scrap and ore	
East Germany				
Plants of the VEB Mansfeld-Huetten-Kombinat Wilhelm Pieck				
August Bebel Smelter at Helbra	8			50X1
Bessemerei Copper Smelter at Hettstedt	15		Operations based primarily on scrap	
Electrolytic Refinery at Hettstedt		33		
Karl Liebknecht Smelter at Eisleben	12			
VEB Kupfer und Blechwalzwerk Michael Niederkirchner at Ilsenburg	10	10	Operations based primarily on scrap	50X1
VEB Berliner Metallhuetten und Halbzeugwerke at Berlin-Schoeneweide	2	2	Operations based primarily on scrap	50X1
Hungary				
Metallochemia Plant at Nagyteteny	5	5	Operations based primarily on scrap	50X1
Poland				
Legnica Copper Smelter and Refinery	13	13	Ultimate capacity to be 25,000 tons	50X1
Szopienice Nonferrous Metals Combine		10		
Trzebinia Zinc Smelter	5			

Table 6

Copper Smelters and Refineries in the Sino-Soviet Bloc
1960
(Continued)

Name and Location	Type of Facility and Estimated Capacity (Thousand Metric Tons) Smelting	Refinery	Remarks
European Satellites (Continued)			
Rumania			
Gheorghe Doja Plant at Zlatna	2	5	
Gheorghiu Dej Metallurgical and Chemical Plant at Baia-Mare	2		
1 Mai Lead Plant at Firiza	1		
Total capacity of the European Satellites	105	101	
Asian Bloc			
Communist China			
Chungking Copper Plant		2	Operations based primarily on scrap
Chiang-an Copper Plant		2	
T'ung-ch'uan Copper Combine	N.A.	N.A.	Under construction; scheduled to be completed by 1962
Canton Copper Plant		1	Operations based primarily on scrap
K'un-ming Copper Plant		2	
Kuei-yang Copper Plant		5	
Pai-yin Copper Combine near Lan-chou	N.A.	N.A.	Under construction; may be completed in 1962
P'eng-hsien Copper Combine	N.A.	N.A.	Under construction; scheduled to be completed by 1962
Shanghai Copper Plant		3	Operations based primarily on scrap
Shao-kuan Copper Combine	60	60	Believed to be operating but probably not at designed capacity
Mukden (Shen-yang) Copper Plant	15	15	
T'ung-ling (T'ung-kuan-shan) Copper Combine	N.A.	N.A.	Under construction; scheduled to be completed by 1962
North Korea			
Hungnam Copper Refinery		4	
Nampo Copper and Zinc Plant at Chinnamp'o	10	6	
Total capacity of the Asian Bloc	85	100	
Total capacity of the Sino-Soviet Bloc	719	731	

Table 7

Trade in Refined Copper by the Sino-Soviet Bloc a/*
1959

Metric Tons

Exporting Country	Importing Country: Albania	Bulgaria	Communist China	Czecho-slovakia	East Germany	Hungary	North Korea	North Vietnam	Poland	Rumania	USSR b/	Total
Free World												
Belgium-Luxembourg		31	1,305	2,352	1,219	2,903			101	2,693	5,300	15,904
Canada			1,016			94					2,974	4,084
Federation of Rhodesia and Nyasaland			1,016						336		45,100	46,452
Finland				508					3,064		3,800	7,372
France		148	3,216					20			4,559	7,943
Netherlands			581									581
Sweden											6,800	6,800
Turkey				500							1,000	1,500
Uganda											10,900	10,900
UK		966 c/	20,706	9,131 c/	711 c/	3,347			10,105	178	26,300	71,444
Union of South Africa											300	300
West Germany		273	61,310	6,739	674 d/	2,015	262		3,978	1,067	13,100	89,418
Other		58	190	177	15	474			1,416 e/			2,330
Total Free World	0	1,476	89,340	19,407	2,619	8,833	262	20	19,000 f/	3,938	120,133	265,028

* Footnotes for Table 7 follow on p. 41.

