Report No. 7379-ME

Republic of Mexico
Mining Sector Review

April 2, 1989

Trade, Finance and Industry Division
Country Department II
Latin America and the Caribbean Office

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CURRENCY EQUIVALENTS

The official exchange rate as of July 1, 1988 was:

US$1 = MP$2290.0
MP$1 = US$0.000437

The exchange rates noted below have been used for the conversion of historical data regarding (i) metal and mineral production and export data and (ii) company financial data. The rates were prepared by Bank staff based on the effective annual exchange rates as reported by different Mexican Mining Companies in their annual reports.

1987 average	US$1	=	MP$1,373
1986 average	US$1	=	MP$ 596
1985 average	US$1	=	MP$ 252
1984 average	US$1	=	MP$ 166
1983 average	US$1	=	MP$ 118
1982 average	US$1	=	MP$ 52
1981 average	US$1	=	MP$ 24
1980 average	US$1	=	MP$ 23

WEIGHTS AND MEASURES

1 ounce troy (oz.)	=	31.1 grams
1 kilogram (kg)	=	32.1 oz. troy
1 kilogram (kg)	=	2.205 pounds
1 ton (t)	=	1,000 kilograms

ACRONYMS

Ag	Silver
C	Carbon
Cu	Copper
Fe	Iron
Pb	Lead
S	Sulfur
Zn	Zinc

AHMSA	Altos Hornos de México S. A. (Blast Furnaces of Mexico Inc.)
APSA	Azufrera Panamericana S. A. (Pan American Sulfur Inc.)
BHA	Book Hunt Associates Limited
CFM	Comisión de Fomento Minero (Mining Development Commission)
CMC	Carbones y Minerales de Coahuila S. A. (Coals and Minerals of Coahuila Inc.)
CPP	Costo Promedio Ponderado (Average Cost of Funds)
CRM	Consejo de Recursos Minerales (Mineral Resources Council)
FMNM	Fideicomiso de Minerales no Metálicos Méxicanos (Trust for Mexican non Metallic Minerals)
Frisco	Empresas Frisco S. A. de C. V. (Frisco Enterprises Inc.)
GDM	General Directorate of Mines
GDMM	General Directorate of Mining and Metallurgy
HYLSA	Hojalata y Laminado S. A. (Plating and Laminating Inc.)
IMMSA	Grupo Industrial Minero México S. A. de C. V. (Industrial Mining Group Mexico Inc.)
LME	London Metal Exchange
MAS	Mineral Assignments
MICARE	Minera Carbonífera Río Escondido S.A. (Coal Mining Rio Escondido Inc.)
NMP	National Mining Program, 1984-1988
NMR	National Mineral Reserves
PECAM	Programa Especial Complementario de Apoyo a la Mediana y Pequeña Minería (Special Complementary Program to Support Medium and Small Scale Mining)
Peña Colorada	Consorcio Minero Benito Juárez - Peña Colorada S. A. (Mining Consortium Benito Juárez - Peña Colorada Inc.)
Peñoles	Industrias Peñoles S. A. de C. V. (Peñoles Industries Inc.)
Real de Angeles	Minera Real de Angeles S. A. de C. V. (Real de Angeles Mining Inc.)
ROFOMEX	Roca Fosfórica Mexicana (Mexican Phosphoric Rock)
San Luis	Corporación Industrial San Luis S. A. de C. V. (San Luis Industrial Corporation Inc.)
SEDUE	Secretaría de Desarrollo Urbano y Ecología (Ministry of Urban Development and Ecology)
SEMIP	Secretaría de Energía, Minas e Industria Paraestatal (Ministry of Energy, Mines and Parastatal Industry)
SICARTSA	Siderúrgica Lázaro Cárdenas Las Truchas S. A. (Lázaro Cárdenas, Las Truchas Steel Inc.)
SMM	Small and Medium Mining
SOE	State Owned Enterprises

REPUBLIC OF MEXICO

MINING SECTOR REVIEW

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This report was prepared on the basis of a Sector Review Mission which visited Mexico in February 1988. The mission consisted of Messrs. F. Remy, P. Fozzard, J. Strongman and B. J. Choe with assistance from Messrs. J. Carman and F. Prokop (Consultants) and, in the environmental segments, from Mr. R. Batstone.

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REPUBLIC OF MEXICO

MINING SECTOR REVIEW

Executive Summary

i. Endowed with significant mineral resources, Mexico's mining industry[1] was one of the most dynamic sectors of the Mexican economy until the late 1930s. It accounted for about 4% of GDP in the 1930s, but this share declined to 1.3% by the late 1970s, mainly because of policies which favored activities related to the supply of local market and the country's petroleum boom. The sector is, however, one among the few that have grown in real terms lately, despite the country's severe economic problems. In 1986 and 1987, mining output grew in real terms by 1.1% and 14.6% respectively, while the economy as a whole contracted by 4.3% in 1986 and stagnated in 1987 with only 1.1% growth. Mineral production reached about US$1.8 billion equivalent in 1987, with metallic minerals accounting for 4/5 of the total. The sector's foreign exchange earnings amounted to US$1,170 million being third in importance, after oil (US$7,870 million) and tourism (US$2,343 million). The composition of the output of the Mexican mining industry is highly diversified with a moderate degree of concentration; 44 commodities were produced in 1987, out of which 10 represented 80% of total value and 90% of mining exports (silver, lead, zinc, copper, gold, sulfur, iron ore, coal, fluorspar and salt). Of these, six commodities each recorded values of production above US$100 million. In 1986, Mexico was ranked among the world top five producers in 13 mineral commodities.

ii. Mexico has a long tradition as a mining country and has a broad base of mine workers and well trained engineers and managers. This highly skilled mining labour force receives wages which are well below those of most other mining countries, helping to make Mexican labour costs in mining highly competitive by international standards. The technology of modern Mexican mining, both private (large and medium sized) and state owned also compares favourably internationally. Mexico's small scale mining subsector uses more labour intensive methods, but is also economically very competitive because of the high quality of ore that it exploits.

iii. Mining in Mexico is dominated by large Mexican controlled private companies and by the state owned enterprises (SOEs). These two groups together with the mixed companies, in which both are partners, control 90% of the output of the sector. The large scale private sector (including mixed companies with minority state participation) contributes about 60% of the sector's output, and state owned and state majority companies are responsible for about 30%. Small and medium mining (SMM) controls the remaining 10%, with each of these subsectors producing about 5%. The large private companies also relate to private foreign groups through various types of associations that go from direct participation at the holding

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1/ All mining figures exclude oil and gas.

company level to participation in specific subsidiary mine operations. These associations, in which foreign participation is limited by law to minority ownership, are the only way in which foreign investors, attracted by the Mexican mining potential, are allowed by law to participate in Mexican mining.

iv. After completing large scale investment programs in the late 1970s and early 1980s, the combined investments of the large private companies (which have traditionally provided the bulk of the production of silver, lead, zinc, gold and manganese in Mexico) have been extremely modest, averaging only about US$70 million per year over the past four years, while they remained consistently profitable with combined annual profits ranging from US$84 million to US$180 million, hence, their combined long-term liabilities/equity ratio has fallen from 55:45 in 1980 to 27:73 in 1986. The largest mixed mining companies include the highly successful silver mine Real de Angeles and the two large copper producers, Mexicana de Cobre and Cananea. These last two are both in a difficult financial situation and in 1987, the Government took the decision to privatize them. In May 1988, the sale of Cananea to the Protexa Group of Monterrey, NL was announced, but in June 1988, the process was put on hold by the Government[2] who nevertheless affirmed its intention of continuing with the privatization of "non-strategic"[3] mining companies. Mexicana de Cobre and Cananea have internationally competitive operating costs, but had always been financially highly leveraged companies. In the face of lower than expected copper prices during the 1980s, they were unable to service their debt and relied on additional shareholders funds (in particular from the Government, which guaranteed much of the debt of the two companies) in order to meet debt service requirements, undertake large investment programs (annual average combined investment between 1980 and 1985 was US$140 million) and continue operating. The Government's decision to fully privatize Mexicana de Cobre and Cananea is considered a sound approach to setting these companies on a viable basis. The large SOEs exploit "priority" minerals (Sidermex-iron and coal, Azufrera Panamericana-sulfur, ROFOMEX-phosphates, and MICARE-coal) used to supply the internal market (with the exception of sulfur, 60% of which is exported) and do not face financial problems similar to those of the copper operations; nevertheless, the distinction between "priority" and "non-priority" does not appear to respond to economic reasons, since similar benefits could accrue to the economy if these mines were operated by the private sector. Several of the smaller SOE operations (mostly silver, lead, zinc producers, owned by

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2/ The reason given for the suspension was the inability of Protexa to comply with the financial conditions of its bid.

3/ Radioactive minerals together with hydrocarbons are defined as "strategic" by the Constitution. Sulfur, potassium, iron ore, coal and phosphates are classified as "priority" minerals by the Mining Law. Enterprises exploiting these commodities are referred as "strategic."

Comisión de Fomento Minero) are money losers, need to be subsidized and play no useful role in the hands of the state.

v. Commodity-wise, an overview of the main subsectors of the Mexican mining industry shows that (i) the polymetallic silver-lead-zinc-gold subsector is very profitable and competitive, and only a combination of record low commodity prices and an over-valued peso could make the least economical operations lose money; (ii) sulphur and some non-metallic, non-strategic minerals are profitable exports; (iii) the coal and iron ore operations constitute efficient import substitutions but could not export their production because the low quality of ores require costly beneficiation and, in the case of coal, also because of the long distance between the mines and the port where any export shipments would take place; (iv) the phosphate producer ROFOMEX (an SOE) having reduced its operating costs to about 45% of the 1982 level showed a positive gross profit in 1987 but still faced quality problems with FERTIMEX, its only client; and (v) the two major copper producers, Mexicana de Cobre and Cananea, remain marginal producers on account of their large debt burden. The competitive position of the mining industry in Mexico is solid, reflecting the comparative advantage of its resources (which is strongest in the silver-gold-lead-zinc and in the non-metallic subsectors), and is very sensitive to the exchange rate policies of the Government. Because 2/3 of the total Mexican mining production is exported, real depreciation of the peso implies an improvement in terms of trade for the mining sector relative to the rest of the economy. In the early 1980s, mineral price increases lagged behind the wholesale price index in Mexico. However, in 1985 and 1986, mining outputs experienced a strong increase relative to the same index, on account of exchange rate adjustments so that by 1987, mining prices had increased 22% relative to the wholesale price index (as compared to 1980), in spite of the fact that international prices of metals had declined between 1980 and 1986. Hence, the mining industry in Mexico has a great deal of interest in the future course of exchange rate adjustments and is concerned that the current real rate should not be eroded.

vi. The comparative advantages of Mexico's mineral resources presents considerable opportunities to the investor. The present institutional or financial capacity of the Mexican mining companies are insufficient to fully realize this potential, a fact that could become a significant constraint for future sector growth and which underlines the importance of promoting the entrance of new enterprises into the sector. The major private mining companies have exploration budgets that are adequate to support their on-going mining operations and to generate some new projects, but are well below the level that Mexico's mineral endowment would require to ensure strong future growth. Total investment in exploration for the "big five" group was US$7 million in 1986, US$12 million in 1987, and is estimated at US$21 million in 1988; in addition, some US$15 million annually is being spent in exploration by the state controlled enterprises and institutes. Together with exploration work carried out by the small scale sector and other parties, present total annual exploration investment is approximately US$40 million. Based on actual Mexican potential and statistics from other countries with a vigorous mining industry which indicate that the level of exploration investment could be of the order of between 8% and 10% of mine product sales value, exploration investment of

closer to US$150 million annually appears to be justified; close to four times the present level. Increased access to land and minerals right, reduced foreign ownership limitations, a review of mining tax legislation, reduced discretionary margin in the mining legislation, and stabilization of the macro-economic environment could be expected to have an important impact on the entrance of new investors, national and foreign, into the sector, and on the level of exploration, provided they are all implemented in a coordinated fashion as it will allow Mexico to grow in tune with its comparative advantages. It must be stressed that investment in mining does not start at the development stage; it starts at the exploration stage with the requirement for constant input over time to make the required discoveries to both replenish depleted reserves and to increase and diversify production. This represents a high-risk cash expenditure which can only be attracted when an enabling environment has been created.

vii. Mining activities in Mexico are regulated by the Mining Law of 1975, which completed the process of "Mexicanization" of the mining industry by confirming the ownership and control requirements of the 1961 law (which limited foreign ownership to 49% equity participation, and 34% in the case of "strategic" minerals) and setting out the policies and regulations currently in force. It also provided for close monitoring of all investment programs as a basis for granting concessions, and established "priority" minerals and the Government's discretionary power to establish reserved exploration zones. It established the work requirements to hold concessions[4] and specified it in nominal pesos. Furthermore, it established an ad valorem production tax, ranging from 4% to 9% (currently 2% to 7%), depending on the mineral.

viii. A consequence of the existing mining legislation is that the amount of land tied up either by the State, through various classes of reservations, or by the mining enterprises or speculators, sitting on land with practically no work requirement, is too large and has no relation to the present exploration effort of the country. This constitutes a major problem which deserves priority attention and immediate action to release such inaccessible land. The Constitution specifies that the subsoil of the Mexican territory belongs to the Nation. This concept of sovereignty over the subsoil is not uncommon, but it is usually exerted via taxes when minerals are exploited; the Mexican law, however, exerts this sovereignty when the minerals are still in the ground by authorizing the Federal Government to establish National Mineral Reserves (NMR) and to assign to the state institutions or to SOEs the areas that it may deem convenient. Furthermore, the procedures that the official institutions have to follow for ceding and disincorporating this land, so that it may be publically available, are lengthy and complex.

ix. In addition to the reserved lands, the work requirements to hold the land are not demanding since they are denominated in pesos and thus periodically depreciated. This is aggravated by the fact that the government does not have the means to supervise all the areas under

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4/ Amount of work or investment, per unit of area of land, that the law demands of individuals or companies holding exploration concessions.

concession and to enforce the minimal work that is required. Consequently, a sizeable quantity of land is tied up by private companies and individuals (5.6 million hectares in NMR plus 0.5 million has. in mineral assignments (MAS) are held by the state and its institutions, while the total amount of land held by mining enterprises as concessions is 2.2 million has); who are able to hold on to the mineral rights for periods of several years without having to undertake much exploration or development work, thus encouraging speculation by non-qualified individuals, who can profit considerably by holding and then selling claims in mineralized areas without working or producing. Access to land is one factor which is essential for vigorous mining development. A high priority should be given to redesigning the regulations to give easy access to minerals rights while insisting on substantial exploration programs and/or development work being undertaken so long as the concession is retained. If an adequate work program is not undertaken, within a stipulated period of time, the mineral rights should be available to others who would undertake a work program, hence, a process to release the NMR and MAS and to establish demanding requirements to hold the land is recommended.

x. A second constraint to the growth of the sector originated by the existing mining legislation is the limitation of foreign investment in mining projects and enterprises to a maximum of 49% of the equity, except for certain minerals defined as "strategic" minerals, in which the limit is 34% of the equity. While the present arrangements provide certain benefits to ensure domestic control over such resources, these benefits are probably outweighed by the constraints, and careful consideration should be given to lifting the limitation. Aside from providing Mexican mining with an interesting new source of funds and technical expertise, in line with the comparative advantages and hence the profitable growth potential of a sector that can absorb several times the present level of investment, foreign investment can play a very valuable role in the opening of new mining districts outside the areas where mining has traditionally taken place in Mexico and in contributing, through the use of new technologies, to improve the efficiency and productivity of the sector. In fact, when local companies venture into new areas, they prefer to do it in joint ventures with some foreign partners, who are limited in their participation by the Mining Law. The existing foreign ownership limitation places the large local companies in a very strong position when negotiating any new partnership since it forces the foreign company to accept conditions of association which have discouraged many potential investors. This situation has benefited the major private national mining companies very much. In fact, a major impediment to substantial reform, along the lines proposed in this report, may be the major Mexican private groups that benefit from the status quo in Mexico, particularly with respect to foreign participation, which enables them to control the sector.

xi. The possibilities present in the Mexican mining activities are not confined to any particular size of enterprise but, are nevertheless particularly interesting for the small scale subsector. Its exceptional geographical location gives Mexico a key competitive advantage for foreign investment in small scale mining, where thousands of prospects could interest small investors which could contribute to the modernization, efficiency and development of added value of the subsector. These small enterprises could then become an inexpensive way for foreigners to

establish a position from which other opportunities may be revealed from time to time. However, the existence of constraints such as access to land, foreign ownership limitations, lack of investment vehicles, discretionary legislation, taxation, and inadequate processing of requests for concessions will make the realization of this potential difficult, unless corrective action is taken. Linkage and interfacing in the liberalization of these issues is essential in order to get the benefits of increased growth and diversification of the sector.

xii. Another constraint to the efficient development of the mining sector in Mexico is taxation. The most important tax collected from the Mexican mining industry at present is a mining right, [5] amounting to a "blind" ad valorem production tax established by the Mining law. This taxation system does not promote the efficiency of the mining enterprises. The use of ad valorem taxes in mining leads to sub-optimal mine design and operations because it has the effect of increasing the cut-off grade in the deposits, and is not responsive to the situation of mines that are starting up and are likely to need additional cash. Mexican mining companies also pay income taxes, at rates which are nominally high. However, the actual amounts paid are surprisingly small, relative to the profitability of the sector, since the corporate income tax system in Mexico provides tax shelters which the large mining companies have traditionally taken advantage of. The present level of low income taxes paid by the mining companies does not justify the existence of an ad-valorem tax, and should lead to a thorough review of the mining income tax legislation seeking to insure a fair contribution by the mining companies. At present, a new income tax regime is being phased in; the process of change from the old to the new income tax system will last until 1991.

xiii. Similar to Mexican legislation in other areas of the economy, the Mexican mining law grants a wide range of discretionary powers to the authorities, instead of setting clear rules applicable to everybody. In many cases this lack of definition leads to protracted and counterproductive negotiations for which paramaters are not well specified, and which (i) increase risks to investors who tend to be conservative in their estimates; (ii) are especially detrimental to small miners and new entrants into the industry, who are not well placed to lobby the authorities; (iii) allows for corruption; and (iv) lead often to arbitrary results. In a sector where the opportunities for profitable growth exceed the capacity to invest of the established companies, the entrance of new qualified investors is a recommendable objective of the policy framework, for which clear rules would be of considerable help.

xiv. In 1984, the Government issued the National Mining Program 1984-1988 (NMP), a strategic program, which specifies the goals and policies to be followed or the development of the sector. The scope of the NMP is comprehensive since it addresses both sectoral and macroeconomic issues which are judged to be critical to the performance of the sector. In order to achieve sectoral goals of self-sufficiency, increased foreign exchange earnings, employment and regional development, the NMP follows the

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5/ The mining right seeks to compensate the State for the loss of wealth due to the extraction of minerals.

policy framework established by the National Development Plan that considers (i) the need for competitive exchange rates and reasonable inflation and interest rate levels; (ii) the elimination of subsidies and that productivity will be the base of the competitive position of Mexican mining; (iii) a close relationship between international and internal prices and that taxes should not place Mexican producers at a disadvantage internationally; (iv) the strengthening of exploration and technical and financial assistance as basic instruments of sector growth; (v) the participation of more enterprises in the sector; and (vi) the continuation of existing operations and projects under execution and the exploration for minerals now being imported. The program, however, specifies actions which run contrary to the general direction of the referred policies and ignores areas of action which could significantly help to achieve the stated objectives and policies. Among the former, the NMP establishes that the national mining reserves should be considered as a basic instrument for the strategic orientation of exploration activities and prioritizes investments of doubtful economic profitability; among the latter, nothing is said about the investment vehicles needed to bring equity funding to small mining.

xv. The inconsistencies between the goals of the NMP and the specific actions it calls for, have been potentiated by the fact that the NMP is a strategic document which has not resulted in a strategic process. Consequently, the Action Plan of the NMP was never subjected to adjustments to make it consistent with its objectives. Lessons from the NMP experience which could be useful for future strategic documents and processes refer to (i) the need for consistency between the stated objectives and policies and the specific actions considered; (ii) the need to propose an institutional set up capable of implementing the plan; and (iii) to establish a procedure for its systematic execution and permanent review. Once this program has been enacted, a process of control of the results of the actions taken vis-a-vis the original plan, of control of the future implications of the decisions taken, and of readjustment and reformulation of the specific actions in order to best comply with the stated objectives and policies should continue on a permanent basis.

xvi. The Government's supervisory body of the sector is the Secretaría de Energía, Minas e Industria Paraestatal (SEMIP) to which three semi-autonomous agencies report. These are (i) the Comisión de Fomento Minero (CFM), a holding company for state participation in the sector, operating agency for mining properties and plants, provider of specialized laboratory services and credit and technical assistance agency specialized in metallic mining; (ii) the Fideicomiso de Minerales no Metálicos Mexicanos (FMNM) a credit and technical assistance agency specialized in non-metallic minerals; and (iii) the Consejo de Recursos Minerales (CRM) a geological survey institute and a promoter of prospects. Although CFM's own resources include income from dividends from its holdings and from royalties and credit activities, CFM is only partly self-financed and receives fiscal resources in order to make up for its financial deficits. Its more important current expenditures are its uneconomic mines and plants and its sizeable bureaucracy of 2,366 people (February 1988). FMNM is a profitable and self-financed credit agency that has increased its new approvals over 1,000% in real terms in the last five years, while staying slim in its expenditures (total staff 135), of which just over half are professionals.

Like most other geological surveys, CRM is not a self-financed institution; at present fiscal resources cover approximately 60% of its expenditures.

xvii. The existing institutional setup does not provide the mining sector with a reasonable quality of the services and roles in the areas that the sector and the state need to have covered, hence, adjustments to deal with the existing deficiencies would be helpful. The state as owner of the mineral resources of the country, should exert an effective and orderly control of these resources. In practice, however, this function is carried out only in part and very slowly as shown by the amount of time required to obtain exploitation concessions, the inability of SEMIP to supervise the compliance of the work requirements, and deficient information available in SEMIP about mining projects. The state as development promoter should execute a continuous process of strategic action whereby objectives and present decisions are constantly contrasted and adjustments are made as part of a comprehensive process that seeks consistency of the actions with the goals and circumstances of the sector. Such a process is not possible with the existing institutional scheme since information on the sector is dispersed and fragmentary among the agencies of the sector and the communication between them is insufficient. Consequently, adjustments to be made would include (i) reducing the monitoring requirements and streamlining the office responsible for the control of the land (General Directorate of Mines) ; (ii) a think tank to address strategic issues of the sector adequately staffed for the role and, having full access to all information concerning the sector, should be implemented in the supervisory body of the sector (presently SEMIP); and (iii) adjustments should be made in the role of the semi-autonomous agencies of the sector, in order to ensure good performance of the functions that are required from them and to eliminate overlaps in areas which can be best covered by other institutions or by the private sector.

xviii. CFM and CRM are two institutions which have grown in complexity and payroll and have lost control of their growth. They have proliferated in operations/projects, many of them unsound, and have not been giving adequate attention to performing well in areas that are critical for the good performance of the sector. Conversely, FMNM has focused on its role of a second tier credit agency and has sold (or is in the process of selling) all of its subsidiaries. It is recommended that adjustments be made to CFM and CRM which include (i) discontinuation of the operating role of CFM, hence, the affected mines should be either closed, sold or be operated independently; (ii) the regional concentrators of CFM should be subjected to careful analysis, as most of them are unprofitable; like the previously mentioned mines, most of these concentrators should be either closed or sold; (iii) a more itemized and open accounting and reporting system that will allow a more rational approach to subsidies and avoid political interference, should be implemented in the institutions of the sector; (iv) CFM should take action to become a second tier financial institution and use the commercial banks for the retail role as far as possible; (v) conversion of CRM into a complete geological survey institute, providing a full range of services from basic systematic geological mapping and exploration to specific detailed work and research; it should release its NMR and assignations and discontinue all detailed property evaluation work done in those areas; in turn a contracting

"Central Services Facility" on a self- financed basis could be set up (where services to be sold to enterprises, mostly exploratory but including others such as laboratories could be included); (vi) transfer of CFM's laboratory facilities to the proposed contracting arm of CRM; and (vii) to the extent to which the Government of Mexico is prepared to implement structural improvement, the remaining roles of CFM, as a holding company, could be transfered to NAFIN and, of second tier credit agency, to FMNM.

xix. Little control has been exercised in the part on safety and environmental matters in Mexico and a new environmental law with strict standards came into effect on March 1, 1988. There is a certain degree of apprehension in the industry as to how forcefully it may be implemented, since SEDUE (the official, responsible institution) appears to have little experience in the mining industry, is not staffed with sufficient qualified personnel and does not have the facilities to perform its function. The Government of Mexico (GOM) has adopted a pragmatic approach by coordinating with industry, and by scheduling a period of progressive phasing in on these new goals. Strict standards are thus considered as a longer term objective, but should apply to new installations. While a few companies have staff who are capable of developing least cost strategies for recycle, recovery and pollution control, others do not have this expertise and technical assistance to develop these strategies is recommended. The main priorities for technical assistance are the smelting operations but in addition some medium and small mining operations (especially the state owned base-metal mines and concentrators) would also require assistance for pollution control and safety matters.

xx. Consequently, the Government faces key questions regarding the future direction of the sector, which concern the organization and institutions of the sector, as well as the policies set by legislation. Mexican mining does have comparative advantages that could enable the sector to increase its export and fiscal contribution to the economy, assuming that action will be taken to relax the existing constraints and that it will be executed in a coordinated manner i.e., recognizing the close interlinkage between the issues involved. In deciding what type of approach it wants to pursue in addressing the future direction of the sector, the Government may in fact define not only the actions it will take, but also the benefits and limitations under which the sector will operate. While the proposed measures will enhance the performance of the sector it must be noted that investment and exports will also be influenced by broader factors such as overall macro-economic performance and exchange rate policy and by external factors, in particular world mineral market prices.

xxi. A recommended approach consists of the implementation of the whole package of recommendations of this report. For the sake of expediency, the implementation could be done in two phases, the front end of which would include (i) the release of reserved mineral land and the establishment of substantial work requirements in order to hold on to concessions; (ii) relaxation of the existing restrictions on foreign management of mining operations; (iii) implementation of a program of institutional reform in order to focus on areas which are critical for good sector performance; and (iv) the commissioning of studies to analyze the taxation of the mining industry, the establishment of investment vehicles for small and medium

mining, the reduction of discretionary aspects of the mining law, and further adjustments to optimize the institutional setup of the sector (especially regarding government ownership arrangements and financial intermediation). In a second phase, a new mining code would be designed and promulgated, which would (i) formalize all actions taken in the first phase; (ii) limit the strategic minerals to those mentioned in the constitution; (iii) lift the existing limitations to foreign investment, and (iv) implement the conclusions of the studies on taxation, investment for SMM, discretionary nature of the law and institutional reform.

xxii. Important progress in the management of the sector was achieved during 1988 and early 1989. The privatization of non prioritized SOEs was well advanced by March 1989, having accomplished the transfer of about 10% of sector output to the private sector, including State participation in Mexicana de Cobre, Real de los Angeles and six smaller enterprises. Cananea and three smaller companies were earmarked for future privatization and four mining SOEs were being liquidated. Eight enterprises, mostly producers of "prioritized" minerals, will remain as SOEs. CFM has been restructured, is being managed by FMNM's former management and has absorbed FMNM, thus achieving a simplification which should lead to improvement of sector management. The cross subsidization of CFM's operations and subsidiaries has been discontinued; dividends accruing from these enterprises are now transferred to the Federal Treasury and if any subsidiary should need financial support, funds will be included in CFM's budget and transferred as open subsidies. CFM decided to continue operating the regional beneficiation plants and to discontinue all subsidies to these plants. In order to achieve the latter, CFM has raised steeply the tariffs charged for the processing of the ore and has tightened the management control of the plants. These actions appear to be a reasonable approach to the problem of subsidized and inefficient beneficiation plants, as long as the present levels of tariffs, costs (in real terms), volumes and efficiencies can be maintained or improved. Therefore, the implementation of adequate accounting and management information systems to assist CFM's management in the supervision of these operations becomes a central feature of CFM's action plans. Finally, effective on January 1, 1989, the new Mexican administration placed the new corporate income tax system in full effect and enacted a tax amounting to 2% of the net value of assets, which is to be accredited against corporate income tax.

I. THE MEXICAN MINING SECTOR: AN OVERVIEW

A. Background

1. Size and Importance of the Mining Sector

1.01 Participation in the Economy. Endowed with significant mineral resources, Mexico has a broad human resource base of mine workers and well trained engineers and managers. Until the late 1930s, mining was one of the most dynamic sectors of the economy. It accounted for about 4% of GDP in the 1930s, but this share declined to 1.3% by the late 1970s, because of slow growth and the country's petroleum boom. The sector is, however, one among the few that have grown in real terms lately, despite the country's severe economic crisis: in 1986 and 1987, mining output grew by 1.1% and 14.6% respectively, while the economy as a whole contracted by 4.3% in 1986 and stagnated in 1987 with only 1.1% growth. Mineral production reached about US$ 1.8 billion equivalent in 1987, with metallic minerals accounting for about 80% of the total. The sector's foreign exchange earnings amounted to US$ 1,170 million, being only third in importance, after oil and tourism.

