



The European minerals industry, EC 92 and Eastern Europe

By Magnus Ericsson,
The Raw Materials Group

The political and economic changes now taking place in Europe will have a major impact on the minerals industry. Magnus Ericsson analyses the present structure of the industry and how changes in ownership and control will affect global production and markets.

Introduction

Europe has again come into world focus both politically and economically.

The European Economic Community is creating the Single Market in 1993, aiming at a free flow of goods, services, capital and people between the member countries.

In Eastern Europe a political and economic revolution is taking place. A transition from a centrally planned economy, which has been rather isolated from the world market, to a more market oriented economy with increasing ties to and dependence on the international economic cycles has begun. In parallel political reforms are being pushed through at an unprecedented speed. This political process is already almost completed in East Europe and gaining momentum in the Soviet Union.

The barriers between Eastern and Western Europe are quickly disappearing. Traditional methods analyzing East and West Europe as two separate entities are quickly becoming out-dated and incorrect. The purpose of this survey is to give a brief picture of *the European minerals industry* and to assess its power in a global perspective.

In this context it is important to underline that, in spite of glasnost and perestroika, it is still difficult to obtain reliable data on the Soviet and East European minerals industries. Further there is neither any theoretical model for, nor any practical experience with, a transition from a centrally planned economy to a market oriented one. Every analysis trying to take these changes into account must contain a certain degree of speculation.

Studying the history of Soviet and East European minerals industries will, however, facilitate an understanding of the present situation and also make suggestions for future trends more reliable.

THE EUROPEAN MINERALS PRODUCTION

The development of production between 1975 and 1989 of a selection of minerals in West and East Europe and the USSR is given in Table 1. West Europe includes Yugoslavia but excludes Turkey. East Europe covers Bulgaria, Czechoslovakia, East Germany, Hungary, Poland and Romania, ie the East European members of the *Council for Mutual Economic Assistance* (CMEA or Comecon) and Albania.

The production of the Soviet Union is given under a separate heading. An increasing part of the Soviet minerals production is located in the Asian parts of the country, east of the Ural mountain range. But it is not yet possible to separate production in the European part of the Soviet Union statistically. There are two other reasons, at least for the purpose of this survey, to consider the production extracted from the non-European republics of the USSR as part of the European production:

First, Siberia is part of the Russian Republic. Second, the economic and demographic center of gravity of the Soviet Union and earlier Russia has always been in the western, European parts of the country and the flow of minerals has gone from east to west.

In the future this situation may change and an east ward flow of mineral resources to Japan and the Pacific might get established. So far, however, only very few signs of such a development have materialized.

Europe by this definition accounts for between 15 and 40 per cent of total world production of the metals studied. Bauxite, copper and gold are all at the lower end, chromite and manganese at the high end, with iron ore, lead, nickel, platinum and zinc in the middle around 30 per cent. There is an important element of complementarity between East and West Europe, in that the metals which are produced in larger volumes in West Europe are low or missing on the

East European production palette and vice versa.

Total European production is declining or levelling off for all minerals. This is to be expected considering the long waves in mining that are gradually moving the production away from Europe. If the total production figure is broken down, production in both East and West Europe exhibits the same trends.

West Europe

There has been a decline in West European production of all the metals studied except nickel. The nickel production has been kept at a constant level with production increases in existing mines. Decline has been either continuous or only taken place in the last five years after a peak in the mid 1980s.

The USSR and East Europe

The Soviet Union covers 22 million km² and has the largest surface area of

all countries. The USSR is the world's leading producer of iron ore, lead, nickel, manganese and potash. It has a strong position in several other non-fuel minerals, such as chromite, copper, diamonds, gold, nickel, the platinum group metals and zinc. Nickel is the only metal for which Soviet production has increased during the 1980s, measured as a percentage of the total world production.

The geographically much smaller countries of East Europe, with an area of only 1 million km² have also been developing important mineral industries.

While they have less than a third of the West European population and cover only a quarter of the area of West Europe, they produce 50 per cent more chromite and 20 per cent more copper than the West European countries.

Further, the East European countries have a bauxite production which is 40 per cent of the West European produc-

tion. In iron ore, lead and zinc the production has been declining rapidly, but is still around 15 per cent of the West European production of these minerals.

Albania is the fifth largest producer of chromite in the world.

Hungary has since long been an important producer of bauxite at least in a European context.

Poland's mine output of copper is of the same magnitude as that of Zaire.

Bulgaria and Romania also have fairly strong mineral industries but they are both high cost producers. Lacking a sufficient domestic resource base, the mining industries of these two countries have been stagnant during the last years.

East Germany and Czechoslovakia have mainly been importers of metallic minerals.

On the whole, the East European mineral production has been contracting more rapidly than that of the West Europe during the 1980s.

Table 1
Mine production of selected minerals in Europe 1975 - 1989
(in per cent of world production)

	1975				1984				1989			
	WE	EE	USSR	Tot	WE	EE	USSR	Tot	WE	EE	USSR	Tot
Bauxite	10.2	4.7	8.5	23.4	8.0	3.8	7.0	18.8	6.0	2.6	6.6	15.2
Chromite	2.9	9.4	26.6	38.9	5.1	7.4	30.0	42.5	4.6	6.9	26.8	38.3
Copper	4.0	5.0	15.0	24.0	3.9	6.9	14.3	25.1	3.6	4.3	10.9	18.8
Gold	1.1	0.2	19.6	20.9	1.4	0.2	18.8	20.4	1.0	0.2	15.3	16.5
Iron ore	13.0	1.1	19.5	33.6	6.5	0.8	28.2	35.5	4.6	0.7	24.5	29.8
Lead	12.1	5.9	16.6	34.6	12.6	5.2	17.1	34.9	10.9	1.3	15.1	27.3
Manganese	0.4	0.9	36.8	38.1	0.5	0.5	43.7	44.7	0.4	0.5	41.2	42.1
Nickel	2.9	0.0	17.2	20.1	3.3	0.9	23.4	27.6	3.5	0.9	24.7	29.1
Platinum	0.0	0.0	32.7	32.7	0.0	0.0	27.6	27.6	0.0	0.0	26.6	26.6
Zinc	13.1	5.4	16.7	35.2	16.7	4.3	14.9	35.9	13.7	2.3	13.4	29.4

WE = Western Europe (including Yugoslavia, excluding Turkey); EE = Eastern Europe (European CMEA countries, excluding USSR).