Table 7

Trade in Refined Copper by the Sino-Soviet Bloc a/
1959
(Continued)

Metric Tons

Exporting Country	Importing Country: Albania	Bulgaria	Communist China	Czecho-slovakia	East Germany	Hungary	North Korea	North Vietnam	Poland	Rumania	USSR b/	Total
Sino-Soviet Bloc												
Albania											300	300
North Korea									60		400	460
USSR b/ g/	235	1,443		19,800	23,500	5,200		437	7,000	7,256		64,871
Total Sino-Soviet Bloc	235	1,443	0	19,800	23,500	5,200	0	437	7,060	7,256	700	65,631
Total imports	235	2,919	89,340	39,207	26,119	14,033	262	457	26,060	11,194	120,833	

50X1

b. 58/

50X1

d. Calculated from value figures published in source 60/. Tonnages are derived on the basis of an estimated average value of $700 per ton for semi-manufactured copper products and $600 per ton for copper wire.
e. Residual.
f. Poland reported imports of about 26,000 tons in 1959. 61/ Inasmuch as imports from the USSR totaled 7,000 tons, imports from the Free World must have totaled about 19,000 tons.
g. All exports by the USSR were refined copper except the 7,000 tons to Poland, which were blister copper, and 1,540 tons to Rumania, which were brass and bronze.

Table 8

New Supply of Copper in the Sino-Soviet Bloc
1950 and 1955-60

Thousand Metric Tons

	1950	1955	1956	1957	1958	1959	1960
Sino-Soviet Bloc							
Production	293.6	462.3	475.5	485.8	514.8	558.9	614.7
Imports from the Free World	31.5	84.6	117.4	84.7	207.9	265.0	200 to 250 a/
Total new supply	325.1	546.9	592.9	570.5	722.7	823.9	814.7 to 864.7
USSR							
Production b/	246.6	377.3	386.7	396.4	406.3	416.5	426.9
Imports from the Free World c/	8.1	45.2	58.0	67.8	109.6	120.1	N.A.
Total new supply	254.7	422.5	444.7	464.2	515.9	536.6	N.A.
European Satellites							
Production b/	40.1	68.2	72.4	72.2	69.6	77.4	87.8
Imports from the Free World c/	16.5	36.8	32.4	13.9	41.2	55.3	N.A.
Total new supply	56.6	105.0	104.8	86.1	110.8	132.7	N.A.
Asian Bloc							
Production b/	6.9	16.8	16.4	17.2	38.9	65.0	100.0
Imports from the Free World c/	6.9	2.6	27.0	3.0	57.1	89.6	N.A.
Total new supply	13.8	19.4	43.4	20.2	96.0	154.6	N.A.

a. Preliminary estimate. Available evidence on copper trade in 1960, although very incomplete, indicates that the level of imports in that year may have been lower than in the preceding year.
b. From Table 1, p. 10, above.

[redacted] The figures for 1959 were derived from Table 7, p. 40, above.

50X1
50X1

Table 9

Value of Imports of Copper and Nonferrous Metals and Minerals by the USSR
1955-59

Million Current US $

	1955	1956	1957	1958	1959	Total 1955-59
Value of imports of copper a/	55.0	60.5	61.6	80.0	74.3	331.4
Value of imports of nonferrous metals and minerals b/	137.7	152.2	139.6	143.7	180.7	753.9
Value of imports of copper as a percent of value of imports of nonferrous metals and minerals	39.9	39.8	44.1	55.7	41.1	44.0

50X1

b. 63/

Table 10

Estimated Consumption of Copper in the Sino-Soviet Bloc
Selected Years, 1931-60, and 1965 Plan