1.02 Mining exports have tended to increase in real terms in recent years and the participation of mining and metallurgical exports in relation to the total exports of the country has grown from 4-5% during the period 1982-1985 to 5-6% in 1986-1987. However. the growth in mining exports has lagged significantly behind that of other non-oil exports, having gone down from about 20% to about 10% of non oil exports during the period 1982-1987 as shown in Table 1.1

Table 1.1: Participation of Mining-Metallurgical Exports in Total and non-oil Exports
(US$ million)

Year	EXPORTS			PARTICIPATION %	
	Total (A)	Non Oil (B)	Mining-Metallurgical (C)	C/A	C/B
1982	21,230.0	4,752.0	956.0	4.5	20.1
1983	22,312.0	6,295.0	1,066.7	4.8	16.9
1984	24,196.0	7,594.7	1,039.6	4.3	13.7
1985	21,663.8	6,897.1	909.6	4.2	13.2
1986	16,031.0	9,723.8	967.9	6.0	10.0
1987 a/	20,656.0	12,026.9	1,172.5	5.7	9.7

Source: GDMM

1.03 Production. In 1985 and 1986 Mexico was the world's largest producer of silver and also ranked among the world's top five producers for

fluorspar, lead, zinc, sodium sulphate, sulphur, celestite, antimony, bismuth, arsenic, molybdenum, graphite, mercury and barite. Mexico is also an important producer of copper, gold, iron ore, manganese, coal and salt, as shown in Table 1.2.

Table 1.2: Mine Production 1985-1988

Metallic Minerals (Metal Content)	Mexican Production (metric tons)		World Production (metric tons)		World Ranking		% of World Production	
	1985	1988	1985	1988	1985	1988	1985	1988
Silver (MT)	2,153	2,303	12,448	12,634	1	1	17.3	18.2
Lead (000 MT)	207	183	5,645	5,435	4	5	3.7	3.4
Zinc (000 MT)	275	271	6,750	6,590	4	4	4.1	4.1
Gold (Kgs.)	7,524	7,795	NA	1,481(MT)	-	-	NA	0.5
Copper (000 MT)	168	175	NA	9,944	-	-	NA	1.8
Iron Ore (000 MT)	5,161	4,817	NA	931,538	-	-	NA	0.5
Manganese (000 MT)	151	174	22,971	23,126	9	-	0.7	0.8
Bismuth (MT)	925	749	3,139	3,002	2	4	29.5	24.9
Antimony (MT)	4,268	3,377	51,606	51,838	3	2	8.3	6.5
Arsenic (MT)	4,782	5,315	39,000	46,020	4	4	12.3	11.5
Mercury (MT)	264	345	6,203	6,285	5	4	4.3	5.5
Molibdenum (MT)	3,761	3,350	98,200	93,900	5	4	3.8	3.6
Non Metallic Minerals (Gross Weight)								
Sulfur (000 MT)	2,020	2,051	54,120	62,220	4	4	3.7	3.3
Coal (000 MT)	9,771	-	-	-	-		-	
Fluorspar (000 MT)	697	757	4,743	4,830	2	1	14.7	15.7
Salt (000 MT)	5,451	5,927	-	-				
Celestite (MT)	32,320	24,289	131,107	NA	2	2	24.6	NA
Graphite (000 MT)	35	37	572	525	2	2	6.1	7.0
Barite (000 MT)	468	321	5,652	5,174	3	5	8.3	6.2

Source: General Directorate of Mining and Metallurgy (SEMIP)

1.04 The total value of Mexican mining production in 1987 according to Secretaría de Energía Minas e Industria Paraestatal (SEMIP) was MP$ 2,424 billion equivalent to about US$1.8 billion, split in US$1.4 billion for metallic minerals (of which 68% was exported) and US$0.4 billion for non metallic minerals (of which 85%[1] was exported). The SEMIP figures do not consider as exports the gold production (7.9 metric tonnes in 1987, valued

1/ The statistics of SEMIP do not include raw materials for construction such as limestone and sand and gravel or 95% of the coal production which is transferred inside the same company for final use.

at about US$100 million), which was purchased by the Central Bank, nor 774 MT of silver, valued at US$150 million, that went into local manufacturing or minting of which a sizeable fraction was exported. Nevertheless, the officially registered traded exports of mining products in 1987 amounted to US$ 1,172 million; it is estimated that about US$342 million in foreign exchange was required by the mining sector for its operational expenditures of foreign origin hence the industry generated about US$830 million in net foreign exchange (not considering capital expenditures or debt service).

1.05 The composition of the output of the Mexican mining industry is widely diversified (44 mineral commodities registered production) with a moderate degree of concentration (6 commodities recorded value of production in excess of US$ 100 million in 1987). Furthermore 10 mineral commodities (silver, lead, zinc, copper, gold, iron ore, coal, sulphur, fluorspar and salt), represent 90% of the mining exports and 80% of the total value of production, as shown in Table 1.3.

Table 1.3: Mining/Metallurgical Production and Exports - 1987

Mineral	Production		Exports	
Metallics	Quantity (metric tons)	Value (MP$ million)	Quantity (metric tons)	Value (US$ million)
Gold Total (kgs.)	7,909	151,091	-	-
Silver Total	2,369	706,917		
in concentrates				1.2
refined			1,595	361.3
Lead Total	176,662	143,247		
in concentrates			20,642	16.8
refined			84,896	45.5
Zinc Total	269,929	289,729		
in concentrates			157,294	23.6
refined			71,711	60.0
Copper Total	228,388	423,544		
in concentrates			377,734	161.4
refined			21,126	44.8
Iron ore Total	4,950,254	91,982	-	-
Manganese Total	150,645	23,394		
in concentrates			158,132	9.8
Other	-	65,657	-	140.0
Non Metallics				
Sulfur Total	2,313,341	347,327	1,444,615	159.2
Barite Total	396,740	17,792		
Barium Sulfate			65,939	1.6
Fluorspar Total	719,251	75,211	474,774	35.0
Salt Total	5,613,383	80,608	4,994,844	54.9
Other		7,245		57.4
Total		2,423,744		1,172.5

Source: Bank staff based on data from GDMM

2. Overview of Mexico's Mining History

1.06 Mining has played an important part in Mexican history and, because of its economic importance, it often became a highly political issue subject to frequent changes in legislation. Until the mid 1800's, mining was dominated by the Spanish and, during the second half of the 19th century, there was a remarkable growth in the sector, with the growing involvement of French, English, US and German interests. At the time of the revolution in 1910 mining production had reached a peak with 90% of the industry controlled by foreigners and technical and management responsibility in expatriate hands. At the end of the revolution in 1917, the recovery to previous output was slow. Many mines and exploration projects had been abandoned and others were waiting to be reopened. New mining laws issued in 1926 and 1930 tried to establish a greater degree of Mexican control over mining, which the foreign investors were slow to accept. In 1938 the oil industry was nationalized. World War II and, later, the Korean war, brought about a mining boom and an increasing involvement of US companies. In fact, by the mid-1950's, fully 28% of the foreign investment in Mexico was channeled into the mining industry.

1.07 In 1955, a tax law aimed at securing a larger share of the profits for Mexico, was promulgated. It increased the production taxes (virtually a royalty) and made mining a marginal operation (for example, the production tax on gold was set at 20.6% of the market value, with the tax on other minerals being only slightly lower). At the same time, export taxes were imposed on minerals (reaching up to 28% of the value of the exported mineral). However, these taxes could be reduced significantly through negotiation, because the Government wanted to encourage the development of processing industries, but this led to complications as the rebates were set arbitrarily. The effect of these laws was a drastic reduction in investment and profits. In 1950, mining taxes provided 28.9% of the budget revenue against 3.3% in 1960.

1.08 After it became obvious that the situation was to nobody's advantage, a new mining law was passed in 1961 (known as the "Mexicanization Law") establishing a compulsory minimum 51% Mexican ownership in mining enterprises; the law also called for minimum 66% Mexican participation in companies gaining concessions (called special concessions) on national reserves and for the exploitation of iron ore and coal. Oil and gas, uranium, sulfur potassium and phosphate rock were reserved for development by the state owned enterprises. At the same time, the Law provided wide discretionary powers to the Government thereby creating uncertainties detrimental to investment and development. Taxation was equally discretionary, reaching in some instances 50% of sales revenues.

3. The Mining Law of 1975

1.09 This law completed the process of "Mexicanization" of the mining industry by confirming the ownership and control requirements of the 1961 law and setting out the policies and regulations currently in force. It also specified the responsibilities of SEMIP and other Government bodies and enacted regulations concerning exploration, processing and trading of all solid minerals. It also provided for close monitoring of all

investment programs as a basis for granting concessions, and established "priority" minerals and the Government's discretionary power to establish reserved exploration zones (National Mining Reserves and Mineral Assignments). Furthermore, it established a mining right, which amounts to a flat production tax, ranging from 4 to 9% of market value, depending on the mineral. Other provisions included a tax credit for re-investment or exploration, and exemptions of up to 75% of import duty on mining equipment and supplies. Since then, most of these taxes have undergone several modifications; at present the mining right is 7% for precious minerals, 2% for coal, iron and manganese and 5% for the rest;[2] import tax rates have been lowered and the exemption has been eliminated; the dividend tax amounts to 50%. These taxes are paid in addition to corporate income tax. A new income tax regime is being phased in to deal with the present environment of high inflation.

4. The National Mining Program (NMP)

1.10 In 1984, the Government issued a strategy program (Programa Nacional de Mineria 1984-1988) which constitutes a sectoral instrument within the broader, economy-wide scope of the National Development Plan. The general objectives of the National Mining Program (NMP) were related to self-sufficiency, import substitution, increase in foreign exchange earnings and in employment, regional development and to strengthen the linkage between the mining sector and the economy as a whole. The sectoral strategy was to be based on maximizing the use of the installed capacity and of the existing knowledge of mineral resources, strengthening the operative and financial aspects of the mining companies, accelerating exploration in the short term, and promoting increased vertical integration in the longer term. Consistent with the policies laid down by the National Development Plan, the NMP (i) contemplates the need for competitive exchange rates and to decrease inflation and interest rates; (ii) establishes that no subsidies will be forthcoming and that the competitive position of Mexican mining will be based on its productivity; (iii) establishes that a relationship must exist between the internal prices and international prices of all mineral products, and that tax schemes should not place Mexican miners at a disadvantage vis-a-vis foreign producers; (iv) defines that growth should be favored through the strengthening of exploration and technical and financial assistance; (v) seeks to promote the participation of more enterprises in mining activities; and (vi) seeks to preserve the continuation of existing operations and of projects already underway and to encourage the exploration of minerals now being imported. The plan details, however, specific actions, some of which appear to run contrary to the general direction of the above policies, while ignoring areas of action which could significantly help achieve the stated objectives. Among the former, the NMP mentions, inter alia, that the national mining reserves should be considered as a basic instrument for the strategic orientation of exploration activities, prioritizes several projects of doubtful profitability, specifies that state-owned enterprises in the mining sector should seek to lead efforts to substitute imports (by focusing their procurement in the internal market, supporting the national

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2/ Full production tax as specified is applicable at present only to large mining companies; medium sized companies are entitled to a 20% discount and small miners to a 40% discount.

manufacturers and the strengthening of Mexican engineering firms) and that the financial structure of the state owned enterprises in difficulties will be strengthened. Among the latter, nothing is said of the investment vehicles needed to modernize and improve the financial position of small and medium mining (SMM).

1.11 The NMP represents a positive effort to coordinate a coherent, comprehensive, intersectoral action in support of the mining sector. As such, it has been well received by the local private sector and planners and has produced interest and confidence to investors. However, the inconsistencies between its goals and some specific actions it calls for have been potentiated by the fact that the NMP is a strategic document which has unfortunately not resulted in a strategic process. Hence it has not been used as the basis for a system where the future implications of all the meaningful decisions of the sector are contrasted with sectoral objectives and policies and where the action plans are subject to adjustments, if need be, in agreement with posterior trends or events. In this context, the referred inconsistency between the stated goals and policies and specific actions has precluded a useful role for the NMP, as discussed in paragraphs 2.03 and 2.04.

5. Privatization

1.12 The decision of the Government of Mexico to sell the state interest in Cananea and Mexicana de Cobre, represents a major shift in the long Mexican tradition of active government involvement in the mining sector. In 1984 decisions to limit the investments of state agencies and enterprises were taken, followed by decisions to sell some small enterprises and the stock held in some mixed companies. However, the significance of these actions was very limited, on account of the small size of the enterprises involved. The process was substantially escalated in late 1987 with the decision to privatize the state holdings in copper, followed by the sale of Cananea; Cananea and La Caridad are the two largest mines in Mexico and had been making heavy losses, in the face of lower than expected copper prices. Their transfer to the private sector was the first significant action that the Mexican state has taken since 1910 in the direction of decreasing the role of the state in the sector, and a sound approach to setting these enterprises on a viable basis. In May 1988 the sale of Cananea to the Protexa group of Monterrey NL (a diversified group with interest in construction and in the building of oil rigs, but with no experience in mining) was announced but the transfer was detained in June 1988, reportedly because of the inability of Protexa to comply with the financial conditions of its bid. Nevertheless, the Government has stated its intention to continue with the privatization process. The decision to privatize is considered to be a sound approach to setting these enterprises on a viable basis.

B. The Institutional Framework

1. The Secretaría de Energía Minas e Industria Paraestatal and the State Agencies of the Sector

1.13 The Government's supervisory body for the sector is the Secretaría de Energía Minas e Industria Paraestatal (SEMIP) which administers the

sector through the Subsecretaría de Minas e Industria Básica with the support of two General Directorates and three semi-autonomous agencies. These offices and agencies are (i) the General Directorate of Mines (GDM), responsible for the administration and control of mineral rights (including registration, processing, granting and supervision of NMR, MAS and concessions) and of the production of all mines as well as the determination of mineral production taxes: (ii) the General Directorate of Mining and Metallurgy (GDMM), responsible for the overall coordination of the Programa Especial de Apoyo a la Pequeña y Mediana Minería (PECAM) credit program for small and medium scale mining (SMM), for the preparation and review of sectoral programs (including the NMP) and for the control of parastatal mining enterprises: (iii) the Comisión de Fomento Minero (CFM) a semi-autonomous agency created in 1934, which serves as a holding company for state participation in mining companies, as a Government parastatal (actually producing and operating mines and beneficiation plants), as a technical service agency for the sector (metallurgical laboratories) and as a credit and technical assistance agency to support metallic SMM enterprises: (iv) the Fideicomiso de Minerales no Metálicos Mexicanos (FMNM) a semi-autonomous agency created in 1974 as a Government trust administered by NAFINSA, which provides credit and technical assistance for the development and industrialization of non-metallic minerals and which facilitates the flow of economic benefits from non-metallic mining operations to indigenous agricultural communities (or "ejidos"); and (v) the Consejo de Recursos Minerales (CRM) an agency which has the role of a geological survey in Mexico, and which takes an active part in exploration and in providing financial and technical assistance for SMM and support in the area of exploration to parastatals and to SMM. A detailed discussion of these agencies is included in Annex 1.

2. The Mining Companies

General

1.14 In terms of importance to the economy as a whole and as an employer, mining in Mexico is dominated by two groups, the large scale private (Mexican controlled) sector and the State Owned Enterprises (SOE). A third, important, group consists of the mixed companies, usually with state minority participation, in which the two mentioned groups are partners. The private sector has until recently been dominated by five companies, four of which have traditionally provided the bulk of the production of silver, lead, zinc and gold in Mexico. These are: Peñoles (Industrias Peñoles S. A. de C. V.), IMMSA (Grupo Industrial Minero Mexico S. A. de C. V.), San Luis (Corporación Industrial San Luis S. A. de C. V., and Frisco (Empresas Frisco S. A. de C. V.), and one manganese and ferro alloy producer Autlan (Compañía Minera Autlan S. A. de C. V.).[3] A sixth private company will be Minera de Cananea (copper producer), now majority state owned, once its planned privatization has been completed. The most important Companies with majority State ownership (SOEs) are Azufrera Panamericana (sulfur), Exportadora de Sal, SIDERMEX (coking coal and iron ore), Minera Carbonifera Río Escondido (MICARE) (thermal coal), and Real del Monte y Pachuca (polymetallic). The largest mixed Companies of the sector have majority private ownership and are Mexicana de Cobre (La

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3/ The state has a 3.37% holding in Autlan, through CFM.

Caridad) (copper producer under divestment) and Minera Real de Angeles (silver). In 1986 the value of production of the large scale private mining sector (including those with minority state participation) was about US$968 million. State majority companies were responsible for a production value of approximately US$401 million and the production value of the small and medium scale (largely private) sector was approximately US$180 million. Annex 2 discusses in detail the size and importance of the major private companies.

1.15 The major private Mexican companies are closely linked with private foreign companies through various types of associations, from direct participation at the holding company level--ASARCO (American Smelting and Refining Co. of USA) with a 34% stake in IMMSA--to specific subsidiary mine company operations. A good example of the latter is the Minera Real de Angeles silver (lead-zinc) operation owned 33% by CFM (on behalf of the Government), 33% by Frisco and 34% by Placer Development of Canada. The Peñoles' Rey de Plata silver-zinc mine in Guerrero has a 40% participation by Outokumpu OY of Finland, and the Fresnillo group is owned 60% by Peñoles and 40I by AMAX of the USA. These associations are the only way in which the foreign investors, attracted by the Mexican mining potential and limited by the mining law to a minority position (see paragraph 2.37), can participate in Mexican mining. As in well developed business environments elsewhere in the world the permutations of company joint-venture linkages are numerous. The state is also associated with foreign companies in some SOEs: this situation exists in the sulphur industry with the Exploradora del Istmo company being owned 51% by the State, through CFM, and where Texas Gulf Sulphur of the USA owns a substantial minority (34%). Even at the smaller scale level there is a presence of associations of diverse groups, for example an excellent operation of 400 tpd is run at the Sabinas mine in Zacatecas where private majority interests are linked with AMAX and Peñoles through their Fresnillo Group.

C. Competitiveness and Financial Position of Mexican Mining

1. The Macroeconomic Environment

1.16 For much of the 1980s, the Mexican mining industry had to cope with the twin problems of low international metals prices and depressed and unstable domestic economic conditions. This was a period when record low world market prices for the base metals forced massive closures and restructuring of mining enterprises in industrial and, to a lesser degree, in developing countries. To a large extent, however, the Mexican counterparts have managed to survive this period relative intact; lately, most of the Mexican mining companies have regained financial health and profitability, as discussed in paragraphs 1.37 and 1.38. Annex 3 is an account of the external environment in which the Mexican mining industry operated, and of its consequences.

1.17 Trade liberalization was implemented in mining much before it was initiated in the rest of the economy, where the liberalization process commenced in 1985. Non-fuel minerals - with the exception of a small number of non-metallic minerals, including salt - were placed basically in a free-trade position by measures taken in 1981/82. Trade liberalization measures initiated in July 1985 completely eliminated non tariff barriers

(NTBs) on imports and exports of non-fuel minerals by December 1987; at the beginning of 1989, the rationalization of the tariff structure set the tariffs in the 10%-20% range. Currently effective protection for non-fuel minerals range from 8.8% for carbon derivatives to 15.1% for non-metallic minerals. Because of the recently established tariff rationalization, iron ore which was virtually free of tariffs has now a 10% tariff; on the other side, the average import tariff on non-ferrous minerals (including gold and silver) went up from 11.2% in May 1988 to 13% in March 1989. Since Mexico imports only small volumes of mineral products and the major part of domestic production is exported, the exchange rate (including the effect of export taxation) and world market prices had a higher impact on the operations of the mining sector during the 1980s than the import protection system. Import licensing - which was generally the most effective constraint to trade in Mexico - was important for non-ferrous metals until 1985 and for a number of non-metallic minerals until discontinued in 1987. Export taxes and other export restrictions for mineral products (export licensing, reference prices) were abolished during the early 1980s. Finally, import liberalization/tariff reduction have diminished tariffs on capital goods to the 10%-20% range, improving the international competitiveness of mining. It is also worth noting that mining does not have access to tariff-free imports of capital goods via the PITEX program (Temporal Import Program to produce export products) as does the rest of the industrial sector.

2. Infrastructure and the Mining Industry

1.18 While mines are usually located in remote areas, most mining companies in Mexico are able to obtain adequate provision of water, power and transportation facilities. Mexican regulations establish that mining enterprises have to pay for their own infrastructure investments, including camp sites, access road, power transmission and transformation (mines are generally not permitted to install their own power generation) and provide for their own water requirements. Mines are charged the same tariffs as other industrial enterprises in Mexico, although, in the case of water supply, cover also the investment costs, in addition to the tariffs. The over-regulation of transportation services in Mexico [4] affects the competitiveness of mining as of other productive sectors with major transport requirements. Mexican mines transport ores generally by truck to the concentrators, while the final metal is shipped to ports for export by both railway and truck. In both means of transport, mining obtains the lowest tariff category. Mining faces the same restrictive practices in trucking as other industries although, at least, the larger mining companies seem to have accommodated well to the limited freedom in Mexico's transportation system, by using the negotiating leverage that their large volume provides them with. As a consequence, large mines enjoy low cost transportation at reasonable efficiency. However, small and medium mines are less able to protect themselves: transportation accounts for about 10% to 15% of production costs on average for these mines. Such costs might be reduced with greater competition among the transport contractors. The Government is currently taking measures to extend the economic liberalization process to the transportation system. Small and medium mining would benefit from such measures.

4/ Some of the more important regulations place barriers to entry into transportation, obstacles to the movement of existing carriers, and limit the freedom of users to select providers.

3. Competitiveness of the Mexican Mining Industry

1.19 For a mining sector as diverse and large as that of Mexico, it is difficult to ascertain its international competitiveness for all of its subsectors. This section focuses on the important metals and minerals produced in Mexico--i.e., silver, lead, zinc, copper, iron ore, and coal. Even in some of these key metals and minerals, the information on which this report is based is less than satisfactory, since the large private mining companies that own and operate major lead/zinc/silver mines and the copper producers do not provide cost data to outside parties.

1.20 Silver, Lead and Zinc. Silver in Mexico is produced jointly with lead and zinc, sometimes also in combination with small amounts of gold and copper. The fact that they are co-products makes it difficult to estimate the costs of the individual metals. The approach used in this analysis is to assign the total cost to the individual metals in proportion to the value of the outputs (pro-rata method). Alternatively. the profitability of the individual mines--the totality of lead, zinc, and silver operations--under different sets of assumptions about international prices will also be looked at. The cost study here is based on a sample of 56 mines of different sizes, accounting for approximately 30% of Mexico's silver and lead production, and for 18% and 10% of zinc and gold production, respectively.

1.21 As shown in Annex 4, Table 1 there is no significant difference in the average direct mining costs between the small and medium-size mines.[5] The differences in the structure of the costs are explained by the transportation of the ore of the small mines to sometimes distant mills and by the fact that the milling costs of these small mines. (mostly using CFM's beneficiation plants), are classified as "other" costs, while the medium mines utilize their own beneficiation facilities and therefore the cost of beneficiation is spread over different cost categories. Small mines usually work on relatively high grade ores to overcome their disadvantages in mining, transportation and beneficiation. The cost share of labor, including the social benefits, is about the same between the two groups, indicating that economies of scale and possible efficiency gains through mechanization probably do not apply to the small and medium mines in Mexico.[6]

1.22 At 1988 market prices, all silver mines surveyed are profitable and the great majority of them are able to weather a worst case scenario. reflecting the clear comparative advantage of this subsector. Largely as a result of high silver content in the ore, the costs of producing silver in

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5/ Cutoff between small and medium scale mines is 50 tons of ore mined per day.

6/ The average output per man-shift is about 2 tons of ore per man-shift of production workers in small mines, compared with 2.7 tons for medium mines. In terms of production per man employed (production workers plus administrative personnel), the difference is almost nil - 1.5 tons for small mines and 1.4 tons for medium mines (see Annex 4, Tables 3 to 6). The fact that the cost share of labor is about the same is explained by more or less the same labor productivity.

the form of silver concentrates amount to less than $3.00/oz for 80% of the mines and 83% of the mining capacities surveyed. (Annex 4, Table 2). The cost of producing by-product gold is also less than $200/oz for all the mines. The costs of transporting, smelting/refining precious metals like silver and gold are small relative to the value of the metal. Thus, the total direct costs per ounce of refined silver range between $0.80-4.00, with most of the mines falling below $3.00/oz. At present market prices of about US$6.00/oz during 1988, the least economical of the Mexican mines surveyed could be profitable after allowing for indirect costs (interest and depreciation), production tax, and other miscellaneous costs. If the price of silver were $5.00/oz, the lowest level in recent years, the least economical of the Mexican silver mines could still cover the total direct costs plus the production tax. Only a combination of record low prices for silver and over-valued peso could make the least efficient operations lose money. Production of gold is likely to be profitable as long as the price of gold does not crash below $200.00/oz.

1.23 The costs of producing lead and zinc concentrates are also very competitive, mostly less than $200 and $300 per ton of fine metal content, respectively (Annex 4, Table 2). For lead and zinc, the cost of refining and smelting is estimated at approximately $180-200/ton and the cost of transportation could amount to $10-40/tons, depending on the distance to the refinery. For most of the mines surveyed, the total direct cost of producing refined lead is estimated to range between $390-440/ton, and $460-510 for zinc. After allowing for indirect costs (30% of direct costs of mining and milling) and production tax, these operations would make profits at the current market prices of about $500-600/ton for lead and $800-1,000/ton for zinc. However, about half of the mines producing lead appear vulnerable to low international lead prices or adverse exchange rate adjustments. In the case of zinc, the profit margin is wide enough, except for one mine, to be able to withstand adverse market conditions.

1.24 Since these metals are produced jointly, losses in one can be compensated by gains in others. The mines will continue to produce as long as they make net profits for the entire operation. Following the pro-rata estimating method, Table 1.4, measures the profitability of the mines under current and worst condition scenarios. For this purpose, assumptions about market conditions consider a set broadly reflecting present conditions and a second with the lowest international prices in recent years and real peso appreciation to bring it to its 1984 level in real terms, as follows:

	March 1988	Worst Case Scenario
International Prices		
Silver (US$/oz)	6.33	5.00
Gold (US$/oz)	442	300
Lead (US$/MT)	656	350
Zinc (US$/MT)	876	600
Real Exchange Rate Index		
(peso/$)	100	71.7

Under the current market conditions, all of the mines surveyed make profits; most of them make profits in excess of 30% of revenues. If the extremely unfavorable market condition prevails, it is estimated that 9 out of 27 mines will lose money. However, 4 of the 9 unprofitable mines would still more than recover the variable (total direct) costs.

Table 1.4: Profitability of Polymetallic Mines Under Different Market Environments

Net Profits a/ as Percent of Revenue	Number of Mines in Each Profit Range	
	Current Condition	Worst Condition
>60	9	0
30-60	13	7
10-30	2	9
0-10	3	2
-(0-10)	0	2
-(10-30)	0	2
-(30-60)	0	2
<-60	0	3
Total	27	27

Source: Mission survey.

a/ Profit margins are net of all direct and indirect costs, where indirect costs are assumed to be 30% of direct costs.

1.25 The estimates reveal that the profitability and the comparative advantage of silver/lead/zinc mines critically depends on the precious metal content of the ore body. Mexico is blessed with high-grade silver ores (sometimes mixed with small amounts of gold); most of the mines surveyed work on ores that contain more than 150g of silver per ton of ore. Since silver has the highest profit margin of the three metals, the greater the silver content of the ore, the greater the profitability of the mine. The highly competitive mines almost invariably have ores containing more than 300g of silver per ton of ore. The only exception of this rule is the large open-cast mine (Minera Real de Angeles) that exploits relatively low grade ore but on a large scale and hence at a far lower costs of mining. The mines that show some vulnerability to adverse market conditions have ores with a relatively low silver content, compared to lead and zinc contents. They generate smaller revenues per ton of ore, while requiring larger costs for smelting and refining. This squeezes the profit margin per ton of ore mined and therefore makes the mine vulnerable to declines in prices.

1.26 With regard to the larger mining companies, it is also possible to examine the competitiveness of the mines through reference to their overall financial performance; the five major private companies are very profitable while lead/zinc/silver SOEs loose money. Most of the 1980s are considered to have been years of relatively depressed prices, especially for lead and zinc and to a lesser extent, for silver and gold. It is noteworthy, therefore, that all of the major Mexican producers--Peñoles, IMMSA, Frisco and San Luis and also the newer large mine, Real de Angeles have successfully maintained their profitability in the face of low prices and non-supportive exchange rates. Given that all of these companies basically sell to foreign buyers or sell in the local market at international prices, the financial results are considered to indicate a reasonable to good competitive position on the world's cost curve for these mines. While these five major companies appear well placed on the world's cost curve, it must be noted that some of the smaller government-owned lead/zinc/silver companies are presently loss makers or scarcely able to cover full production costs. Such operations include Cia Real del Monte y Pachuca and CFM's El Bote mine.

1.27 Copper. The production costs at Mexicana de Cobre and Cananea can be directly compared with other producers. From the standpoint of cash operating costs (i.e., excluding financial charges) Mexicana de Cobre is well within the lower quartile (the lowest 25%) of the world cost curve and Cananea would appear to have the potential to achieve that quartile also when its ongoing expansion is completed. However, with high interest charges on its large debt, Mexicana de Cobre becomes amongst the higher cost producers in the world today, while Cananea could become an internationally competitive producer once the now detained privatization process is completed.

1.28 Data comparing copper production costs in different countries indicate for 1985 that after by-product credits the average world copper production costs for refined copper in cash terms excluding interest was US$0.44 per lb. By comparison, costs were US$0.65 per lb for Cananea and US$0.48 per lb for Mexicana de Cobre (since then, both companies have reduced their costs significantly, partly as a result of the devaluation of the peso and partly through improved productivity and efficiency measures which have cut costs; Mexicana de Cobre estimated its cash operating costs, after by-product credits at US$0.31 per lb. in 1987, making it one of the world's lowest cost producers). However, when interest charges are included, Cananea had a total cash cost of US$1.19 per lb in 1985 (previous to the privatization) and Mexicana de Cobre US$0.81 per lb compared with an industry-wide cost of US$0.65 per lb. On a full cash cost basis, both producers are more expensive than the average for all producers in other countries as shown in Table 1.5.

