OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

16342-E

Distr.
LIMITED

ID/WG.470/2
17 July 1987

ENGLISH

United Nations Industrial Development Organization

First Consultation on the
Non-ferrous Metals Industry

Budapest, Hungary
30 November - 4 December 1987

FINANCIAL ASPECTS OF THE COPPER AND ALUMINIUM INDUSTRY *

Prepared by

Magnus Ericsson **
UNIDO consultant

---

* The views expressed in this paper are those of the author and do not necessarily reflect the views of the UNIDO Secretariat. This document has been reproduced without formal editing.

** Raw Materials Group, Stockholm, Sweden

V.87-87817

Contents

A. Introduction

The shift in mining investment away from Thrid World countries to USA, canada, South Africa and Australia is a well known phenomenum. In the early 1980s it was obvious that the sources of capital which had been most important during the preceding decade were no longer so easily available to Third World mineral producers. This situation continued in spite of the fact that in the long run Third World countries probably represent the greatest potential for mining because of their vast untapped resources and their future demand for metals and minerals.

In the 1970s, the traditional direct investment by transnational mining companies was replaced by more complex sources of capital. Commercial banks, export finance agencies, suppliers' credits, international public agencies, national development agencies, and government funds together with mining transnationals, participated in project financing of mining ventures. The availability of these sources was linked to the oil crisis of 1973-74. Mineral importers in Europe and Japan were trying to stabilize the supply of minerals by supporting new sources of investment. Commercial banks were trying to invest in the Eurodollar pool which grew quickly from inputs of revenues from oil producing countries. Financing funds were freely available.

The production capacity for many metals grew substantially during the 1970s. In the early 1980s a situation of continuing imbalance between supply and demand emerged. Due, inter alia, to the global economical recession and to a lower intensity of use of the "older" metals in the industrialized countries, demand for metals has stagnated. The prices of most metals have sunk to extremely low levels. Several projects have run into serious financial problems; Selebi-Phikwe, Ok Tedi are but two examples. The investors of the 1970s, the commercial banks and the transnational mining companies, are not as interested in mineral projects as they were ten years ago 1/, 2/, 3/, 4/. This development has been aggravated by the global economic setting, where the overall flows of foreign direct investment into Third World countries fell during the early 1980s. Total inflows fell by almost 25 per cent between 1981 and 1984. In the western Hemisphere the decline was almost 55 per cent while in Asia it was fairly constant 5/. In the absence of new international policy initiatives, the outlook for foreign direct investment in developing countries is not bright.

1/ The Selebi-Phikwe nickel/copper mine - lessons from a financial disaster, R Mikesell, Natural Resources Forum, Vol 8 No. 4, 1984

2/ Project financing applied to the OK Tedi mine, S McGill, Natural Resources Forum, Vol 7 No. 2, 1983

3/ Third World mineral development in crisis, T Wälde, Journal of World Trade Law, Vol 19 No. 1, 1985

4/ Developments in international mining finance, E Murphy in Yudelman Ed. Financing Canadian mining in the 1980s, 1983.

5/ Recent developments related to transnational corporations and international economic relations, UN/CTC/E/C 10/1986/2.

B. Capacity of development

From the mid 1970s to the mid 1980s copper production capacity grew 25-30 per cent in all stages of production. The growth was 2.3 times the total Western world growth during the same period. Third World producers accounted for approximately 50 per cent of the total Western World mine capacity in 1976 and 58 per cent in 1984 (4 600 kt). Tables 1, 2, 3. This development was primarily a result of the investments started in the late 1970s. In 1987 the investment level for projects under construction was of 3 billion US dollars, which represents practically 50 per cent of the level of investment of the late 1970s. Table 4.

The capacity addition was unevenly distributed between the copper producing regions in the Third World. Investments were concentrated in Latin America, whilst the African producers were not able to keep their relative capacity levels and their smelter and refinery capacity even decreased in absolute figures.

Projects under construction in African developing countries were down to aslmost zero in the early 1980s but have slowly risen since that time. The African projects are concentrated at the mining stage of the production chain. The African share of the total investments each year was constant during the period under study.

Investments under implementation in Asian developing countries have declined in a similar way to those in Africa but have remained at a higher level throughout the decade. In the mid 1980s between 30 and 40 per cent of the total investments in the Third World were made in Asia, mostly in smelters and refineries.