Source:
RMG Data

CONTROL IN WEST EUROPEAN MINING

The mining industry has traditionally been much more international in terms of both production and ownership than most other branches of industry. In contrast to most other industry branches there is no particular attention paid by the mining industry to acquisitions and mergers to prepare for the changes inside the EEC after 1992. However all structural changes in the West European mining is monitored continuously by the Raw Materials Group. Using 1975 and 1984 as years of reference the developments up to 1989 is quantified in two ways:

1. Control of production in West Europe
2. West European companies control of mine output worldwide.

The analysis is based on eight minerals: bauxite, chromite, copper, gold, iron ore, lead, nickel and zinc. All percentage figures are related to the *total world production*.

It is important to differentiate between two basic concepts: control and ownership. Control can be exercised by many means of which ownership is the most common and important one. There are many other ways of exercising control for example through interlocking directorates, proprietary technology, long term contracts, financing and vertical integration. To be in control does not necessarily mean to have day-to-day influence over a company but rather a possibility to act decisively on strategically important issues.

Recently there has been a more pronounced interest in new mining technology. There are at present some signs of an emerging new structure within the industry manufacturing equipment for the minerals industry. Transnational mining companies like Trelleborg and Outokumpu are creating new, strong groups of equipment manufacturers and the industry on the whole is being concentrated. So far the equipment manu-

facturers have been independent from the mining companies. The new link between mineral producers and equipment producers and the increased R&D efforts in the minerals industry are two factors that together could lead to a situation where new innovations will not be generally available but proprietary technologies will be used as a competitive advantage.

Control over a mining operation exercised by its customers could be substantial, particularly if the customers are not so many and large buyers on the world market. This way of controlling mineral production is at present not measured in the RMG model. This gives a somewhat biased picture with Japanese companies appearing to weak in the international mineral industry. This is however only partly a methodological problem. It also gives a reflection of the Japanese dependency on foreign raw material sources. As is well-known long term contracts has been one important way for Japan to secure its mineral supply. There are however recent signs of that the Japanese strategy could be changing and more emphasis put on direct investments. The acquisition of parts of some US copper and iron ore mines and in the Australian iron ore industry are examples of what could become a new trend.

Method

The corporate structure in the mining industry is complex. Hierarchies of companies that own the mining companies have been formed over the years. The ultimate corporate owners on top of these hierarchies are often not producers themselves but holding companies. This intercorporate control in the minerals industry is measured by a method, developed by the Raw Materials Group.

1. Assess who has control over each mineral producing company or com-

pany which owns a mineral producer and establish control patterns (Fig 1). These controlling companies are those of their owners that fulfill certain criteria on ownership level and/or management contract.

2. Attribute systematically the operating mining companies' production to the controlling company or companies. The computerization of the model makes it, very easily, possible to change those control criteria and definitions and thus gives high flexibility. The criteria upon which an analysis is based can be chosen according to each specific situation.

All data are taken from the *Raw Materials Group* (RMG) Database on ownership, control and production of non-fuel minerals. The data are primarily based on corporate annual reports. For the 15 most economically important minerals more than 90 per cent of the Western world production is identified by company. In the present study we deal only with the mining stage of metal production, our data however also cover the refining stage for the most important base metals.

(For further details see Annex.)