Table 1.5: World Copper Cash Production Costs - 1985
(US$ per lb refined copper)

	Direct Costs	Indirect Costs	By-Product Credits	Cash Cost Before Interest	Interest	Total Cash Costs
S. Africa	49.3	8.4	(26.2)		2.1	28.6
Zaire	58.8	5.2	(25.9)		1.7	39.8
Peru	66.6	12.4	(44.2)		6.4	41.2
Chile	40.2	6.3	(8.8)		4.5	42.2
Canada	107.7	11.6	(85.9)		8.9	42.3
Indonesia	62.9	2.1	(15.5)		0.2	49.7
Australia	69.4	5.4	(25.2)		1.8	51.9
Sweden	105.9	10.4	(65.1)		2.8	54.0
Zambia	46.3	13.0	(10.0)		6.5	55.8
Average	64.3	7.4	(27.7)	44.0	6.6	65.3
Mexicana	43.3	14.5	(10.2)	47.6	33.2	80.8
Cananea	56.4	14.2	(5.4)	65.2	54.2	119.4

Source: Western World Copper Production Cost Study, Brook Hunt Associates, London.

1.29 Iron Ore. Mexican iron ore production provides an efficient import substitution but does not qualify as an internationally competitive export. The competitive position for import substitution is solid for the northern mines (Hércules and La Perla), but in the case of the southern mines (Encinas and Peña Colorada), it could change easily, if macro-economic developments (i.e., exchange rates) would modify the relative cost of the more important production factors in relation to foreign producers. While the mining conditions are technically not very difficult, ore grades are relatively low compared to international standards and result in higher production costs for equivalent products. (Comparative costs of iron ore production and imports are summarized in the Annex 4, Table 7). The northern iron ore mines benefit from a natural protection, since they are located close and linked to the steel mill of AHMSA to which they supply pellet feed. The approximate cost of supply of pellet feed to AHMSA's pellet plant amounts to about US$17/ton, while imported pellet feed would range around US$35/ton. The supply of whole pellet to AHMSA and to HYLSA's northern plant is assured from the southern mines and ranges between US$33 and 36/ton compared to costs of imported pellets (from Brazil or Chile) amounting to US$42-44/ton; a similar difference would hold for pellet supplies to HYLSA's Puebla plant near Mexico City. The situation for the supply of iron ore to the steel mills in the south is different because of the closeness of SICARTSA to the Lazaro Cardenas port. No detailed information is available from SICARTSA on the cost of its own ore supply from the Las Truchas mine, although the company has apparently been able to

keep production costs of its own pellets below purchase prices of imported pellets in the past. Pellets from Peña Colorada delivered to SICARTSA currently run around US$33/ton compared to costs of imported pellets of US$29.5-31/ton. Studies are now being undertaken to see whether the relatively long and expensive land transport cannot be replaced by cheaper barge transport along the coast when SICARTSA starts up its second phase production facility.

1.30 Cost data available for iron ore mines do not permit an evaluation of trends, but it appears that inflation, exchange rate movements and the development of factor costs has resulted in a cost decreasing impact. Annex 4, Table 7 shows in detail the costs of the different supply possibilities for the Mexican steel mills. Peña Colorada does not operate at full capacity and could produce at lower costs if its capacity were used fully. Hercules has a good potential for lowering its operating costs since it has not yet achieved its design capacity. La Perla is rapidly approaching the end of its life, as is the HYLSA mine, Las Encinas, and therefore have little potential for cost reductions. The effect of the planned expansion of the SICARTSA mine, Las Truchas, on its costs have not yet been determined, and the potential project of HYLSA (Cerro Nahuatl) is low grade and high cost.

1.31 Coal. Mexico's production of metallurgical and thermal coals qualifies for efficient import substitution but not for internationally competitive exports. There are two main reasons why Mexico probably will not become a competitive coal exporter. One is the low quality of coal found in Mexico that requires costly beneficiation. The other is the long distance between the coal mines in the north and the Lázaro Cárdenas port in the south, where any export shipments would take place. From the point of view of efficient import substitution, the long distance to the port works in favor of the indigenous coal mines when supply to the AHMSA steel mills in the north is concerned. However, the distance works against the northern coal mines in supplying the SICARTSA steel mills near the port.

1.32 Table 8 in Annex 4 shows the costs of production, direct and indirect, for SIDERMEX's mines and four washing plants. The costs per ton of washed coal ranged between $20-45 in 1987, with the average of about $25 for all of SIDERMEX's production. Given the average freight of $3.00 per ton from the mines to the AHMSA mill, the most expensive of SIDERMEX's coal mines (Hullera Mexicana) can compete efficiently against imported coal, which currently costs about $50, CIF Lázaro Cárdenas, plus $15.80 in freight from the port to AHMSA. At SICARTSA, however, the imported coal is cheaper than those of Hullera Mexicana and Minera de Guadalupe, considering that the imported coal has higher quality than the domestic coal. Because of lower costs at other mines, SIDERMEX's coal on average can compete against imported coal at SICARTSA. The margin, however, is not wide enough to cover conceivable situations of lower international prices and higher domestic costs.

1.33 The Minera Carbonífera Río Escondido (MICARE) supplies raw thermal coal for direct burning to a thermal power plant of Comisión Federal de Electricidad. Table 9 in Annex 8 presents direct and indirect costs of production for each of MICARE's mines. When converted into washed coal equivalents, the costs of MICARE's thermal coal at $12-35/ton will rank

higher than those of imported thermal, CIF Lázaro Cárdenas area, estimated at $25-30/ton for comparable quality. The freight to MICARE would be large enough to make MICARE's coal economical at today's prices. The relevant question, however, is whether MICARE is the least cost solution for supplying electricity to the area, considering that Mexico has other energy options available. However, it is important to note that MICARE's high cost of production apparently is due to unusually large depreciation and amortization charges. The direct cash costs are less than half of the total costs. On the basis of direct costs alone, MICARE qualifies as a low-cost producer, except for Tajo II.

1.34 The competitive position of Mexico's coal mining industry has undergone significant variations in recent years, primarily as a result of changes in real wages and exchange rates. Average earnings per worker in coal mining increased sharply in the early 1980s but dropped sharply in real terms by more than 40% during the 1983-84 period (Annex 4, Table 10). This was the main reason for sharp declines in coal mining costs over this period. In 1986, the mining sector earnings recovered some of the earlier losses. Over the same period, the real output per worker has steadily declined to less than 80% of its 1980 level, reflecting the depletion of four open pits which had dominated the supply of coking coal and which have been replaced with underground mines. As a result, the real earnings adjusted for productivity changes stood in 1986 at only slightly below the 1980 level.

1.35 Other Minor Metals and Non-Metallics. The international competitiveness of many of the non-metallics that are currently being exported at increasingly larger volumes--particularly such products as marble and other forms of stone aggregates, graphite, fluoride, and salt--indicates the presence of clear comparative advantages in the production of these minerals in Mexico. There were also reasonably good indications that most of the remaining non-metallics and other minor metallics, such as barite and manganese, are at least efficient substitutes for imports.

1.36 Autlan (manganese and ferro alloys) and APSA (sulfur) are the two largest enterprises producing minor metals and non-metallics. Since both of these companies sell about half of their production in export markets, their overall financial performance can be used to infer a broad competitive position. Both companies have recently achieved modest profits. Autlan faces a potentially difficult world market outlook, especially for Manganese, and may be considered as marginally competitive. The outlook for the world sulfur market is slightly more promising and APSA may have more scope to establish a competitive position. However, given their modest profit margins at the prevailing exchange rates of late 1987/early 1988, the competitiveness of both producers could be vulnerable to a strengthening of the peso vis-a-vis other currencies.

4. The Financial Position of Selected Mining Companies

1.37 The 1980s have been a period of financial strengthening for the four major private companies that produce non-ferrous (precious and base) metals (Peñoles, IMMSA, San Luis and Frisco). They have remained consistently profitable with combined annual profits ranging from US$76 million to US$171 million from 1981-86. IMMSA and Peñoles completed large

investment programs in the early 1980s but since then, the combined investments of the four companies have been extremely modest--averaging only about US$64 million per year over the past four years. In 1980, the four companies had a combined long-term liabilities/equity ratio of 51:49. Since then, combined long-term liabilities have broadly remained at about the same level while equity has increased almost fourfold with the result that the long-term liabilities/equity ratio has fallen to 21:79.

Table 1.6: Selected Mining Companies - Combined Selected Financial Indicators a/ (US$ million)

	1980	1981	1982	1983	1984	1985	1986
Sales Revenue	1632	1185	1050	1272	1246	1081	1037
Net Income After Tax	166	99	106	171	123	76	113
Long Term Debt	550	692	624	344	480	419	334
Equity	527	777	498	619	1604	1393	1255
Capital Expenditures	210	277	138	59	74	78	46

Source: Bank staff estimates derived from Annual Reports.

a/ Peñoles, IMMSA, Frisco, San Luis.

1.38 A more detailed analysis of the financial position of the companies is included in Annex 5. Nevertheless, it is clear from the above figures that the major issue facing these companies is what type of capital expenditure strategy to follow given their high liquidity and low debt and, in particular, the extent to which funds are reinvested in the mining industry or are used to diversify away from mining.

1.39 In addition to the four companies identified in previous paragraphs, there are four other noteworthy metal mining companies. Cia Real de Angeles is a new and highly successful silver producer with 1986 sales of about US$90 million. Cia Minera Autlan (Autlan) is the main producer in Mexico of manganese and various ferro alloys with annual sales of about US$80 million in 1986; it was in a breakeven/loss-making situation in the early 1980s and has made very modest profits since 1984. An important issue, therefore, is how to reduce costs and improve Autlan's competitive position vis-a-vis other producers. Autlan borrowed heavily in the late 1970s for a major investment program and is burdened with a large debt which it has had difficulty in servicing; it is still highly leveraged (long term debt:equity ratio of 79:21) and thus a second main issue facing Autlan is how to improve its financial structure and reduce its indebtedness. Financial data for Autlan is given in Annex 5.

1.40 Copper Mining Companies. Mexicana de Cobre and Cananea are Mexico's two largest copper producers. In the face of lower than expected copper prices, both companies have made large losses, have been unable to service their debt and have relied on additional shareholder funds (in particular, from the Government which guaranteed much of the debt of the two companies) in order to meet debt service requirements, undertake capital expenditures, and continue operating. Both companies have maintained large investment programs in recent years to expand mining capacity, reduce unit costs and introduce smelting capacity. For example, between 1980 and 1985, their combined investment programs averaged US$140 million per year--more than double the combined capital expenditures of Peñoles, IMMSA, Frisco and San Luis. Presently, both companies are increasing their output as the expansions are completed. As discussed in paragraph 1.13, as part of a new policy initiative to limit Government participation in the mineral industry to the so-called strategic minerals, the Government has taken the decision to completely privatize both companies.

D. Safety and Environment

1. General

1.41 Firstly the Mexican mining industry is a mature industry, in the sense that mining and smelting operations have been carried out quite extensively since late in the last century. Secondly, most of the mining and smelting takes place in the more sparsely populated arid/semi-arid regions north of Mexico City. However, urban areas have now surrounded smelters, which were originally built on sites well separated from residential areas. Thirdly, the mining sector is characterized by large numbers of small-scale operations, medium scale operations and even large-scale operators such as Peñoles and IMMSA producing silver, lead, zinc, copper and gold. Fourthly most metal mining operations are underground; the main exception being Real de Angeles and the large open cast copper and iron ore mines.

2. Base Metal Mining

1.42 The larger private Mexican companies employ modern mining techniques which enable them to achieve high levels of productivity and to provide safe working conditions for their miners, at standards comparable with those of advanced economies, although some problems remain. Because the main concentrator facilities are operated by the larger companies and the State institutions, tailings dams for tailings disposal are used for the most part, and the discharge of tailings directly to rivers is not extensively used. The new law[7] specifically prohibits such unacceptable practices. However, dust blow-off is a serious problem at most tailings dams and companies should be required to stabilize the finished embankment as well as the surface of the final impoundment. The Mexican Chamber of Mines is preparing a manual on tailings dam construction and operation which addresses this problem.

1.43 Little control has been exercised in the past by Government environmental bodies in the control of pollution from mining operations and

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7/ See paragraph 1.47.

SEDUE (the official, responsible institution) appears to have little experience in the mining industry. The State enforcement officers of SEDUE have little experience in the mining industry and no facilities for pollution testing. The industry needs to cooperate with these officers and to assist them in arriving at the best technical and least cost solutions to environmental problems. With the increasing emphasis on environmental matters (due to the new law) mining companies will be required, inter alia, to provide better control of the water circuit to prevent discharge of contaminated effluents to the environment. During the site visits examples were noted where SEDUE recommendations would have increased pollution due to the complexities of the water circuit and a lack of understanding of the concentrator/mining operation.

1.44 The lack of worker health and safety provisions in many of the small mines and some of the medium-scale mines is a matter for concern, but the concentrator operators, appear to be an interesting potential source of technical assistance in the area of safety for the small miners. The most serious problem in this respect occurs in the small-scale mercury mines around Puebla (south of Mexico City) where mercury poisoning and early death are often a fact of life for the mine workers. Only very crude methods are used to detect mercury poisoning, and even if the worker is discharged he and his family face a bleak economic future, because small-scale mining is often the only source of employment for the people. Some of the concentrator operators are providing technical assistance to small- and medium-scale ore suppliers seeking to improve their productivity and quality of ore. There seems to be considerable scope for these companies to provide training in mining techniques and improved safety which would have an economic benefit to all concerned, as well as to the Mexican economy.

1.45 The level of investment required to bring the major production units in the base metal mining sector up to acceptable environmental and safety standards seems to be relatively minimal. The investment cost of remedial work may be high in relation to output in the case of small scale operations; further analysis is needed to establish the level of such costs and their impact on the finances of small scale producers.

3. Base Metal Smelting and Refining

1.46 The environmental and worker health concerns and the pollution abatement investment costs in this activity are orders of magnitude greater than in the mining activity (except possibly for small-scale mercury mining) and widely varying attitudes were found in management. Likewise, the potential benefits to the operators and to the economy are also correspondingly higher. Two extremes of management attitude to environmental and safety matters were observed during the site visits; from total concern and appropriate remedial action to a lack of cooperation and inaction. However, well run Mexican companies find (like their counterparts world-wide) that pollution prevention pays. This is well demonstrated in the case of the Peñoles Smelter and Refinery at Torreon.

1.47 The main smelting and refining operations are concentrated in only six locations, namely, Mexico City, San Luis Potosi, Torreon, Chihuahua, Cumpas and Cananea. Due to the general shortage of water in Mexico these plants are very effective in water recycling and reuse, and water pollution is not a problem. Some of the more frequently observed problems in the smelters and refineries are:

- Where sulfur dioxide is not recovered from off-gases and dust control is not practiced, smelters can produce severe environmental and health effects. For older plants, sulfur dioxide recovery presents a problem because of the low SO2 content in the off-gases. However new processes are being developed to overcome this problem, as evidenced by the new ammonium sulfate plant at Torreon. In this case the low concentration sulfur dioxide is recovered as a useful fertilizer rather than as sulfuric acid or as sulfur.

- Dust and fume collection are essential components of all smelter and refinery operations. Hence, fugitive dust control should be included in any environmental control program. The economic benefits are considerable and pay back times are often very short.

- For those plants which have not installed environmental controls investments to secure the most immediate benefits should be instituted without delay. A phased program should be developed and agreed with the authorities to meet longer-term environmental and safety objectives.

- Operator training and awareness raising and preventive maintenance are essential for ensuring the continued efficient operation of environmental control units and for protection of worker health.

- Many of the solid wastes generated by base metal smelting and refining operations are classified as toxic and should only be disposed of in secure landfills or recycled for some other productive use (i.e., in production of cement clinker).

4. Approach to the Environmental Problem

1.48 The new environmental law which came into effect on March 1, 1988 has certainly had the desired effect of raising awareness of environmental issues at top company level. The two concerns most frequently expressed about the new law within the mining industry were that; strict implementation of the law would entail substantial additional investment and operating costs, and SEDUE staff did not have the technical expertise to understand the application of the law to the industry.

1.49 The Government has adopted a sensible and pragmatic approach in the provisions of the new law to the setting of environmental standards and limits on liquid affluents and gaseus discharges from industry, by

coordinating with industry in developing the new standards and by scheduling a period of progressive phasing in of these goals. Joint input working groups are being set up to develop these standards and discharge limits for each industry sector. Notwithstanding these provisions, since the Government will draw heavily on the experience in developed countries such as the US, Canada and Europe, it is probable that stringent standards will be set. It is considered that the Mexican mining industry would be able to meet these much stricter standards and continue present production levels, only if these standards are phased in over a period of time. Strict environmental standards should therefore be considered as a longer term objective. In the interim a phasing of stricter environmental controls over a period of time with implementation of effective enforcement of regulations by the Government will achieve improvement in environmental quality with many economic benefits that far outweigh the initial expenditures, such as the more efficient use of scarce resources, increased product recoveries, lower energy costs, less waste for disposal, etc. This will alleviate industries concerns and allow adequate time to implement least cost appropriate technologies to meet stricter environmental standards. The strict environmental standards should, however, apply to new installation to encourage establishment of efficient low waste technologies in Mexico.

1.59 The State enforcement agencies of SEDUE are not staffed with sufficient qualified personnel or with adequate testing facilities to effectively perform their functions. Cooperation of industry is needed to ensure that the most effective pollution controls are implemented at least cost. While a few companies have staff who are capable of developing least cost strategies for recycle, recovery and pollution control, others do not have this expertise and would require technical assistance to develop these strategies. The main priorities are the smelting operations, but in addition the state owned base-metal mine-concentrator operations (mostly CFM's mines and concentrators) would also require assistance for pollution control and safety matters.

II. THE MAIN CONSTRAINTS FACING THE MINING SECTOR

A. Institutions

1. The Role of the State

2.01 The State as Owner of the Mineral Resources. The State of Mexico, as owner of the mineral resources of the country, should exert an effective and orderly control of the land, of the work requirements and projects associated with the concession or assignation of the land, and of the taxes and royalties due to the State for the exploration or processing of the mineral deposits. In practice, however, these functions are carried out only in part and very slowly. The Mexican constitution assigns the ownership and specifies that the exploitation or use of the mineral resources by individuals or corporations can be done only through concessions granted by the Federal Government. Hence it is the responsibility of the Federal Government to legislate and organize itself in such a way as to comply with the mandate of the constitution. For such purpose, the law has established monitoring requirements and the SEMIP has assigned the responsibility of administration and control of the mineral resources to the General Directorate of Mines (GDM) (paragraph 1.6 and Annex 1). There is evidence, however, that the execution of these functions can be improved; since inter alia; (i) obtaining an exploitation concession requires years; in other mining countries, the time for these procedures is measured in weeks, or at the worst in months; (ii) the information available on projects and foreign investment refer only to data on the proposals rather than actual investments. The deficiencies causing the mentioned shortcomings are: (i) excessive monitoring requirements; (ii) excessive red tape and inadequate systems for the processing of requests, and (iii) insufficient facilities and personnel to comply with the required work load. The correction of the first problem will require modification of the controlling regulations of the mining law. The correction of the second and the third problems will require the streamlining of the GDM.

2.02 The State as Development Promoter. As promoter of the development of the mineral resources of the country, the State should execute, on a continuous basis, a process whereby (i) the present situation and the present decisions are consistently evaluated against the permanent goals and policies of the sector and with the results of previous actions, and (ii) remedial actions are taken accordingly. This work is not being done now, nor has it been done in the past, although the NMP was a useful first step in the direction of strategic action.

2.03 The NMP is a strategic document, but is not (nor has it resulted in) a strategic process; consequently, the inconsistencies noted in paragraph 1.10 between the detailed specific actions and the stated objectives and policies of the program have not been clarified, since the NMP has not been subjected to a process of continuous revision to better adjust it to trends or events or, alternatively, political considerations have outweighed economical ones. Inter alia, restrictions to the access to land or foreign investment have not been modified, in spite of the stated objectives to increase self sufficiency, exports, employment and equity participation and to prioritize exploration and vertical integration. Also, in spite of a strategy that specifies that (i) there would be no

subsidies, institutions (i.e., CFM); continue to subsidize uneconomic operations with the dividends coming from the profitable ones (ii) there should be a relationship between internal prices and international prices, transfer pricing mechanisms in which prices are set at actual cost plus profit at levels above those of international prices (i.e., Peña Colorada); and (iii) the participation of more enterprises should be promoted, the discretionary nature of the legislation, which favors the large well established companies over the newcomers, has not been adjusted.

2.04 By addressing the sectoral and macroeconomic issues critical for the performance of the sector, in the context of the sectoral objectives and policies, the NMP has had positive contribution to the sector. Lessons from the 1984-88 experience, which could be useful for future strategic documents and processes, refer to (i) the need for consistency between the stated objectives and policies and the specific actions considered; (ii) the need to propose an institutional set up capable of implementing the plan; and (iii) the need to establish a procedure for its systematic execution and permanent review. Once this program has been enacted a process of control of the results of the actions taken vis-a-vis the original plan, of control of the future implications of the decisions taken, and of readjustment and reformulation of the specific actions in order to best comply with the stated objectives and policies (which should be permanent) should continue on a permanent basis. This process, to be valid, should cover the entire sector. The work presently being done by the General Directorate of Mining and Metallurgy (GDMM) (paragraph 1.6 and Annex 1) deals only with SOEs (which do not include the enterprises controlled by NAFIN, that are defined as private) and refers mostly to level of detail (which should be delegated to the management of the SOEs) rather than strategy. Also the work of GDMM when dealing with sector-wide issues (such as the review of the NMP recently done), does so without the indispensable full access to pertinent data and on an on-again-off-again, or periodic, basis instead of the continuous process needed for an adequate strategic planning program. Because the work now done by the GDMM is not relevant to the strategic process and, as the privatization of SOEs moves forward, it will most likely continue to be so in the future, consideration by SEMIP about the need for an independent GDMM would be recommendable. In any case, the size and level of GDMM should be adjusted to be consistent with the scope and importance of its role.

2.05 The official entity responsible for the sector (at present the SEMIP) should consider having a specialized "think tank" for matters concerning mining activities, responsible for supporting the Head of the Sector in the supervision of the sector and in carrying out a comprehensive strategic action process. Such office should be small, staffed with highly-qualified, well-paid professionals who report directly to the top level of the sector (either to the Secretary or to the Deputy Secretary) and with <u>full access</u> to <u>all</u> pertinent information.

2. <u>Implications for the Existing State Institutions</u>

2.06 The size and complexity of the Mexican mining sector requires a precise and specific definition of objectives for each one of the institutions of the sector. The present situation, however, is far from being so. With the exception of FMNM, an institution with a clearly

defined role as a financial and technical assistance agency, the other two institutions, CFM and CRM, act in several fields and roles simultaneously, notwithstanding the Government's decision to cut, across the board, the investment by the institutions of the mining sector, and consequently, (i) they have grown in complexity and in payroll; (ii) as new functions and operations are brought in, control of growth has been lost and a major portion of the substantial work has been delegated on the second or third tier of management, who have not succeeded in developing sound enterprises; (iii) the proliferation of operations has led to an unsound, uncontrolled situation; CFM-operated mines and most of its mills are not economically viable (as a consequence of low capacity utilization, low mineral recoveries and tolls which are not kept up with inflation, as illustrated by the data in Annex 1) and CFM does not appear to have the capabilities nor the will to rectify the situation; and (iv) the areas where the quality work of the institutions is critical to the overall performance of the sector, do not get adequate attention.

2.07 The State should therefore define, after careful analysis, the functions that the sector needs to have covered; then assess which ones can best be covered by the private sector, define those that should not be done by private enterprise and have the semi-autonomous institutions discontinue those functions that are not required or that can be covered by the private sector. The following specific considerations apply to the existing institutions:

2.08 Comisión de Fomento Minero. CFM has accumulated too many functions. It could improve its contribution to the overall performance of the sector if, in a first phase, it is trimmed and focused as a holding company and as a second tier credit and technical assistance agency. In a second phase, and depending to the extent to which the Government of Mexico is keen in structural improvement, consideration could be given to transferring the remaining roles of CFM to more suitable agents. The number of functions, roles and objectives of CFM are considerable (see Annex 1); some of these roles can be done better by others (i.e., the private sector as mining/beneficiation plant operator, and the commercial banks as retail banks). A recommended agenda for CFM includes:

- Review its role as an operator. CFM operates several mines and mills which are technically and economically unsound (as shown by the information in Table 1 of Annex 1), and their role in the sector is minor. In a country with the mining tradition of Mexico there are more qualified operators in the private sector. Unsound operations such as El Bote and El Barqueño mines should be discontinued. The beneficiation plants should be subjected to careful analysis to determine the possibility of operating them profitably. Prices and tariffs should be raised to reflect real costs and be kept at such levels. Alternatively the plants should be sold, preferably to associations of small miners and alternatively to private enterprise, in the clear understanding that access of small miners to the plants is to be maintained by clear and fair regulations. The action should be complemented by an aggressive policy of not subsidized financial and technical support to the new owners, seeking to minimize the impact of these steps on the small miners.

- Initiate the process to become a second tier financial institution, by making the most extensive use possible of the commercial banking system for the retail role, and (if needed) start working in a self-financed guarantee or security fund that would provide the financial intermediaries with the securities required to lend to mining activities. Simultaneously, CFM should initiate the process to reduce and ultimately eliminate its retail level role; the speed of this process should be governed by the performance of the commercial banks in the handling of the mining sector. The existing commercial banks are the most qualified institutions in Mexico to do the retail banking, a function that (to a limited extent) they are already performing in the mining sector. The use of the commercial banking system will result in: (i) a wider coverage of the sector and, hence, more mining loans being financed by the existing SMM financing schemes; (ii) an increase in the speed of the placement of the resources of the SMM financing programs; and (iii) the institutional build up of the commercial banking system (which is thoroughly spread geographically) with expertise in mining.

- There is a need for a more itemized and open accounting and reporting, seeking a more rational approach to subsidies and to avoid political interference. The financial statements of CFM presently do not make clear which operations or functions are profitable and which ones are not. CFM, in addition to receiving more than US$10 million/year in royalties, receives substantial dividends from Exportadora de Sal and Real de Angeles and does not pay any dividends to the State (as a holding company could be expected to do). Additionally, CFM is not self-financed and requires fiscal funding. The explanation is found in the sizeable bureaucracy it keeps and in the financial losses in the operations of mines and regional concentrators (where the readjustment of tolls, charged to the small miners for the beneficiation service, is delayed and affected by political interference). A clear, explicit and open accounting and reporting system would report openly the subsidies and force their periodic review and justification.

- CRM appears to be the most suitable institution in which to centralize the supply of technical contractual services to the sector, thus CFM should reach an agreement with CRM to transfer its metallurgical laboratories once CRM is restructured (see paragraph 2.14) and its "Central Services Facility" is operative. Any such agreement should guarantee adequate access to the laboratories for CFM.

- After having implemented the preceding recommendations, the Government may find it opportune to review the convenience of having a specialized sectoral holding company, instead of centralizing this role in NAFIN, and the benefits of having two second tier financial and technical assistance agencies (CFM and FMNM) instead of one (concentrate everything in

FMNM). NAFIN appears to be a more suitable agency than CFM when decisive action, such as divestment, is taken. Similarly, FMNM has been a more effective credit agency than CFM; nevertheless considerations of size (they are both of sufficient size) and specialization (CFM with metallics and FMNM with non metallics) might justify both credit agencies operating separately.

2.09 Fideicomiso de Minerales No-Metalicos Mexicanos. Overall, FMNM has now come close to its objective of laying the foundations of a fast developing new subsector in the Mexican economy. The role of FMNM has been focused in supporting the private sector (preferably in the small and medium scale) and in the development of non-metallic minerals (aside from its role of support to the agrarian communities). Thus, FMNM's work has concentrated in the "non-priority", non-metallic substances, since the "priority" minerals (coal, iron ore, sulfur, potassium and phosphates) are exploited by SOEs. FMNM has developed considerable expertise in the area of international trading of the minerals and finished products of the minerals it deals with and has been instrumental in applying such know-how to several of the projects it has financed. Interesting work has been done in developing markets for marble, granite and other ornamental building stones in the southern United States and in the export of ceramics; other possibilities have been identified, but work has not started yet (i.e., glass). The fast growth of FMNM as a credit agency (Annex 1, paragraph 12) is evidence of the importance of this subsector.

2.10 The policy of FMNM to support the downstream processing of industrial minerals should be defined in order to avoid either future conflicts with other initiatives or the presence of vacuums in key areas. FMNM is a financial and technical assistance agency that appears to be working well, hence adjustments should not be made to its objectives and roles, which are sensible and well defined, nor to its management, which has proven to be competent and, should be provided with stability. Nevertheless, in promoting the exploitation of industrial minerals, FMNM is financing (i) the downstream processing of such minerals; (ii) industrial plants that temporarily use other inputs and which later will use industrial minerals as raw materials, and (iii) the processing of industrial by-products and wastes that will be used for local market consumption and liberate non metallics for export. The arguments used to justify the approvals of these loans are valid, however in some other similar instances, (i.e., cement and glass, financing has been denied because the activity to be financed is not a mining activity. An explicit, well defined policy regarding the scope of FMNM's activities would be of help.

2.11 Consejo de Recursos Minerales. A phased program to re-orientate CRM towards more basic development work and data gathering, with emphasis to provide basic sector development needs rather than specific promotional activities (now done in areas assigned to CRM either as NMR or MAS) should be undertaken; contractual services to the mining companies, on a self financed basis should also be provided. The fundamental requirements which Government should expect from a reorganized and strengthened CRM should be (i) systematic geological mapping work to provide high-quality coverage of the country; (ii) systematic exploration and mineral inventory programs for

both metallic and non-metallic minerals and materials; (iii) selective detailed geological mapping and exploration aimed at deposit/model recognition; (iv) collection and storage of the relevant geological data from other activities (mining, stratigraphic, construction, etc.); (v) minerals processing and materials testing support and research; (vi) technical and financial assistance to small-scale mining activities; (vii) specialized earth science investigations (environmental and hazardous waste disposal geology, natural disasters, engineering geology, etc.); (vii) publication and dissemination of information; and (ix) staff training and development. Outside of banking and producing operations sensu lato (e.g., CFM, FMNM, SOEs, etc.), CRM should be the only public institute providing geological and exploration-related functions on behalf of Government. In other words, CRM should become a complete geological survey institute providing a full range of services from basic systematic geological mapping and exploration through to specific detailed work and research.

