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Ferrous and Non-ferrous Metals — A Problem of Supply or a Challenge?

by C.-W. Sames, Bonn *

The following article represents an excerpt from a report made by the author on September 30, 1976 to the German-Brazilian Chamber of Commerce in Rio de Janeiro, sponsored by the Fried. Krupp Company. It offers an outlook on the future supply and demand situation for ferrous and non-ferrous metals and identifies a number of factors which might, in the long run, lead to supply problems for the Federal Republic of Germany. Against this background it illustrates the Federal Government's policy for safeguarding the supply with metals vitally needed by the German economy.

The Federal Republic and the European Economic Community are more or less 100 p.c. dependent on outside resources for all alloy metals, copper, and to a lesser extent, lead and zinc. From a geological point of view there are almost no prospects of locating new significant deposits of all these metals within the European Community.

Recognizing this dependence on foreign resources, the Federal Government several years ago ordered comprehensive studies to be made in order to get a thorough knowledge of all raw material aspects, be they geological, economical or political problems. The background question was always fairly identical with my present subject: will there be a future supply problem with metals vitally needed by our economy, or can all problems be solved by simply buying from the markets? I will give the answer before the details: there are risks and we believe that there might be serious difficulties ahead. The entire policy of the Federal Government to safeguard a steady flow of supplies aims to minimize these risks and to put our industry in the long run in a competitive position in the raw material business.

Let us go into some important geological facts. From a study made by our Federal Institute for Geosciences and Natural Resources we learned that in the case of 45 minerals and metals, which cover more than 99 p.c. of world mining production, only seven countries account for more than 62 p.c. of total world output. This mining hierarchy, or the "Seven Giants", as they could be named in rough analogy to the "Seven Sisters" in oil, reads as follows: The Soviet Union ranks first with roughly 24 p.c.; the United States holds the second position with 14 p.c.; Australia is fairly behind with 9.3 p.c.; Canada with 4.6 p.c.

Struggling for fifth and sixth place are the People's Republic of China and Brazil, with 4.3 p.c. and 4.1 p.c. respectively. South Africa holds the seventh position with a mere 2.2 p.c. of world mineral production. None of these figures include hydrocarbons. Among the wide range of countries of the Third World, Brazil holds the first position.

Fear of Resources Depletion

The danger of "running out" of raw materials is the most naive of fears. Our geologists, supported by the US Bureau of Mines and the French BRGM, definitely say that a physical depletion of minerals and metals will not happen before the next century or even later. This is quite different from an attitude which came into vogue some years ago and which could be termed as the "doomsday syndrome". This fear of depletion was introduced into public discussion by the MIT-study on the limits to growth. Surely, this study had one merit: The world began to think about resources depletion, and about conserving materials as a unique heritage of our planet.

True, the cost of extracting them may increase in the future, but this is another matter. Advances in the technology of prospecting and extraction, and improvements in productivity, may progress less rapidly than the exhaustion of the most easily accessible resources. At any rate, prospection must be carried out to the extent necessary to maintain reserves at a level sufficient to meet the next ten years of expected demand. If exploration investment were really made to such a degree — which we decidedly doubt, and that is a special point of my consideration — 10 years normally would be long enough to allow technical

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substitution for different materials, compensating adjustments in the pattern of demand. In any case it would be foolish to expect sudden calamities on the depletion score.

But the depletion discussion in my opinion had also other effects: some countries believe that they might obtain a redistribution of wealth by manipulating raw material prices, in the same way OPEC countries demonstrated so effectively for themselves.

If we come to the conclusion that raw materials are widespread over the earth's crust we have to investigate the question of *where* those resources can be found, *who* dominates them, and *what the demand* analysis shows for the years to come.

Geopolitical Distribution

As for the first question: Production capacity is a function of a country's reserve situation: the above-mentioned seven giants of world mining possess a share of world reserves similar to their share of world production. World reserves of the 18 most important minerals and metals are distributed as follows: industrialized countries 37 p.c., developing countries 32 p.c., and socialist countries 31 p.c. These are reserves which can be mined by commercial standards of today.

Our world is tripartite: each political sphere dominates more or less one third of the resources. New discoveries are certain — but let a geologist say, that the discovery ratio will never substantially change the division of resources among these groups. The situation of today is the result of thorough investigation in the most promising areas. New finds at best may shift the division by 1 p.c. or so which means in absolute figures a metal content of 1 bn tons, given the world's major metal reserves in the magnitude of 100 bn tons.