	Steel Production		Copper Consumption (Thousand Metric Tons)	
	Quantity a/* (Million Metric Tons)	Index (1931-35 + 1938 = 100)	Unadjusted b/	Adjusted c/
USSR				
1931-35 + 1938 (base period)	58.8		577.6 d/	
1931-35 + 1938 (annual average)	9.8	100	96.3	96.3
1950	27.3	279	268.7	268.7
1955	45.3	462	444.9	418.2
1956	48.6	496	477.6	448.9
1957	51.0	520	500.8	470.8
1958	54.9	560	539.3	506.9
1959	59.9	611	588.4	553.1
1960	65.3	666	641.4	602.9
1965 Plan	88.5 e/	903	869.6	817.4
European Satellites and Asian Bloc				
1931-35 + 1938 (base period)	22.4			
1931-35 + 1938 (annual average)	3.7	100	36.7 f/	36.7

* Footnotes for Table 10 follow on p. 47.

Table 10

Estimated Consumption of Copper in the Sino-Soviet Bloc
Selected Years, 1931-60, and 1965 Plan
(Continued)

	Steel Production		Copper Consumption (Thousand Metric Tons)	
	Quantity a/ (Million Metric Tons)	Index (1931-35 + 1938 = 100)	Unadjusted b/	Adjusted c/
European Satellites and Asian Bloc (Continued)				
1950	9.3	251	92.1	92.1
1955	17.3	468	171.8	161.5
1956	20.0	541	198.5	186.6
1957	21.8	589	216.2	203.2
1958	25.8	697	255.8	240.5
1959	33.2	897	329.2	309.4
1960	39.9	1,078	395.6	371.9
1965 Plan	66.2 g/	1,789	656.6	617.2
Sino-Soviet Bloc				
1931-35 + 1938 (base period)	81.2			
1931-35 + 1938 (annual average)	13.5	100	133.0 h/	133.0

Table 10

Estimated Consumption of Copper in the Sino-Soviet Bloc
Selected Years, 1931-60, and 1965 Plan
(Continued)

	Steel Production		Copper Consumption (Thousand Metric Tons)	
	Quantity a/ (Million Metric Tons)	Index (1931-35 + 1938 = 100)	Unadjusted b/	Adjusted c/
Sino-Soviet Bloc (Continued)				
1950	36.6	271	360.4	360.4
1955	62.6	464	617.1	580.1
1956	68.6	508	675.6	635.1
1957	72.8	539	716.9	673.9
1958	80.7	598	795.3	747.6
1959	93.1	690	917.7	862.6
1960	105.2	779	1,036.1	973.9
1965 Plan	154.7	1,146	1,524.2	1,432.7

Table 10

Estimated Consumption of Copper in the Sino-Soviet Bloc
Selected Years, 1931-60, and 1965 Plan
(Continued)

a. [redacted] Figures for 1960 are preliminary data. Figures for the Sino-Soviet Bloc are the sums of those for the USSR and for the European Satellites and the Asian Bloc combined. 50X1 50X1

b. Steel production index multiplied by the average annual consumption of copper in the base period.

c. For 1951-55, the copper consumption index in the US rose only 0.94 for every 1.0 rise in the steel production index. The copper consumption index of the Sino-Soviet Bloc countries has been adjusted to reflect this same phenomenon by multiplying the unadjusted copper consumption figures for 1955 and subsequent years by 0.94.

d. Consumption of copper is estimated to have been equal to the supply of copper in the base period. The supply of copper was 577,600 tons. 67/

e. Midpoint of range.

f. The difference between the figure for the Sino-Soviet Bloc and that for the USSR.

g. Excluding Rumania.

h. Consumption of copper by the Sino-Soviet Bloc in the base period is estimated to have borne the same relationship to consumption of copper by the USSR as did production of steel. Therefore, 58.8 million tons (Soviet steel) : 81.2 million tons (Bloc steel) :: 96,300 tons (Soviet copper) : X (Bloc copper).

Next 5 Page(s) In Document Denied