2.12 Presently, CRM--apart from its work on the compilation of State monographs--does not carry out any systematic coverage of the country to provide a coordinated data base. This is a major gap in its activities compared with most other geological institutes in the world. Presently, CRM does not effect a multidisciplinary (geology-structure-exploration) coverage of the country to provide a sound data base; in particular, basic geological mapping coverage is provided by the Instituto Nacional de Estadistica, Geografia e Informatica (INEGI) and the interfacing between CRM and INEGI appears to be weak and informal. The geological map of Mexico is compiled not by CRM but by a special committee and can only be purchased from the Autonomous National University of Mexico. CRM should gradually assume the responsibility of this work. Initially, a Joint Commission between CRM and INEGI could be formed to design, cost and initiate a work program. This program should be directed toward upgrading and completing the 1:250,000 scale mapping program of INEGI, completing and upgrading the 1:50,000 scale mapping program and producing a special series of maps (say 1:25,000 and 1:10,000 scales) of selected areas of promising mineral potential.

2.13 Also contrary to the majority of public geological institutes, the CRM can and does take exploration work through to preliminary or prefeasibility studies. It then uses this data to either negotiate contracts with the private sector, retaining a royalty in the process, or hand over operations to CFM (i.e., El Barqueno). This type of direct participation work in the mine development process should not be undertaken by CRM, which is not well equipped, both professionally and financially, for performing this work efficiently and cost-effectively. The end result is that CRM holds title (through National Reserves and Mineral Assignments) too long on interesting targets and tends to carry out work in excess of normal requirements for promotion to the investment level. Eliminating this direct development mandate of CRM would also automatically resolve the undesirable conflicts of interest mechanism of CRM retaining royalties on specific properties through negotiations and would, in effect, put properties onto the market more expediently.

2.14 As has been the practice of some industrialized country geological survey institutions over the last few years (i.e., BRGM of France and BGS of the United Kingdom), consideration should be given to the establishment

of a consolidated contracting facility within CRM. This could be achieved through the establishment of a "Central Services Facility" which could draw upon staff on an as-required basis. With emphasis on technical and support facility excellence (laboratory, minerals processing, etc.), this facility should be able to win and obtain substantial contracts from the public and private sectors alike. The initial goal could be for this facility to generate 50% of CRM budgetary requirements so alleviating considerable public (federal) spending. Finally, if CRM is to become a modern geological survey, it should have a clear policy to upgrade its staff. Salaries of professional staff (said to be about 50% lower than equivalents in the private sector) should be kept in line with market levels. Similarly, senior staff would benefit greatly from more exposure to modern exploration approaches, design and methodology. This will allow CRM to manage its exploration work in a more efficient and cost-effective manner. Participation in international exploration seminars and carefully organized visits to company exploration projects in selected developed countries should be encouraged.

3. State-Owned Enterprises

2.15 The policies of the sector, have been responsive to the liberalization effort, as shown by the decision to privatize many of the State holdings in "non-priority" materials. The State has traditionally been one of the most important investors in the mining sector; parastatal companies account for 25% of total production, but if minority State participation is also considered, 47% of the total was produced by companies with State participation, thus giving the State a participation of around 35-40% of the sector, at year end 1987. The Government has recently decided to review this situation and to sell its investment in copper companies, with a view to concentrate only in "strategic" substances.

2.16 The majority of the State-owned enterprises operate under a competitive environment. There are no internal pricing schemes in commodities, however transfer pricing is used in the steel industry for the purchases of raw materials. In these cases the use of actual cost plus profit does not provide incentives for efficiency, and the use of either international prices (like the fertilizer industry has been doing lately) or standard cost plus profit (using the international price as a ceiling) is recommended. At present, most of the SOEs have already adjusted to the above approach, however some individual operations (i.e., Peña Colorada) continue to transfer their products at actual cost plus profit.

2.17 The SOEs exploiting "priority" minerals (coal, iron-ore, sulfur), do have a positive contribution to total mining sector production as well as to the overall economy of the country, nevertheless, it is clear that similar benefits could accrue to the economy, if these mines were operated by the private sector. Conversely, the distinction between "priority" and "non-priority" minerals does not appear to attend to economic reasons and presents problems related to the access to land/mineral rights by the private sector and to the unnecessary presence of the state as a mining operator, as discussed in paragraph 2.51. On the side of the "non-priority," divestiture decisions have been taken with respect to the major copper producers (Mexicana de Cobre as well as Cananea) and Macocozac (a

CFM subsidiary); however, it is not clear why the State continues to maintain a majority and, in some cases, 100% interest (Real del Monte, El Barqueño) in base and precious metal mining activities. The Government would do well to reconsider its position of the State as entrepreneur in this sector, and to privatize or close its operations. The State's minority positions in operations could be more effective in achieving public objectives. Maximum returns are obtained with minimum overhead administrative costs.

B. Access to Land

1. General

2.18 Access to land and mineral rights is an essential factor for vigorous mining development but is limited in Mexico since large areas that are reserved or assigned to SOEs or public institutions. Access to land is particularly important for the exploration cycle through which the majority of new mining projects are generated. In the case of Mexico, constraints to land access have become a major impediment to the development of the sector, as some 3% of the total surface area of Mexico (56,403 km^2 of 1,958,000 km^2) are covered by either National Mining Reserves (NMR) or Mineral Assignments (MAS).[1] In relation to areas of known good mineral potential the percentage of land held under either NMR's or MAS's is much larger, possibly between 20 and 30 percent. National Reserves assigned to the various public sector institutes and enterprises (SOE's) are shown in Annex 6. In most countries sovereignty over non-renewable resources is exerted after a mine comes into production through, largely, the taxation process which provides governments with an equitable share of the proceeds. In Mexico, the State assumes the power (and, has been using it freely) to create the NMR's or MAS's and hence to exert its sovereignty while minerals are still in the ground and before they have even been explored or evaluated.

2. National Mining Reserves (NMR)

2.19 The Federal Government can establish National Reserves with respect to both areas and (strategic) minerals; these resources can be assigned to CFM, CRM, and Majority State Owned Companies (SOE's), or may remain unassigned. Special mining concessions within NMR's can be granted to State majority, minority or private parties but in this case foreign participation is limited to 33% rather than 49%.

2.20 The NMR's are divided into three categories:[2]

Group I: For substances or areas which may be required to provide the future needs of the State and which cannot be exploited.

1/ Nevertheless, over the last 25 years CRM has made substantial progress by reducing in its NMR from an original area of about 110,000 Km^2 (5% of the total area of Mexico) to the present level of 19,237 Km^2 (the remaining 37,166 Km^2 are assigned to other institutions as shown as Annex 7). However, this positive policy has not yet been reflected in amendments to the laws.

2/ Articles 71 and 72 of Mining Law.

Group II: For substances which can only be exploited by the State through CFM or SOEs under assignments.

Group III: For substances which can be exploited by CFM and SOEs and persons (companies) through special concessions.

2.21 The arguments used to defend the permanence of the system of NMR are not always consistent with the development goals of the sector. One rationale used is that the State can control the manner in which its (non-renewable) resources are exploited and provides a mechanism which promotes mining development. In effect NMRs provide a major obstacle to development; Group I NMRs allows the State to effectively ban the development of any area or mineral at any time, Group II restricts the minerals which can be developed through private enterprise and Group III--unclear at best--appears to determine who can produce what. A further argument used to support the NMR (& Assignment) system is that it detracts from the holding of promising ground by private speculators. This problem would be largely solved by the provision of more demanding requirements to hold concessions and improved supervision and control by GDM (see paragraphs 2.01 and 3.08). It should also be remembered that business promotion of staked concessions[3] provided the main thrust to mine development in what are now major mining countries; USA, Canada, and Australia.

2.22 In contrast to the 56,403 km^2 of NMRs held in total, the GDM reports that as of the end of 1987, there were 18,708 mining concessions in force, covering an area of 21,676 km^2. Presumably, the great majority of these would be for exploration, as operating mines seldom require more than a few square kilometers for working space and protection. In any case, the point is that only one-third of the areas considered to have the best mineral potential is in private hands, that is the segment best qualified to find and develop mines. Furthermore, because concession holders do not have incentives to release land which they may not be exploring (see paragraphs 2.31 through 2.34), an important fraction of the land in private hands is not given adequate use; therefore only a small fraction of the land with restrictions to access is being properly explored.

3. Mineral Assignments (MAS)

2.23 Assignments ("asignaciones") are parcels of land assigned by Government to public entities and institutions at their request or directly by decree and where no minimum work is required; this is the most dangerous vehicle being used by the SEMIP to limit the access to land. In effect this process is used as another, and easier, vehicle to ban promising areas of mineralization from the hands of the private sector for indefinite periods. As far as mineral development promotion is concerned this process is an even greater inhibitor than the NMR system. The process is more rapid, the areas are nearly always "assigned" where mineralization has been demonstrated and, all things being equal, the public sector has the priority right to the Assignment over private parties who apply for the

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3/ Concessions where the boundaries are defined by stakes physically existent in the field.

land at the same time, regardless of the capability of the applicant. Areas can be assigned (to CFM, CRM, & SOE's) by substances directly through SEMIP at the request of the interested parties (CFM, CRM etc.) or directly by Presidential Decree, although the latter category of assignments normally concern NMR's. No minimum work is required to be done by assignees and an area, theoretically, can be assigned without due and prior evaluation by Government mining authorities.

2.24 CRM alone holds 118 different areas under the Assignment category covering 5,438 km^2, which it cannot possibly evaluate in the foreseeable future (as can be seen in CRM's work program in Table 9 of Annex 1), even though they are subjected to the present (lax) concession holding requirements. These 118 areas are specific areas of mineralization whereas NMR's normally cover large areas of potential but largely of unknown importance. Therefore, whereas the total land area under assignments is approximately one-quarter of land held under NMRs their direct influence is at least equivalent to the NMRs and possibly more so.

2.25 The Assignment system is attractive to the autonomous institutions because if mining operations are negotiated with an interested party after positive evaluation then royalty accrues to them. In effect this just adds another layer to the complicated process of mine development and administration of the law as well as reducing the attractiveness of exploration and mine development projects to potential investors.

4. Ceding of Assignments/Reserves to the Private Sector

2.26 There is no need for the autonomous institutions to publicly promote a property with development potential. Confidentiality of results of work on an interesting property are almost non-existent in the mining business. Maps and assay results become readily available. Interested parties already knowledgeable of results, approach the institutions for a Special Concession, and when they so decide, provide selected interested parties with detailed information. Work proposals are presented to a special committee, the Internal Committee of National Mining Reserve Zones.

2.27 Before work can ensue on an Assignment, the status has to be changed to that of a National Mining Reserve. During this entire process which takes a minimum of one year to complete (and often three or more), the institution, on the basis of an evaluation of presented work programs, selects a party with which it enters into a work contract. The institution then supervises this work to see that compliance is made with the work program (a proper function of GDM). Even though an assignment will not have been ceded to the private party at this time, production can ensue and the institution collects its royalty (normally 5% for metallics and 6% for non-metallics).

2.28 Finally, the institution then requests GDM for liberation of the relevant part of the NMR (ex-Assignment). When ready to be released as a Special Concession a contract bidding is then held at which the party under contract to CRM (and likely already producing) has the right to meet the best offer from other participants. What a "best-offer" may constitute is unclear, presumably in theory a combination of (a) technical work program, (b) level of investment, and (c) level of royalty to the institution.

Obviously this method does not favor a new entrant-entrepreneur with limited access to capital and is discretionary in the extreme.

2.29 Zones which are unprotected (by Assignments or NMR's) are literally raffled off if there is more than one interested party. There is nothing to prevent several employees of one company or group soliciting entry into the raffle as private parties. This process tips the balance heavily in favor of larger groups. As mentioned previously, CRM (or CFM) has the priority right to acquire unprotected land if its proposals are made at the same time as other parties. It has been known for private parties to present a request to GDM in the name of CRM and to have been awarded concessions.

2.30 Obviously this whole process, apart from being unnecessarily complicated and lengthy, provides room for arbitrary decisions and corruption at every level. Possibly, except for Group II NMR categories (priority minerals) where private sector interest would be limited, the simple answer to resolving the land access problem would be to eliminate NMRs and Assignments, develop a more demanding requirement for the holding of exploration concessions, and increase the capability of DGM to effectively administer and enforce the Mining Law. It is important to note however, that this process of "land liberalization" should be carried out in an orderly fashion and in coordination with other actions recommended in this report (institutional reform, lifting of foreign investment limitations, tax reforms). In order to maximize the effect of this initiative, previous work in classification and (if appropriate) promotion of land would be convenient, for which the Mexican authorities may want to make use of foreign technical assistance.

5. Concessions to the Private Sector and SOEs

2.31 Private Sector: Exploration Concessions. In most mining countries, a basic principle for stimulating mineral exploration involves opening the door to all from the man of modest means to the large mining houses. Sound policy dictates that acquisition of the right to explore should cost little more than the time and effort put into staking claims and recording the same. But the retention of such must involve meaningful expenditures which are relatively easy to verify. Otherwise mineral deposits may be tied up for many years with little effort having been made to find and outline an orebody. The Mining Code grants concessions to explore for an initial period of three years. The area concerned may be as large as 50,000 hectares (500 km^2). Under any circumstances, this should be viewed as excessive.[4]

4/ On rare occasions, such as a bedded deposit, for example potash, 500 square kilometers could be underlain by continuous mineralization (Saskatchewan). Extensive gold placers could be another such rare occasion. But no single company would have the capacity or incentive to explore more than a small part of the whole. In general, even with large mining companies playing for high stakes, the demarcation of a promising area tends to cover, at most, a few tens of square kilometers. The condition that the exploitation concession shall not exceed 500 hectares should therefore be reasonable in the majority of cases.

2.32 In regard to obligatory work, the Mining Code has a weakness so serious that it negates the first principle of sound mineral exploration policy, namely, the need to spend sums sufficient to provide a reasonably sound evaluation of the prospect concerned. When the Law was written in 1975 and the Peso was 12.50 to US$1.00, this factor was given full recognition. But shortly thereafter the peso started its slide and adjustments to the work requirements were not made, no thought apparently being given to indexing. This extraordinary rigidity has resulted in work requirements today which are quite meaningless as shown in Annex 7. It cannot be over-emphasized that in an inflationary world, mandatory assessment work must be defined in terms of physical quantities rather than monetary units. The regulations should therefore be rewritten to introduce meaningful work-requirements in line with other countries with important and vigorous mining economies such as Canada and Australia. Such requirements must be designed or continually updated so that they will not be rendered ineffective by inflation.

2.33 In the Ontario province of Canada, a patent for mining rights over a leased claim is subject to payment of a nominal annual rent of Cd$2.50 per hectare for the first year and Cd$0.10 per hectare per year thereafter. To maintain rights, 200 days of work must be performed and proved per claim with 20 days of work required in the first year, 40 during each of the next three years, and 60 during the fifth and final year. In Western Australia, a prospecting license requires a A$64 application fee, a rental of A$1.25 per hectare, a minimal proved annual expenditure of A$40 per hectare (minimum annually of A$2,000). An exploration license, apart from application and rent fees, demands a minimal annual expenditure of A$300 per sq. km., and a minimum total of A$20,000 (US$15,600) each year. A mining lease in addition to application and rental fees requires a minimum annual expenditure of A$100 per hectare and a minimal annual total of A$5,000. In Western Australia, it can be appreciated that the system is geared to higher demand requirements at the exploration stage so that properties on which no mining can start are quickly released back into the system for availability to other interested parties. Unlike Mexico, therefore, access to land is optimized.

2.34 The lack of interest illustrated in Annex 7 in indexing the cost of complying with exploration concession requirements to a widely fluctuating Peso are quite indicative. It raises the question as to whether the Government has more or less given up on enforcement of the work requirements. In effect, it seems that Mexico is caught in a vicious circle. The inability to separate the serious prospector from the speculator has led to putting much of the better geological settings under reservation. The problem of concessions being held year after year by people with no intention or ability of investing in mine seeking, has only been partially solved over the last 20 years. The task of finding the path to growth of Mexican mining has, therefore, devolved in a considerable measure upon public agencies which, simply do not have the resources which could be applied by a citizenry enjoying a most promising geology and one of the most ancient mining traditions, if allowed full freedom to seek mines in any part of the national territory. The GDM is responsible for checking on compliance with assessment work on privately held exploration concessions. Regional officers that handle the bulk of this work number 120 of which only 20 are professionals. Controlled inspections of the

18,000 concessions in force is obviously impossible. It is estimated that the staff would be hard pressed to carry out field inspections on more than 1,500 to 2,000 concessions per year to ensure compliance with the law. The solution involves, on the one hand tougher work requirements which would reduce the number of outstanding claims held idle by claim holders, and, on the other hand, streamlining and modernizing the systems and procedures of GDM, an increase in the number of inspectors combined with adequate reporting requirements and meaningful penalties for violations.

C. Foreign Ownership

2.35 Foreign investment in mining projects is presently limited to a maximum of 49% equity, except in certain minerals that are defined as "strategic" minerals, for which the limit is 34% equity. Such a limit provides a considerable barrier to the presence of foreign mining companies in the sector. That is not to say no foreign mining companies will enter the sector, but rather foreign companies will be very selective in their commitment to the sector. This limitation places local mining companies in an enviable position when negotiating a partnership as it forces the foreign company to ultimately accept conditions of association which may have discouraged many potential investors who would have otherwise invested in Mexican mining. This situation has benefited the major private national mining companies very much in providing them with access to sophisticated technologies and to high risk equity financing. In fact a major impediment to substantial reform, along the lines proposed in this report, is the fact that the major Mexican private groups are satisfied with the status quo, in Mexico, particularly with respect to foreign participation which enables them to control the sector.

2.36 At present, investment in the mining sector, especially in the lead/zinc, gold and silver subsector, seems to be relatively meager even though, as noted in Table 1.4, Mexico has a clear comparative advantage in this subsector and as noted in Table 1.6 and Annex 5, the companies in this segment are presently quite profitable, have relatively low indebtedness and are fairly cash rich. As discussed in paragraph 1.35, the four largest lead, zinc, silver companies (Peñoles, IMMSA, Frisco and San Luis) which together with the State, have traditionally been responsible for the great majority of the investment in the mining sector, have cut back their annual capital expenditures (including exploration, replacement investments and new investments) to a combined total of about US$64 million from 1983-1986 of which US$15-20 million is estimated to have been used for exploration. Such exploration expenditures are minimal in relation to new venture potential, and based on sales earnings, an annual expenditure of about US$80 million is indicated or about four times the present level for these major companies. Statistical analysis of exploration in Canada and Australia over the last 20 to 25 years shows that it required approximately US$35 million to discover one economic metal deposit. Obviously, this figure will vary considerably depending on deposit type and should be lower in Mexico because of lower personnel and service costs. Even though these discovery costs are spread over time, this demonstrates the level of effort necessary to continually replace and find new deposits. In these circumstances, a stronger presence of foreign investors could give a considerable boost to investment in the sector which appears to have good potential for development.

2.37 The potential role of foreign investment in the Mexican mining sector is not only one of investing more, in line with the comparative advantages and thus the profitable growth potential of the sector, but also of (i) opening new mining districts outside the areas where mining has traditionally taken place in Mexico; and (ii) contributing through the use of new technologies, to improve the efficiency and productivity of the sector. Local mining companies have a reticence to invest in high risk areas, due to their preference to limit their exploration efforts to well known districts close to the existing mines, where risks are minimal and marginal investments usually yield higher returns than greenfield projects. In fact, when local companies venture into new areas they prefer to do so in joint ventures with the few foreign partners, who are willing to invest under the existing rules and which are limited in their participation by the Mining Law. Similarly, a larger presence of qualified foreign companies would contribute to the wider use of new technologies in all areas of mining operations which would benefit most especially the segment of small and medium sized mines.

2.38 The Canadian group, Placer, has demonstrated in the Real de Angeles project, that foreign companies are able to successfully participate in the identification, development and operation of large new mines in Mexico. Furthermore, other companies such as Newmont are actively involved in exploration activities in conjunction with local companies. However, many international companies will tend to hold back if they are denied majority ownership and control of a new venture and if the State restricts the access to land. Therefore, it seems most probable that a stronger foreign presence would occur and more exploration take place and more capital be made available for investment if the foreign ownership restriction could be eased in some way.

2.39 Another area in which foreign investment could make a substantial contribution to the Mexican mining industry is in the modernization and development of the small scale mining subsector. The excellent geographical location of Mexico should attract small scale foreign miners and investors who could bring high risk equity capital and adequate technologies to the subsector. Unfortunately, this possibility has never been explored by the Mexican State.

D. Taxation of Mining Companies

2.40 There are several important objectives for a mining taxation and incentive system. It should provide an overall balance so that the sector makes a reasonable contribution to the Government's fiscal base while enabling shareholders to earn a return on capital that is broadly commensurate with the risks involved. It should provide incentives to encourage the optimal technical arrangements for new mine development. It should be designed so that the heaviest tax burden falls on operations which are best able to pay taxes (i.e., the most profitable operations) and that the lightest burden falls on new mines (which typically face a very tight cash flow when getting started) and on marginal or loss making operations. It should be well defined so that the same rules apply to all producers. While the tax burden may be largely reduced for marginal operations, the system should not provide direct subsidies to enable non-viable operations to continue operating.

2.41 The present tax system in Mexico works well from the point of view of (a) providing incentives to encourage new investment and (b) providing a steady stream of taxes to support the Government's fiscal base. The present tax regime for the mining industry places a strong emphasis on encouraging mining investments through generous accelerated tax allowance for writing-off new investments and through incentives. As a result, companies who have undertaken large investment programs can achieve high levels of profitability while paying little, if any, income tax. The mining industry in Mexico has taken very good advantage of the various tax shields available so that income taxes paid by some very profitable companies in recent years have been relatively minor, as illustrated in the table below.

Table 2.1: Income Taxes Paid by Selected Mining Companies 1986
(Billion Pesos)

	Peñoles	IMMSA	Frisco	San Luis	Real de Angeles
Revenue	321.62	197.4	48.7	42.8	53.7
Income Before Tax	49.9	24.2	13.6	10.7	25.7
Income Tax a/	(19.7)	(3.1)	(5.4)	-	(1.6)
Net Income After Tax b/	30.2	21.1	8.2	10.7	24.1
Effective Tax Rate	39%	13%	40%	0%	6%

Source: Company Annual Reports

a/ Net of deferred taxes.
b/ Before adjustment for minority shareholders.

2.42 While some of the companies have paid relatively little in income taxes, the Government has not gone empty handed from a fiscal viewpoint. Instead, a steady stream of tax payments have been obtained from all companies through ad-valorem taxes on production. The rate of taxation has been modified several times; at present, it is 7% for gold and silver, 2% for coal, iron ore and manganese and 5% for all others. Small mines and medium mines get discounts of 40% and 20% respectively. From 1983-1986, the average effective rate appears to have been in the range 3.4-3.9%.

Table 2.2: Minerals Production Tax and Value of Minerals Products 1983-86
(US$ Million)

	1983	1984	1985	1986
Annual Production Taxes Paid	68	71	59	53
Value of Non-Fuel Minerals Products	1,780	1,830	1,630	1,550
Ratio	3.8%	3.9%	3.6%	3.4%

Source: Taxes - SHCP; Value of Non-Fuel Mineral Production-SEMIP

2.43 The overall Mexican income taxation system is presently in the process of a major transition to a new system which will become fully operational in 1991. The process of change from the old to the new income tax system is estimated to take 5 years (1987-1991) by phasing in the new system by 20% each year and phasing out the old system by 20%/year, until the new system is finally in effect in 1991. The new system will use an accelerated depreciation schedule for investment and will lower the maximum corporate tax rate from 42% to 35%. It is not anticipated to cause major changes in the tax liabilities of mining companies.

2.44 While the present taxation of the mining activities in Mexico is effective in raising taxes, it does not promote efficiency nor the optimal exploitation of the deposits. As noted, the largest tax collections from the Mexican mining industry comes from a mining right, which amounts to an ad-valorem production tax. However, the use of ad-valorem taxes in mining is not recommended as it has negative economic effects. In particular, it leads to sub-optimal mine design and operations because it has the effect of increasing the cut-off grade for ore deposits and for marginal mines may encourage high grading which may cause wastage of potentially valuable ore. Furthermore, it places an added burden on mines that are starting up which is a time when they are likely to face a very tight cash situation.

2.45 It may be argued that the production tax has the effect of slowing mining investment which may be desirable under certain circumstances, for example if a development boom is getting out of control or if a large mining boom may cause undue exposure to foreign debt or to over-dependence on a particular commodity. This would not seem to be the case in Mexico. But even if it were, a more appropriate response would be to reduce investment incentives rather than to use an ad valorem, across the board tax.

2.46 The fact that the mining industry has been generally paying low income taxes should not lead to ad-valorem taxation, but should lead the Government to review the present and new taxation arrangements to ensure adequate incentives and a fair contribution by the mining companies. From an economic standpoint, the industry could benefit from an examination of the production tax independently of the result of the new tax law which, if necessary, should also be reviewed in order to ensure a fair contribution by the mining companies. It is recommended that the Government review present and new taxation arrangements, in order to see if the system could be improved to (a) provide incentives to encourage optimal technical solutions to the exploitation of the mines, and (b) protect the cash flow of operations that are getting started and which consequently cannot easily afford taxes that are not based on results, while at the same time, ensuring that the Government receives a fair share of the wealth generated by the mineral resources of the country. Technical assistance support may be considered by the Mexican authorities to analyze these complex issues.

E. Other Problems in the Legislation

2.47 The Mexican Mining Code is unduly complicated, involves too many agencies, grants a large number of discretionary powers to many different parties, inhibits development of major parts of the country judged to have special mineral potential through Assignments and National Reserves, by placing restrictions to the exploration of some minerals and has been

administered with too much rigidity to react promptly by an industry facing a rapidly changing economic environment and which requires flexibility. This section discusses these constraints.

1. Sector Organization

2.48 In most of the market-oriented countries with a strong mining industry, development and administration of mining legislation tends to be centralized. This perceived advantage does not apply in Mexico. In the Mining Code, the following main institutions/agencies offices are mentioned among others of lesser importance:

Secretaría del Patrimonio Nacional
Secretaría de Energía, Minas e Industria Paraestatal
Consejo de Recursos Minerales
Comisión de Fomento Minero
Petróleos Mexicanos
Secretaría de Comercio y Fomento Industrial
Secretaría de la Reforma Agraria
Registro Público de Minería
Secretaría de Hacienda y Crédito Público
Secretaría del Trabajo y Provisión Social
Instituto Nacional de Energía Nuclear

2.49 The involvement of a multitude of agencies, often with overlapping responsibilities and lacking a common vision of what is good for the industry and the country, leads to undue complexity, inefficient management and stagnation. In comparison, the province of Ontario in Canada has only one authority in regard to administration of the Mining Act, the Ministry of Natural Resources while the Australian States have their Department of Mines. Thus, the system is streamlined and long term policy administered by competent professionals with full job security. Obtaining an exploitation concession in Mexico can take three to five years with the average would-be mine developer. In most developed countries with strong mining economies, these procedures are completed within weeks.[5] If the mining sector is to realize its full economic potential, a reform of the mine licensing process and procedures is necessary in order to achieve a relatively rapid process of approvals.

2. Strategic and Priority Minerals

2.50 The Mexican Constitution establishes that no concessions or contracts will be given for the exploitation of hydrocarbons and radioactive minerals, which are defined as "strategic" and, which can only be exploited by the State under conditions specified by law. The mining

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5/ The provinces of Ontario in Canada and Western Australia in Australia can be broadly compared with Mexico. They are blessed with good mineral potential, mining is a major force in the economy and the physical settings involve difficulty of access into remote sparsely populated areas. The gross value of Mexican mineral production during 1986 amounted to the equivalent of US$1.8 billion. The comparable figure in Ontario was US$3.5 billion and for Western Australia US$4.5 billion.

law classifies sulfur, phosphorus, potassium, iron and coal as "priority" minerals and specifies that sulfur, phosphorus and potassium deposits will invariably be included as National Mining Reserves for exploitation by the State, CFM and SOEs with majority State participation, and that iron ore and coal deposits can only be exploited by CFM and enterprises with some State participation.

2.51 Consequently the legal mandates concerning these substances, present problems related to (i) the forced additions of lands containing strategic minerals to the National Mining Reserves, and (ii) the compulsory presence of the State in the activities concerning these commodities, which refer to raw materials for energy generation and for the domestic steel and fertilizer industries, in which the State keeps a predominant participation anyhow. In the case of sulfur, about 65% of the production is exported. Hence, with the possible exception of sulfur, the matter of priority minerals is not considered to be a major deterrent to the growth of the mining sector, since it is most unlikely that major private investments would ensue in the short-term, should the presently classified priority minerals be opened up to greater private participation through either national or foreign sources. Nevertheless, the usefulness of the principle is questionable and it is recommended that, within the framework established by the Constitution, economic criteria should determine which minerals should be considered "priority."

3. The Discretionary Nature of the Mining Legislation

2.52 Mining legislation grants a wide range of discretionary powers to the authorities of the sector instead of setting clear rules applicable to all. In many cases, this leads to open negotiations for which no parameters are specified. This results in counterproductive situations because such a process (i) increases the risk to investors who tend to be conservative in their estimates; (ii) is especially detrimental to small miners and new entrants into the industry, who are not well placed to lobby the authorities; (iii) allows for corruption, and (iv) results are often viewed as arbitrary. This situation is particularly unattractive for new entrants and results counterproductive in a sector where the comparative advantages, and hence the opportunities for profitable growth, clearly exceed the ability or willingness to invest of the established companies. Such sector would benefit much from the entrance of new enterprises, national or foreign, and a favorable policy framework for newcomers is recommendable. A review of the Mining Code shows the following discretionary aspects of importance:

- Action by CRM, CFM or a SOE for the exploration, exploitation or beneficiation of an area will be done through a Mineral Assignment either at their request or at the decision of the Federal Government;

- The granting of concessions to parties that comply with all the requirements is a prerogative, not a duty, of the Federal Government;

- CFM and CRM are free to contract third parties to explore, exploit or beneficiate in areas assigned to them, without limitations or

parameters; similarly they are free to give special concessions in areas of National Mining Reserve (although in this case the selection of the beneficiary has to be done through a competitive process);

- The authority is free to decide who gets a MAS or who gets preference to an area when more than one application has been presented for special concessions in areas of NMR;

- The Federal Government is free to establish or to disincorporate National Mining Reserves, without limitations;

- The Federal Government is free to establish Industrial Mining Reserves in areas containing minerals considered necessary to supply an industrial facility.