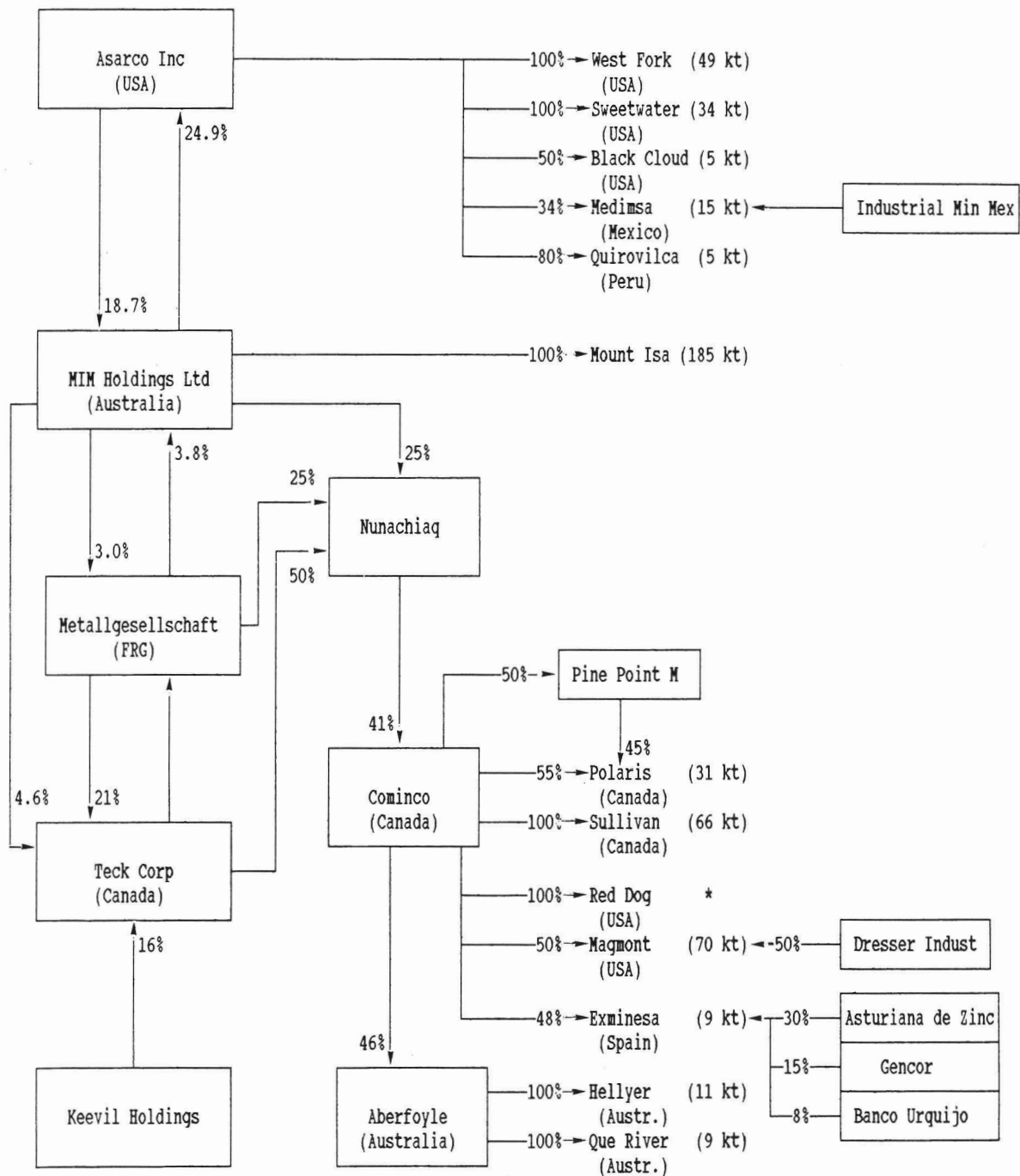
Control of production in West Europe

European mining companies control virtually all mining production in West Europe. The only foreign companies with any control over mineral production in Western Europe are Alcan in French bauxite, Cominco and Gencor both with interests in the Spanish lead/zinc producer Exminesa (Tab 2).

Control by West European companies

Total control is measured as a mean value (in per cent) of total world production controlled by West European companies. For the eight minerals under study it decreased from 1975 to 1984

Fig 1
Intercorporate control in the minerals industry – an example
Asarco, MIM, Teck and Metallgesellschaft relations
(Ownership per year-end 1989, production figures refer to lead content of 1989 concentrate production)



Source:
 RMG Data

but has been increasing. In 1989 West European control reached roughly the same level as in 1975 (Tab 3).

West European companies have their strongest position in *bauxite*, *nickel*, *lead* and *zinc*, where they control between 20 and 25 per cent of total world production. The most notable change during the late 1980s was the increase of European control globally in gold, nickel and zinc.

In nickel this was due to the takeover of the Canadian nickel producer Falconbridge by Boliden and Noranda. The French controlled nickel mines in New Caledonia have also increased their production considerably during this period.

Boliden has also gained increased control over the Canadian zinc industry through the Falconbridge holdings in

Kidd Creek. Metallgesellschaft has also entered the Canadian zinc scene by acquiring part of Cominco.

When looking at the distribution of European control geographically the trend away from Europe is obvious in all metals.

The European mining transnationals control important parts of the *Australian* mineral production; 40 per cent of the bauxite production, 17 per cent of copper, 11 per cent of gold, 43 per cent of iron ore, 29 per cent of lead and 33 per cent of the zinc production.

In *Canada* there has been a strong growth of European controlled share of production particularly in copper, lead, zinc and nickel where European control is up to respectively 23, 15, 19 and 8 per cent of total Canadian production. It

is once again the activities of Boliden and Metallgesellschaft which gives these increased shares.

In *the USA* there has been a decrease in European controlled part of the copper production which is down from 25 per cent in 1984 to 18 per cent in 1989. This is due to the revival of the US controlled domestic copper producers having raised their production sharply after the bottom level in the mid 1980s.

There has also been a strong increase in European control over gold production, the fastest growing sector of the American minerals industry. This development is mainly explained by the British Hanson group taking full control over Consolidated Goldfields.

Table 2
Control of West European mine production by West European and foreign companies (in % of total world mine production)

	1975	1984	1989
Bauxite	10.2	8.0	6.0
European	9.3	7.5	5.8
Foreign	0.9	0.5	0.2
Chromite	2.9	5.1	4.6
European	2.9	5.1	4.6
Copper	4.0	3.9	3.6
European	3.8	3.9	3.6
Foreign	0.2	-	-
Gold	1.1	1.4	1.0
European	1.0	1.4	1.0
Foreign	0.1	-	-
Iron ore	12.6	6.4	4.6
European	12.6	6.4	4.6
Lead	12.1	12.6	10.8
European	10.8	11.0	10.7
Foreign	1.2	1.6	0.1
Nickel	2.9	3.3	3.4
European	2.9	3.3	3.4
Zinc	13.1	16.6	13.7
European	11.3	12.6	13.4
Foreign	1.8	4.0	0.3

Table 3
West European companies' control of world mine production distributed on control of West European and foreign production (in % of total world mine production)

