



The world mineral market & mining in the state of Pará, Brazil

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Since the early 1970s, the global economic model based on the metal-mechanic industry has shown signs of exhaustion, a development which has coincided with the arrival of a new economic order based on technological development and services. The situation has led to overproduction and mounting stockpiles of minerals around the world. These changes have reverberated on the world mineral market, yet it is in this setting that the state of Pará of Brazil has undertaken a series of mineral developments. This paper was presented to the First International Symposium on Mining & Development, July 1995, Campinas, Brazil.

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Since the beginning of the 1970s, the global economic model based on the metal-mechanic industry has shown signs of exhaustion, while a new model based on advances in technology and a service-based economy has arisen. In this transition, economic factors responsible for the strong postwar increase in demand for minerals as raw materials have become less critical and the market and price control exercised by the producers no longer exists. The profound modifications which have occurred in the world mineral market, however, have led to a crisis in the mining industry. Moreover, external factors have contributed to a deepening of the crisis. These factors include inflation and increased investment and production costs, escalating energy costs, new government policies of stricter protection of the environment, and a reduction in the rate of growth of the world economy. Interpretations of these economic phenomena suggest that the world mineral market has undergone a restructuring in the past few decades. It is in this setting of change that the state of Pará undertook a series of mineral ventures which have transformed its economy into a typical mining economy. A reflection of the impact of certain aspects of the world mineral market on the economy of the state of Pará is thus in order.

Supply

The world production of selected metals in the period from 1950 – 1990 proves that changes have taken place in the market. Since the second half of the 1970s, the rate of growth in production has been reduced significantly. Aluminium has suffered the largest decrease in rate of growth, while copper has also reacted negatively. These decreases have generated excesses in production and in capacity. The existence of a planned excess in capacity is not uncommon in the mineral industry; it is typical of oligopolistic markets and results from the determination of a minimum economically feasible rate of production as a function of deposit

availability and characteristics, infrastructure availability, and financing capital necessary. Mining over capacity can also result from over investment in an area, due to difficulties in forecasting demand tendencies, modifications in capital composition and forms of financing in the mineral industry, and the development of new sources of profit. During the 1970s, the cost of production of minerals and metals increased tremendously, requiring new developments to maintain profits. Investment decisions came to include not only market demands, but also the reduction of production costs. This new emphasis reflects escalating utility costs, especially for energy; depreciation of out-of-date facilities, foreign exchange policies, and the assumption of environmental costs, as well as the discovery of better ore deposits. The resultant situation is one of overproduction and mounting stockpiles. Many analysts see the overproduction and over capacity generated to be more than merely the result of strategies of an individual company. Some see them as cyclic variations which may, over time, be reversed, whereas others think they are the result of structural changes which have occurred in world mineral demands.

Demand

Various interpretations have been offered for the tendencies observed in the mineral market since the 1970s, including the concepts of intensity of use, and of the life cycle/market maturity curve, as well as the effect of relative price modifications and technological changes. Intensity of use (IU) is the ratio of mineral consumption to per capita GNP. For developing countries and those in the phase of developing an infrastructure, the curves of IU for minerals tend to be ascendant, while for the industrialized countries the curve shows a constant downward slope. This latter tendency reflects the demand saturation resulting from the development of the basic infrastructure. Recycling of metals has also

contributed to a reduction in consumption of primary metals, and this procedure is much more widely practised in the industrialized countries than in underdeveloped ones. Crowson, however, argues that studies on IU only describe the phenomenon of the composition of consumption without explaining its origins or the meaning of the changes involved. In the long run, it is the dynamics of technological changes in the industrial sector which use mineral raw materials which will determine future trends in metal consumption. In the United States, the consumption of aluminium, copper, iron and steel has suffered significant sectorial alterations in the past 20 years. The relative consumption of zinc, nickel and lead, however, has not varied as much, which can be explained by the difficulty in finding a substitute with the same characteristics and availability at a lower cost. The IU also reflects the transformations provoked by technological dynamics, i.e., the participation of a mineral in the composition of the final products. The substitution of plastics and ceramics for metals has also influenced changes in the tendencies of world demands, although these are still subject to the effect of many factors such as manufacturing technology, costs, R&D, availability of skilled labour, etc.

Industrial trends and impact on mineral production

From the end of the war until the 1970s, the style of industrial development was dictated by the metal-mechanic industry. The transformation now observed in the technological pattern which previously supported industrial production arose as a function of the advent of information technology, microelectronics and the development of advanced materials. The changes have been in the direction of greater efficiency and lower costs through techniques of organization of production, rational utilization of raw materials and energy and the use of skilled labour, as well as an influence on