2.53 In spite of the long list of discretionary powers, the mining code is an instrument that is both inflexible and difficult to administer on account of the detail with which it regulates due dates, requirements, substances, tolls, areas and movement of equipment. A satisfactory solution to these problems is considered important in order to allow the sector to realize its economic potential, thus the law should be reviewed and streamlined to allow for an efficient administration with as few discretionary elements as possible.

III. GROWTH PROSPECTS: FUTURE OPTIONS

A. Reservations about External Factors

3.01 International Minerals Markets. The outlook for the international base metals markets in general is not very promising. The main reasons for this general conclusion are the likely sluggish growth in international demand, and cost-saving productivity improvements and greater competition among producers on the supply side. Important structural changes have been going on since the mid-1970s in both the supply and demand of base metals. As a result of these changes, the markets already experienced record low prices in 1986. In all likelihood, these changes will continue to take place in the 1990s and beyond. 1987 and 1988 have been periods of mineral market recovery and strong prices are encouraging higher expenditures for exploration and new mining projects elsewhere in the world. However, when this is over, the industry could face periods of extremely low prices again, even lower than those of 1986, depending on the severity and timing of economic downturn. In such mineral market recessions, exploration and investment will likely be cut back sharply, irrespective of overall mineral sector policies and incentives.

3.02 World demand for most base metals are forecast to grow only at 1.2% per annum (copper, zinc, and silver) or not at all (lead) in the 1990s. In addition to slower growth in industrial production than in the 1960s and 1970s, continued material substitution, down-sizing, and changes in the product mix will all contribute to the slow growth of metals consumption. The only positive factor is the possibility of a major revival of investments in capital goods, after a long period of dormancy in the 1970s and 1980s. On the other hand, there is strong potential for increased low-cost supplies of base metals. The industry also has the potential for further cost reductions in existing operations, particularly in developing countries where productivity improvements have not been as forthcoming as in industrial countries. Investment decisions in mining, however, are likely to be made much more cautiously than before, the industry having experienced painful adjustments in the 1980s. A reasonable planning assumption therefore would be to expect the long term prices of base metals as a whole to gravitate toward levels slightly below the average level of the 1980s in real terms. Among the metals important to Mexico, silver and zinc are expected to do relatively better than lead and copper because of better demand prospects.

3.03 The Mexican Economy. The future of Mexican economy is contingent on a number of political and economic factors that are beyond the scope of this report. However, as far as the key economic variables that are important to the mining sector are concerned, it would be reasonable to proceed under the following set of premises. Mexico's foreign debt and balance-of-payments situation is likely to continue for some time to come, and it will continue to be of great importance to maintain further, with as little variation as possible, the real exchange rate of peso at a competitive level. The terms of trade between mining and non tradeables, after the 30% appreciation of the peso during the last year, can be expected to remain reasonably stable. Over the long term, however, it is not clear to the Mexican mining industry where the real exchange will settle. A prudent assumption for the industry is to assume that at least

some part of the recent terms-of-trade gains will eventually be lost in increased wages and material costs. Economic stability and success in controlling inflation will have a considerable impact on the investment decisions in the mining industry. If the macro-economic picture shows signs of long term improvement, investors will become more willing to commit funds for projects with future payoffs. If the economy should deteriorate, however, companies will hesitate to make commitments, irrespective of other reforms to encourage investment in exploration and new mining projects.

B. Direction for a New Mining Policy

3.04 The change of administration in Mexico and the expiration of the National Mining Program 1984-1988, will occur at a moment in which efforts are made to liberalize the Mexican economy. Thus 1988-89 is a crossroad in which the new Government can either give the mining sector the importance that the mineral endowment, its comparative advantages and the tradition of the country allows, seeking to make of Mexico one of the great mining countries in the world, or decide to continue with the existing legal and institutional framework. In the latter case, a process of slow growth limited by the investment decisions of the existing companies and agencies can be expected. It is in this context that the thought of a new mining policy has to take place.

3.05 A second point to bear in mind is that the new policy has to be comprehensive in that (i) it will cover all areas, required for the actions to be effective; and (ii) it should be a continuous established process affecting and affected by all key decisions of the sector, and not only a strategic document. The linkage and interfacing of the different aspects of a given option is essential; the actions across the board must be consistent with each other and the actions must be consistent with the objectives and policies of the program. Additionally, care should be taken to make sure that the head of the sector has the adequate support for the execution of such process. At present, SFMIP is not in the position to do this, hence the recommendation has been made to establish a think tank to provide the needed support for the process.

C. Options Implied for the State and its Agencies

3.06 As provided in the Mexican Constitution, the State is the owner of the mineral resources and the promoter of the development of the sector. As owner of the mineral resources of the country, the State acts as a regulator, as an administrator and as a controller and its actions have the purpose of excerting an effective and orderly control of these resources. As the promoter of the development of the sector, the State acts as a policymaker, as owner of enterprises and agencies, as provider of services, and also as regulator, administrator and controller; State actions, in this latter function, have the purpose to assure an adequate contribution of the sector to the growth of the economy.

3.07 The options for the State as owner of the resources concern the regulations about mineral rights and the agencies that control the use and property of all mineral rights in order to exert the required effective control of the resources. The revision and simplification of the amount of

controls and requirements for the request of and maintenance of rights could facilitate procedures, while avoiding the encouragement of undue land speculation. Similarly, the streamlining of procedures of the agency responsible for the administration of mineral rights, the General Directorate of Mines (GDM), should help to assure the prompt processing of requests for concessions and to transform GDM into a well informed agency that is in a position to effectively supervise the work requirements that are considered necessary.

3.08 The most important role of the State as promoter of the development of the sector is that of a policy maker. In this respect, the Government will need to decide if it is prepared to have more liberalization in the mining sector, in order to provide the framework and incentives that will allow the sector to contribute more to the economy. The options for the State as a policy maker refer to:

The Institutional Set-up of the Sector. The existing arrangement:

- does not enable the State to execute a full process of strategic planning. Thus, setting up a think tank (paragraph 2.05) with full access to all information of the sector, supporting and reporting directly to the head of the sector is recommended; agencies, such as GDMM, which have responsibilities in the general area of sector planning, should be restructured;

- has allowed the growth of CFM and CRM to a point where they have lost control of growth and present deficiencies in critical areas and overlaps with agents in other areas; thus CFM should become a second tier financial institution, transfer its laboratories to CRM, discontinue its unsound mining operations and review its policies concerning beneficiation plants in order to ensure the implementation of the most economically efficient solution for the processing of ore coming from small miners and implement open accounting and reporting systems to better control subsidies (paragraph 2.08); CRM should become a complete geological survey (paragraph 2.11 to 2.15). On a second phase, and depending on the extent to which the Government is keen in structural improvement, CFM's role of holding company can be transferred to NAFIN and that of a second tier credit agency to FMNM (paragraph 2.08).

Land. Access to land and mineral rights are essential for mining development because they are critical for the exploration cycle through which most mining projects are generated. The State should not compete with the private sector for land holdings, when the decision to limit the State presence to the production of strategic minerals has been taken. As discussed in paragraph 2.30, the land tied up by the State, its institutions and the SOEs in the form of National Mining Reserves (NMRs) or Mineral Assignments (MAS) should be released in an orderly fashion. Similarly, the implementation and control of more demanding work requirements for the holding of concessions will avoid speculation

and the unnecessary holding of mineral land. The above not withstanding, the State should keep the right to separate the land under special circumstances that the Law ought to specify (and not leave to the discretion of the authorities).

Foreign Ownership. Investment in exploration in Mexico adds to a total of about US$40 million annually, while a figure close to US$150 million could be in order considering the competitive position and the possibilities of Mexico's mineral endowment, even though the larger private Mexican mining companies, which should contribute with 50% to the above figure, are in a good financial situation. In addition, the State, the most important individual investor in the sector, has taken the decision to limit its entrepreneurial action to the "strategic and priority minerals." Hence, it is highly recommendable to promote the entrance into the sector of new investors, whose favorable reaction is expected in the light of the comparative advantages that Mexico has to offer, which are strongest in the silver-gold-lead-zinc and in the non-metallic subsectors. As discussed in Section II C, the lifting of existing limitations on foreign ownership in mining activities, now limited to a maximum 49% equity (and 34% in "priority" minerals) could contribute (together with the solution of other constraints in the access to land, taxation and institutional aspects) to the promotion of this source of additional funds for investment in the sector. Foreign investment is poised to help also in the opening of new mining districts and in improving the efficiency and productivity of the sector, by providing its expertise in exploration and in the development of the Mexican small scale mining, a subsector that presents very attractive possibilities to foreign investors on account of the geographical location of Mexico.

Taxation. Mining, as any other economic activity, should pay a fair share of its income. However, the State ought to focus on collecting such taxes from performance-related taxes (i.e.; income tax) rather than blind production taxes which represent a cost to the producer rather than a sharing of profits. Because Mexico collects most of the taxes from mining from an ad-valorem mining right, which amounts to a production tax, it is advisable that the Mexican Government carry out a study about the ways of replacing the mining right with performance-related taxes. As discussed in paragraph 2.46, if the income tax collection is considered insufficient, the development of a rate-of-return-related or a profitability-related tax, that will provide the State with its fair share, could be an adequate solution.

Strategic and Priority Minerals. In addition to hydrocarbons and radioactive substances which the Constitution specifies as reserved for State exploitation, the Mining Law adds coal, iron ore, sulfur, phosphorus and potassium to the list of minerals with restrictions to exploitation by private interests. Although, the economic impact of these definitions for the mining sector (excluding oil and gas) has not been major, the long term benefits

of this policy are questionable and the State should consider limiting the list to the commodities specified by the Constitution.

Discretionary Aspects of the Legislation. Two of the main purposes of improvement of the sector policies have to be to make it attractive to new investors (foreign or national) and to promote the growth of the smaller enterprises. The newcomers and the small miners are the two groups that have the most to gain in an environment of clear rules without discretionary margin for the authorities, as compared with the larger, established operators, which are well positioned to lobby. The State ought to review its legislative environment and reduce the discretionary elements to a minimum.

3.09 A second role of the State as promoter of the development of the sector is that of owner of enterprises. In defining this role two factors appear to be pivotal in Mexico's present circumstances: (i) the extent of participation of the SOEs in the sector, recently redefined by the decision to privatize the two large copper producers and to limit state investment to strategic materials; and (ii) the competitive environment under which the SOEs operate. The Government's decision to privatize the copper producers, is an adequate initiative based on sound economic criteria; it is recommended that in the future, decisions continue to be based on economic criteria and that as a consequence, the State reconsiders its role as entrepreneur. The competitive environment of SOEs appears to be fair, as most enterprises qualify as either export operations or efficient import substitutions. There are however some exceptions, such as Peña Colorada, where subsidized transfer pricing is used, and which should be discontinued as soon as possible.

3.10 As provider of services to the sector, the State should (i) work in those areas required for the development of the sector, which normally are not of interest to commercial enterprises (i.e.; the geologic mapping of the country), and (ii) select carefully the other areas in which it will work in, by ascertaining its own institutional capabilities and the adequacy of the services that other agents may provide the sector with. In the first case the work ought to be financed with fiscal funds and in the second the services ought to be self-financed. Consistent with these principles the recommendation is made that CFM review its policies concerning the beneficiation plants, in order to ensure the implementation of the most economically efficient solution to the processing of ores by small miners, and transfer its laboratories to CRM. CRM in turn appears to be the most suitable institution where the supply of technical services function can be centralized.

D. Small-Scale Mining

3.11 Mexican small-scale mining is an important activity that stands to benefit notably from a more liberalized management of the sector. The immense majority of Mexican mining enterprises are small, provide most of the employment of the sector and have traditionally opened the districts where the larger companies now operate. Although the labour productivity of many small mining operations is low, operations are competitive by

international standards (mostly because of the high grades of the ores), and the potential for contribution to the economy from the modernization and growth of this subsector is important. However, as it is price-sensitive, small mining is a policy-sensitive subsector (the smaller investments that it require and the closeness of the workers to other activities, mostly agriculture, makes it susceptible to the environment that surrounds it). Thus, many potential benefits often do not materialize, whenever the policy framework is not adequate. Nevertheless, one must be aware of the very important role of small scale mining in the sector. In addition to being an integrated, labour intensive activity, with modest infrastructural requirements and opportunities for indigenous entrepreneural development, it has traditionally fed the larger size operations with projects, as the small prospector has played an important role in exploration. It is estimated that more than 50% of the major mines currently operating in the USA derive from exploration targets found by small prospectors.

3.12 Essential policy recommendations applicable to small-scale mining refer to taxation, licensing and registration, institutional assistance, financial assistance and basic infrastructural facilities. The application of tax duty regimes that directly increase costs (i.e., production taxes, export taxes and royalties) should be minimized; tax holidays are not considered favorable due to their potential to induce high grading practices; similarly, depreciation allowances should be granted cautiously in order not to jeopardize the choice of the appropriate technology. Licensing and registration procedures required to obtain exploration and mining rights have to be simple, rapid and inexpensive; free access to public land and grant of right to first applicant are important. The agency selected to assist SSM must be autonomous, compact, competent and efficient for which the agency must be staffed with highly qualified and motivated personnel. Financial assistance should preferably be provided through local commerical banks which frequently have a large branch network with offices close to mining districts and greater lending and collecting experience with small borrowers than public institutions; concessionary interest rates for promotional purposes should be avoided, since it may lead to a misdirection of funds; lending institutions should be encouraged to accept proven reserves and physical assets as collateral; this will require improved documentation which may require extensive external assistance to SSM. The provision of basic infrastructural facilities such as access roads, power supplies and process water is important to SSM and is advisable to provide them where specific circumstances, including considerations of regional development and employment, justify it.

3.13 Modern small-scale mining has plenty to offer in Mexico, particularly to those able to establish proven reserves and to obtain on reasonable terms the capital required to develop a viable mine on a scale commensurate with such reserves. Some of the advantages of the small miner are (i) access to the deposits either through old workings or current operations, rules out the need for grassroots exploration particularly in long established mining districts; (ii) a mine ranging between 100 to 250 tons/day can be brought on stream in a period of two to three years (if financing were assured in advance and if complicated negotiations with the Government can be avoided, development will be a relatively simple process); and (iii) the small enterprise should be viewed in Mexico (taking

advantage of its excellent geographical location) as an inexpensive way to establish a position for foreign investors, to demonstrate enlightened policies and to maintain an observation post at little or no cost from which other opportunities may be revealed from time to time.

3.14 Even though the sector may excel for the quality and quantity of its mineral resources, it is difficult to envision sizeable investments (either national or foreign) going into a sector which makes the access to such resources so difficult, establishes lengthy and exceedingly slow procedures and negotiations, restricts foreign investment to a non-controlling position, leaves too many key decisions to the discretion of a large number of authorities and provides no investment vehicle through which funds from willing investors could be channeled into profitable projects. This situation has severely restricted the availability of high risk equity money to small mining and has forced it to work mostly with borrowed capital. Because the modernization and development of small-scale mining is particularly sensitive to the policies involved in the above-mentioned points, action by the Government to support small-scale mining ought to consider (i) the release of National Mineral Reserves and a more demanding mining code for the holding of concessions; (ii) the streamlining of the mining code and of the GDM for faster processing of claims; (iii) promulgation of non-discretionary legislation; (iv) relaxation of the foreign investment limitations; and (v) the promotion of investment vehicles (in the Mexican stock exchange) to provide SMM with equity funds, by allowing tax write-offs to those who invest in the sector.

E. Exploration Outlook: Objectives and Implications

3.15 With the possible exception of AUTLAN, all major private mining companies have adequate exploration budgets to both support their on-going mining activities and generate new projects. However, as discussed in paragraph 3.16 this is insufficient for optimal growth of the industry. In the case of many of the "big five", new project generation is quite heavily focussed on epithermal volcanogenic gold, placer gold and maintaining a store base in silver dominant polymetallic deposits. With a 1988 exploration budget of US$10 million, the Peñoles group is by far the most active and is also branching out into non-traditional mineral resources. As previously discussed, the Penoles group is favorably placed not only because of the relative importance of its exploration budget but because it has been able to attract specialized expertise (and high-risk financing from foreign partners). Emphasis is placed on "specialized" because there is no doubt of a considerable recent focus on gold in Mexico. Experience with respect to major disseminated gold models (in Nevada and Dominican Republic type) is concentrated within only a few of the major international mining groups (i.e., Newmont, BP Minerals, Western Mining, Lac Minerals, BHP). Much of the gold exploration activity is concentrated to the States of Sonora, Baja California and Sinaloa. Total exploration expenditure for this "big five" group including their joint venture companies and subsidiaries, was about US$7 million in 1986, $13 million in 1987 and is expected to be about US$21 million in 1988. In addition to exploration investment by the "big five" group, some $12 million to $15 million annually is being spent on exploration by the public sector institutions. Additional exploration by the small and medium scale sector plus other private venture work, would probably account for a further US$5.0 million.

3.16 There is an upward trend in exploration expenditure, but for the size of Mexico and its considerable mineral endowment, the present level remains well below the level required for optimal growth of the industry. Instead of US$40 million annually, an annual exploration investment closer to US$150 million is justified given the comparative advantages that the high grades of the silver-gold-lead-zinc deposits and the location of the non-metallic mineral deposits provides Mexico with, as well as the existing infrastructure and access to two oceans. Adjustments in land-access procedures, a stabilization of the macro-economic environment and laws which would permit larger foreign participation at the production level would support a much higher exploration investment. In the short-term, it could even triple from the present level. A typical major international mining company will have an annual exploration budget of between US$15 and US$20 million of which 90% is now spent in the USA, Canada and Australia. With the opening up of Mexico there would be ample justification of diverting at least 25% of this toward Mexico; between US$3 million and US$5 million per company.

3.17 In addition to the important impact of a liberalization of the sector in shifting the investment of the major mining houses towards Mexico, the small scale mining subsector also stands to benefit from the liberalization of the mining sector, capturing resources now being invested or spent in other activities. Traditionally, small scale mining has little available capital to spend even on reserve definition, let alone on serious grass roots exploration efforts. Opening up the sector to foreign markets would dramatically increase the amount of equity capital and qualified operators and hence the small scale exploration activity. Meanwhile assistance mechanisms in place (i.e., CRM and PECAM) are worthy of continued support.

3.18 Exploration for gold in Mexico has lagged behind other areas of the world (i.e., USA, Canada and Australia) in particular, and mine production even more so. In 1986 reported gold production was a relatively small 7.8 metric tons. With the proper level of exploration investment this could easily be increased to between 15 and 20 MT over the next 8 to 10 years. Silver will also figure strongly in the overall exploration effort and certainly the potential is there. It is said that, historically, the Faja de Plata belt alone along the central spine of Mexico has produced 85,000 MT of silver (equivalent to a present value of US$19 billion). It seems quite possible that a similar level of reserves is still waiting to be discovered and developed over the next 50 years. The present level of production is about 2,150 MT p.a.

F. Recommended Next Steps.

3.19 The key questions that the Government faces regarding the future direction of Mexican mining, concern the organization and institutions of the sector, as well as the policies set by the legislation. Existing comparative advantages provide the sector with an important growth potential which could be promoted with a policy framework that would be in line with the recent efforts of the Government to liberalize the Mexican economy. The above notwithstanding, reservations have to be made about the future performance of factors which are external to the sector, namely the international minerals markets and the Mexican economy, which could have a

significant impact in the level of exploration and investment, regardless of sector policies and incentives. This report outlines the actions needed to lift the constraints for growth, identified in the sector. In deciding what type of approach it wants to pursue in addressing the future direction of the sector, the Government may in fact define not only the actions it will have to take now, but also the limitations under which the sector will operate and the benefits of its contribution to the Mexican economy.

3.20 In order to achieve the desired results from the recommended actions, the Government must recognize that the proposed actions are closely interrelated which means that realising most of the benefits will depend on implementing a comprehensive package. The linkage and interfacing of the different aspects of the recommendations is important in order to achieve consistency among the actions. For example, very little would be gained by releasing the mineral reserve lands unless demanding work requirements went into effect at the same time; if land is released to companies who then keep it idle without undertaking any meaningful exploration work programs for several years, the land will make no greater contribution to economic development than if it were kept as a mineral reserve. Similarly, the impact of relaxing the existing constraints on foreign management and investment would be minimized unless improved access to land and mineral rights is also available. Furthermore, the streamlining of GDM, the agency that administers all mineral land, is important if the administration of mineral rights is to be successful. Nevertheless because of the complexity of the proposed package, and the different actors involved, the implementation may need a phased approach, including in the first phase the actions that can be controlled directly by the Executive (presently the SEMIP), and on a second phase the actions that depend on actors which are indepedent from the Executive (i.e. Congress) or the implementation of studies that were initiated in the first phase. Recognition is given to the fact that the implementation of some aspects may take longer than that of others, and thus that completion of different actions may not always be as planned. Nevertheless the package approach is considered important if the objective is that the sector achieve a growth rate commensurate with its international competitiveness.

3.21 Based on the above approach, the <u>first phase</u> of the package would consist of four main elements. The first two are designed to support an expanded role for the local and foreign private sector and consist of (i) the release of reserved mineral land, and the establishment of substantial work requirements in order to hold on to concessions; (ii) a relaxation on the existing restrictions on foreign management of mining operations; (iii) improving the government institutional support for the sector through implementation of an ambitious program of institutional reform, including (a) the discontinuation of CFM's role as an operator, the initiation of the process to turn CFM into a second tier financial institution, the implementation in CFM of a more itemized and open accounting and reporting and the transfer from CFM to CRM of all technical contractual services, (including metallurgical laboratories); (b) reorientation of CRM towards the role of a geological survey institute (emphasizing the provision of basic sector development needs rather than specific promotional activities), in addition to which a self-financed consolidated contractual facility could be established in CRM, and (c) the streamlining of GDM and the updating of the controlling regulations of mineral rights and the setting-up of a specialized think tank (with access to all pertinent

information to support the head of the sector). (iv) The fourth element consists of the commissioning of studies (a) to analize the taxation of the mining industry; (b) to design investment vehicles for small and medium mining capable of providing equity funds; (c) to reduce certain discretionary aspects in the mining law, and (d) to examine further adjustments needed to optimize the institutional setup of the sector, especially regarding the holding of state equity and financial intermediation. The second phase would consist of the design and promulgation of a new mining code, which would formalize the end of the present system of mineral land reserves (although the state would keep the power to reserve land for specific purposes); limit the minerals with restrictions to exploitation by private interests to those mentioned in the Constitution; lift the existing limitation in foreign investment; and implement the conclusions of the studies on taxation, investment vehicles for SMM, the discretionary nature of the law and institutional reform.

IV. EVENTS OF 1988 AND EARLY 1989

4.01 Important progress in the management of the sector has been achieved since the main mission that prepared this report visited Mexico in February 1988. The main events that took place between the date of the mission and the end of the first quarter of 1989 follow:

4.02 The implementation of the process of privatization of SOEs exploiting non-prioritized minerals, was initiated in mid 1988 and was well advanced by March 1989. The major copper producer Mexicana de Cobre, the silver producer Real de Angeles as well as six other smaller enterprises, had been sold to the private sector; altogether this represents the transfer of about 10% of the total sector output to the private sector. Cananea (the other large copper operation) and three smaller companies, were earmarked for privatization in the near future, and four mining SOEs were being liquidated. Eight mining enterprises, mostly producers of "prioritized" minerals will remain as SOEs; of these, six are subsidiaries of CFM (producers of sulfur phosphates, thermal coal and common salt) and two are subsidiaries or majority owned by SIDERMEX (producers of iron ore and coking coal).

4.03 The new Mexican administration, which took office in December 1988, has restructured CFM by having it absorb FMNM, giving it a new organizational structure and placing FMNM's former management in charge of the new institution. The merger of the two institutions has resulted in a simplification which should lead on to improvement of sector management. Initial steps had been taken to start CFM working as a second tier financial institution; however, legal problems were encountered since CFM, unlike FMNM, is not classified as an "auxiliary credit institution," which are the only institutions allowed to work in such role. Options to solve this problem, which were under consideration, include amending CFMs organic law to adapt it into an auxiliary credit institution, or to establish a new trust (Fideicomiso) as a CFM subsidiary. It was decided to discontinue the cross subsidization of CFM operations and subsidiaries. Currently, the dividends accruing from such companies are transferred to the Federal Treasury, and if any of these subsidiaries should need financial support from CFM to cover its losses, funds are included in CFM's budget and are transferred as open subsidies. With respect to CFM's own mines, the decision was taken to discontinue the operation of the non-profitable El Barqueño mine; the marginal (but non-loser) El Bote mine has continued its operation. The privatization of both properties is presently under consideration.

4.04 While CFM had decided to continue operating the regional beneficiation plants, where ore from small miners is processed, it has discontinued all subsidies to these plants. In order to achieve this goal, the tariffs charged for the processing of the ore were raised steeply, in some cases up to 250%. Furthermore CFM has tightened the management control of the plants; the new organizational chart of CFM assigns the responsibility for the supervision of the plants to a Director. CFM was also considering the possibility to purchase the ore from the small miners (rather than charging tariffs for processing), which should allow for

better ore blending and longer runs, and result in improved plant recoveries and productitivities. These actions appear to be a consistent and reasonable approach to the problem of subsidized and inefficient beneficiation plants, as long as the conditions of real value of the tariffs, volumes, costs and efficiencies, assumed in the design of the program can be maintained. Hence, the adequate supervision of these operations by CFM's management becomes very important and the implementation of the structure and the systems to enable it is a central feature of the action plan for the beneficiation plants. As mentioned above, the new organizational chart of CFM addresses the structural aspect of this problem. Therefore the implementation of adequate systems, namely updated financial and cost accounting as well as management information systems must be a necessary component of CFM's management program.

4.05 As regards to income taxation, the new Mexican administration discontinued the process of progressive transition from the old to a new income tax system (see paragraph 2.43) and placed the new system in full effect as of January 1, 1989. In addition, a tax amounting to 2% of the net value of assets, which is to be accredited against corporate income tax was enacted, effective January 1, 1989.

THE INSTITUTIONS OF THE MINING SECTOR

SEMIP

1. The General Directorate of Mines (GDM) and the General Directorate of Mining and Metallurgy (GDMM) are part of the Ministry (SEMIP), depend on the budget for their expenditures, and have the functions of the Government or Central authority in the administration of the sector. The GDM is the Government's administrator of mineral rights and the controller of mineral production and mineral production taxes; it has the following functions: (a) the registration and control of the National Mining Reserves (NMR); (b) the registration and control of Mineral Assignments (MAS) (land assignments to state institutions and to parastatal companies), including the control of their compliance with the work requirements; (c) the processing, granting, registration and control of all concessions to private parties and state owned enterprises, including the maintenance of a cadastral system and control of compliance of work requirements, and (d) the control of mineral production and the determination of the ad valorem production tax to be paid by all mining operations. In addition to the Central Office in Mexico City, the GDM has eight regional offices and 34 reception offices. These field offices are responsible for all field work that the existing mining legislation requires.

2. The GDMM is the coordination agency for SEMIP's projects and programs for the mining sector and the controlling agency for parastatal enterprises, and has the following functions: (a) establishes operating policies and regulations and supervises the PECAM program; (b) evaluates and follows up the budgets and investment programs of the parastatals; (c) prepares and reviews sector programs; (d) prepares sectoral safety, health and training programs. The GDMM participates in the board of the parastatal enterprises.

Comisión de Fomento Minero (CFM)

3. Objectives. CFM is the largest, oldest and most important of the agencies of the sector; it was created in 1934 to promote and develop the national mining industry, concentrating in the metallic subsector, and has the following functions: (a) serves as a holding company for state participation in mining or mineral related companies; (b) provides financial and technical assistance to metallic mining enterprises, primarily to SMMs; (c) promotes, and acts as the executing agency for the development of medium and large scale mining projects; (d) owns, administrates and operates mines and beneficiation plants; (e) operates research plants and laboratories, selling services to private and parastatal enterprises.

4. Organization and Staffing. CFM's overall policy-making body is its Board of Directors, headed by the Secretary of SEMIP. The day to day operations are managed by a Director General. CFM has 18 regional offices (in addition to 18 other smaller support offices) outside Mexico City, where the technical assistance and the credit agency functions take place. CFM employs 2366 people (February 88), of which 47% are blue-collar, union-

affiliated workers and 53% are white-collar non-union workers, including some 600 professionals). In 1988 CFM headquarters are scheduled to be transferred out of Mexico City to Pachuca (Hidalgo).

5. Operations. CFM owns and operates 18 beneficiation plants to process metallic ores from small miners (including the mine that feeds the largest of these concentrators) and one coal washing plant. Furthermore, CFM operates one central and four regional metallurgical laboratories, where paid-for technical services are rendered to all types of enterprises. The total value of the minerals processed in the beneficiation plants is in the order of US$15-18 million/year; capacity utilization is low overall; it can be as high as 80% in some plants and as low as 20% in others, the average being around 60%; recoveries of minerals have also shown important variations and the average is also about 60%. Table 1 shows the total output of each of the beneficiation plants, the tolls (in constant prices) charged for the use of these plants in the last five years (1983-1987) and the detailed operating economic financial and utilization indicators for each of the plants.