	1975	1984	1989
Bauxite	23.3	26.2	25.1
Europe/abroad	9.3/14.0	7.5/18.7	5.8/19.3
Chromite	6.3	8.1	7.4
Europe/abroad	2.9/3.4	5.1/3.0	4.6/2.8
Copper	7.8	11.7	10.5
Europe/abroad	3.8/4.0	3.9/7.8	3.6/6.9
Gold	13.8	4.3	8.7
Europe/abroad	1.0/12.8	1.4/2.9	1.0/7.7
Iron ore	17.5	13.4	12.3
Europe/abroad	12.6/4.9	6.4/7.0	4.6/7.7
Lead	17.1	17.3	19.7
Europe/abroad	10.8/6.3	11.0/6.3	10.7/9.0
Nickel	21.8	12.8	19.6
Europe/abroad	2.9/18.9	3.3/9.5	3.4/16.2
Zinc	14.8	16.3	21.9
Europe/abroad	11.3/3.5	12.6/3.7	13.4/8.5

USSR AND EASTERN EUROPE Introduction

The Soviet mining industry has been facing a number of escalating problems all through the 1980s. Some of the most urgent of these are:

- An unplanned decline in metals demand nationally.
- Pollution causing serious ecological disturbances.
- An increasing proportion of the mine output coming from Siberia with its severe climate and remoteness creating tremendous production and transport problems.

The political and economic reform program launched during the end of the 1980s is radically changing the general economic environment for the Soviet minerals industry and adding to the problems mentioned above which are not directly linked to the reform program.

What will these continuous and simultaneous changes mean to the future of the mineral industry of East Europe and the USSR? What levels will national mineral production reach during the 1990s? How will national consumption patterns develop? How will the changing supply/demand situation affect Soviet exports and imports? How will such changes in its turn affect the world market for minerals? Last but not least how will this all affect European and Japanese mining and smelting companies?

In spite of glasnost there is still a lack of mineral statistics from the Soviet Union. Hopes that the flow of information on key factors such as production, consumption and trade should increase have not yet been met. The statistics presented in this paper are all based on traditional Western sources, estimating most of the figures.

Four principles

The Soviet minerals policy has been based on four principles. To be able to understand the present situation it is

necessary to introduce these briefly. Inherent in these four principles are a number of basic problems which have been becoming more serious over the years. These problems will be introduced below but discussed at some length only later in the paper.

Principle	Problem
1. A centrally planned economy	Production not consumption oriented
2. High growth rates in mineral production	Pollution
3. High level of self sufficiency	High cost of extracting raw materials
4. International trade and cooperation within CMEA	

It is important to underline and to note that the USSR has adopted these basic four principles only as a part of the centrally planned economic system. They are also a response to other ideological and economic factors determined by the international environment such as the non-convertibility of the currency, the COCOM trade embargo for strategic products and the extensive economic development model chosen by the socialist countries based on a strong emphasis of the growth of the heavy industry.

1. Centrally planned economy

In the system with five year plans there are no direct links between production costs and prices. The minerals industry is guided by quantitative rather than qualitative goals. This system is one of the major, but not the only cause for an overconsumption and waste of raw materials through the production chain. These problems have been focused by Soviet planners for many years but have

been very difficult to cope with. In the mines recovery grades have been low, in the refineries yield of metal from concentrates has also been low and in the metals fabricating industry more metal has been consumed than in a comparable product of Western origin.

2. High growth rate in mineral production

From the end of the second world war up till the end of the 1970s the growth rate in the socialist countries mineral production has been phenomenal, albeit starting from a low level. Copper production has risen from 200 kt in 1950 to around 1 100 kt in the late 1970s, bauxite from 500 kt to 6 500 kt and iron ore from 43 Mt to 245 Mt in the same period.

Environmental problems both around mines and smelters and work environment inside the works are extremely serious. Pollution for example around the Norilsk complex, in the Kola peninsula and in Poland's copper district is devastating, leaving an ecologically dead landscape. The work environment has been also neglected as witnessed by Soviet coal miners on strike last summer.

3. High level of self sufficiency

Traditionally the Soviet Union has been self sufficient in most minerals and metals and there has been a balance between demand and supply. Figure 2 and 3. Only bauxite, molybdenum and tin have been imported in large quantities. The Soviet Union has been a net exporter of all other minerals and even among the world's largest exporters of chromium, manganese and potash. Trade in most other minerals is marginal to domestic consumption and production levels. For copper, aluminium, lead and zinc exports/imports represented less than 10 % of Soviet and East European consumption/production.

The economic planners have put high priority on self sufficiency, particularly

in strategically important metals. This policy is well illustrated by the bauxite, which is the only mineral sector which has had a different development:

- The only significant foreign direct investment by the Soviet Union to secure raw material supplies has been made in Guinea.
- The Soviet Union is the only country in the world to have exploited on a large scale non-bauxite sources for aluminium production.

The costs of self sufficiency have always been high and have recently been rising both in terms of capital input and operating costs needed to extract raw materials from sources not necessarily of the highest international standards and also located progressively to the east. Siberian aluminium production rose from zero in 1960 to 75 % of the total aluminium production in 1980. Nowadays also more than 80 % of the copper production takes place east of the Ural mountains.

4. International cooperation within CMEA

The Soviet Union has been the main supplier of raw materials to the East European countries since the second world war. Other CMEA members have also been supplied with Soviet raw materials. The bulk of Soviet minerals exports have been directed to East Europe in exchange for which the Soviet Union has received industrial goods.