In Central and South America the number of projects under construction peaked around 1980 and has declined since. Investments are made both in mining, smelting and refining. The share of total investments is around 50 per cent and it has been declining slowly. Tables 5, 6, 7.

The new capacity which was under construction in 1976 represented an increase of approximately 60 per cent of total Third World capacity; the corresponding figure in 1984 was only 10 per cent (see Tables 8, 9, 10). The growth rate projected for the period up till 1990 will be considerably lower than during the preceding decade, around 20 per cent, but still twice the total Western World projected growth. Table 11.

The copper projects were becoming increasingly complex at the end of the 1970s. In the 1980s the project size decreased, reflecting the change to rehabilitation rather than green field projects. The projected capacity increase will necessitate an investment of about 5 G USD (current value) towards the end of the decade. That means that even if the outlook for the industry is gloomy even the small increases in capacity which are anticipated will require sizeable volumes of capital investments in the next few years 6/. For details see Appendix 1.

6/ Financing the next generation of copper projects, MD Fitzgerald and G Pollio, National Resources Forum, Vol 8 No. 4, 1984.

The capacity growth in the aluminium industry has been concentrated at the bauxite mining stage, 33 per cent during the last 12-year period. Aluminium smelting capacity grew by 20 per cent in the same period, while alumina refining capacity growth was only 14 per cent (Tables 12, 13, 14, 15).

Third World countries' share of Western World capacity is much lower in the downstream production stages. In 1984 their share of bauxite mining capacity was 50 per cent, while their share of the alumina refining capacity was 24 per cent and the share of aluminium smelter capacity was only 18 per cent.

The distribution of the capacity additions during the last decade has been mixed. Third World countries' share of Western World bauxite mining capacity decreased from 60 per cent in 1973 to 50 per cent in 1984, largely due to the capacity additions in Australia.

Third World share of alumina refining increased somewhat from 1975 to 1984; from 21 to 24 per cent. mostly due to new capacity which came on stream in Brazil and Venezuela. Third World share of aluminium smelting capacity almost doubled during this period, from 10 per cent to 18 per cent. This increase can be attributed to investments in Brazil, Venezuela and some Asian countries.

The expansion and new project investment level in the aluminium industry has decreased substantially over the last four years, from 14.4 GUSD (billion) in 1983 to 8.0 GUSD in 1987 (current currency rates) (Tables 16, 17, 18, 19, 20). This trend is largely due to decreasing investments in Latin America and Africa as well as declining investment levels in the developed countries. It is only Asia which can exhibit increased investments during this period. The Third World share of the total aluminium investments in the Western World has oscillated around two thirds during the last decade.

A recent forecast suggests a turning point for the aluminium industry will come around 1990 when consumption should grow at a similar rate to the industry production 7/. It is believed that demand for primary aluminium in 1995 will justify a production capacity of 18 Mt in the Western World although present plans only foresee around 15 Mt at that time. It remains to be seen if this scenario will materialize. Even if it does it is not obvious, as it is in the copper industry, that the new investments will be made in Third World countries. On the contrary is is doubtful if the trend towards the industrialized countries which has prevailed during the last ten years will be reversed.

c. Sources of capital

In the 1970s, mining investment was financed to a large extent by long term debt. In the case of copper, a figure of 53 per cent has been reported 8/.

7/ Aluminium Annual Review 1987, Anthony Bird Associates

8/ Fitzgerald, Pollio op. cit.

Table 21 shows the increasing debt/equity ratio of the most important metal companies in the Western World and illustrates the debt financing pattern. The table excludes aluminium producers as well as producers of precious metals in South Africa. In the aluminium industry, debt financing was already used extensively in the 1960s and has resulted in an even weaker financial situation for these companies. It should be noted that the South African gold producers have an extremely low debt/equity ratio of 6 per cent reflecting their powerful situation. It is however unlikely that lenders will be prepared to take such risks in the future. Commercial banks have become less eager to participate in large, complex mining projects particularly in developing countries. The role of transnational corporate investment is also likely to be far less significant than in the 1980s. A recent survey of sources of capital in the period 1984-1985 for 79 projects, mostly gold mine ventures, gives some indication of the present financing patterns for new mine projects (Table 22). However, most projects are located in developed countries and it is doubtful if the non-precious metals projects with extremely high debt/equity ratios will actually proceed beyond the planning stage. In any case it is obvious that the smaller projects in gold, with an average size of 25 MUSD, will have no problem to obtain funds either from internal or external sources. Various new forms of supplying capital such as the bullion loans have emerged.

