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Communities (CEC)

Santiago, Chile, 19 to 23 November 1984



TECHNICAL ASSISTANCE AND TECHNOLOGY TRANSFER IN THE LATIN AMERICAN
MINING AND METALLURGICAL SECTOR

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I. INTRODUCTION

In June 1983 the Sixth Interparliamentary Conference of the European Community and Latin America adopted a final act, which contained the following statement:

"Both parties are concerned over Europe's lack of mineral resources and hope to see an economic policy coupling close cooperation with regard to research and exploitation of the resources of Latin America and the use of such resources on site in the production of refined metals (primary processes), which would enable Latin America's vast potential sources of energy (hydroelectric and geothermal) to be exploited".

This statement clearly points to the wish of both regions to exploit their respective complementary economic interests.

Against this political background a dialogue was conducted by the Inter American Development Bank and the Liaison Committee of the Non-Ferrous Metals Industries of the European Community on February 7 and 8, 1984 in Brussels on "European Investment in the Mining Sector of Latin America". This dialogue, to my knowledge, did not produce much in the way of concrete, positive results. Its aim, however, was rather ambitious and attempted to take the third step before even the first one was taken. Investment, after all, usually is the last step in a long row of painstaking activities including the definition of a potential, the technological and infrastructural boundary conditions, market studies, etc.

I see this workshop as an attempt to approach the common goal in a more realistic way and I want to congratulate the organizers on their approach to the subject.

We should bear in mind, that resources, on the one hand, and demand, on the other hand, complement each other. One is not viable without the other. This situation calls for cooperation. And this is what we are here for. It also explains the fact, that ECLAC/ALADI and the CEC jointly sponsor this workshop.

II. PRODUCTION AND RESERVES OF INDIVIDUAL MINERAL RAW MATERIALS IN LATIN AMERICA

Mineral resources are distributed according to specific geological principles. It is, therefore, the geological environment which defines the mineral potential of a region. Obviously, large countries tend to contain more geological units than small ones. Therefore, as a first approximation, the mineral potential of a country is a function of its size.

When looking at the 155 developing countries in the world we notice that only 78 out of them have any mineral production at all. Only 30 developing countries contribute a significant share, more than 5%, to the production of any one mineral or metal. Seven of them are situated in Latin America.

It is interesting to note how the production of metals, the financial value of this production and the reserves are distributed amongst the country groupings:

	Production %	Value %	Reserves %
Industrialized market economy countries	39.3	39.1	31.3
Developing countries	27.6	30.7	36.0
Centrally planned economy countries	33.1	30.2	32.7

When we compare these figures with the regional extent of these country groupings we discover significant discrepancies:

	Size %	Reserves %
(onshore, excluding Antarctica)		
Industrialized market economy countries	27.3	31.3
Developing countries	46.3	36.0
Centrally planned economy countries	26.4	32.7

These figures show that reserves are not only a function of geology and regional size. Reserves have to be found before they can be listed. The figures, therefore, also reflect the degree of exploration. For a number of reasons exploration efforts in industrialized countries have been much more intensive than in the developing countries. Developing countries, in contrast, might be called underexplored. This fact, however, should not only be seen as a disadvantage. It is first of all a challenge and a promise for the future.

Let us now turn to the production and reserve figures for individual metals and mineral commodities. I am happy that I can supply you with the latest figures for 1983. They just became available in October 1984.

The constant observation of these figures and their updating is the task of the Mineral's Commodity Research Group in the Federal Institute of Geosciences and Natural Resources in Hannover. This group closely cooperates with the corresponding groups in the U. S. Bureau of Mines, the U. S. Geological Survey, the Canadian Geological Survey, the Bureau of Mineral Resources in Australia and others. Commodity data bases and mine data bases are being maintained. Since the informations, which are supplied by commodity research groups, are vital for efficient development planning, it is suggested that a similar group be established with a focus on mineral developments in Latin America. This new group could possibly work under the auspices of ECLAC.

A glance at the statistics given to you shows that Latin America contributes significantly to the production of several important mineral commodities: bauxite 21.6%, antimony 27.6%, copper 22.2%, molybdenum 38%, niobium 87.9%, silver 36.7%, bismuth 29.3% and tin 19.7%. In addition, there is a significant contribution to the production of lead, iron ore, fluorspar, tungsten and zinc.