6. Although some of the state properties are now being privatized, CFM's role as a holding company reflects the traditional active involvement of the Mexican state in the mining sector. At present CFM's involvement is related to thirteen enterprises in which a majority interest is held (total employees 15,994 annual sales US$450 million) and to twelve enterprises where a minority interest is maintained (total employees 13,716, annual sales US$650 million). Table 2 shows the list of companies in which CFM has equity participation and provides relevant financial information. Through these enterprises, CFM's involvement in the sector is widespread and multi-disciplinary. As a consequence of the recent decision by the Government of Mexico to reduce the role of the state as entrepreneur, four of the majority owned enterprises (total employees 1324, annual sales of US$20 million) and four of the minority owned companies (total employees 7,683, annual sales US$330 million)[1] have been placed for sale.

7. Credit and Technical Assistance. As a credit and technical assistance agency the role of CFM has increased with time in its importance for the metallic SMM subsector. The financing provided during 1987 was 40 billion pesos (about US$30 million), or 68% higher than the budgeted amount of 23.8 billion pesos and 360% (in current terms) above the actual figure for 1986 of 8.7 billion pesos (about US$15 million). Of the credits approved during the first half of 1987, 57% pertained to the PECAM program and 43% to CFM loans. Similarly, the number of visits to borrowers for purposes of technical assistance increased by 10% in 1987.

8. Financial Position. CFM is only partly self financed; a substantial fraction of the resources it requires have traditionally been supplied by the Federal Government. The relative importance of fiscal resources has, however, progressively diminished over the last four years as income from credit activities, dividends and royalties have increased and its investments have been restricted, decreasing from 60% of total

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1/ Including the two large Mexican copper producers, Mexicana de Cobre and Cananea.

expenditures in 1982 to 20% in 1986 as shown in Tables 3-5. In the last five years, the loan portfolio of CFM has increased 43 times in current terms and 4.7 times in constant terms and amounted to 147 billion pesos (about US$70 million) at end 1987. The portfolio in arrears at end of 1987 was 8.5%, which compares with 22% at end 1986; the improvement is attributable to a "Special Portfolio Recovery Program" now in effect. The debt to equity ratio meanwhile has remained 1 to 1 during the referred period.

Fideicomiso de Minerales No Metálicos Mexicanos (FMNM)

9. Objectives. FMNM was created in 1974, as a Government trust administered by NAFINSA with the following functions: (a) to promote the development of non-metallic minerals by providing credit and technical assistance for their exploitation and beneficiation and by supporting the establishment of industrial plants to process such minerals; (b) to facilitate the flow of economic benefits and the creation of employment among "ejidatarios" by opening "ejido" (land-owning cooperatives created under the Agrarian Law) land for exploration and development of non-metallic minerals, and (c) to initiate mining and quarrying activities, processing and manufacturing plants and to formulate and execute marketing policies.

10. Organization and Staffing. FMNM is clearly perceived by its management to be a credit agency with additional responsibility to help the land-owning cooperatives; these well focused objectives, and the adequate operating systems used, result in a simple, streamlined organization. FMNM employs 135 people in total, of which just over half are professionals. FMNM's governing body is its Technical and Funds Disbursement Committee, presided over by the Secretary of SEMIP or, in his absence, by the representative of NAFINSA. FMNM's day-to-day operations are managed by a Director General, who is assisted by two Deputy Directors and a Controller.

11. Operations. Beginning at the time of its foundation, FMNM undertook functions of exploration and promotion, market research and direct management of operations. FMNM's role as a direct operator, or owner of operations, was limited to six enterprises and focussed in areas where, in coordination with private enterprises, it assumes a role in ordering a specific market, or, in some cases, to salvage operations for enterprises in difficulties. In 1984 FMNM experienced a significant reorientation of its activities, when the decision was taken to give greater emphasis to its credit and technical assistance functions and to move away from its investment and exploration activities. This decision led to the privatization of three of its subsidiaries and the remaining three are now in the process of being privatized.

12. Credit and Technical Assistance. The growth of FMNM as a credit agency is impressive, in the last five years the total amount of approved credits has grown one hundred times in nominal terms (from 330 million pesos, about US$2.6 million, in 1983 to 31.7 billion pesos, about US$23 million, in 1987) and eleven times in constant terms; this growth reflects the increase in the size of the loans by a factor of four (in constant terms), and in the number of loans by a factor of three. The growth

continues: there were 79 approvals in 1986 and 47 in the first half of 1987; (55% of the volume of approvals for 1987 is accounted for by the PECAM program). The program of visits to clients, for purposes of technical assistance, was systematized only in 1985 and is increasing at a rate of about 10% per year. A total of 136 visits were made in 1987.

13. Financial Position. FMNM has been a profitable institution since 1984 and a self financed institution since 1985 when its investments were drastically cut. Since then, the profits of the organization have increased every year, both in nominal and constant terms, from US$1.6 million in 1984 to US$8.6 million in 1987.[2] Portfolio in arrears is minimal; at end 1987 it stood at 1.1%, down from 1.9% in 1986. Reflecting the same policy followed in CFM, the debt to equity ratio is kept at 1 to 1 and the excess cash from FMNM has been used to build a very liquid position as can be seen in Tables 6-8.

Consejo de Recursos Minerales (CRM)

14. Objectives. CRM was established in 1955 and made responsible for: (a) carrying out geologic/mining explorations and the valuation of mineral resources of the country; (b) supporting medium and small mining through financial and technical assistance; (c) providing recommendations to Government about the areas and minerals that should be considered national mining reserves or assignations; (d) advising the Government on matters related to the exploration, exploitation and preservation of mineral resources; and (e) coordinating its research work with other public entities and preparing the mining geology inventory of the country.

15. Organization and Staffing. CRM's policy making body is its Board of Directors, which is chaired by the Secretary of SEMIP and where three other cabinet members--Secretaries of Hacienda (SHCP), Presupuesto y Programacion (SPP) and Industry--sit together with the General Directors of PEMEX, NAFIN, CFM and DGM. The day to day management of the organization is the responsibility of the General Director. The payroll of full time workers of CRM totals 670 (reduced gradually during the last five years, from 1,077 in 1982); the total amount of people employed by CRM--when the part time and temporarily employed employed are considered--is much larger; in 1986 it was 4,533. The organization is spread geographically in four regional offices and twelve residencies. The present policy is to strengthen the decentralization process--presumably through strengthening the autonomy of the regional representatives--although in the short-term major re-structuring will involve the transfer of CRM Headquarters out of Mexico City to Pachuca (Hidalgo) which is slated to be the new National Mining Center of the country.

16. Operations. CRM acts as the geological survey service it is supposed to be, but has not limited itself to the basic infrastructure and research work inherent to such institutions and has spent considerable effort in undertaking a wide range of exploration activities, including detailed exploration and prefeasibility work in areas (reserves or assignations) over which it has control. Broadly defined, CRM's work falls

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2/ Figures include profits from subsidiaries.

into four categories;(i) regional exploration; (ii) semi-detailed & detailed exploration; (iii) evaluation (to the prefeasibility or feasibility stage), and (iv) technical assistance to small and medium mining. The breakdown of projects by type which are either under active operation or planned for 1988 is 17 regional; 9 regional with detailed components; and 5 semi-detail or detailed. Table 9 lists all these projects and describes their objectives.

17. CRM exploration work covers all commodities rather evenly and includes Assignments and NMR's. Of the approximate 31 CRM projects which are either operational or planned (for 1988) about 40% are over Assignment areas and 60% over National Reserve areas. Of the latter, about seven projects relate to strategic minerals (coal, iron-ore and sulphur), and are usually done for parastatal enterprises. These strategic mineral projects account for 22.0% of the total CRM Investment Budget for 1988. The heaviest single project investment is scheduled for iron-ore exploration (Los Pozos Fierro, Mich) and represents 8.5% of the total 1988 budget. Further planned work on sulphur to support the State-owned Azufrera Panamericana (done mostly at CRM's expense) account for 5.0% of the 1988 budget. Excluding work on strategic minerals, a review of the CRM work program over the last 5 years shows a general trend away from regional type work over National Reserves (Volcanic Axis, lithium, uranium programs etc.) towards more specific detailed work within both National Reserves and Assignments. In general, Assignments-based projects are becoming more common because this designation is administratively easier to obtain than a National Reserve designation. From a commodity point of view, CRM projects have quite a good spread and are well focussed. Possibly a heavier commitment to basic regional research exploration focussed on epithermal gold models is justified; a combination of the Mexican geological environment with commodity forecasting would justify an annual investment of 25% to 30% of the investment budget over the next 5 years.

18. Technical Assistance to small and medium mining is done through (a) agreements between CRM with the authorities of a certain state in order to define the potential of an area or of a district, where the exploration work is specified and the financing is defined; (b) reconnaisance visits of prospects of SMM, done at CRM's expense, at the request of the owner of a project (during the last year, 213 requests were received, of which 157 visits were approved), and (c) contracts for exploration services between CRM and small and medium miners, usually as a result of the recommendation of the reconnaisance visit; the financing is done through the PECAM program; 13 contracts were signed during the last year.

19. Credit Assistance. As can be seen from the previous discussion, the importance of the credit function to CRM is secondary. During the year July 1986-June 1987, CRM lent a total amount of 748 million pesos (about US$ 0.5 million), which is projected to increase to 1.6 billion pesos (about US$0.7 million) for the period July 1987-June 1988; 90% of the first figure and close to 95% of the second come from the PECAM program.

20. Financial Position. CRM, like most other geological surveys, is not a self financed institution; at present fiscal resources cover approximately 60% of its expenditures and keeps its Balance Sheet with a low amount of debt (30% of assets). PECAM (through its financing of the contracts for exploration services) and CRM's own resources cover the remaining 40%. On the side of the expenditures, the relative importance of investments have gone down from 62% of total expenditures in 1982 to 21% in 1987 as shown in Tables 10-12 which provides the statement of income and expenditures and the balance sheet of CRM.

CPM Beneficiation Plants
Selected Statistics - 1986

Concept	El Bote, Zac	Guanacevi, Dgo.	Parral, Chih.	Barrones Zac	Hermosillo, Son	Badiraguato, Sin.	Choix, Sin.	Villa Matamoros, Chih.	Parrilla, Dgo.
General Information									
Annual Installed Capacity (t)	216,000	187,200	144,000	126,000	54,000	54,000	54,000	54,000	50,400
Number of ore suppliers	4	21	2	24	7	6	6	4	4
Personnel	304	86	69	123	32	37	36	40	56
Operating profit (loss) pesos (000s)	62,404	(76,124)	193,940	(132,798)	(96,074)	(71,055)	(69,422)	(36,936)	(86,806)
Economic and Financial Indicators									
Average Toll	2,738.63	2,771.67	12.39e	2,383.33	2,317.50	2,382.50	2,944.16	2,629.16	2,636.86
Average Op. Adm. and Sales Cost a/	6,914.49	3,662.94	23,241.72	7,230.60	5,591.23	9,965.75	5,267.13	6,997.20	5,906.82
Total Income ($/t)	7,322.77	2,524.27	27,011.47	8,328.97	2,304.98	2,406.16	2,620.94	4,550.46	2,640.90
Income/Expense Ratio (%)	105.90	68.91	116.22	80.19	41.22	24.14	49.76	65.03	44.70
Utilization Indicators									
Used capacity (%)	71.01	63.90	44.79	79.92	55.74	18.33	52.96	28.12	59.38
Labour Productivity (Tons/man shift)	1.40	3.86	2.01	2.27	2.61	0.74	2.20	1.04	1.48
Operating Parameters									
Processed ore	153,300	119,600	64,500	100,700	30,100	10,000	28,600	15,200	30,000
Ore grades Au (gr/t)	0.58	1.10	0.83	0.60	0.76	1.13	-	-	-
Ag (gr/t)	100.77	193.15	283.50	119.90	257.24	-	133.5	228.30	246.00
Pb (%)	0.43	-	0.96	0.39	0.66	-	1.34	0.76	1.73
Cu (%)	0.69	-	-	0.69	-	-	0.58	-	-
Zn (%)	1.02	-	0.42	0.18	-		11.89	0.71	1.38
Concentrate grades									
Au (kg)	57.10	96.20	26.9	29.062	11.30	0.4	-	-	-
Ag (kg)	10,535.80	17,048.50	12,454.0	7,485.837	5,025.10	12.504	3,043.9	2,740.09	5,605.70
Pb (t)	505.40	-	273.1	274.126	86.50	-	298.4	114.07	435.00
Cu (t)	222.40	-	-	537.104	-	-	2,425.3	-	-
Zn (t)	1,122.00	-	141.5	141.900	-	-	120.0	107.2	272.70
Recoveries Au (%)	63.6	72.9	54.0	48.1	49.6	83.06	-	-	-
Ag (%)	68.2	73.08	68.1 (kg)	62.0	64.9	65.02	79.7	79.5	75.03
Pb (%)	76.5	-	44.1	69.8	43.3	-	77.7	64.2	84.0
Cu (%)	21.1	-	-	77.3	-	-	71.3	-	-
Zn (%)	71.5	-	141.5	80.0	-	-	71 8	48.4	85.9

a/ Total cost for mining and beneficiation, per ton. of milled ore, of own and tolled ore.

CFM Beneficiation Plants
Selected Statistics

Concept	La Minita, Sin	Pinzan M., Gro.	Santa Ines, Oax	El Coco, Sin.	Cusuhtemoc, Chih.	Ocampo, Chih.	Sta. Rita, Zac.	S. Barnabe, Dgo.	Talpa, Jal.
General Information									
Annual Installed Capacity (t)	50,400	43,200	43,200	36,000	36,000	36,000	36,000	36,000	36,000
Number of ore suppliers	17	1	7	12	2	8	n.d.	6	1
Personnel	46	138	42	40	34	31	4	22	21
Operating profit (loss) pesos (000s)	(51,430)	(146,419)	(129,772)	(51,845)	(93,205)	(135,204)	(189,941)	(78,725)	(70,626)
Economic and Financial Indicators									
Average Toll	2,469.16	2,362.50	2,362.50	2,899.17	2,148.75	2,398.75	1,700	2,502.50	2,445.00
Average Op. Adm. and Sales Cost a/	3,737.08	18,913.56	21,247.12	4,385.34	7,141.72	14,617.4	15,156.66	33,990.40	18,100.15
Total Income ($/t)	2,143.55	7,458.72	4,952.62	2,524.82	1,568.28	2,126.13	5,686.92	2,213.20	1,971.79
Income/Expense Ratio (%)	57.36	46.83	23.31	57.57	1.42	14.54	37.52	6.50	15.05
Utilization Indicators									
Used capacity (%)	75.99	40.28	46.06	90.56	48.33	30.95	10.83	6.91	18.61
Labour Productivity (Tons/man shift)	2.31	0.35	1.32	2.26	1.42	0.99	2.71	0.31	0.88
Operating Parameters									
Processed ore	38,300	17,400	19,900	32,600	17,400	11,100	3,900	2,500	6,700
Ore grades: Au (gr/t)	2.22	2.51	1.52	1.63	167.77	2.20	188.9	537.53	1.4
Ag (gr/t)	178 [illegible]	36.83	93.34	159.30	-	185.10	1.1	-	219.8
Pb (%)	-	-	-	-	0.57	-	3.8	4.405	-
Cu (%)	0.08	-	-	-	-	-	-	-	-
Zn (%)	-	-	-	-	1.12	-	-	5.74	-
Concentrate grades									
Au (kg)	58.20	24.60	21.3	31.80	982.48	18.48	555.13	1,1[illegible].00	6.78
Ag (kg)	4,185.40	157.00	1,502.7	3,395.00	-	1,514.25	27.89	-	794.04
Pb (t)	-	-	-	-	14.32	-	47.67	60.33	-
Cu (kg)	21.90	-	-	-	-	-	-	-	-
Zn (t)	-	-	-	-	16.89	-	95.51	-	-
Recoveries Au (%)	68.5	56.4	70.2	60.56	50.68	75.7	-	80.81	62.37
Ag (%)	61.1	24.05	80.9	65.87	-	73.7	75.43	-	72.81
Pb (%)	-	-	-	-	14.80	-	83.28	56.99	-
Cu (%)	68.2	-	-	-	-	-	-	-	-
Zn (%)	-	-	-	-	5.5	-	-	-	-

a/ Total cost for mining and beneficiation, per ton. of milled ore, of own and tolled ore.

CFM Beneficiation Plants
Selected Statistics

Concept	Nueva R., Coah.	Julimes, Chih.	Nuevo M., Zac.
General Information			
Annual Installed Capacity (t)	1,800,000	90,000	-
Number of ore suppliers	16	2	-
Personnel	314	4	4
Operating profit (loss) pesos (000s)	622,947	(77,064)	(26,231)
Economic and Financial Indicators			
Average Toll	9,144.59	9,250.00	-
Average Op. Adm. and Sales	9,758.74	3,874.58	
Total Income	106.70	41.89	4,373.33
Utilization Indicators			
Used capacity (%)	56.10	51.78	8.9
Labour Productivity (Tons/man shift)	8.93	1.39	0.32
Operating Parameters			
Processed ore			
Ore grades Au (gr/t)			
Ag (gr/t)			
Pb (%)			
Cu (%)			
Zn (%)			
Concentrate grades			
Au (kg)			
Ag (kg)			
Pb (t)			
Cu (kg)			
Zn (t)			
Recoveries Au (%)			
Ag (%)			
Pb (%)			
Cu (%)			
Zn (%)			

CFM PARTICIPATION IN STATE OWNED ENTERPRISES

Information at September 1987
(MP $ \times 10^6$)

MAJORITY OWNED	SOCIAL CAPITAL	CFM PARTICIP. (%)	BOOK VALUE	TOTAL ASSETS	LOCAL SALES	EXPORT SALES	NET SALES	PROFIT (LOSS)	EMPLS.
Azufrera Panamericana, S.A.	460.0	55.33	120,240	111,381	86,614	81,863	168,477	13,827	3,443
Barrenas de Acero y Aguces, S.A.	98.2	78.80	151	282	340	-	340	46	35
Cia. de Real del Monte y Pachuca, S.A.	1,140.4	99.99	53,897	61,800	24,673	-	24,673	149	3,026
Cia. Exploradora del Istmo, S.A.	270.0	51.00	40,572	86,510	33,486	8,076	41,562	7,928	859
Exportadora de Sal, S.A. de C.V.	4,900.0	51.00	127,509	150,300	-	48,541	48,541	13,723	1,379
Imp. Minera e Ind. de B.C., S.A.	13.1	99.96	8	50	67	-	67	7	16
Inm. y Const. Rio Escondido de Coahuila, S.A. de C.V.	4,850.1	24.65	32,602	38,969	1,576	-	1,576	1,025	287
Macocozac, S.A.	1,343.1	99.88	7,281	17,033	6,927	-	6,927	1,197	736
Minera Carbonifera Rio Escondido, S.A.	21,989.0	48.27	29,229	531,975	111,082	-	111,082	8,054	4,202
Refractarios Hidalgo, S.A.	377.1	80.11	(383)	2,114	1,784	-	1,784	(93)	235
Roca Fosforica Mexicana, S.A. de C.V.	4,854.6	99.82	(41,132)	97,331	12,110	-	12,110	(35,089)	1,861
Transportadora de Sal, S.A.	20.0	51.00	12,711	20,536	660	-	660	(168)	97
Zincamex, S.A.	553.6	99.00	7,218	13,675	6,428	-	6,428	45	318
Subtotal:	40,869.2		389,918	1,331,936	285,747	138,480	424,227	10,653	15,994
MINORITY OWNED									
Atisa Atkins, S.A. de C.V.	88.4	1.93	185	765	151	76	227	(50)	81
Baja Bulk Carriers, S.A.	1,276.0	50.00			-	22,485	22,485	(2,016)	5
Cia. Minera Autlan, S.A. de C.V.	65,072.0	3.37	102,078	368,548	35,917	35,918	71,835	10,999	2,464
Cia. Minera Cedros, S.A. de C.V.	100.0	15.00	9,698	12,017	9,451	-	9,451	6,918	-
Cia. Minera de Cananea S. A.	6,228.4	22.36	61,104	1,741,647	128,077	-	128,077	2,469	3,816
Cia. Naviera Minera del Golfo, S.A. de C.V.	814.3	10.56	(31,209)	30,643	17,406	-	17,406	(16,593)	135
Consorcio Minero Benito Juarez-Pena Colorada, S. A.	768.1	4.76	115,381	221,051	44,771	-	44,771	(22,563)	1,651
Mexicana de Cobre, S.A.	100,923.1	6.00	70,628	2,116,380	68,743	98,589	167,332	61,476	3,848
Minera Lampazos, S.A. de C.V.	57.6	32.00	18,234	21,197	7,589	-	7,589	3,556	386
Minera Real de Angeles, S.A. de C.V.	1,240.0	33.00	151,753	208,588	77,448	12,392	89,840	45,896	1,067
Quimica Fluor, S.A. de C.V.	800.0	17.00	85,874	101,427	3,734	41,794	45,528	8,086	325
Refractarios Mexicanos S.A.	477.4	33.34	23,951	32,114	23,229	-	23,229	1,337	438
Subtotal	177,843.3		607,655	4,854,377	416,516	211,254	627,770	99,515	13,716
T O T A L	218,712.5		997,573	6,186,313	702,263	349,734	1,051,997	110,168	29,710

ANNEX 1
Table 3

COMISION DE FOMENTO MINERO

STATEMENT OF INCOME AND EXPENDITURES 1982 - 1986

MP$ X 10^6

CONCEPT	B U D G E T				
	1 9 8 2	1 9 8 3	1 9 8 4	1 9 8 5	1 9 8 6
INCOME					
Own Resources	1,627	3,680	9,379	15,202	25,711
Fiscal Resources	2,535	3,011	9,414	5,034	6,046
Resources Generated by Financial Role	128	-	-	-	778
TOTAL	4,209	6,691	18,793	20,236	32,535
EXPENDITURES					
Current Operating Expenses	1,726	2,996	7,183	11,272	20,777
Physical Investment	1,260	875	1,358	1,150	1,603
Investment in Stock Subsidiaries	934	1,368	5,150	2,709	2,151
Credit Program (Includes (PECAM)	201	756	1,694	3,020	3,382
PECAM - Other Organizations	-	-	1,174	1,033	1,530
Recoverable Expenditures	62	179	751	946	83
Reduction of Liabilities	107	124	117	148	97
TOTAL	4,290	6,298	17,427	20,278	29,623

ANNEX 1
Table 4

COMISION DE FOMENTO MINERO

BALANCE SHEET DECEMBER 31, 1982 - 1986

MP$ X 10^6

CONCEPT	1 9 8 2	1 9 8 3	1 9 8 4	1 9 8 5	1 9 8 6
ASSETS					
Cash	207	594	1,978	1,930	7,585
Accounts Receivable	3,350	6,070	12,243	22,526	38,028
Inventories	494	1,441	2,436	2,646	6,775
Investment in Stock	5,128	9,784	16,779	20,276	22,438
Investment in Fixed Assets	2,141	2,738	3,518	4,002	5,119
Deferred Expenditures	333	377	530	945	1,103
TOTAL	13,650	21,004	37,484	52,325	81,048
LIABILITIES					
Accounts Payable - Short Term	284	1,274	1,923	2,701	7,954
Accounts Payable - Long Term	36	27	26	17	12
Deferred	316	-	-	-	-
Total Liabilities	636	1,301	1,949	2,718	7,966
EQUITY	13,014	19,703	35,535	49,607	73,082
TOTAL	13,650	21,004	37,484	52,325	81,048

ANNEX 1
Table 6

COMISION DE FOMENTO MINERO

PROFIT AND LOSS STATEMENT DECEMBER 31, 1982 - 1986

MP$ X 10^6

CONCEPT	1 9 8 2	1 9 8 3	1 9 8 4	1 9 8 5	1 9 8 6
Sales	385	3,147	5,404	8,596	13,206
Service Income	116	810	592	794	1,212
Interests and Rentals	260	871	1,149	2,734	4,645
TOTAL REVENUES	761	3,828	7,145	12,124	19,063
Operating Cost	573	2,833	4,575	8,124	14,826
Gross Profit	188	990	2,570	4,000	4,237
Administrative Expenses	495	825	1,995	3,427	4,916
Operating Profit (Loss)	(307)	165	575	573	(679)
Financial Income	273	384	720	918	2,582
Dividends	118	484	326	1,129	3,031
Result before Royalties	84	1,033	1,621	2,615	4,934
Royalties	505	679	1,547	3,406	7,665
Net Operating Result	589	1,712	3,168	6,021	12,599

ANNEX 1
Table 6

MINERALES NO METALICOS MEXICANOS

FIDEICOMISO DEL GOBIERNO FEDERAL EN NACIONAL FINANCIERA, S.N.C.

BALANCE SHEET 1983 - 87

(MP$ x 10^6)

	1983	1984	1985	1986	1987 June	1987 December
Liquid Assets						
Cash	17,948	560,095	108,536	798,976	4,170,648	265,200
Accounts Receivable	132,262	92,764	1,102,988	5,230,725	3,451,915	7,476,775
Subsidiaries	73,041	123,069	105,939	234,479	174,675	114,871
Other Accts. Receivable	7,448	27,034	4,405	423,820	61,982	585,802
Anticipated Payment		4,023	9,467	7,471	11,659	23,318
	230,697	806,986	1,331,335	6,695,471	7,870,874	8,465,966
Other Assets						
Accts. Rec. Long-Term	109,995	1,269,878	2,993,925	4,015,220	8,949,151	21,088,991
Subsidiaries Long-Term	43,534	302,500	243,854	273,459	232,259	191,059
	153,529	1,572,378	3,237,779	4,288,679	9,181,410	21,280,050
Investment in Stock Fixed	907,919	1,573,424	1.773,665	1,667,791	1,667,791	1,655,745
Equipment and Buildings (Net)	31,419	23,781	294,406	388,440	311,197	418,954
	939.338	1,597,205	2,067,971	2,056,231	1,978,988	2,074,699
Projects and Studies Deferred	151,504	1,974	19,635	56,774	75,410	165,410
Deferred Payments (Net)	2,538		611	578	562	546
	154,042	1,974	20,246	57,352	75,972	165,956
Total Assets	1,477,606	3,978,543	6,657,331	13,097,733	19,107,244	31,986,671
Short Term Liabilities						
Accounts Payable	41,455	107,708	584,707	1,010,322	-	1,615,004
Other Suppliers	1,062	575	492	-	3,276	327,624
Accounts Payable	38,907	157,477	69,836	225,258	224,050	175,741
	81,424	265,760	655,035	1,235,580	227,326	2,118,369
Long Term						
Comisión de Fomento Minero	96,614	1,546,135	2,640,704	5,058,614	8,169,008	14,535,032
Reserves for Guarantees	49,780	111,071	138,438	-	-	-
Total Liabilities	227,818	1,922,966	3,434,177	6,294,194	8,396,334	16,653,401
Shareholders Equity						
Capital Stock	1,739,326	2,308,172	2,508,272	2,877,105	2,911,331	4,011,331
Retained Earnings	(240,835)	(635,508)	(244,869)	662,498	3,825,399	3,825,399
			292,311	98,540	98,540	98,540
Balance	(248,703)	(284,913)	669,440	3,165,396	3,875,640	7,398,000
Total Equity	1,249,788	2,055,577	3,223,154	6,803,539	10,710,910	15,333,270
Total Liabilities and Equity Account	1,477,606	3,978,543	6,657,331	13,097,733	19,107,244	31,986,671

ANNEX 1
Table 7

FIDEICOMISO MINERALES NO METALICOS MEXICANOS

Project and Loan Statement
1988-87

(MP$ x 10^6)

	1983	1984	1985	1986	1987 December
Interest on Credits	104,638	373,252	1,281,876	4,069,662	11,048,200
Commissions	2,851	191,009	247,193	313,382	333,300
Interest on Financial Investment	10,075	30,948	61,094	206,396	1,151,200
Rentals	555	2,941	3,830	3,513	3,000
Others	1,226	3,000	8,530	37,049	804,700
	119,345	601,148	1,602,523	4,630,002	13,340,400
Benefits & Entitlements for Administrative Personnel	108,906	189,256	329,173	532,768	1,511,100
Other Administrative Expenses	34,248	63,434	103,801	226,730	353,002
Commission and Fees	6,773	19,792	22,496	8,282	9,038
Depreciation	9,845	8,952	79,084	99,675	115,360
Interest Paid	19,216	86,597	305,491	535,989	2,920,000
Granted Guarantor	49,780	61,291	27,366	(983)	
		1,589		62,165	433,900
Provision for Accts. of Debt Collection		30,363	65,862		
	228,766	461,274	933,273	1,464,606	5,342,400
	(109,421)	139,874	669,250	3,165,396	7,998,000
Provision Fee	139,282	(73,254)			600,000
Operation Subsidies		71,785	190		
Excess (Insufficient) Assets	(248,703)	284,913	669,440	3,165,396	7,398,000

ANNEX 1
Table 8

MINERALES NO METALICOS MEXICANOS

Sources and Applications of Funds 1983-87

(MP$ x 10^3)

	1983	1984	1985	1986	1987 December
	(248,703)	284,918	669,440	3,165,396	3,825,399
Depreciation & Repay	9,845	8,953	79,084	840,974	33,788
Reserve		30,363	65,862	48,162	686,128
Granted Guarantors	49,780	61,291	27,367	(138,438)	
Expenses Due - Not Paid		49,196	40,054	177,516	327,624
Interests Not Collected		(2,985)		(1,238,865)	2,288,424
Reserve	139,282	(73,254)			
Income generated by the Operation	(49,796)	358,477	881,807		
Financed by CFM	783	1,515,774	1,571,568	3,523,706	10,544,034
Surplus for Revaluation				(412,268)	
Increase in Accts. Payable	31,775	63,415		(171,181)	
Equity - Contribution	264,588	566,846	200,100	370,833	98,452
Subsidies		111,493			
Assets - Revaluation				(820,540)	453,116
Decrease in Fixed Assets	64		176		
Decrease in Accts. Receivables		77,916	9,135	22,491	
Correction of Previous Results			5,728		
Decrease in Accounts Receivables of Subsidiaries			75,776		12,046
Increase (Decrease) in Investments of Subsidiaries				587,219	
Total	325,330	2,625,140	2,757,644	5,930,514	18,269,011
Accounts Receivable	83,135	1,176,489	2,799,995	4,531,120	16,991,371
Increase of Accounts Rec. to Subsidiaries		308,991			
Increment in Shares of Subsidiaries	169,992	592,251	200,141	25,000	
Increase of Machinery and Equipment	2,404	1,315	57,542	122,384	30,514
Increase in other Assets	1,474	1,485	6,087		
Increase in Studies and Projects	48,352	1,974	17,661	37,140	108,686
Decrease in Supplies		487	575		
Decrease in Other Accounts Receivables			127,203		
Decrease in Financing of CFM	22,098			534,416	604,682
Adjustment to Patrimonial Applications	940				
Total	328,395	2,082,992	3,209,204	5,240,060	17,735,203
Increase (Decrease) of Assets and Equivalents	(3,065)	542,148	(451,560)	690,454	533,808