For developing countries the major sources of capital during the late 1980s are:

- internal sources, generated by state mine enterprises
- national private capital
- official sources, national development agencies, export credits and public international agencies 9/
- capital from the centrally planned economies.

Details from the copper industry and its most recent financing schemes are given in Table 23 and in Appendix 1. In Appendix 2 the present situation in the South American aluminium industry is highlighted.

One possible strategy based on financial scurces is to continue the "unbundling" of the traditional package of capital offered for mineral projects. The state-owned companies both from the socialist countries and the more industrialized developing countries such as India and Brazil, could be potential sources of finance. It should also be possible to use sources of funding from medium-size enterprises in the developed countries, which could benefit from direct cooperation with Third World mineral producers without participation of the large mineral TNCs. A second strategy, partly interwoven with the first, is to pursue and develop the South-South cooperation efforts both regionally and globally.

9/ Financing investments in minerals in the 1980s, S Zorn, The Courier No 94, 1985.

1. Internal sources

The crisis in the minerals industry world-wide has hit state mining enterprises in the Third World particularly hard. In many countries the industry has hardly been able to accumulate enough reserves to maintain production levels and continue production through the priod of depressed prices on the market. The financial situation of the major Third World copper production as shown in Table 24 reveals, however, that their long-term debt/equity ratio is relatively sound. The ratio improved considerably in the late 1970s and has remained constant in the 1980s. The debt/equity ratio for Latin American producers is 0.13 and for African producers 0.21 in 1985.

The major copper producers in the Third World have, at least in this respect, a relatively favourable position. The debt/equity ratio of the metal producers in the developed countries deteriorated from 0.50 in 1979 to 0.58 in 1983.

The internal generation of funds has been fairly satisfactory. However one reason for the apparent better debt/equity ratios of the Third World copper producers is their problem in obtaining credits, which in some cases has resulted in underinvestment and capacity decreases. Another factor explaining this situation is that Third World Governments have been forced to turn debts into equity when rescheduling loans. In some cases the very strained overall debt situation of the copper-rich countries makes it difficult to obtain further loans even for a micro-economically-sound mining company. The importance of the foreign exchange earnings of the mining industry to the national economy of these countries has also made it difficult for the mining industry to reinvest, and capital has been transferred to other branches of the economy.

On the whole, further debt financing should be possible in carefully selected projects, at least with respect to the balance sheet situation of the major copper producers.

Codelco announced an investment programme of 1385 MUSD for the five-year period 1987-1991 in early 1986. At the end of 1986 the Ministry of Finance slashed 150 MUSD from the programme. The internal funds are the most important source of long-term financing as well as being the one which is subject to the greatest fluctuations. All use of internal funds has to be approved by the Ministry of Finance and thus depends on the country's macro-economic variables and government priorities. If announced investment figures are compared with effective ones of previous years, it is evident that the latter have been consistently lower. The same is likely to also happen in the future. The government, because of political considerations, will probably adopt before the referendum in 1989, a more expansive economic policy and limit Codelco's use of internally generated funds 10/.

10/ Minería y Desarrollo, various issues.

As Table 25 shows, the aluminium producers have used debt financing for a long period. The long-term debt/equity (D/E) ratio of the "Big six" deteriorated from 0.51 to 0.83 between 1980 and 1985. The Venezuelan aluminium producer, Venalum, reported a D/E ratio of 0.88 which is a healthy figure against this background 11/. On the whole the quick growth of the Venezuelan aluminium industry has been financed by nationally accumulated state-controlled capital. Further plans for expansion are planned based on internally generated funds 12/.

2. National private capital

The growing importance of national capital contributing to mining investments is obvious from Table 26. In Third World countries, the national sources of foreign exchange are often very limited but local banks can supply national currency loans. This procedure has been used in the copper industry of Mexico, Zaire and Zambia. In the Venezuelan aluminium industry it has even been a major source of capital in several projects.

3. Commercial banks

Most of the commercial banks have taken a short-term view of mining, and many, having encountered serious problems, have decreased their involvement in mining practically nothing. It is unlikely that this trend will change in the near future. The share of commercial banks in financing of mining projects declined by almost 50 per cent between 1968 and 1986.