With regard to reserve figures, Latin America occupies a prominent position for the following commodities: bauxite 26.8%, iron ore 20.5%, copper 35.3%, lithium 59.2%, molybdenum 34.0%, niobium 82.4%, silver 23.0% and bismuth 24.9%. In addition, antimony, fluorspar, and tin occupy positions between 10 and 20% of the total world reserves.

These data, I think, are impressive evidence for the economic importance of Latin America in the field of mineral raw materials. Although it is not the subject of my talk, I might add, that this wealth is complemented in the field of energy resources, be it in the form of conventional or unconventional hydrocarbon resources, of geothermal energy or hydropower.

III. EXAMPLES OF TECHNICAL ASSISTANCE PROJECTS

Technical assistance projects are usually carried out upon the request of the host country. Therefore, the share of the minerals' development sector in the overall picture of technical assistance, reflects the political importance which is given to the minerals' sector by the host country. Development strategies always are complex systems. Agriculture, basic human needs, natural and human resources, infrastructure and land use are parts of this complicated network and in addition have to be seen against the individual social and cultural background of each country. The aim of technical assistance can shortly be described as "help for self-help". The complicated structure of development is almost impossible to plan. It rather works on the basis of incentives, which set free forces acting in the same direction. If the system, the structure of the above-mentioned element is right, compatible and homogeneous, development can become a self-propelling process once it is started. I think it is important to understand the complexity of development before considering the sector with which we are concerned in particular: mineral resources, mining and metallurgy.

I confess that I have not been able to compile a comprehensive documentation of the technical assistance given to Latin American countries in the minerals' sector during the last 25 years. It has been difficult enough to compile these data for my own agency, the Federal Institute of Geosciences and Natural Resources in Hannover. There are, however, many organizations in the world which have carried out technical assistance projects in Latin America, mainly on a bilateral basis. In addition, multinational agencies, for instance UNDP, have conducted numerous projects of high value to the countries

concerned. It may suffice to name but a few of the many organizations which have participated in the international effort to stimulate mining and development in Latin America:

British Geological Survey (U.K.) formerly IGS.

BRGM, Orléans, France.

U.S. Geological Survey.

Geological Survey of Japan,

and from Germany my own organization together with GTZ.

During the last 25 years my own organization, the BGR, has carried out technical assistance projects in 14 Latin American countries. A total of 49 individual projects was involved. The scope of these projects ranged from the search for groundwater, geological mapping, geophysical and geochemical surveys (partly conducted by helicopter), prospecting and exploring for minerals and energy raw materials to engineering geological projects related to dam construction or earthquake hazards. A new line of projects is related to the geoscientific question of the environment, to the compilation of the nature potential as a basis for land use and planning. GTZ has carried out projects to rehabilitate and improve existing mines, to increase the metal recovery in ore processing and to introduce new technologies for mining and metal extraction. Some of these projects have had a follow-up by an investment of european mining companies. It can not be denied, however, that market conditions in recent years have influenced these ventures in an adverse way.

Systematically, the needs of the mining industry can be assisted by several steps of technical assistance projects dealing with specific levels of minerals' identification and development:

- Basic geological mapping including geophysical and geochemical surveys on a regional basis with the aim to compile an inventory of the natural resources.
- Compilation of metallogenetic maps with the aim to stimulate prospection and exploration.

- Strengthening of technical and laboratory facilities in geophysics, geochemistry, ore-dressing and metallurgy.
- Technical advice for mine planning and mining operation.
- Geological advice for mining operations.

Due to the extensive knowledge and experience which already exists in individual Latin American countries in the fields of mining and metallurgy, it is conceivable that a large part of these requirements can be covered by horizontal cooperation within Latin America. There will, however, remain sectors where bilateral or multilateral assistance from outside the region is required. It is here, where the mutual and complementary interests outlined above can play an important role.

IV. TECHNOLOGY TRANSFER

Technology transfer is a very sensitive issue. All too often it is understood as a one way street. On the other hand it is clear that development has to be accompanied by a refinement of technological standards. It is exactly here, where the complementary interests of the producer and the consumer countries can be exploited in a detailed and diligent way. There will never be one simple solution for each and every case, but is it quite possible to find solutions for many cases on an individual basis, case by case. There are many factors which can influence this picture:

- Reliable supplies at acceptable price levels.
- Protection of investments.
- Profitability and taxes.
- Long term stability,

to name but some of them.

Since technologies themselves are in a process of fast evolution, cooperation amongst suitable partners might offer advantages in this very competitive field. Who would have thought that microbiological processes would play such an important role in the extraction of certain metals? Where will be the limits of these techniques? What possibilities do hydrometallurgical processes offer in view of high energy costs?