Terms of trade in the intra CMEA trade has largely been to the disadvantage of the USSR. Setting of prices within the CMEA has always been a difficult problem, with no convertibility of currencies and little relation between costs and prices in any of the countries. The cost for the USSR of supplying East Europe with raw materials has been so high that the Soviets have demanded a gradual change towards prices based on world market prices. More or less dramatic rises in prices have been enforced at several occasions starting already in 1975 after the first OPEC oil price shock. The countries of

East Europe have further been favoured by rising terms of trade for their manufactured goods.

Within CMEA joint investment programmes have also been developed to supply the enormous amounts of capital needed to exploit the Siberian natural resources. These joint projects have however had serious problems and delays have been notorious. Altogether the efforts by the Soviet Union to decrease the high costs of supplying East Europe with mineral resources have not been very successful.

Present situation

As late as in the second half of the 1980s the official version of the Soviet raw materials policy was still in accordance with the brief outline given above. In spite of this it is obvious when looking in some more detail at the developments during the 1980s that the four basic goals of Soviet minerals policy were not fully reached and this situation started to emerge long before the perestroika was begun.

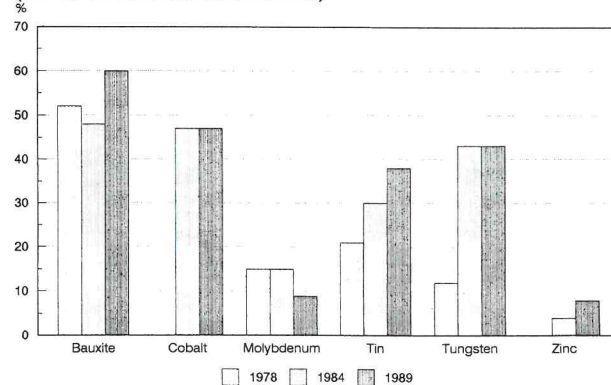
Growth rate has levelled off

The strong growth rate in the production of minerals levelled off already in the late 1970s and significant production increases during the 1980s has only taken place in nickel (See Table 1.)

For several minerals, eg bauxite and copper, even an absolute production decline has been recorded.

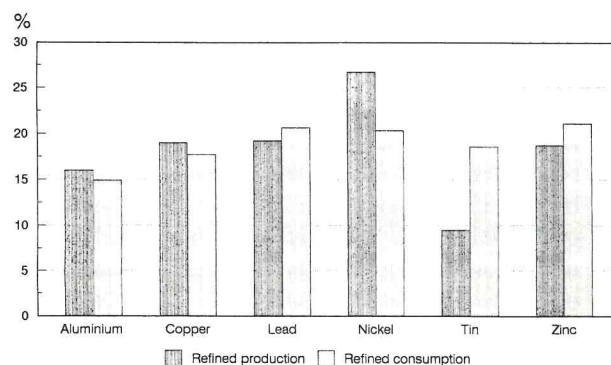
There are many reasons behind this gradual change. On the *supply* side the difficulties in extracting Siberian minerals have already been mentioned as well as the pol-

Fig 2
USSR: Net import reliance on selected minerals (in % of selected minerals)



Source: Mining Annual Review

Fig 3
Production and consumption of selected minerals in Eastern Europe and the USSR in 1988 (in % of total world production/consumption)



Source: World Bureau of Metal Sta-

lution problems caused by the minerals industry. There has also been an unplanned reduction in *demand* for most metals. The high metals *intensity of use* (IU) in comparison to Western economies has been one of the most striking features of metal consumption in the CMEA countries. A number of factors have been identified to work to reduce the IU of metals: the rising oil price, decline in the construction sector, government and enterprise "rationalization programmes" aiming at reduction of overconsumption and waste.

Level of self sufficiency has decreased

The level of self sufficiency has decreased and in 1989 the Soviet Union was a net importer of bauxite, cobalt, tungsten, tin molybdenum and zinc

In spite of these gradual policy changes in recent years it is however still important to mention and to underline that compared to West Europe, the US and certainly Japan, the Soviet Union is still much more self sufficient. The Soviet Union is only to a very limited degree reliant on mineral imports from Third World countries. In general the Soviet trade structure, with an important raw materials export, has more in common with the Third World minerals exporting countries than the industrialized countries.

CMEA cooperation in convertible currencies

The cost of supplying East Europe with raw materials has finally become so high that the Soviet Union has demanded to get paid in convertible currencies.

The necessity of this reform is also recognized by the East European countries, what is now discussed is the speed of the transformation. Gradually this will mean that the East European countries will have to rely on the world market for their supplies and will not necessarily import the bulk of their supplies from the Soviet Union. These Soviet ex-

port volumes could either be consumed in the USSR, sold on the world market or closed down because of too high environmental or other costs.

Future prospects

Based on these observations of recent changes in Soviet mineral production/consumption as well as in minerals policies it is possible to discuss at least in general terms the future prospects of the Soviet mineral industry. This discussion will be divided into two parts:

- What will be the likely production levels?
- Who will control the Soviet and East European post-perestroika minerals industry?

Production levels

Short term outlook

The time needed to transform the Soviet and East European industry from central planning to market economy is difficult to estimate. Most probably this process will last over several years and might not be completed until the end of this century. Probably problems encountered during this transition period will not be as severe as when moving the other way round after the revolution in 1917 when mineral production fell to almost zero during the early 1920s. The present situation in the Soviet Union is, however deteriorating quickly and in particular transport problems are reaching serious levels.

During this period there will certainly be disturbances in Soviet mineral production due both to the long term trends and problems discussed above and to the economic and political reforms. Of the former category the rising environmental problems and the increasing costs of raw materials production in Siberia are the most important. The environmental problems will cause some production facilities to close down. Some of the CMEA projects in

Siberia will probably have to be closed down or postponed due to that the East European countries do not want to participate any more but prefer other sources of supply independent of the USSR.