the style of life and habits of consumption. The result has been a weakening of the comparative advantage based on natural resources and cheap labour. As a consequence for the mineral market, such transformations have brought the tightening of competition between companies, with a rupture in the relation between prices and cost, and the weakening of oligopolistic sectors; the necessity of modernization and technological diversification, as a form of guaranteeing one's position in the market; and the weakening of traditional static comparative advantages based merely on the abundance of natural resources, cheap labour, tax advantages, etc. Although in certain cases the comparative advantages are still responsible for the appearance and increase of profits from mining, as is the case of some high-quality mineral reserves such as the Escondida mine in Chile, or the deposits of kaolin in Amapá and Pará, they are insufficient to guarantee a competitive position in the world market. Thus, repeating the question once posed by Bomsel, "Do mining countries have a future?" Brazil, with a strong potential internal market, offers a favourable setting for the development of mining. One of the possible options available is joint ventures between national and foreign companies, with the latter offering expertise, technology, financing and market expertise; this is also a means of taking advantage of the decrease in mining in the industrialized countries due to rigid environmental controls, higher production costs and the exhaustion of ore deposits. However, due to its continental dimensions and the social-economic contrasts, Brazil still has regions with typical mining economies, where mining is the principal industrial activity and the international market the main objective.

Mining economy of Pará

The case of the state of Pará is unique. It has abundant mineral deposits of high quality available with low production

costs, but it is not a traditional mineral producer. In 1980, the value of its mineral production was 420 MUS\$ (from gold, bauxite, granite, and limestone), although with the maturation of the large-scale projects born in the 1970s, the value of mineral production had reached 1 068 MUS\$ by 1989. This tremendous mineral production comes from various regions of the state, located hundreds of km from each other; only a small number of large companies operate, including two of the largest national companies involved in mining: the Companhia Vale do Rio Doce (CVRD) and Mineração Rio do Norte (MRN)¹. In the area around the Trombetas River, in the north-northwestern part of the state, MRN has produced metallurgical bauxite since 1979; Mineração Santa Lucrecia (Caemi) has produced refractory bauxite since 1985. In the mining region of Carajás, in the southeastern part of the state, CVRD has produced iron and manganese since 1985 and gold since 1991. In the northern part of the state, Albrás² has produced aluminium since 1985. And the kaolin deposits along the Capim River in the northeastern part of the state have been exploited by Cadam since 1976. Numerous "garimpos" (gold panning areas) produce gold, especially in the region of Itaituba, which is responsible for over 60 per cent of the production of this mineral in the state. Major projects for mining are also in the phase of development, such as those for alumina of Alunorte, for kaolin of CVRD/Cadam and of Mendes Jr., and for copper and nickel of CVRD. Other projects are scheduled for implantation for 1995 – 1996. The strategy of CVRD is to maximize the utilization of the infrastructure which has been set up for the Iron-Carajas project, joining other companies for the development of new joint projects for the production of alumina (Alunorte), coating grade kaolin (with Caemi Group), and the development of the copper deposits of Salobo (with RTZ or Anglo American), and that of those of nickel of Igarapé Vermelho (with the

Italian firm ILVA). In addition to these, the Mendes Jr. Group is preparing to develop its kaolin deposits in São Domingos do Capim, where the deposits of CVRD are also located. The alumina project of Alunorte was scheduled to start up operations in May 1995 after being paralysed since January 1987. These five projects will require financial resources of approximately 1 900 MUSD, with 20 per cent already invested. As a group, they should generate approximately 3 870 new jobs.

Pará in the world mineral market

Most of the mineral goods produced by Pará are destined for the international market. Supposing that the principal tendencies of the international market for mineral commodities verified in the past few decades (reduction in demand for metals and an oversupply) continue until the turn of the century, what will be the impact on the economy of the state of Pará? It is likely to be pronounced, since most of the mineral production is destined for the foreign market. In 1991, mineral production accounted for 76 per

cent of total state exports, with 53 per cent being raw materials and 23 per cent industrialized products. The situation is the result of various factors, such as the discovery of large iron and bauxite deposits, availability of low-cost energy supplies, and the distance of the industrial centres in the southeastern part of the country, as well as national political factors which have led to an ambitious federal program for the integration of the Amazon region (Programa de Integração Nacional) and the need for foreign currency to be obtained from exportation under the Carajás project (Programa Grande de Carajás).

The table shows the mineral and metal exports of Pará for 1991, as well as the value of these exports, and their proportion of the world market.

Only three products account for 92 per cent of the exportations: iron ore (50.31 per cent), aluminium (28.91 per cent) and metallurgical bauxite (12.92 per cent). Iron ore from Pará has been produced by CVRD since 1985. The high quality of the deposits, with 66 per cent iron content, in conjunction with the expertise of

CVRD and the tax incentives available, justified the implantation of an infrastructure never before seen in the Amazon region. Transoceanic demand for iron ore has undergone important changes, however, with a reduction in the relative participation of the United States, the European Economic Community, and Japan since the 1970s, when they accounted for 96 per cent of the total importations, to the end of the 1980s, when their participation fell to approximately 80 per cent. On the other hand, the international demand for iron ore in the Asiatic countries (South Korea, Taiwan and China) went from zero to 12 per cent in the period. However, although the total sales of iron ore have increased from 30 mt in 1950 to 357 mt in 1989, the average annual rate of growth has undergone a drastic reduction, from 12.75 per cent in the period of 1950 – 60 to 1.27 per cent in the period of 1980 – 89. This situation is cause of concern to the state of Pará, since 90 per cent of its iron ore production is sold on the international market, representing 8 per cent of that market. The principal purchasers are Japan, Germany, Italy and the European Economic Community, exactly those countries where a reduction in intensity in the use of metals has been observed.