There are few factors which have influenced the metal extraction industry so drastically as the jump in energy prices. Not only individual processes but the whole structure of the industry is being affected by it. To a large extent these structural changes have also influenced the market situation and have contributed to the tendencies towards saturated markets as we can observe them today for some raw materials. Technological changes, on the other hand, are responsible for the emergence of a whole new group of high-technology, modern elements, the supply structures of which are still evolving. You will know, that I talk of lithium, gallium, germanium, rhenium and others. The position of Latin America with regard to these elements is not at all unfavourable but it needs work and effort to make use of the perspectives to the maximum extent.

V. CONCLUSIONS

In addition to its on-going mining activities, Latin America has a large potential for new mining developments. An inventory of mineral occurrences based on existing knowledge and on new geological mapping should lead to a metallogenetic interpretation, which acts as an incentive for prospection and exploration. In my opinion, both intensive horizontal cooperation within Latin America and technical assistance by industrialized countries are necessary to achieve this ambitious goal. The same holds true for the technological development of the mining sector. Much can be achieved within Latin America by sharing experience and expertise and by pooling technological resources. The establishment and integrated use of modern training facilities is seen as a vital component for development. Technical assistance and cooperation with industrialized countries for instance in Europe will be required to speed up this long-term process and at the same time to achieve a better integration of a typical consumer region with a fast developing producing region. The evolution of an internal market structure for metals within Latin America can be an added advantage in this picture, because it widens the scope for industrial cooperation and joint ventures.

As an instrument to achieve this goal and to actively promote international cooperation I recommend the establishment of a Regional Minerals' Research Institute to conduct research and development in the fields of prospection, exploration, mining and metallurgy. The activities of such an institute could in addition to metal raw materials also include important non-metallic resources like building materials, mineral fertilizers, potash, etc. Thereby the institute would become attractive also to Latin American countries less endowed with metal resources. This Research Institute could operate under the auspices of ECLAC and either use existing facilities in member countries or be established as a new, regional research centre for the whole of Latin America. Personally, I would favor the second option in order to ensure maximum regional integration. The institute could also play an important role in acting as a partner to the numerous research activities conducted by european university institutes in the fields of metallogenesis, metal extraction and regional geology. It also would be charged with the establishment and maintenance of data bases for metals and mines including production and reserve figures, especially for the needs of Latin America.

Such an instrument of regional and international cooperation will help to achieve the integration of the mining sector within Latin America, it can attract projects of technical assistance in international cooperation and it can solidify the basis for attracting investment capital for the mining sector in Latin America.

WORLD MINE PRODUCTION IN 1983

Commodity	Dim	World	Latin America	Develop. Countries		West. Ind. Countries		Cent. Econ. Countries		
		Quantity	Quantity	%	Quantity	%	Quantity	%	Quantity	%
Bauxite	C	78568.0	16986.0	21.6	34206.0	43.5	32825.0	41.8	11537.0	14.7
Antimony	B	48343.0	13355.0	27.6	16884.0	34.9	10564.0	21.8	20900.0	43.2
Asbestos	C	4176.4	136.4	3.3	423.3	10.1	1392.5	33.3	2360.6	56.5
Lead	C	3451.0	470.2	13.6	717.2	20.8	1744.6	50.6	989.2	28.7
Chromite	C	7879.7	160.0	2.0	1814.1	23.0	2657.6	33.7	3408.0	43.3
Iron ore	C	750542.0	120509.0	16.1	193614.0	25.8	224858.0	30.0	332070.0	44.2
Fluorspar	C	4301.5	689.1	16.0	1148.2	26.7	1188.2	27.6	1965.1	45.7
Gold	A	1418848.0	108026.0	7.6	190496.0	13.4	849323.0	59.9	379029.0	26.7
Graphite	B	554711.0	42200.0	7.6	158340.0	28.5	51371.0	9.3	345000.0	62.2
Cadmium	B	17664.0	1500.0	8.5	2490.0	14.1	11099.0	62.8	4075.0	23.1
Cobalt	B	24127.5	117.9	0.5	15812.2	65.5	4305.5	17.8	4009.8	16.6
Copper	C	8219.8	1821.2	22.2	3697.9	45.0	2512.6	30.6	2009.3	24.4
Lithium	B	80698.6	3070.8	3.8	9058.2	11.2	2694.4	3.3	68946.0	85.4
Manganese ore	C	21992.3	1935.4	8.8	5587.3	25.4	4365.0	19.8	12040.0	54.7
Molybdenum	B	62830.0	23860.0	38.0	24137.0	38.4	24443.0	38.9	14250.0	22.7
Nickel	C	655.0	46.9	7.2	174.7	26.7	241.1	36.8	239.2	36.5
Niobium	B	17523.5	15400.0	87.9	15496.2	88.4	1327.3	7.6	700.0	4.0
Pt-Metals	A	201619.0	622.0	0.3	750.0	0.4	88896.0	44.1	111973.0	55.5
Mercury	B	5668.0	279.0	4.9	541.0	9.5	2397.0	42.3	2730.0	48.2
Silver	B	12393.1	4552.6	36.7	5167.2	41.7	4712.4	38.0	2513.5	20.3
Bismuth	B	4152.5	1215.5	29.3	1306.2	31.5	2424.6	58.4	421.7	10.2
Tungsten	B	40742.0	5073.0	12.5	10439.0	25.6	9223.0	22.6	21080.0	51.7
Zinc	C	6498.2	1043.9	16.1	1403.3	21.6	3468.5	53.4	1626.4	25.0
Tin	C	210.1	41.3	19.7	154.2	73.4	17.8	8.5	38.1	18.1