The perestroika will also cause short term problems before the necessary adjustments and organizational measures have been taken to make the former centrally planned companies change to react to market demands and not only to planners instructions. Many companies are run by bureaucrats, who will not automatically benefit from the changes taking place and who not only have problems in following the new economic decrees but also could actively oppose and block reforms. The present development with high inflation and increasing unemployment in both Poland and East Germany are examples of this. The rapidly deteriorating social and economic situation of the workers in the mineral industry, of which unemployment is only one example, will probably lead to strikes and other protests.

The national question with demands for self rule in several parts of the Soviet Union could also cause serious problems. There are for example important mineral deposits of both copper and bauxite in the Asian soviet republics where there has already been serious social and political conflicts. Most of the important mineral resources are however located within the Russian republic, which makes the problem a bit less difficult for the central government in Moscow.

Glasnost in itself, revealing details of earlier shortcomings and errors could also cause political and economic turbulence.

The combined effect of these factors will make export/import patterns and volumes change. The Soviet government will however try to minimize the influence of such disturbances on mineral exports/imports not to have a too dramatic effect on the availability of

foreign exchange. There are two main alternatives open to the Soviet government to limit the impact:

- Cut domestic consumption
- Reduce exports to CMEA

As has been shown above there has already been a fall in domestic consumption together with a reduction of exports to both the East European and to other members of the CMEA such as Cuba.

However, most of the Soviet mineral exports are still directed towards East Europe and there is probably room for considerable cut backs. It has also been suggested that the liquidation by industries in the centrally planned economies of excess inventories could become a new source of metal supply. Since stocks of raw materials have not been an economic burden like in a market economy there is reason to believe that considerable amounts of for example copper could become available. In addition the fact that both ways of dealing with the problem of declining production levels have already been tried and partly implemented makes it more plausible that the Soviet government will be able to deal with at least some of the shortages and minimize the disturbances of production shortfalls on exports at least in the short term.

Long term outlook

In a long term perspective where perestroika has transformed the USSR into a market economy it is even more difficult to make any quantitative predictions about production/consumption levels and hence on their effect on the Soviet exports/imports and the world market for metals.

However it is possible to list some of the main factors influencing the situation and to discuss them in qualitative terms. Some examples will be given from the copper and aluminium industries, which are among the most well known of the Soviet mineral industries.

Supply

Basically the production will be depending on ore grades and reserves. Available information on the existing reserves and the vast areas of Siberia which have not yet been fully explored seem to guarantee that there will be long term possibilities to continue metals production given that there are enough capital and other necessary resources such as new and improved, environmentally acceptable technology.

The high costs of producing from the Siberian ores could decline as the inflexible planning procedures will be replaced by managerial freedom and possibilities and incentives for mine managers to reduce costs.

The increased possibility of technology transfer through cooperation with foreign mining companies and access to the latest available technology could also decrease production costs considerably.

The resulting effect of these two factors will vary from metal to metal. In aluminium the decline in costs due to more effective production will probably not balance the problems of operating on non-bauxite resources but the production of aluminium raw materials inside the Soviet Union will diminish. In copper on the other hand the bright prospects which were foreseen in the late 1970s for the 1980s might very well materialize under new economic conditions and the production of copper could rise.

Demand

In a simplified model the consumption of metals in the Soviet Union and Eastern Europe can be assumed to be influenced by two main factors:

- The general economic expansion
- Level of overconsumption and waste

One of the aims of the perestroika is ultimately to increase overall economic growth which has been stagnant or even declining during the last years. A re-

sumed economic growth would result in an increased metal demand. The possibility to reduce overconsumption and waste would work in the opposite direction and lowers metal demand.

There is a high level of metal consumption per unit of GDP in the CMEA countries compared with the OECD countries. This gap in IU has also had a tendency to grow over time. In the case of steel the CMEA countries consume 2.6 times more per unit of GDP than the OECD countries, for other metals such as zinc, lead and nickel the consumption is 25-50 % higher. Aluminium and to some extent also copper are exceptions where the CMEA countries have a lower or almost equal IU to the OECD countries.

The high metal consumption is due to a number of factors of which some are attributable to the centrally planned economy some are not. Among the former should be mentioned that the centrally planned economies were designed to produce rather than save resources. Natural resources are considered as free goods resulting in a systematic underpricing of metals and other minerals. Such factors however only explain part of the overconsumption. Policy related factors such as the relatively large industrial sectors and the highly investment intensive structure of the economy together with the low share of services in GDP further explains the high metals IU. The military complex has been a large consumer of all Soviet resources including minerals and metals. The decreasing speed of the arms race between the USA and the USSR could give lower demand from the military sector for several metals.

This means that it is not enough to change the central planning system but that several policy changes must also be made such as de-emphasizing heavy industry and promoting the service industries to lower the metals IU.

When trying to summarize the combined effects of changes in demand both

the main factors, increased demand through increased general economic growth and decreased demand through lowered metals intensity of use, must be estimated. In the case of copper and aluminium there is not so much room for a lowered consumption as for the other metals such as steel, lead, zinc and nickel.

For aluminium even a slight increase in IU could be anticipated if the industrialized CMEA countries were to get the same levels of metals intensity of use as the OECD countries.

If we try to weigh both supply and demand factors together the USSR aluminium domestic consumption could grow leaving less metal for export which could increase the impact of lowered production of minerals containing aluminium and even further increase the USSR import demand for bauxite. The increased copper production could perhaps even be enough for an increased export.