It is an interesting detail that some two dozen developing countries produce about 90 p.c. of the mining output of all developing countries. If we concentrate on the major ferrous and non-ferrous metals, the picture is even more favourable from the viewpoint of the industrialized countries: In the case of copper, 36.5 p.c. of primary production is mined in the United States, Canada, Australia and the Republic of South Africa. As to reserves, the industrialized countries hold 41 p.c. compared to 45 p.c. in the developing countries. Lead and zinc, twin metals in our smelting industry, are produced mainly in the USA, Canada, Australia and the Soviet Union. Again the bulk of the known reserves are to be found in a relationship 69 p.c.: 14 p.c. in favour of the industrialized countries.

If we consider the alloy materials which are essential for the production of stainless steel and advanced technological equipment, we can recognize a very marked geographic concentration. In the cases of chromite, manganese, molybdenum, nickel, cobalt, tungsten and the base metal iron, our detailed studies gave us a rather good feeling: the developing countries have a leading position in cobalt (55 p.c. share), the Eastern bloc in tungsten and vanadium (77 p.c. and 59 p.c. respectively) and iron. For all other alloy metals the Western mining countries have a major share.

The Role of Private Mining Industry

The second question is who dominates production of resources. In the developed countries, private mining companies, which are often vertically integrated "multinational" firms, do most of the operational chain: mining-smelting-semifinishing-marketing-recycling. The supply of the European and Japanese economies mainly depends on materials originally mined by these companies. It is remarkable that, despite growing governmental influence, the mining business is not carried out by state-owned companies. The reason for this phenomenon might be traced to historical evolution. All our big companies date from the late 19th or the early 20th century — a time, when there was no discussion of the role of private industry, planned economy and government participation.

Within the Third World we have to deal mainly with state-owned or controlled companies as our suppliers. Nationalisation has taken place in several cases: the former parent companies now serve as agents for marketing or suppliers of technology.

Demand Outlook

We have to deal with the third question — the demand for ferrous and non-ferrous metals during the years to come. In this case a distinction must be made between a short-term observation and a medium-longterm prognosis.

The actual supply situation is characterized by the consequences of the 1975 recession which hit the whole metal industry. To date the stocks of materials piled up during the recession still exert a decisive influence on commodity prices. The recession also brought a slowdown in many mining operations, so that the recovery taking place in the three main industrial centres — the USA, the European Community and Japan — could possibly meet with an insufficient capacity in some fields. But generally, from our German point of view, there is today no difficulty in buying ores and metals at whatever quantity and quality we want.

But the medium-longterm outlook is rather different: François Callot, a renowned French raw material expert, has just shown in a new study on world mineral production and consumption that the future is anything but bright. He gives detailed figures to prove this fact. Since the end of World War II raw material production underwent an explosive development. From 1950 to 1973, the annual growth of mineral production was about 5.5 p.c., which means a doubling every 14 years. If growth were to keep up this speed to the end of the century, unimaginable amounts of minerals and metals would have to be explored, mined, smelted, processed and marketed. We believe today that the average growth rate up to the end of the century will be distinctly below 5.5 p.c. But even in this case, the challenge remains for the international mining industry to deliver in time the materials needed. I would like to give you an outlook on the demand we expect. This outlook could be of vital interest for every producing country.

In practice there is a parallel between growth of population, industrial production, production of steel and other metals in the same way as there exists roughly a parallel between these basic parameters and energy consumption. The forecast for raw steel production up to the 1980s is that the Federal Republic has reached a degree of industrialisation where growth cannot continue at previous rates. The situation in the European Community is about the same: the 1985 figure is predicted near the record level of 1974! Because there is likely to be an ever growing demand in standard steel, our analysis shows the additional producer capacity will be partly developed in the ore producing countries which are now on the threshold of industrialisation.

The prognosis for stainless steel is somewhat different. The retarded growth of steel production does not parallel stainless production, for which a rather overproportional growth is assumed in the United States, the European Community and Japan.

In other words, experts predict that steel production will continue to be of great importance, but will not show spectacular growth. Conventional production, as noted, will shift more and more

into producer countries. On the other hand, production of stainless steel should remain within the foreseeable future the domain of the industrialised countries. Thus we come to the root of the matter: alloy steel production rises, quality specifications become more and more stringent (set by our competitors!) and it will be imperative for us to find reliable sources of nearly all ferrous and non-ferrous metals for a long time to come in order to be competitive with other producers of similar steel grades and refined metals.