The aluminium market has also suffered profound changes, especially since the energy crisis of 1973. The result has been a loss in the relative importance of the traditional producing countries – USA and Canada – and the emergence of new producing regions endowed with large bauxite reserves, low-cost energy supplies, and a favourable localization, especially Australia and Latin America. The state of Pará has integrated itself into the international aluminium scene during this period of restructuring. On the other hand, it is clear that the average rates of growth in world consumption of aluminium have been decreasing, from approximately 10 per cent in the period between 1960-70 to 1.42 per cent between 1980-90, which has implications for the

Table 1. Metal and mineral exports of the state of Pará 1991

	Production (kt)	Exports		World market share per cent	
		(kt)	Total value (MUSD)		per cent value
Iron ore	32 600	29 153	601.0	50.31	8.2
Aluminum	290	270	345.4	28.91	1.4
Metallurgic bauxite	8 527	5 614	154.4	12.92	8.1
Manganese ore	620	253	36.4	3.05	6.0
Kaolin	400	319	34.0	2.85	2.0
Metallic silicon	9	10	8.6	0.72	3.4
Tin	1.4	1	5.6	0.47	0.7
Refractory bauxite	129	64	5.2	0.43	n.a.
Pig iron	n.a.	39	4.0	0.34	n.a.
Total export value			1 194.6	100.00	

Note: Modified from Silva, 1993.

competitiveness of production. Brazil has production costs below the average of the principal producing countries. The production of aluminium in Pará also benefits from the supply of electrical energy under extremely favourable conditions. The present monetary policy of the Real Plan, however, may provoke a loss of competitiveness for aluminium in Pará. The integration of the state of Pará into the role of metallurgical bauxite producer took place as late as 1979, although Alcan had discovered the deposits in 1967. The explanation for this delay in development can be explained by the fact that the world production of metallurgical bauxite was concentrated in the hands of an aluminium cartel controlling 85 per cent of the production in 1965; in 1990 this share had been reduced to 74 per cent. Assisted by the quality of their deposits and by favourable tax incentives, MRN was able to make its product competitive on the world market, for which 70 per cent of the production is directed. This 70 per cent accounted for 8.1 per cent of the world market. This performance guarantees fourth place for Brazil as far as world production of metallurgical bauxite is concerned, following Australia, Guinea and Jamaica, and makes MRN the second largest Brazilian company in mining.

Final considerations

The characteristic of the mining sector of Paraná of being aimed for the foreign market, in combination with the structural modifications in international mineral demands, has left it exposed to the dynamics of the fluctuation of the international market. The changes in the international scene which have been observed since the end of the 1980s, with the reduction of market barriers and the formation of regional trading blocks, have contributed to the reduction of restrictions on the international flux of commodities, goods and services, which implies a constant increase in competition and a need for competitiveness in order to survive in

the market. The crucial question for the state of Pará, as a mineral producer, is to know what the implications of the processes of transformation will be, both in terms of supply and of world demand for minerals. The continuation of participation in the important importing markets requires a constant search for competitive conditions. This means that the so-called static comparative advantages detained by Pará such as the quality of the ore deposits, tax exemptions, low-cost energy supplies, etc. are still important. But, in the long run, they may not be sufficient to guarantee dynamic, competitive conditions. As President Fernando Henrique Cardoso pointed out³, "What makes the difference is the combined efficiency of the chain of production and commercialization of each country." Although the basic system of railroads and ports is adequate, broadening the infrastructure in terms of energy, telecommunications and mineral transport, may pave the way for a third generation of mining ventures, ventures which are less capital intensive and with greater possibilities of articulation, as well as diversification by means of the intensive use of science and technology to facilitate a development which is harmonious with the environment.

Upon evaluating the impact of mining in Pará one cannot ignore the environmental question. The leading mining enterprises in the state observe careful plans for environmental control, responding to pressure from environmentalists and the demands of world financing agencies. However, despite the defence of the Amazonian ecosystem, neither mining nor public powers have been capable of resolving the social problems facing the state. Various crucial issues which have not been addressed by the current model of mineral exploitation must still be considered, including the agrarian crisis, the unequal distribution of income, the formation of economic and social enclaves, the unequal distribu-

tion of the economic and social benefits obtained from mining, and a minimization of the poverty faced by the majority of the population in the region.

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Notes

This paper is partly based on data from the MSc dissertation of M.A.R. da Silva.

1. MRN was organized in 1967 by Alcan, with CVRD and CBA as shareholders since 1974; since 1992, Billiton, Alcoa, Reynolds and Norsk Hydro also participate as shareholders.
2. Albras is constituted by Vale do Rio Doce Alumínio S/A (Aluvale), holding 51 per cent of the shares, and by Nippon Amazon Aluminium (NAAC) Corporation, a consortium of 33 Japanese companies.
3. Departure speech to the Senate, December 14, 1994. ■