Control of Soviet and East European minerals industry

The Soviet and East European mineral companies are at present all state owned and state controlled. As discussed above there are many ways to exert control. When examining Soviet control over its mining industry it is a matter of course that from most aspects there is full state control.

- The industry is 100 % state owned.
- The industry is highly centralized and production levels have been set by the 5 year plans.
- Imports and exports have been handled by specialized and centralized state trading organizations. The influence of the world market has been lowered further by the marginal volumes of trade and by that trade often has been made in barter deals.

- Capital for the expansion of Soviet and East European mining has been raised within these countries.
- No information on the minerals industries has leaked out.
- The only route through which there has been some influence by Western companies is through Soviet import of technology. There has been two main periods of technology imports over the years to the mining industry: when rebuilding the industry after the revolution in the late 1920s and early 1930s and later in the 1970s.

On the whole this system of state control in the minerals industry has been basically the same since the second world war.

Recently however there have been some important changes in this system as part of the economic reform program.

The Soviet Union no longer takes full state ownership as a principle without exceptions. Soviet ministers have been actively promoting foreign investment also in the field of minerals exploitation. Measures have been undertaken to facilitate the establishment of joint ventures between foreign and Soviet mining companies. Earlier limits and conditions to foreign share holding in joint companies have been removed or relaxed. So far however no major projects have been announced.

In East Europe there are plans to privatize also existing mining and metallurgical companies. Even if there are many basic problems yet to be solved such as Who should sell what to whom at what price? there have been rumors that both the Polish copper producer KGHM and the Hungarian bauxite and alumina producer, Hungalu, are at least partly up for sale. There has not yet been any signs of such sales in the USSR but they might come.

The central planning organizations have lost some of their earlier absolute control. In the mining and metallurgical industry a prime example is the merger

of Norilsk mining and metallurgical complex together with the Severonikel and the Pechenga Nickel complexes, the Olegorsk engineering works and the Krasnoyarsk non-ferrous metallurgical works to form the Norilsk Nickel group. Norilsk Nickel has been removed from direct ministerial control and placed under the control of the Council of Ministers.

This means that almost all Soviet production of platinum group metals, two thirds of nickel output and considerable amounts of copper and cobalt are not so tightly controlled by the planning bodies and ministries but that the management of the Norilsk Nickel group has been given a larger responsibility and has got a growing influence. These reforms are said by Soviet officials to reduce bureaucracy, consolidate management and improve the efficiency of the companies.

In the trade the Norilsk Nickel group is also allowed to export and import without engaging the usual state controlled trading companies. So far the attitude from the central Soviet organs to increased decentralization of trade in metals and minerals have been cautious primarily due to the large importance to the availability of foreign exchange of minerals exports, but this attitude could very well change in the near future.

The lack of capital for restructuring the Soviet and East European economies in general is well known. In the field of minerals capital from the East European countries has been an important source for the USSR which is already running dry. The East European CMEA members have already become partly integrated with the international financial system. Also the Soviet Union will have to turn to new sources for the supply of capital, both commercial banks and institutions such as the World Bank to finance its minerals industry. The urgent need for new technology including environmental technology and for replacement of outdated equipment

might even force the governments to sell out part of the mining industry to get the capital necessary for investments in less polluting technology.

Technology export is the oldest field of East-West cooperation hence it is an area in which there is considerable experience on both sides. During the 1970s there were several large projects involving technology exports carried through such as the Kostamus iron ore mine, the refurbishing of the Norilsk metallurgical combine and the construction of several aluminium plants. Even other projects concerning for example the joint Soviet Japanese exploitation of resources in the Far East never left the planning level. During the 1980s there has been a considerable much lower interest in this type of projects. During the 1990s it is probably in this area the quickest results will show up.

All these measures diminishes state control over the mineral production and paves the way for increasing influence by Western companies and finally for direct foreign control over Soviet and East European mineral resource industry and mineral resources. There are also forces counteracting this trend trying to prevent a sell-out of the minerals industries. Basically the support for a continued and strong state owned sector could be anticipated to come from those who are now in the planning organs and in the industry itself. They will, however probably be closely associated with the present politically impossible, conservative part of the Soviet leadership. Their influence will accordingly be limited, if not the advantages of a continued state involvement could overcome some of the fluctuations caused by changes in the world market for metals and to some extent guarantee continued production and employment. The process will begin in Eastern Europe and continue later in the Soviet Union. The speed of the transformation will be depending on how serious the general

economic problems in East Europe and the Soviet Union will get and hence how urgent the need for foreign capital, new technology and foreign exchange.

The present speed of changes in Eastern Europe might suggest that changes in the Soviet Union could be quicker than anticipated so far. It lies however in the interest of both the Soviet authorities and the transnational mining companies that the pace of change does not create too much disturbances and causes instability in the international minerals markets.

The agreement between DeBeers and the Soviet Union, which was renewed after a long period of at least no open cooperation, giving the CSO the right to market the bulk of the Soviet diamond production is interesting and probably indicative of future developments. A scenario with increasing presence, influence and gradually control by the large Western mining transnationals seems likely.

The possibility of a massive flux of capital, technology and trained personnel into East European and Soviet minerals industry redirecting important parts of the large transnational mining companies' resources away from the mineral deposits of the Third World countries has already been worrying mineral economists and political leaders in the developing countries such as the CIPEC Secretary General:

"It likewise has to be asked whether those countries (of the Southern hemisphere) are now in a position to compete for the international resources available for lending and/or foreign investment purposes. Will the countries of the southern hemisphere be left to their own devices or will the external aid they receive be pared down?"