DIMENSIONS: A - kg; B - Tonnes; C - 1000 t; D - Mill t

133 November 1984.

Bundesanstalt für Geowissenschaften und Rohstoffe

World Reserves in 1983

Commodity	Dim	World	Latin America	Develop. Countries		West. Ind. Countries		Cent. Econ. Countries		
		Quantity	Quantity	%	Quantity	%	Quantity	%	Quantity	%
Bauxite	D	23400.0	6270.0	26.8	16810.0	71.8	5790.0	24.7	800.0	3.4
Antimony	C	4305.0	650.0	15.1	970.0	22.5	840.0	19.5	2495.0	58.0
Asbestos	C	123100.0	5650.0	4.6	13900.0	11.3	66000.0	53.6	43200.0	35.1
Lead	C	156700.0	14100.0	9.0	22800.0	14.6	105400.0	67.3	28500.0	18.2
Chromite	D	3541.0	7.0	0.2	1031.0	29.1	2302.0	65.0	208.0	5.9
Iron ore	D	93600.0	19230.0	20.5	28850.0	30.8	33150.0	35.4	31600.0	33.8
Fluorspar	C	303000.0	52400.0	17.3	97900.0	32.3	176200.0	58.2	29000.0	9.6
Gold	B	32254.2	1866.1	5.8	4510.0	14.0	19968.3	61.9	7775.9	24.1
Cobalt	C	3665.0	45.0	1.2	2290.0	62.5	375.0	10.2	1000.0	27.3
Copper	C	550800.0	194500.0	35.3	318300.0	57.8	160500.0	29.1	72000.0	13.1
Lithium	C	2193.7	1299.2	59.2	1940.7	88.5	253.0	11.5	-	-
Manganese ore	D	1835.0	42.4	2.3	171.4	9.3	963.4	52.5	700.2	38.2
Molybdenum	C	9480.0	3225.0	34.0	3642.5	38.4	4882.5	51.5	955.0	10.1
Nickel	C	82030.0	5000.0	6.1	39310.0	47.9	18120.0	22.1	24600.0	30.0
Niobium	C	7940.0	6545.0	82.4	7105.0	89.5	135.0	1.7	700.0	8.8
Pt-Metals	B	36778.0	31.0	0.1	31.0	0.1	30527.0	83.0	6220.0	16.9
Mercury	B	186600.0	9600.0	5.1	26900.0	14.4	96000.0	51.4	63700.0	34.1
Silver	B	230675.0	53150.0	23.0	58205.0	25.2	114510.0	49.6	57960.0	25.1
Bismuth	B	95000.0	23700.0	24.9	29150.0	30.7	58550.0	61.6	7300.0	7.7
Tungsten	C	2634.6	107.6	4.1	351.0	13.3	594.6	22.6	1689.0	64.1
Zinc	C	241020.0	18100.0	7.5	30100.0	12.5	175920.0	73.0	35000.0	14.5
Tin	C	9715.0	1395.0	14.4	6465.0	66.5	730.0	7.5	2520.0	25.9

DIMENSIONS: A - kg; B - tonnes; C - 1000 t; D - Mil t

BGR November 1984.
Bundesanstalt für Geowissenschaften und Rohstoffe.