In this context the question arises what are the factors which overshadow in the long run the outlook for our supply which appeared to be rather promising at first sight? The Federal Republic sees three main factors with different negative potentials. These are:

- ☐ The danger of cartelisation.
- ☐ Growing domestic demand of competing developed countries.
- ☐ Insufficient investment in new deposits.

Please allow me to comment on each point, since this is the very core of our supply policy.

Danger of Cartellisation

Combining to raise prices and manipulate tonnages and so secure a transfer of financial resources would be the objective of raw material producers in a position jointly to control the market. There are two basic conditions for the successful operation of a cartel, as defined by Hugh Corbet, Director of the British Trade Policy Research Centre:

- ☐ The members must control a large proportion of the total market supply, in the magnitude of two thirds. Otherwise the quantities they have to withhold from the market in order to raise the price would be so great as to reduce the cartel's total revenue in spite of the increased price. An effective control, however, does not merely mean a certain percentage, but the cartel in allocating exports and production cuts must count on the discipline of its members.
- ☐ The supply from sources not participating in the cartel has to be inelastic in the longer run, which means besides controlling current supply,

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the cartel has to control a substantial proportion of the reserves which are commercially exploitable at the price level the cartel seeks.

The large number of attempts at cartel forming during the past, and the absence of enduring successes, testify to the stringency of these conditions. Nevertheless new attempts have been made or are under way. Best known is CIPEC, the copper exporting countries association, the IBA, the international bauxite association and the AIOEC, the association of iron ore exporting countries. In addition, unofficial groups of some mercury and phosphate producers have been established.

For the reasons mentioned, it is not likely that actions similar to those taken by the OPEC will be followed by these organisations. This is because, for these materials, there are always a number of suppliers from developed, developing and socialist countries. The income needs are more urgent, demand could be partially shifted to substitutes and recycled materials, and purchases can be postponed.

However, bauxite producers succeeded in raising prices by taking a greater share in royalties and taxes. But the greater the number of cartel members, the greater is the incentive for individual members to cheat. The outlook for cartel making in the alloy metals field is even less favourable: International firms of high reputation and traditional relationships to consumers would have to be members of such cartels.

Summing up, dangers from cartelisations in the mineral field are smaller than it might have been expected. This does not exclude

- ☐ the risk of denial of supplies and
- ☐ the risk of temporary disruptions of supply.

It is obvious that a denial of supply would be a serious political step for a producer, with dangers for his international reputation as a supplier. More difficult would be the consequences of an even ultimately unsuccessful attempt to cartelize which could disrupt supply, causing economic damage to the importer and even more important, political danger to the government in power. This is a real danger which motivates governments of importing countries in their search for compromise.

Growing Domestic Demand of Competing Developed Countries

The two major mining countries of the world, the Soviet Union and the USA, in this order of succession, mainly supply metals to their own industry. The USA is in addition a net importer and in the long run I deem it advisable to consider the growth in home markets of these two large coun-

tries and beyond that, their future export quota, which will determine the quantities at free disposal. I do not want to give too gloomy a picture, but I feel quite sure, that especially the USA and the Soviet Union will continue to consume a major portion of their raw material production and will not be in a position also to supply other and competing industrial production centers. Europe and Japan should look for other additional supply possibilities, because deliveries from the two richest countries could tend to decrease.

Insufficient Investment In New Deposits

Our Government has considerable concern on the investment activities of the mining companies. Everybody knows that the time lag between exploration of a major deposit and putting it on stream lies between 5 and 8 years. If the necessary capital expenditures are neither adequate nor in due time invested to produce the raw materials when they are needed, serious capacity gaps will result. Since even governments do not have a thorough knowledge about what is really invested in exploration activities, corporate reluctance to go into new mining investments has the character of a time bomb. The detonation will be in the eighties and most people will be rather surprised.

The main reason that mining investments may not be forthcoming is the uncertain investment climate in many developing countries, particularly in the extractive mineral field, which has led to a concentration of investment either in certain developed countries or in other industrial sectors. The recently proclaimed right of each country to nationalise its natural resources, with the resultant additional weakening of adequate compensation and of legal security, is a powerful deterrent to exploration by international firms which possess the most developed expertise, and can mobilize the very substantial capital required. A representative of a leading world mining house bluntly explained to me that his board of directors seriously has under consideration a switch from mining to manufacturing.