List of Projects Under Execution by Consejo de Recursos Minerales (CRM)

Project	Location	Objective
North-West Region		
El Triunfo - a/ (S. Antonio)	B. California Sur	Gold associated with tonalite (+ silver, lead & zinc)
Surutato c/	Sinaloa	Mina Grande being promoted; gold, lead, zinc, and silver
Magallanes b/	Sonora	Disseminated gold in stockwork
Puerto Lobos b/	Sonora	Gold associated with quartz veins (270 g/t Au)
San Fernando b/	Durango	Gold in epithermal breccia near La Fortuna gold mine (59/t Au)
Quipemar	B. California N.	Regional project for gold
Nacozari a/	Sonora	Regional project for gold
Baboyahue a/	Sonora	Gold-silver exploration near Los Alamos
W. Hermosillo a/	Sonora	Regional project for arthracite coal

North-East Region

Faja de Plata a/	Zacatecas	Regional silver (poly-metallic) project. 13 areas of interest to be evaluated.
General Sepeda a/	Sierra de Parras	Regional rare-earths study (? assisted previously by French aid). Probaly not active.
Fierro Coahuila c/	Mina Hercules	Outside exploration for additional iron-ore reserves for Sidermex. Poor geophysical results. Work almost complete
Veta Providencia b/	Nr Charcas Mine (IMMSA), S.L.P.	Detailed drilling programmed. Some gold, silver, lead and zinc reserves already established.
Charcas c/	S.L.P.	Starting regional work for lead, zinc, silver over Nat. Reserve
Pinos Altos a/	Chihuahua	Support to small-scale mining activity? silver
Villa de Cos a/	Zacatecas	Regional work on National Reserve starting up for lead, zinc, silver

Matehuapil- El Rabioso a/	Zacatecas	Regional exploration over Nat. Reserves for gold and silver. Initial compilation of data.
Fierro Chihuhua a/	N.E. part of Chihuhua	Regional work planned
Central Region		
Jalisco Assignations c/	Jalisco	El Barqueno gold project handed over to CFM and being mined but reserve etc. incomplete. 5 other projects planned
Sierra del Alo a/	Jalisco	Area of gold vein potential. Regional studies.
Costa de Mich. a/	Mich.	Regional compilation over 8 areas of which 2 are under exploration: Arroyo Seco & Los Pozos
Arroyo Seco c/	Mich.	Lead, zinc, silver (350 g/t silver)
Los Pozos c/	Mich.	Detailed geology for iron ore close to Las Truchas iron-plant
S. Jose de Tepenene c/	Hidalgo	Continuation of Real del Monte (CFM) lead, zinc, silver mineralization. Belt contains Samaria Mine (Cia. Los Freilles)
Huautla de Reyes a/	Hidalgo	Coal exploration for CFE to feed coal-fired electrical plant. (Altamira)
Tixapa b/	Mexico	Japanese bi-lateral assistance. Evaluation of massive sulphides gold, silver, zinc, (lead)

El Cubo-Vilalpando a/	Guanauato	Regional project over Nat. Reserve extension to El Cubo mine (Penoles)
South Region		
Istmo de c/ Tehuantepec	Veracruz	Present work at Ojapa has defined sulphur reserves for Panamericana de Azufre. Further work on 2 other zones (La Encantada and Las Limas) programmed for 1988
Ostuacan Laterites c/	Tenejapa, Chiapas	Regional exploration for bauxitic (alumina) laterites. Only limited tonnage defined with poor grade, with UNIDO assistance
Faisan Project a/	Guerrero	Regional Project for volcanogenic sulphides (gold, silver, zinc, lead) and includes following areas:
	Sta. Maria b/	Geophysical work for massive sulphides
	Morelos a/	Planned regional work over Nat. Reserve. Possible gold mineralization similar to operational mines of Nukay and Minera El Carmen y Anexas
El Bastonal a/	Veracruz	Project planned for silver mineralization

ANNEX 1
Table 10

CONSEJO DE RECURSOS MINERALES

STATEMENT OF INCOME AND EXPENDITURES

1982-87 (MP million)

Concepts	1982 a/	1983 a/	1984 a/	1985 a/	1986 a/	1987 b/
Income						
	1,232	2,094	3,096	3,209	4,572	9,300
Own Resources	264	382	613	1,939	4,463	9,865
PECAM	--	--	1,798	--	--	--
Others	55	94	438	209	--	--
Total	1,551	2,570	5,945	5,357	9,035	19,165
Expenses						
Investment	859	1,462	3,495	2,669	3,790	4,440
Operation	511	718	1,120	2,766	7,490	16,329
Total	1,370	2,180	4,615	5,435	11,280	20,769
Result	181	390	1,330	(78)	(2,245)	(1,604)

a/ Actual at current prices
b/ Estimate based on invoices

ANNEX 1
Table 11

CONSEJO DE RECURSOS MINERALES

BALANCE SHEET DECEMBER 31, 1982-87

(MP million)

Concepts	1982 a/	1983 a/	1984 a/	1985 a/	1986 a/	1987 b/
Assets	929	2,938	6,696	9,285	34,889	15,675
Liquid Assets	479	800	2,312	2,899	3,818	5,913
Cash	97	290	124	191	459	150
Federation Treasury	86	94	--	401	--	--
Accounts Receivable	296	393	1,771	1,149	519	1,903
Warehouse	--	--	349	549	890	1,510
Inventory	--	--	--	313	1,014	1,200
Others	--	23	68	296	936	1,150
Fixed Assets	314	1,823	3,426	2,390	25,267	3,650 d/
Land	2	2	2	7	7	7
Machinery and Equipment	311	213	647	1,345	1,952	2,688
Revaluation (Net)	--	1,564	2,763	695	23,280	880 d/
Others	1	44	14	343	28	75
Other Assets	29	--	--	--	--	487
Long Term Accounts Receivable	29	--	--	--	--	487
Deferred Payments	107	315	958	3,996	5,804	5,625
Financing (PECAM)	41	39	842	--	1,552	1,059
Others	66	276	116	3,996	4,252	5,566 c/
Liabilities						
Short Term	99	267	343	842	1,990	1,755
Suppliers	26	46	101	196	204	305
Creditor	42	9	121	183	233	282

a/ Actual at current prices
b/ Estimate based on invoices
c/ It is estimated that 3,995 million MP will be cancelled for preparation expenses received from URAMEX which should not affect the results of this Institution.
d/ Decrease by adjustment of external auditors to the depreciation (of revaluation) of equipment transferred from URAMEX to the Institution.

ANNEX 1
Table 12

CONSEJO DE RECURSOS MINERALES

BALANCE SHEET DECEMBER 31, 1982-87

(MP million)

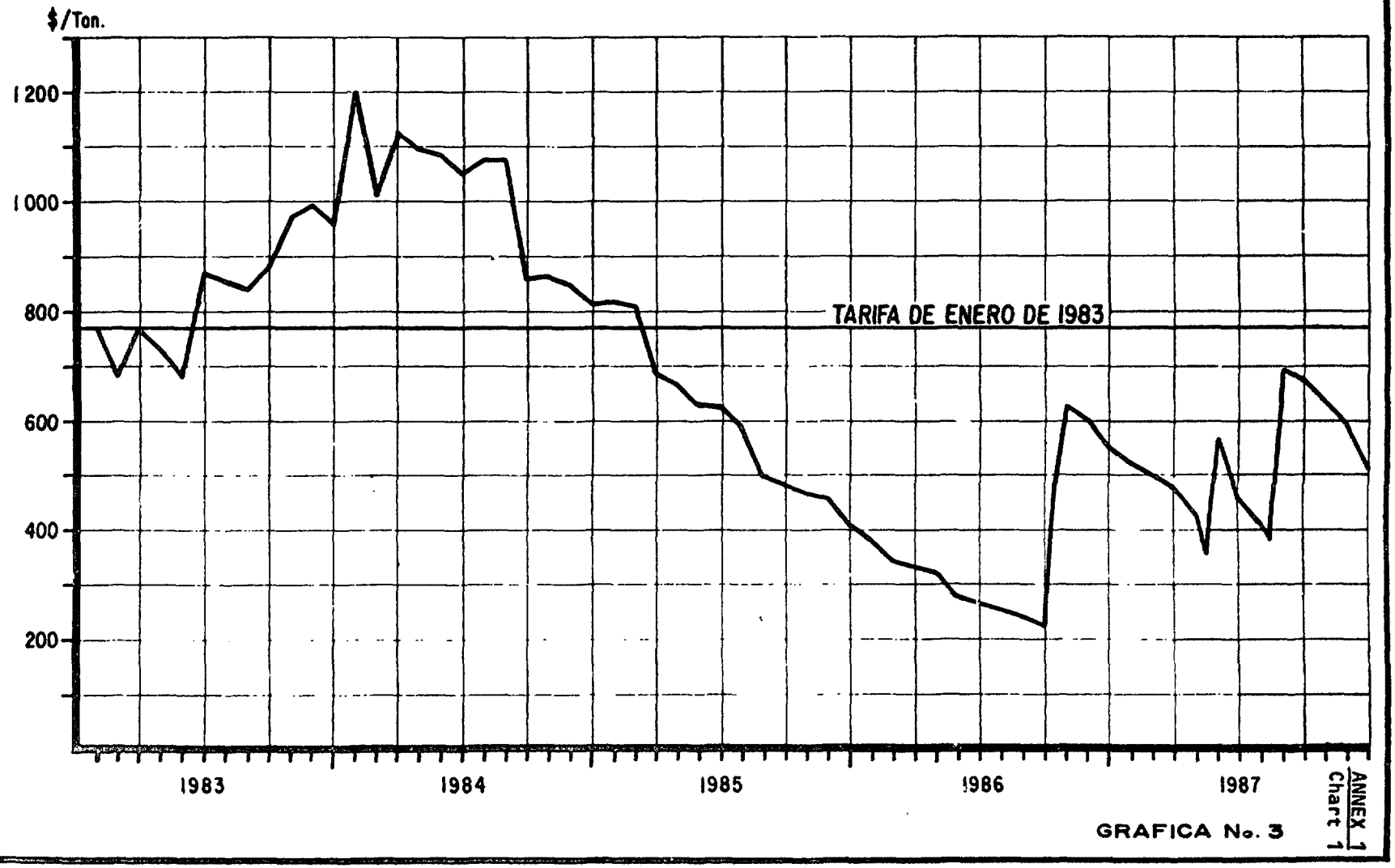
Concepts	1982 a/	1983 a/	1984 a/	1985 a/	1986 a/	1987 b/
Committed Requests	5	173	68	--	--	--
Accounts Payable	--	--	--	--	198	--
Others (Taxes & Provisions	26	39	53	463	1,355	1,168
Long Term	41	38	872	1,925	3,531	3,617
Accounts Payable (PECAM)	41	38	872	1,901	3,531	3,617
Accounts Payable (URAMEX)	--	--	--	24	--	--
Equity	789	2,633	5,481	6,518	29,368	10,303
Equity Revaluation	313	215	732	4,996	2,145	(670)
Surplus Revaluation	--	1,564	2,763	986	23,316	10,577 d/
Surplus Donation	--	--	--	--	4,714	4,747
Remanent	295	464	656	614	(1,562)	(2,747)
Result	181	390	1,330	(78)	(2,245)	(1,604)
TOTAL	929	2,938	6,696	9,285	34,889	15,675

a/ Actual at current prices
b/ Estimate based on invoices
c/ It is estimated that 3,995 million MP will be cancelled for preparation expenses received from URAMEX which should not affect the results of this Institution.
d/ Decrease by adjustment of external auditors to the depreciation (of revaluation) of equipment transferred from URAMEX to the Institution.

AVERAGE TOLLS OF THE PRODUCTION UNITS IN

CONSTANT PRICES OF JANUARY 1983 MP$/TON

TOLL OF JANUARY 1983



GRAFICA No. 3

ANNEX 1
Chart 1

THE MAJOR COMPANIES AND THE MINING CHAMBER OF MEXICO

Size and Importance of the Private Companies

1. In 1986 the mining division of the Peñoles group alone produced approximately US$200 million in concentrates with a marketable metallic content of 2,145 kgs of gold, 612,168 kgs of silver, 47,696 MT of lead, 52,293 MT of zinc and 4,050 MT of copper, and the value of metal production for the company (including the mining and metals groups) was about US$465 million. This demonstrates the equal strength of Peñoles as both a mining company and a smelting and refining company through its metals division. In addition to mining and metals, Peñoles has an Industrial Chemical Division and Refractories Division which both mine and process industrial grade ranges of fluorspar, barite, sulphuric acid, sodium sulphate, magnesium oxide and various refractory products, as shown in the production statistics of Peñoles, Table 1. Value of total group sales in 1986 was about US$552 million of which 47% was sold in Mexico, 39.5% in the USA, 6% to Japan and 2% to Brazil and 5.5% to other countries.

Table 1: Peñoles Production Statistics a/

	1982	1983*	1984	1985	1986
Gold (kgs)	4,799	3.595	4,286	4,472	4,495
Silver (kgs)	1,077,541	1,041,734	1,307,690	1,284,505	1,353,456
Lead (tons)	107,778	109,133	118,592	124,140	123,583
Zinc (tons)	72,076	70,3[illegible]	76,493	85,317	90,142
Copper (tons)	6,054	6,634	6,917	7,621	6,524
Cadmium (tons)	542	582	604	485	600
Bismuth (tons)	344	328	320	372	532
Sulphuric Acid (tons)	224,348	213,920	260,967	280,308	290,218
Acid Grade Fluorspar (tons)	80,641	45,242	29,540	18,103	45,898
Metallurgical Grade Fluorspar (tons)	77,968	62,768	96,484	101,912	80,087
Ceramic Grade Fluorspar (tons)	10,467	-	1,200	-	4,145
Barite (tons)	-	52,800	119,340	94,334	58,030
Sodium Sulphate (tons)	440,751	365,287	383,238	364,074	425,360
Manganesium Oxide (tons)	64,485	66,273	105,701	121,698	99,965
Granular Refractories (tons)	43,627	39,864	45,785	47,011	39,969
Refractory Bricks (equiv.) (pts.)	23,874	21,999	28,218	27,040	23,149

Source: 1986 Annual Report.
* 11 month figures.
a/ Includes material from other companies processed by Peñoles smelters; excludes Peñoles concentrates exported for smelting and refining.

2. Peñoles, through its economic and technical strength has been able to attract foreign joint-venture partners both at the exploration and production levels despite limitations on foreign ownership and, hence, management. At the exploration level this is extremely advantageous. The

associations provide Peñoles with US currency financing and experienced exploration techniques whilst maintaining management control. This is an enviable position for the company but obviously with limitations for the country; many potential foreign groups would not be willing to enter into such arrangements. Peñoles has remained profitable and has had a strong positive cash flow throughout the 1980s with annual after tax and profit sharing net profits (excluding income applicable to minority shareholders of subsidiaries) averaging about US$20-30 million per year. Peñoles was very profitable in 1986 and 1987. Peñoles has maintained a moderate investment program during the 1980s--although it has steadily declined from about US$80 million average during 1980-82 to about US$30 million average in 1985-87. Peñoles has used this decreasing investment to steadily build up its equity through large retained earnings so that as of 1987, the long term debt equity ratio was reduced to 5:95.

3. IMMSA, which is largely a mining, smelting and refining company, also has broader industrial interests and owns three coal subsidiaries, a fluorite subsidiary and produces various chemical industry related products such as zinc oxide, sulphuric acid, petrochemical products, plastic cements, etc. Despite this diversification, metallic mineral products (gold, silver, copper, lead and zinc) accounted for 85% of the value of group sales in 1986. In 1986, IMMSA metals production had a value of approximately US$240 million (gold, silver, lead, zinc and copper) whereas the value of total group metals processing (including processing of concentrates of third parties) was approximately US$305 million. Table 2 shows the production statistics of IMMSA.

Table 2: IMMSA - Production Statistics

Mining Production (metal content)

Mineral	Unit	1982	1983	1984	1985	1986
Silver	kg.	386,945	407,586	440,138	405,026	438,262
Zinc	t	149,695	145,621	157,282	144,648	144,669
Copper	t	16,484	14,199	17,775	17,396	16,767
Lead	t	56,283	54,156	66,954	58,403	54,716
Gold	kg.	403	333	351	301	328
Coal	(t)	898,966	803,332	755,412	579,588	441,571

Metal Production a/

Mineral	Unit					
Silver	kg.	564,772	669,662	630,987	674,577	777,476
Zinc	t	36,366	76,741	82,097	74,375	78,946
Copper	t	29,711	32,661	35,069	30,612	29,755
Lead	t	58,839	63,892	61,630	70,082	61,349
Gold	kg.	1,684	2,015	1,423	1,905	1,870

Source: 1986 Annual Report

a/ Includes material from other companies processed by IMMSA smelters; excludes IMMSA concentrates exported for smelting and refining.

4. IMMSA has been consistently profitable during the 1980s with after-tax profits in the range of US$30-60 million per year. About 30% of IMMSA's equity is held by minority owners--thus net income after tax and after minority interest has been in the range US20-40 million per year. IMMSA undertook a large investment program in the 1970s and early 1980s and capital expenditures averaged US$100 million per year in 1980 and 1981. However, investment levels have been cutback during the 1980s and were at the modest level of just under US$10 million in 1986. This appears to reflect a combination of factors including the time needed to digest the large program previously undertaken, insufficient exploration and uncertain macroeconomic conditions.

5. Peñoles and IMMSA are the two largest private mining groups in Mexico, and have had different approaches in their relations with foreign investors. A close look at mine production of 3,829,000 MT by Peñoles and 4,913,000 MT by IMMSA, and at self-generated values of production of these two companies, demonstrates that these two major groups are of almost equal importance. A major difference between the Peñoles and IMMSA groups relates to their relationship with the foreign private sector. By virtue of its ties to ASARCO (US) at the holding company level--even though this is a long and apparently profitable relationship--IMMSA has diluted its possible relationship with other foreign private sector groups at the subsidiary mining company or project level, so that a maximum 49% foreign sector interest is maintained. Peñoles on the other hand is able to capture more easily a variety of foreign private sector expertise and financing at the exploration and project operational level. This would appear to place the Peñoles group in a stronger position for diversification and growth.

6. Corporacion Industrial San Luis S. A. de C. V. (San Luis) is a holding company with a wholly-owned mineral producing subsidiary, a 51% majority holding in Woolworth Mexican (retailing), a 38.08% holding in La Dominica (Mining Company) and a 27.8% minority holding in Grupo Aluminio (aluminum processing). San Luis had consolidated sales of 42,842 million pesos (US$72 million) in 1986 and net income after taxes of 12,027 million pesos (US$20 million). The mineral subsidiaries were the most important operations contributing 41% of sales and 79% of after tax net income. San Luis now producing 1,200 kgs of gold and 84 MT of silver per annum is an important producer of precious metals as shown in Table 3.

Table 3: SAN LUIS Production Statistics

Gold and Silver Production (kgs)

	1982	1983	1984	1985	1986
Gold	1,209	1,147	1,302	1,271	1,209
Silver	80,600	71,300	86,800	83,700	83,700

Source: 1986 Annual Report

7. San Luis is in a strong financial position with little debt, a good cash position and a substantial equity base. Investments have followed a conservative policy in recent years and the main issue is the extent to which San Luis adopts a growth oriented investment strategy for which it is well positioned, with four of five projects scheduled to come on stream in 1990 and a further 10 firmly in the pipeline.

8. AUTLAN is different from the other major private sector groups in that (i) it is focused on the steel and, largely, battery industries through its manganese operations, (as shown by its production statistics in Table 4), and (ii) it is partly owned by the state, CFM holds a 3.37% equity of AUTLAN. Manganese production in 1986 and 1987 was about 1.5 million MT per year and through its "ferroalloys" operations produced about 136,000 tons of ferro-manganese, manganese-silicate, ferro-silicate and ferro-chrome products. Autlan was in a loss-making situation in the early 1980s and made small profits from 1983-86. (Gross product value in 1986 was about US$80 million.) 1987 saw an improvement in Autlan's performance with a net income for the first nine months of about US$9 million on sales of about US$57 million. During the past five years the company undertook a minor investment program reflecting its tight financial situation, after a large expansion in the 1970s left it with long term debt of US$500 million in 1980, which had been reduced to US$193 million by end 1986 (compared with equity of US$51 million) thus the main issue facing the company is to improve its financial structure.

Table 4: Autlan--Production Statistics a/
(000 tons)

	1983	1986
Manganese - Carbonate	608.0	642.5
- Nodules	337.4	394.3
-	30.0	30.0
Ferro Manganese - High Carbon	99.9	91.1
- Medium Carbon	28.1	36.4
Manganese Silicate	30.4	48.4
Ferroalloys b/	34.7	19.1

Source: 1986 Annual Reports

a/ Includes reprocessed material
b/ Includes ferrosilicon, ferrochrome and manganese ferrosilicon

9. Apart from interests in non-metallics (clays and fluorite), the FRISCO group is a metals and hydrofluoric acid producer as shown in Table 5. In 1986, metals with a dominance of silver accounted for 41% of sales and hydrofluoric acid 56%. Total group sales in 1986 (including only the majority controlled subsidiaries) had a value of about US$94 million. The dominant metals producer of Frisco has been the Real de Angeles operation (where Frisco holds a 33% participation) which realized a product value in 1986 of about US$90 million for a net profit of US$40 million for the joint

venture group. With reserves of about 200 million ounces of silver (gross value of $1.2 billion in 1988 prices), Real de Angeles can be classified as one of the top ranked world class silver deposits. During 1986 and 1987, the mine produced 12.98 and 10.75 million ounces of silver or about 17% and 13% of total Mexican silver production respectively.

10. Profitability has varied from year to year but has generally been good. After tax profits reached a very high level in 1986 (US$55 million--equivalent to 25% of sales revenues) and a similar performance is likely in 1987. Frisco's capital expenditures have tailed off from US$10-20 million in 1980 and 1981 to US$2-3 million per year in recent years. Frisco is in an extremely sound financial situation with no long term debt and very good liquidity.

Table 5: Frisco - Production Statistics
(tons)

	1982	1983	1984	1985	1986
Hydrofluoric Acid	40,900	35,300	46,400	45,396	51,754
Silver	110	116	119	115	110
Molybdenum	923	1,206	1,182	874	725
Zinc	26,835	25,355	25,946	24,406	20,944
Fluoride	69,321	62,823	55,966	41,841	37,326
Lead	17,879	17,356	18,298	17,241	14,798

Source: 1986 Annual Report

Size and Importance of State Mining Companies

11. It was difficult for the mission to effect a complete analysis of the large Majority State Owned Enterprise operations. Whereas, partial information was obtained on some; Carbones y Minerales de Coahuila (CMC) a subsidiary of Sidermex, MICARE (Minera Carbonifera Rio Escondido) Real del Monte y Pachuca, Roca Fosforica Mexicana, information with respect to other major SOE producers, e.g., Azufrera Panamericana, was not forthcoming.

12. CMC runs major iron-ore and coking coal operations producing about 2.5 million MT of washed coking coal and 5 million MT of pellet feed per year with an estimated value of about US$200 million/year. MICARE (owned 46.26% by CFM), the largest coal producer extracts steam coal with annual production value of about US$80 million. Exportadora de Sal, the State salt monopoly is a profitable enterprise generating some US$35 million in sales during 1987. The sulfur industry in Mexico is dominated by Azufrera Panamericana and Exploradora del Istmo who between them had net sales of about US$250 million during 1986 and which will be equalled in 1987.

13. In the area of base metals, Minera de Cananea produced 44,433 MT of copper in 1986 and is completing in 1988 an expansion project to increase its capacity to 170,000 tpy copper content in concentrates. State controlled producers of base and precious metals are Real del Monte y

Pachuca, a medium scale silver mining operation expected to produce about US$23 million in 1987, and, Mococozac which is also silver based and a similar size operation to Real del Monte (1,700 tpd) with minor gold and copper by-products. Expected production value for 1987 is US$5 million. Data on the El Barqueno (CFM operated) gold project are not available.

The Mining Charber of Mexico

14. The Camara Minera de Mexico is a well-run and influential institution which has provided essential guidance, coordination and political stability to the Mexican mining industry for many years. Formed initially in 1937, the Chamber has realized significant work in the following areas; reviewing changes and monitoring the mining legislation, providing services and assistance in human resource development, mine safety regulations and environmental concerns and conditions, infrastructure and mechanization, mining industry promotion and information as well as overall representation of the industry and as a consulting body. The Chamber has also been concerned about the problems of access to land and shares the view that the present situation is a major hindrance to the development of the sector. Concerning the SOE's the Chamber has expressed support for the divestiture policy of the Government.

15. Specialized consultative committees and working groups are an integral part of the Chamber and include: (i) copper producers; (ii) steel producers; (iii) non-metallic mineral producers; (iv) non-ferrous metallic minerals (excluding copper); (v) smelting and refining group for non-ferrous metals (excluding copper). Its membership is open to all mining enterprises, both private and State owned. Presently the Camara has 250 members representing 28 states and 300 municipalities (entidades federativas). Members are drawn from producers of 47 different minerals and substances. In addition to the above 5 groups, special commissions have been formed as follows: mining legislation; taxes; transport/tariffs; training; capital goods; social/environmental; productivity; foreign trade; energy requirements. The Camara Minera provides an excellent service to the mining community. Apart from its numerous specific functions it is in close contact with the Government.

ECONOMIC ISSUES OF MINING IN MEXICO

The International Markets

1. Spurned by low demand and large excess capacity, the international market prices of base metals remained extremely low during most of the 1982-87 period; in 1986, the prices recorded the lowest levels in the post-war period. For the metals important to Mexico--silver, lead, zinc, and copper--in constant terms, the average price in 1986 was 65.5% lower than in 1980, and 39.5% lower than in 1970.[1] The price of copper declined by 44.5% between 1980 and 1986, silver by 76.6%, lead by 60.5%, and zinc by 12.7%. Prices of these metals in international markets staged a strong recovery in 1987, particularly for copper and lead.

Exchange Rate Adjustments

2. During the 1980s, changes in the real exchange rate of peso vis-a-vis the U.S. dollar probably had greater impact on the economics of the Mexican mining sector than any other factor. Since many metals and minerals produced in Mexico are exported at international prices, real depreciation of peso by definition implies a terms-of-trade improvement for the mining sector relative to the non-traded goods and services. Table 2.1 shows the movement of metals and minerals prices in relation to those of other relevant activities. It shows that for the early 1980s mining prices lagged behind other prices. However, in 1985 and 1986, mining experienced one of the fastest price increases in current peso terms so that by 1987 mining prices had increased relative to other prices, despite the declines in international prices. When deflated by the wholesale price index, the price of the mining sector output in real peso terms was higher in 1986 by 22% than in 1980, despite the fact that the dollar prices in international markets were at the lowest in 1986. Improvements in the prices of mining products, quoted in pesos, were particularly sharp in relation to such important mining inputs as labor and capital.

Table 1: Price Indexes for Mining and Other Economic Activities
(1980 = 100)

	Mining Sector (A)	Wholesale Price Index (B)	Real Price Index for Mining (A/B)	Average Earnings Per Worker in Mining	Gross Capital Formation	Electricity
1982	146	198	74	186	200	165
1983	381	394	97	299	375	349
1984	547	645	85	462	606	613
1985	978	1,001	98	775	928	925
1986	2,377	1,946	122	1,272	1,808	2,101
Jan.-Sep. 1987	4,714	3,851	122	3,514	3,239	

Source: INEGI, Boletín Mensual de Información Económica y Cuentas Nacionales de Mexico, varios ejemplares.

1/ The percentage changes are calculated in terms of an index of international prices of the four metals, with weights defined by Mexico's export volume during 1979-81.

3. The importance of the exchange rate policy to the mining industry in Mexico is fundamental. An erosion of the current real rate could have negative effects, especially in the more marginal subsectors. A combination of current real exchange rate and a significant improvement of international metals prices would imply a highly profitable year for the Mexican mining industry. This raises the question of what is the appropriate real exchange rate for the mining sector. Since an answer to this question depends so much on the international metals prices and given the prospect of long-term deterioration of the terms-of-trade for primary metals against manufactured goods, it is important to take a long-term view and not to be influenced too much by short-term considerations. It is important to ensure that the adjustments of the exchange rate will adequately reflect the underlying inflation rates of Mexico and those of its major trading partners. Uncertainty in this regard could seriously hamper future investments in this sector. Stable and predictable real exchange levels are, in the long run, the most important basis for a healthy development of the mining sector.

Credit and Interest

4. As of June 1987, Mexico's mining sector had a total domestic credit balance of about US$1.88 billion, or 3.8% of the total credit extended by the banking system (as compared to a 1.4% share in GDP). However, the great majority of this credit went to the SOEs, especially the copper producers and, to a smaller extent, MICARE. This concentration of the credit in the SOEs is reflected in the fact that unlike other sectors that received credits more or less equally from the development and commercial banks, credits to the mining sector came mostly (89%) from the development banks, with which the large private mining companies do not work.