It is possible that the transnational mining companies when restructuring their balance sheets, will start investing again, albeit at a lower level. Their projects will most probably be concentrated in the developed countries and will hence absorb most of the funds available from commercial banks. A recent study by the UNCTC points to the fact, however, that compared to the manufacturing industry and other industries aiming primarily at the Third World's home markets, the mining industry has an advantage in that it results in foreign exchange earnings which could be earmarked for the repayment of debts 13/.

11/ Mining Magazine, December 1986

12/ Mining Journal 85 06 16

13/ UNCTC op. cit.

4. International public agencies

The most important multilateral financing agencies are:

- the World Bank group;
- regional development banks: the African Development Bank, the Asian Development Bank, the Inter-American Development Bank, and the Caribbean Development Bank;
- European Investment Bank of the EEC;
- UN funds, UN Development Programme and the Revolving Fund for Natural Resources Exploration;

In addition, there are bilateral development agencies and funds supporting mineral projects such as:

- Arab Mining Company, Saudi Fund, Kuweit Fund, Caisse Centrale de la Coopération Economique (France), Kreditanstalt für Wiederaufbau (FRG), Overseas Development Council (UK), Overseas Resource Mineral Development Agency (Japan), and the Canadian International Development Agency.

4.1. The World Bank Group

The World Bank supports mining projects mainly from its International Bank for Reconstruction and Development (IBRD) and International Finance Corporation (IFC). Only a very few and minor projects have received credits from the International Development Association (IDA). The Group has formulated its strategy as a bridge between producing countries and foreign mining concerns [14]. The World Bank's role is twofold:

- to help prepare projects and to provide assistance at an early stage of a project;
- to provide assistance to developing countries in determining their resources, in planning a strategy for resource exploitation and in obtaining technical expertise to design, implement and operate mining ventures.

The Bank is prepared to take a share of up to 15 per cent of total project cost in three basic type of projects [15]:

- Greenfield installations and expansion of existing operations;
- restructuring and rehabilitation of existing operations;
- exploration and pre-investment work.

---

[14] Annual Report, World Bank 1978, p. 21.

[15] Impact of international lending on metals, M Haug, May 14 1986, Arden House.

In the period 1968-1986, the World Bank and IFC participated in 27 major metal projects. See Table 26. The projects had a minimum individual size of 50 MUSD and an average size of 230 MUSD (except for the single largest one, the Carajas iron ore project which required a total financing of approximately 5 GUSD). Of the total 11 000 MUSD invested into metals industries, 9 billion was invested in Latin America and only 2 billion in African countries. This trend is similar to the overall trend listed in the capacity discussion above.

The importance of World Bank Group lending has declined and bilateral funding agencies have increased their lending. This trend reflects in particular the efforts by the European countries and Japan to ensure a stable supply of raw materials by financial support to the Third World producers.

4.2. World Bank

World Bank supported projects are summarized in Table 27. The average credits granted are 40 MUSD. Several projects however, are smaller exploration and feasibility projects and those involving actual construction of mining and metallurgical facilities are larger, i.e. between 80 and 100 MUSD. The copper industry has received 26 per cent of total World Bank credits and the aluminium industry 10 per cent.

4.3. International Finance Corporation

The lending pattern of the IFC from 1957 to 1985 is given in Tables 28, 29 and 30. It exhibits similarities to the World Bank in that it is also concentrated to Latin America (46 per cent IFC, 82 per cent WB) and that the copper industry has received a large proportion of the investments (47 per cent of total mining project cost). Bauxite accounts for 10 per cent of total project cost of IFC supported projects. IFC has recently studied a Zairean aluminium project.

The IFC has played a major role in copper investments. IFC financed projects accounted for 16 per cent of the increase in Third World copper mining capacity in the 1970s and 18 per cent of the increase between 1980 and 1983. Since 1983, IFC investment in the copper industry has practically ceased.

In the early 1970s, IFC concentrated on nickel and in the 1980s on gold, silver and diamonds. However, this pattern reflected more the project proposals received than a planned development. In 1980, IFC attempted to identify favourable minerals, such as tungsten, silver and fluorspar, which should be the most attractive mineral investments. It turned out that this recommendation had little influence on which projects were actually financed. In 1984 IFC decided to concentrate on four types of projects 16/:

16/ IFC Five-year programme FY 85-89, 1984.