Additionally, the Soviet Union makes considerable efforts to attract foreign investment capital for the development of its vast Siberian and other areas. As a member of the German-Soviet group for joint exploration, I have some experience with these tendencies.

Both tendencies have one aspect in common: They divert capital from the developing countries due to their exaggerated hostility against foreign companies.

Let us make a conclusion: The convergence of cartelisation dangers, temporary disruption risks

of supply, insufficient exploration investment and growing domestic demand of the resource-rich countries is enhanced by man-made obstacles in our countries. Environmental and pollution regulations prevent some promising search for new deposits, deter companies from building up additional smelting capacity, and impose heavy financial charges for anti-pollution equipment.

Measures of the Federal Republic

The result of a final analysis simply is we have to worry about our future supply for certain materials. The Government of the Federal Republic of Germany cannot stand aside and expect that everything will be well done by private industry only. The world of minerals has become an instrument of politics. Governments have to set new frames for supplier-consumer relationships.

What action can be taken in order to minimize the supply problem? 5 years ago the Federal Government set up an exploration program which includes risk sharing with private industry when exploring new deposits of important minerals at home and abroad. The Federal Ministry of Economics participates with risk money up to two thirds of the whole exploration investment. The money has to be paid back in case of economic success. This program comprises all exploration activities from the first grass-root steps up to feasibility-studies, including pilot plants and engineering studies. We spend a growing amount of money each year: DM 31 mn in 1976, rising to DM 40 mn in the 1977 planning budget.

This program is supported by the guarantee and financing system of the Federal Government for the investment phase. These two instruments are, so to speak, offensive weapons and directed at the deposits of the materials. The Federal Government takes, according to our market system, no responsibility for the selection of materials or their location. But the Government especially favours joint venture projects. I dare say that no German company of the raw material branch would reject the 49:51 basis which is nearly becoming a rule for such projects, on the basis that other factors of investment are adequately regulated.

German-Brazilian Cooperation

Our exploration program applies *inter alia* to the Barro Alto project in Brazil, where a consortium of very reputed German alloy steel producers together with Metallgesellschaft, the leading nickel company INCO and a Brazilian partner is going to make the final check on the feasibility of a large lateritic nickel deposit. Barro Alto on stream would mean a considerable amount of nickel coming from a mine in which Brazilians and Germans are partners in management, mar-

keting and consumption. Germany's advantage is further to have a solid bargaining position in times of shortage. Brazil's advantage is that a part of the production remains in the country, thus relieving the trade balance. Moreover, the ferro-nickel smelter will be built in Brazil so that the first step of processing is done in the producing country.

Other German companies are involved in the search for chromium with the support of our ministry. The case of chromium seems especially critical because our two suppliers, the Soviet Union and the Republic of South Africa, face difficulties in their deliveries for very different reasons.

Gaps in our targets are manganese, vanadium, niob and tantal, cobalt and of course the major non-ferrous metals copper, lead and zinc.

As for lead, the German lead industry repeatedly urged the construction of a new lead smelter. In the Federal Republic today it is nearly impossible to get approval from the authorities to build a new smelter, because environmental barriers are the main obstacle. I have heard that our industry is seriously thinking of a new smelter in a producing country which at the same time offers a long-term delivery of concentrates for the smelters still running in Germany.

This would be a perfect example for transferring technology for up-grading of primary products to countries on the way to industrialisation. Of course, geological and political factors must be in harmony: a deposit allowing a German participation and a favourable investment climate. It is rather difficult to harmonize both factors. The number of countries where both factors favour mining investment is decreasing. That might be an advantage for all those countries which in the long run, and well beyond emotional attitude, know that partnership with an industrialized country, its capital, its technological skill and marketing power can give the necessary impulse for industrialisation. In my opinion, Brazil is on the right track.

The engagement of German companies in Brazil may be supplemented by technology transfer, which means that our engineering supply and construction industry is open for rendering assistance in this respect. This policy would be generally supported by our Government in view of the Third World demand for technology transfer. This would mean a closer contact between mining companies, plant construction companies and consuming industries. All of them finally need raw materials — why not join for certain projects with partners abroad? Here does exist a chance for cooperation for all of us, rather than a problem.