5. The fact that the development banks dominated the domestic financing of the mining industry implies slightly lower interest rates were made available to the sector than to the rest of the economy. The rates applied to the mining sector in December 1987, for example, were 100% of CPP[2] for small-scale miners and 100+1% for medium-scale miners. These rates were broadly comparable to those given to the industrial sector. Interest rates charged for the PECAM projects were 90% of CPP for the small miners and 100% of CPP for the medium miners, which may be considered as mildly subsidizing rates.

Pricing of Metals

6. The non-strategic metals and minerals traditionally have been outside the realm of government price controls, while those of the strategic minerals, by the virtue of being the exclusive domain of the government, have been subjected to "transfer" pricing. For the metals and minerals that are exported, the international markets dictated their prices in domestic transactions. Table 2.2 compares the international prices of the important metals exported by Mexico with their "official" prices determined by the Government for taxation and other purposes. Although not

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2/ Costo Promedio Ponderado - Weighted Average Cost of Funds.

actual transaction prices, the official prices of the metals not subject to price controls are believed to have closely reflected the international market conditions. It is shown in Table 2.2 that the official prices, after allowing for the costs of further processing and transportation, were not much different from their international counterparts.[3]

Table 2: Mexican Official vs. International Prices of Metals

	GOLD		SILVER		COPPER		LEAD		ZINC	
	Official	Int'l	Official	Int'l	Official	Int'l	Official	Int'l	Official	Int'l
	US$/oz				US$/mt					
1980	630	588	20.6	19.8	2,161	2,092	967	869	776	730
1982	410	376	8.3	7.9	1,170	1,480	434	548	647	745
1984	397	318	8.7	6.1	1,316	1,417	494	391	985	783
1986	382	338	5.5	5.5	1,220	1,374	384	406	693	754
1987	453	447	7.2	7.0	1,429	1,783	623	597	807	799

Source: Dirección General de Minas SEMIP, International Commodity Markets Division, the World Bank.

3/ Instances of official prices higher than international prices can be explained by the lags in adjusting the former to the latter.

ANNEX 4
Table 1

STRUCTURE OF MINING COSTS

	Average Cost (US$/MT of Ore)	Percent Share of					
		Wages & Salaries	Social Benefits	Energy	Supplies & Materials	Transportation	Others
Small Mines	11.4	28.9	2.6	8.5	12.1	14.7	43.1
Medium Mines	11.7	20.4	6.6	7.7	38.3	9.6	17.3

Source: Mission's survey.

ANNEX 4
Table 2

DIRECT MINING COSTS a/

	Number of Mines	Number of Small Scale Mines	Daily b/ Capacity	% of Total
Silver (US$/oz)				
<1.00	4	2	40,511	66
1.00-2.00	14	9	6,938	11
2.00-3.00	3	2	3,789	6
>3.00	5	2	10,302	17
Total	26	15	61,540	100
Gold (US$/oz)				
<100	3	3	2	3
100-200	6	4	16	20
>200	3	0	60	77
Total	12	7	78	100
Lead (US$/mt)				
<100	3	1	157	91
100-200	5	2	11	7
200-300	1	1	Neg.	Neg.
>300	1	1	4	2
Total	10	5	172	100
Zinc (US$/mt)				
100-200	3	1	131	85
200-300	4	2	18	12
>300	1	0	4	3
Total	8	3	153	100

Source: Mission's survey.

a/ Includes labor, materials, energy, transportation and overhead at the mine. Does not include overhead at headquarters, depreciation, amortization, nor interests.

b/ Daily capacity is expressed in ounces or tons of the metal contained in the concentrates.

ANNEX 4
Table 8

Small Scale Mines

Direct Costs per Ton Mined in US Dollars (1988) a/

Mine	Daily Output (M Tons)	Wages & Salaries	Social Benefits	Energy	Supplies & Materials	Transport	Other	Total
Mine A	10	3.27	0.18	0.38	0.67	1.30	6.48 b/	12.28
Mine B	10	2.26	0.17	0.69	0.92	1.09	7.22 b/	12.35
Mine C	10	3.08	0.10	0.13	0.12	1.30	6.47 b/	11.20
Mine D	20	1.30	0.43	0.86	3.48	2.61	-	8.68
Mine E	30	2.41	0.17	0.52	1.54	1.09	6.14 b/	11.87
Mine F	20	2.68	0.21	0.46	0.36	1.30	6.52 b/	11.53
Mine G	12	2.94	0.14	0.36	0.49	1.30	6.32 b/	11.55
Mine H	15	1.09	0.48	-	2.70	1.20	0.86	6.33
Mine I	30	1.89	0.57	0.27	2.88	2.17	2.58	10.26
Mine J	16	3.04	0.10	0.46	0.45	1.35	7.82 b/	13.22
Mine K	10	2.17	0.26	0.64	0.87	1.30	6.85 b/	12.09
Mine L	8	4.78	0.20	-	-	1.22	6.52 b/	12.72
Mine M	10	4.38	0.22	0.70	0.52	1.09	6.13 b/	13.04
Mine N	14	1.09	0.35	-	2.54	1.09	0.87	5.94
Mine O	25	5.64	0.53	0.38	0.50	3.57	6.61 b/	17.21
Mine P	10	2.74	0.08	0.48	0.48	1.30	6.39 b/	11.45
Output Weighted Averages	250	2.73	0.30	0.40	1.38	1.68	4.92	11.41

a/ Exchange Rate - US$ = Pesos 2300.
b/ Largely treatment charges of CFM concentrators.

ANNEX 4
Table 4

Small Scale Mines

Labor Productivity - All Employees
(Tons/Man Shift)

Mine	Daily Output		Employees		Productivity
	Rated	Actual	Production	Administration	
Mine A	15	10 a/	8	1	1.4
Mine B	20	10 a/	3	1	2.5
Mine C	20	10 a/	7	1	1.3
Mine D	20	20	8	2	2.0
Mine E	50	30 a/	13	3	1.9
Mine F	40	20 a/	14	1	1.3
Mine G	32	12 a/	8	1	1.3
Mine H	15	15	8	2	1.5
Mine I	40	30	18	3	1.4
Mine J	16	16	14	2	1.0
Mine K	10	10	5	1	1.7
Mine L	8	8	4	2	1.3
Mine M	10	10	8	2	1.0
Mine N	14	14	7	2	1.6
Mine O	38	25 a/	27	3	0.8
Mine P	40	10 a/	6	1	1.4
Total	388	250	158	28	1.5

a/ CFM concentrators apparently unable to accept more. A common complaint, "there is no capacity available in CFM plant."

ANNEX 4
Table 5

Medium Scale Mines

Direct Costs per Ton Mined in US Dollars (1988) a/

Mine	Daily Output (M tons)	Wages & Salaries	Social Benefits	Energy	Supplies & Materials	Transport	Other	Total
Mine Q	70	2.38	0.48	0.88	3.06	0.14	0.13	6.97
Mine R	82	2.74	0.60	1.88	7.68	2.39	1.88	17.17
Mine S	120	3.12	0.94	0.36	4.11	0.55	0.72	9.80
Mine T	200	1.68	0.88	-	6.33	3.76	-	12.60
Mine U	330	4.28	0.48	1.00	3.15	0.19	8.49	17.54
Mine V)								
Mine W)	800	1.29	-	0.60	5.00	1.32	2.17	10.38
Mine X)								
Mine Y	600	3.13	2.94	1.32	6.34	0.34	2.40	16.47
Mine Z	700	1.48	[illegible]	0.48	3.33	1.61	-	7.09
Mine AA	600	3.11	0.47	1.59	3.15	0.78	1.44	10.54
Mine BB	1,700							17.97
Mine CC	1,800							6.96
Output Weighted averages excluding Mine AA and Mine CC		2.38	0.77	0.90	4.47	1.12	2.02	11.66
Output Weighted average - all								11.98

a/ Exchange Rate - US$ = Pesos 2300.

ANNEX 4
Table 2

Medium Scale Mines

Productivity - All Employees
(M tons/Man Shift)

Mine	Output (M tons/day)	Employees Production	Employees Administration	Overall Productivity (M tons/day)
Mine Q	70	45	10	1.8
Mine R	82	65	15	1.0
Mine S	120	45	15	2.0
Mine T	200	51	9	3.3
Mine U	330	120	27	2.2
Mine V	800	124	25	5.4
Mine Y	600	300	54	1.7
Mine Z	700	160	60	3.2
Mine AA	600	320	92	1.5
Mine BB	1,700	2,272	355	0.6
Mine CC	1,800	617	124	2.4
Totals	7,002	4,119	788	1.4

Weighted average of productivity - all employees 1.4 tons/man shift.

ANNEX 4
Table 7
Page 1 of 2

Comparative Iron Ore/Pellet Feed/Pellet Supply/Prices/Costs (US $/ton)

A. Pellet Supply to Northern Steel Mills (AHMSA, HYLSA, Monterrey)

1. Mexican Pellet	Encinas (HYLSA)	Nahuatl (Project)	Peña Colorada
Operating Costs	15.2	15.5	16.7
Financial Costs	5.0	8.3	6.5
Transport/Handling	12.4	12.4	13.0
Total	32.6	36.1	36.2

2. Imported Pellet	Brazil (through Lázaro Cárdenas)	Chile (through Lázaro Cárdenas)
CIF	30.2	28.7
Transport/Handling	13.8	13.8
Others	--	--
Total	44.0	42.5

B. Pellet Feed Supply from Northern Mines to AHMSA

1. Operating Cost and Transport	Hércules	La Perla
Materials	2.66	2.19
Labour	0.93	1.33
Power	1.62	1.54
Maintenance	1.83	2.23
Overhead & Indirect Expenses	1.60	0.46
Depreciation	5.72	2.58
Sub-Total	14.36	10.33
Slurry Pipeline	-	2.17 a/
Total Operating Cost	14.36	12.50
Financial Charges (Est.)	3.00	3.00
Total	17.36	15.50

2. Imported Pellet Feed	Brazil (through Lázaro Cárdenas)
CIF	20.8
Transport/Handling	13.8
Others	--
Total	34.6

C. Pellet Supply to SICARTSA	SICARTSA	Peña Colorada
Operating Costs	n.a.	16.7
Financial Costs	n.a.	6.5
Transport/Handling	n.a.	10.0 b/
Total	n.a.	33.2
	Brazil	**Chile**
CIF	30.2	28.7
Transport/Handling	0.8	0.8
Total	31.0	29.5

a/ The cost of the slurry pipeline has been changed to La Perla; if alternatively it had been changed to the total output of both La Perla and Hércules, the unit cost would be $0.99/ton.

b/ Approximate estimate.

ANNEX 4
Table 8

SIDERMEX'S COSTS OF COAL PRODUCTION
(US$/mt)

Mines & Washeries	Development & Extraction a/	Crushing & Washing b/	Cost per ton of Washed Coal c/
Minerales Monclova	7.84	3.26	19.98
Cia. Minera de Guadalupe	14.04	6.26	39.46
Cia Minera la Florida	8.65	6.59	27.89
Hullera Mexicana	15.24	5.64	45.12
Hullera Saltillito	7.40		24.91 d/
Carbon y Cok	9.08		29.16 d/
Average	9.01	5.36	26.76

Source: SIDERMEX

a/ Per ton of raw coal.
b/ Per ton of washed coal.
c/ Applying the average washery yield of each washing plant.
d/ Assumed washery yield of Hullera Mexicana.

ANNEX 4
Table 9

MICARE'S COSTS OF COAL PRODUCTION
(US$/mt of Raw Coal)

	Direct Cost	Depreciation & Amortization	Total Cost
Mine I	8.96	13.41	22.37
Mine II	5.87	6.07	11.94
Mine III	6.59	10.23	16.82
Tajo I	6.42	5.41	11.83
Tajo II	16.96	18.58	35.54
Average	8.26	10.17	18.43

Source: MICARE.

ANNEX 4
Table 10

CHANGES IN LABOR PRODUCTIVITY AND WAGES IN COAL MINING
(1980 = 100)

	Real Earnings Per Worker (A)	Real Output Per Worker (B)	A/B
1981	114.5	96.2	119.0
1982	136.7	97.5	140.1
1983	81.7	92.7	88.1
1984	59.4	86.2	68.8
1985	59.7	84.3	70.8
1986	75.9	79.7	95.3

Source: INEGI, SPP.

THE FINANCIAL POSITION OF THE MINING COMPANIES

Private Mining Companies

1. Peñoles, IMMSA, San Luis and Frisco are each listed on the Mexico City Stock Exchange and have traditionally provided the bulk of the production of silver, lead, zinc, and gold in Mexico. In 1986, these four groups of companies accounted for 75% and 50% of the mine production of silver and gold and 65% and 80% of lead and zinc respectively. These companies also have certain non-minerals related business activities and, it should be noted that not all of their revenues and earnings are from mining or minerals processing. Peñoles and IMMSA are much larger than the other companies (accounting for 48% and 30% respectively of total sales of the four companies in 1986) and made the largest after tax profits (US$44.5 million and US$28.8 million respectively). However, Frisco and San Luis were also extremely profitable with after-tax profits each of over US$20 million in 1986. All four companies are in a very sound financial position with relatively little debt and substantial equity.

2. A detailed analysis of the financial position of the companies in 1986 illustrates their considerable financial strength. With the low capital expenditure programs in recent years and relatively modest dividend policies, the companies have been building up liquid assets. At the end of 1986, the companies had built up current assets of about US$0.8 billion of which just over half (about US$0.6 billion) are estimated to be cash and other liquid assets. By comparison, long term liabilities are only US$0.3 billion as shown in Table 1. A summary of financial statistics for each of the five large private companies is given in Tables 2-6.

3. Preliminary estimates of the 1987 results for the four companies indicates that higher metals prices will result in after tax profits of about US$200 million--a significant improvement on 1986 results. The major issue facing these companies is what type of capital expenditure strategy to follow given their high liquidity and low debt and, in particular, the extent to which funds are reinvested in the mining industry or are used to diversify away from mining.

4. In addition to the four companies identified in previous paragraphs, there are four other noteworthy metal mining companies. Two are listed on the Mexico City Stock Exchange (Cia Minera Autlan S.A. de CV and Cia Minera de Cananea) and two are joint ventures (Mexicana de Cobre S.A., a joint venture of IMMSA and the Government, and Cia Real de Angeles, a joint venture of Frisco, the Government and a Canadian Mining Company, Placer). These four companies have had mixed fortunes. Cia Real de Angeles is a new and highly successful silver producer with sales of about US$90 million. Cia Minera Autlan (Autlan) is the main producer in Mexico of manganese and various ferro alloys with annual sales of about US$80 million in 1986. Autlan was in a breakeven/loss-making situation in the early 1980s and has made very modest profits since 1984. An important issue, therefore, is how to reduce costs and improve Autlan's competitive position vis-a-vis other producers. Autlan borrowed heavily in the last

1970s for a major investment program and is burdened with a large debt which it has had difficulty in servicing. Autlan is still highly leveraged (long term debt:equity ratio of 79:21) and a second main issue facing Autlan is how to improve its financial structure and reduce its indebtedness.

Copper Mining Companies

5. Mexicana de Cobre and Cananea are Mexico's two largest copper producers. The Government owns 46% of Mexicana de Cobre and private interests (IMMSA) own 54%. All of Mexicana de Cobre's debt is guaranteed by or owed to NAFINSA, a Government financial institution. The Government is the largest shareholder in Cananea. Both companies started up in the 1970s and were highly leveraged. In the face of lower than expected copper prices, both have made large losses and have been unable to service their debt and have relied on additional shareholder funds (in particular, from the Government which guaranteed much of the debt of the two companies) in order to meet debt service requirements, undertake capital expenditures, and continue operating. Both companies have maintained large investment programs in recent years to expand mining capacity, reduce unit costs and introduce smelting capacity. For example, between 1980 and 1985, their combined investment programs averaged US$140 million per year--more than double the combined capital expenditures of Peñoles, IMMSA, Frisco and San Luis. Presently, both companies are increasing their output as the expansions are completed.

6. Mexicana de Cobre is the most indebted--with over US$1 billion in debt. The ore body has a relatively low stripping ratio (1:0.56) and since the mine is located on a hillside above the concentrator, haulage distances will tend to be reduced as mining continues over time. Mexicana de Cobre completed a concentrator expansion and smelter development in 1986 and in 1987, expected to produce 150,000 tons of copper in concentrates from the mine of which 90,000 tons were due to be exported as concentrates and 60,000 tons processed into anodes for export. By 1989, the smelter should be operating at full capacity of 150,000 tpy anodes. The mine also produces an important bi-product--molybdenum.

7. As part of a new policy initiative to limit Government participation in the mineral industry to the so-called strategic minerals, the Government has taken the decision to completely privatize Mexicana de Cobre and is interested in selling its equity to its minority partner, IMMSA--or possible to other private partners. The decision to privatize is considered to be a sound approach to setting Mexicana de Cobre on a viable basis. One option would be to request bids from interested qualified potential shareholders. Another would be to float the Government shares as an issue for public subscription on the Mexico Stock Exchange. However, if the Government prefers to negotiate a direct sale of its shares to the minority partner (or to some other institution or group of institutions), it is important care be taken to establish a reasonable estimate of a fair market value for making the sale.

8. Cananea is in a similar situation to Mexicana de Cobre but is in the process of completing an expansion which should result in significant cost reduction. Cananea has suffered from severe cash shortages in the past two to three years which have caused slippages in the investment program as well as adversely affecting production performance. Cananea has a stripping ratio of about 2.5:1 at present (considerably higher than Mexicana de Cobre) and expects mine production to increase from 44,000 tons of copper content in 1986 to about 140,000 tons of copper content in 1990. Another 30,000 tpy should be produced by solvent-extraction and electrowinning to give a total production capacity of 170,000 tpy copper content by 1990. At that time, Cananea would expect to have cash operating costs well below US$0.40 per lb. In early 1988, the Government took the decision to privatize Cananea and in May 1988 the operation was sold to the Protexa group of Monterrey, NL, a well diversified group with interests in the building of oil rigs, construction and pipe manufacturing, but with no experience in mining. However, the transfer was detained in June 1988, reportedly because of the inability of Protexa to comply with the financial conditions of its bid.

Non-Metallic Mining Companies

9. In addition to the various metal mining companies, there are two large non-metallic mining companies--Azufrera Panamerica S.A. (Azufrera) (the sulfur producing company) with annual sales of US$240 million in 1986 and Minera Carbonifera Rio Escondido SA (MICARE), (a coal mining company) with annual sales of US$95 million in 1986. Both are Government-owned (mainly through CFM). Azufrera exports about half its production and has achieved modest profits during the 1980s. It has a relatively sound financial structure with a 49:51 ratio of long term debt to equity as of end 1986. MICARE sells completely to the domestic market. MICARE had small losses in 1983 and 1985 and very small profits in 1984 and 1986. MICARE has a highly leveraged financial structure with about US$400 million long term debt and a long term debt/equity ratio of 93:7 as of end 1986.

ANNEX 5
Table 1

Selected Mining Companies - Summary Financial Performance 1986 a/
(US$ million)

Sales Revenues	1027
Cost of Sales	(826)
Operating Profit	211
Financial and Other Charges b/	(53)
Income Before Tax	158
Income Tax	(47)
Income After Tax	111
Current Assets	843
New Fixed Assets	1029
Total Assets	1872
Current Liabilities	287
Long Term Liabilities c/	330
Total Liabilities	617
Equity	1255
Total Equity and Liabilities	1872

Source: World Bank staff estimates based on Annual Reports.

a/ Consists of Peñoles, IMMSA, Frisco, San Luis.
b/ Includes interest, depreciation, other financial and monetary adjustments and workers profit sharing.
c/ Includes long term debt and certain other long term liabilities.

ANNEX 5
Table 2

SELECTED FINANCIAL INDICATORS: PENOLES

(Pesos millions)

INCOME STATEMENT	1980	1981	1982	1983	1984	1985	1986	1987
SALES REVS.	21,728	17,618	30,501	80,879	115,042	145,547	321,582	659,506
	(16,228)	(14,923)	(24,591)	(58,193)	(91,778)	(128,110)	(270,001)	(506,511)
OPG. PROFIT	5,500	2,695	5,910	22,686	23,264	17,437	51,581	152,995
	(3,695)	(1,789)	(3,069)	(11,080)	(15,018)	(13,587)	(25,052)	(90,411)
NET INCOME	1,805	906	2,841	11,606	8,246	3,850	26,529	62,584
BALANCE SHEET								
CURRENT ASSETS	7,991	8,105	17,898	36,252	92,619	143,466	350,054	841,082
TOTAL ASSETS	15,740	25,045	61,028	103,894	208,239	303,914	658,028	1,378,114
CURRENT LIABILITIES	5,092	5,200	16,280	28,504	35,011	46,982	129,765	336,409
LONG TERM LIABILITIES	6,404	10,513	27,710	25,975	39,891	61,881	93,592	91,509
TOTAL LIABILITIES	11,496	15,713	43,990	54,479	74,902	108,863	223,357	427,918
MINORITY EQUITY					44,015	66,317	48,320	22,905
TOTAL EQUITY	4,244	9,332	17,038	49,415	133,337	195,051	432,671	950,196
SOURCES AND USES								
INVESTMENT	1,978	3,583	3,183	2,497	6,018	9,668	15,064	27,397

Source: Banco de Mexico

Date: 2/29/88

ANNEX 5
Table 3

SELECTED FINANCIAL INDICATORS: IMMSA

(Pesos millions)

INCOME STATEMENT	1980	1981	1982	1983	1984	1985	1986	1987
SALES REVS.	12,798	9,229	16,285	49,287	59,655	79,941	197,387	326,029
	(10,340)	(8,430)	(14,602)	(33,713)	(42,936)	(66,470)	(139,845)	(212,124)
OPG. PROFIT	2,458	799	1,683	15,574	16,719	13,471	57,542	113,905
	(1,403)	192	(131)	(11,465)	(9,924)	(6,802)	(42,746)	(76,609)
NET INCOME	1,055	991	1,552	4,109	6,795	6,669	14,796	37,296
BALANCE SHEET								
CURRENT ASSETS	5,482	5,992	11,923	19,601	63,723	123,543	346,981	685,801
TOTAL ASSETS	11,687	14,223	56,693	84,320	177,574	323,138	741,650	1,426,227
CURRENT LIABILITIES	1,539	2,461	9,027	7,592	21,646	33,491	93,603	99,806
LONG TERM DEBT	6,205	7,016	29,382	34,264	42,834	80,282	177,985	298,811
TOTAL LIABILITIES	7,744	9,477	38,409	41,856	64,480	113,773	271,588	398,617
MINORITY EQUITY					37,051	68,133	153,354	339,589
TOTAL EQUITY	3,943	4,746	18,284	42,464	113,094	209,365	470,062	1,027,610
SOURCES AND USES								
INVESTMENT	2,302	2,744	3,067	3,140	5,701	6,996	5,230	9,796

Source: Banco de Mexico

Date: 2/29/88

ANNEX 5
Table 4

SELECTED FINANCIAL INDICATORS: SAN LUIS

(Pesos millions)

INCOME STATEMENT	1980	1981	1982	1983	1984	1985	1986	1987
SALES REVS.	1,074	949	5,578	10,976	16,088	21,201	42,842	56,652
	(391)	(572)	(4,069)	(6,901)	(12,239)	(18,718)	(33,415)	(44,585)
OPG. PROFIT	683	377	1,509	4,075	3,849	2,483	9,427	12,067
	(310)	128	(569)	(1,871)	(89)	3,337	2,600	10,343
NET INCOME	373	505	940	2,204	3,760	5,820	12,027	22,410
BALANCE SHEET								
CURRENT ASSETS	940	921	4,771	7,264	9,280	13,028	30,304	48,359
TOTAL ASSETS	1,681	2,590	9,577	17,463	32,359	54,932	133,282	286,563
CURRENT LIABILITIES	423	306	3,782	2,903	4,896	8,869	15,633	44,998
LONG TERM LIABILITIES	13	649	3,087	6,653	9,246	12,859	30,887	7,519
TOTAL LIABILITIES	436	955	6,849	9,556	14,142	21,728	46,520	52,517
MINORITY EQUITY	NA	NA	NA	NA	2,349	5,572	14,325	29,375
TOTAL EQUITY	1,145	1,635	2,128	7,907	18,217	33,204	86,762	234,046
SOURCES AND USES								
INVESTMENT	103	243	845	927	0	2,213	4,938	11,640

NOTE: 1980-84 INDUSTRIAS LUIS; 1985-87 SAN LUIS
Source: Banco de Mexico

Date: 2/29/88

ANNEX 5
Table 5

SELECTED FINANCIAL INDICATORS: FRISCO

(Pesos millions)

INCOME STATEMENT	1980	1981	1982	1983	1984	1985	1986	1987
SALES REVS.	1,935	1,246	2,761	9,559	1,611	25,059	56,076	89,534
	(961)	(771)	(2,338)	(6,860)	573	(25,458)	(48,780)	(73,176)
OPG. PROFIT	974	475	423	2,699	2,184	(399)	7,296	16,358
	(400)	(448)	(214)	(372)	(572)	3,104	6,749	22,862
NET INCOME	574	27	209	2,327	1,612	2,707	14,045	39,218
BALANCE SHEET								
CURRENT ASSETS	1,842	1,339	2,189	4,404	10,347	18,099	45,515	99,569
TOTAL ASSETS	3,696	5,656	11,381	22,293	49,304	80,902	186,128	359,053
CURRENT LIABILITIES	668	475	942	1,669	3,536	3,602	24,456	53,137
LONG TERM DEBT	131	180	452	88	583	0	0	9,562
TOTAL LIABILITIES	799	655	1,394	1,757	4,119	3,602	24,456	62,699
MINORITY EQUITY					8,249	14,830	29,813	47,428
TOTAL EQUITY	2,897	5,001	9,987	20,536	45,185	77,300	161,672	296,354
SOURCES AND USES								
INVESTMENT	447	234	131	376	528	777	973	2,705

Source: Banco de Mexico (CL/EQ 80-83-Bourse) Date: 2/29/88

ANNEX 5
Table 6

SELECTED FINANCIAL INDICATORS: AUTLAN

(Pesos millions)

INCOME STATEMENT	1980	1981	1982	1983	1984	1985	1986	1987 (9 MTHS)
SALES REVS.	2,632	3,108	5,410	12,938	20,980	27,731	48,331	68,113
	(2,443)	(2,992)	(4,755)	(12,894)	(18,653)	(25,500)	(46,109)	(57,114)
OPG. PROFIT	189	116	655	44	2,327	2,231	2,222	10,999
	(265)	(115)	(1,943)	103	(405)	(165)	150	0
NET INCOME	(76)	1	(1,288)	14/	1,922	2,066	2,372	10,999
BALANCE SHEET								
CURRENT ASSETS	2,486	3,082	9,273	12,804	13,689	20,084	43,344	62,637
TOTAL ASSETS	6,163	9,011	26,437	43,058	60,440	97,090	237,544	409,604
CURRENT LIABILITIES	2,524	2,456	5,853	3,603	2,692	7,484	13,061	17,522
LONG TERM DEBT	2,730	4,704	17,956	36,383	53,597	81,074	177,588	289,004
OTHER LIABILITIES	NA	NA	NA	NA	293	166	36	54,000
TOTAL LIABILITIES	5,254	7,160	23,809	39,986	56,582	88,724	190,685	360,526
EQUITY	909	1,851	2,628	3,072	3,858	8,366	46,859	48,078
SOURCES AND USES								
INVESTMENT	1,195	982	1,154	172	1,393	4,057	1,333	2,401

Source: Banco de Mexico (except CL80-83-Bourse) Date: 2/29/88

ANNEX 6

National Mining Reserves
(at 31 December 1987)

Assigned to:	COMISION DE FOMENTO MINERO	2,422,887 Has.
Assigned to:	CONSEJO DE RECURSOS MINERALES	1,923,723 "
Assigned to:	AZUFRERA PANAMERICANA S.A.	490,000 "
Assigned to:	BARITA DE SONORA S.A.	111,600 "
Assigned to:	CIA. REAL DEL MONTE Y PACHUCA, S.A.	52,200 "
Assigned to:	GRAFITO DE MEXICO, S.A.	4,000 "
Assigned to:	SICARTASA	8,300 "
Assigned to:	COMISION NACIONAL DE ENERGIA NUCLEAR	96,607 "
	Non-assigned	530,979 "
	T o t a l	5,640,296 Has.

Source: S.E.M.I.P.
Dirección General de Minas
Mexico, D. F.

ANNEX 7
Table 1

Mine Development Requirement in Exploitation Concession

Area in hectares	Annual obligation - metallic mines*			
	1975		1988	
	Pesos/ha	US$ Equivalent	Pesos/ha	US$ Equivalent
Up to 10	Exempt		Exempt	
More than 10 and up to 50	300	24	300	0.13
More than 50 and up to 100	400	32	400	0.17
More than 100 and up to 200	600	48	600	0.26
More than 200 and up to 400	800	64	800	0.34
More than 400 and up to 800	1000	80	1000	0.43
More than 800 and up to 1500	1400	112	1400	0.60
More than 1500 and up to 3000	1800	144	1800	0.77
More than 3000 and up to 4000	2200	176	2200	0.95
More than 4000	3000	240	3000	1.29

* Non-metallic developers are obligated to invest only 75 percent of the rates given above.

ANNEX 7
Table 2

Evolution of Work Obligations on Exploration Concession

Areas in Hectares	1975 First Year Pesos	US$ Equivalent	1988 First Year Pesos	US$ Equivalent
From 500 to 1000	250	20	250	0.11*
More than 1000 to 3000	200	16	200	0.08
More than 3000 to 20,000	120	10	120	0.05
More than 20,000 to 50,000	100	8	100	0.01
	Second Year		Second Year	
As above	550	44	550	0.24
	450	36	450	0.19
	240	19	240	0.10
	200	16	200	0.09
	Third Year		Third Year	
As above	1200	96	1200	0.52
	850	68	850	0.36
	640	51	640	0.28
	700 **	56	700	0.30

* Exchange rate as of March 5, 1988
** The 700 figure is not a typographical error