The Soviet Union and the countries of Eastern Europe will be in a better bargaining position than the Third World countries since they have an established

industry with the production also of the necessary inputs such mine machinery, further there is a full research and exploration organization. All these are manned with a highly qualified staff from geologists to metallurgists.

However, like Third World countries the Soviet Union lacks the capital necessary and the inroads to the markets in the Western World.

Finally, the Soviet and East European managers completely lacks the market orientation which will become vital to succeed in competition with the leading mining transnationals.

Western mineral companies with a capability to engage in large scale projects and which have access to proprietary, environmentally clean and efficient technology to export will be the most likely partners in future joint venture between East and West.

Companies which have long experience in dealing with the USSR and have personal contacts will be at an advantage. These companies will perhaps soon be in a position to negotiate novel deals with the Soviet Union and the East European governments beginning to open up their vast resources.

Clearly there are several European companies, but not so many companies from the US, Canada or Australia, which fit into such a description. Finnish Outokumpu, with a long tradition and experience in Soviet ventures, Boliden with experience from demanding standards for the environment set at its plants in Sweden. Companies such as Metallgesellschaft and Pechiney with long, successful contacts with the Soviet Union will also have a lead on many competitors.

SUMMARY

Regardless of the outcome of the coming battle for control over Soviet and East European mining the former isolation of their mineral industries will gradually be broken and a new European mining industry will appear. Its

size is impressive, when aggregating the three parts formerly always treated separately, Western Europe, Eastern Europe and the USSR, a continent which accounts for around one third of total world output of most minerals emerges. In addition to this the importance of European mining TNCs grows on a global scale.

They also have lead on their international competitors with regard to the new possibilities opening up in East Europe and the Soviet Union. A picture of a European minerals industry, which will become even stronger during the 1990s emerges. The European minerals industry will profoundly influence both the minerals industry in Third World countries, the leading minerals companies in the US, South Africa, Canada and Australia and consumers in Japan, Europe and the US.

Sources:

The first part of this paper, on the West European mining industry, is based solely on the Raw Materials Group's database on ownership and production in the world's minerals industries, the *RMG Database*.

The second part on the USSR and East European mining industries in addition to the RMG Database has the following sources:

1. Statistics are mainly from World Bureau of Metal Statistics, Metallstatistik, Mining Annual Review and British Geological Survey.
2. An introduction to Soviet mineral policies is found in *Plundring eller planhushållning* (in Swedish) UF-förlaget 1980 by M Ericsson, O af Geijerstam and A Tegen.
3. A recent study by Marian Radetzki at the SNS Institute of Energy in Stockholm, "*Prospects for USSR energy exports after perestroika, a survey of issues.*", Stockholm 1990, has contributed considerably to the methodology of this paper.
4. Detailed studies of East European and Soviet metals demand and consumption has been made by Istvan Dobozi, see for example: "*Centrally planned economies: The extravagant metals consumers. A quantitative analysis of long term trends and over-*

consumption propensity." Colorado School of Mines, Working papers No 89/13.

5. Mining Annual Review regularly presents a thoroughly researched and well-documented survey of Soviet minerals industry.

6. For a Soviet account of its mineral policies of the mid-1980s in English see: "*Talking about the future. Is mankind heading for a raw materials crisis?*" by A. Arbatov, I. Amirov and A. Shakai Progress Publishers Moscow 1989.

The following sources are shorter or more limited in scope but nevertheless valuable:

Cipec Quarterly Review, First quarter 1990, Quarterly Review by Gaston Frey.

De Beers Centenary AG, press statement 1990-05-25.

European Affairs, 3/90 Autumn.

Financial Times 1990-08-21.

International Mining: "Eastern promises", June 1990, "Consolidation in copper and coal", July 1990.

Resources Policy, September 1989, James Dorian and Helene Caldwell as cited in Mining Journal.

Veckans Affärer 1990-09-19, "Everything is up for sale" (In Swedish).

APPENDIX

The method operates in three steps.

First all minerals producing companies are divided into three groups:

- independent
- fully controlled
- partially controlled

The method takes into account the dispersion of the shareholding and identifies, if there are two or more major owners, if they are "rivals" or belong to the same corporate group.

The most common example of full control is when company A holds all or a majority of the shares in company B, and there is no other large owner of company B.

An example of partial control is when company B has two or more owners whose holdings are substantial (more than about 20 per cent) and are approximately of the same size. However, if one of the owners of B, company C, controls another owner of B, company

D, their holding should be added and attributed to company C, possibly making the total - direct and indirect - holding by C large enough for full control. There are certain limitations of a computerized model. Careful "manual" evaluation must always be made when the ownership and control situation is not clear.

The second step of the method is to attribute the operating mining company's production to the company/ies which control it. All of its production is attributed to the controlling company if it has full control. Also in the case of partial control, all of the producer's production is attributed to the controlling companies, in this case, however, in proportion to their shareholding, direct or via subsidiaries.

The third step is to add the value at the mining stage of all production of different minerals, which a controlling company controls to get an aggregate measure of control.

The value of the production of the various minerals at the mining stage are figures as reported by the French journal *Annales des Mines*.

Three other main methods of using ownership as an assessment of control have been used in the literature:

1. "Equity" method, control is proportional to the equity held.
2. "Majority equity" method, control is proportional to the equity held, if it is a majority holding (more than 50 per cent).
3. "Majority all" method, all companies in which a company holds a majority share (more than 50 per cent) is considered to be fully controlled.

In a study on state ownership we tested all these three methods and compared them with the method used in our model. We found that in most cases there are, with some exceptions, only limited differences in the result of all four methods.