- exploitation of relatively small mineral deposits which are not of great interest to transnational mining companies but of considerable economic significance to local producers;

- large projects in small countries to facilitate negotiations with foreign mining companies;

- those in which they could participate essentially as an equity investor to facilitate an acceptable balance between local and foreign ownership and to provide an adequate base of riks capital;

- those in conjunction with government or public sector mining companies.

These goals have not yet been fulfilled.

It has been claimed, primarily by US copper producers, that the international public agencies provide funds at costs below those of commercial banks. An interesting study by Price Waterhouse shows however that it is difficult to find empirical support for such a hypothesis. US mineral producers paid an effective interest on debt varying from 6.3-16.2 per cent with a 9.9 per cent average. Third World mineral producers borrowing from commercial sources paid 10.3-21.1 per cent interest and 8.7-15.8 per cent when the financing was supported by international public agencies. The US producers could apparently get loans which tended to have lower interest rates than Third World producers 17/.

5. European Economic Community

The EEC has two main windows for funding investments in the minerals industry of primarily the African, Caribbean and Pacific (ACP) countries:

- The European Investment Bank (EIB),

- the Sysmin special financing facility for mining products under the Third Lomé convention 18/.

17/ Subsidization of non-fuel mineral production at home and abroad, John Schanz, CRS Report No 87-62S, 1987.

18/ The whole section is based on The Courier No 89 and 94, 1985 and annual reports of the EIB.

5.1. European Investment Bank

The EIB has come to play a major role in the EEC Commission's investment in the mining and metallurgical industry of the ACP states. In August 1985, EIB approved loans amounting to over 290 MECU (European Currency Units) of which 175 million under the Second Lomé Convention. 161 MECU went to West and Central Africa, 57 million to East Africa, 59 MECU to the Pacific and 4 million to the Caribbean. 12 MECU has been invested in small and medium scale projects mainly in Africa.

A whole range of different types of project has been funded: green field projects as well as rehabilitation and reconstruction projects. Financing has been made in the following minerals: bauxite (Cameroon, Jamaica), aluminium (Guinea), iron ore (Gabon, Mauritania, Senegal), copper (PNG, Uganda, Zaire, Zambia), gold (Burkina Faso, Ethiopia, Sudan), phosphate (Senegal), potash, uranium (Gabon), diamonds (Ghana), manganese (Ghana), cobalt (Zaire, Zambia), tin (Rwanda, Zaire), chromite (Madagascar), fluorspar, limestone, ferro-nickel and energy resources.

The share of mining and quarrying together with metal production and semi-processing of the total financing provided in ACP-states by the EIB has diminished in recent years. For the period 1958 to 1982 the figures were 13.9 and 3.5 per cent respectively. In the period 1976 to 1985 the same figures were down to 10.9 and 2.7 per cent. The trend in lending during the 1980s has been inclined towards gold projects. Of a total number of 7 projects approved between 1984 and 1986, three were in gold mining, two in bauxite/alumina, and one in each copper and phosphate.

Most of the African projects have been co-financed by the World Bank and bilateral financing institutions from Europe and Arab countries. EIB has a policy to concentrate on the mining part of a project and cooperate with other sources such as the European Development Fund or the World Bank to fund the infrastructure parts of a complex project.

The EIB has shown more interest than has the World Bank Group in the bauxite/aluminium industry.

In the copper industry the Bank has participated with loans in Zambia (25 MECU, 1975) and Zaire (16 MECU, 1971; 16.6 MECU, 1974; 50 MECU, 1986). In 1987 the Portuguese Neves Corvo project applied for a 200 MUSD from the EIB.

In Guinea a loan of 7.5 MECU (1984) was part of a financing package for a process development project to facilitate and rationalize the production of alumina at the Fria-Kimbo plant of the Friguia company. A loan was given to Cameroon in 1983 to expand and modernize aluminium production, making use of the abundant national hydroelectric resources.

Jamaica was given a 4 MECU loan in 1984 to modernize its two alumina plants at Kirkvine and Ewarton.

Since the First Lomé Convention of 1980 the EIB has participated in the financing of 21 small and medium sized mining projects totalling 32 MECU and 281.3 MECU was lent to large scale projects.

5.2. Sysmin

Originally the Sysmin focused on maintaining production capacities. Under the Third Lomé Convention the prime objective is to restore the viability of the mining industry of the ACP states concerned through rehabilitation, maintenance and rationalization measures. The system also supports diversification measures.

Sysmin aid is primarily in the form of contributions to defined projects in ACP countries which are dependent on their mining industry and exports when the industry has been affected by serious unforeseen events. Table 31.

The system covers 7 minerals for 13 countries where either one mineral represents 15 per cent of total exports or all mineral exports account for at least 20 per cent of total exports. For landlocked, island or the least developed countries 292 MECU were available under Lomé II 19/. This amount was increased to 415 MECU under Lomé III. Financing with funds from Sysmin has been applied three times to the copper industry:

1980-81	Zambia 55 MECU	copper/cobalt
	Zaire 40 MECU	-"-
1983-84	Zambia 28 MECU	-"-
1987	Zaire 41 MECU	-"-

In 1984 the EEC approved a Sysmin intervention for the Guyana bauxite sector, in an amount of up to 35 MECU. The tin industry of Rwanda has also been supported. Other applications have been made concerning iron ore and cobalt.

19/ The Courier op. cit.

6. Bilateral agencies

6.1. Japan 20/, 21/

Japan, as a low-resource country, relies heavily on the stability of the foreign resource supplies for its overall economic security. Two of the major elements in Japan's strategy to secure stable mineral supplies are:

- develop projects and import schemes with Japanese equity participation;
- loan and import with Japanese contributions as concessionary loans in exchange for long-term contracts.

The former type also includes a more comprehensive form of joint venture called the Asahan formula, which was originally worked out to develop an aluminium smelter and the necessary power facilities and local community in Sumatra, Indonesia. The venture, which was set up in the late 1970s, comprises both the Indonesian and Japanese Governments together with Japanese industrial partners. The project was also supported by the Japanese EXIM bank. Production at the Asahan smelter was started in 1984. The project lost 47 MUSD up to 1985 and further losses are expected for 1986 and 1987. The strength of the Japanese yen has added to the financial problems of the venture since the financing of the 411 G JPY (billion Yen) project was made in Yen. In spring 1987 the Japanese consortium agreed to invest another 24GJPY to enable continued production at the PT Inalum plant 22/.

Economic problems have also been experienced by the Albras venture. The second stage of the project is said to still be co-financed by the Japanese consortium but it has not been disclosed how the total investment for both stages (1310 MUSD) will be divided between the participants of the joint venture CVRD (51 per cent) and the Nippon Amazon Aluminium Company (49 per cent). For details on the Alunorte alumina project see Appendix 2.

The loan and import approach has been used particularly to secure copper and iron ores for Japanese smelters. In 1978, 50 per cent of the copper ore imported was acquired under such schemes.

20/ A newer type of foreign investment in Third World resource development, T Ozawa, Rivista Internationale di scienze economiche e commerciale, Vol 29 p. 1134, 1982.

21/ Non-fuel mineral procurement policy, P Crowson in Japan's economic security, N Akoa Ed., New York 1983.

22/ Mining Journal 1987-02-27.

A review of current major mineral projects with Japanese participation is given in Table 32. There are also examples of other types of joint venture and financing arrangements such as exploration support, technical aid, advance payments against deliveries of concentrates.

The Japanese EXIM bank has played an important role in financing these schemes. The bank is unique internationally in this respect. The type of loans provided is listed in Table 33. The project loan type is given to large, complex projects such as aluminium smelters. Table 34 confirms the picture of the EXIM bank as the single most important source of capital to the Japanese policy to secure a stable supply of minerals.

In the early 1950s the so called Goa formula was created to facilitate iron ore imports. The contracts of this type include delivery of Japanese machinery with supplier's credits and a long-term contract for ore deliveries. The Japanese did not however participate with equity.

The development and import formula grew in importance and was the major formula used in the 1960s. After the oil crisis in 1973-74 financing according to the loan and import formula increased. In this period direct loans to foreign governments were also granted. The continuing emphasis given to financing of resource development is clear from the growing proportion of the bank's total commitments going into resource financing. In the late 1970s almost one third went into this area. Table 35.

Also for the 1980s the bank considers the development and import of energy and mineral resources one of its major activities.

7. Centrally-planned economies

7.1. China

The Chinese Government through its China International Trust and Investment Corporation (CITIC) concluded an interesting deal in 1986. CITIC joined the Portland aluminium joint venture (Victoria state government 35 per cent, Alcoa 45 per cent, public 10 per cent) and acquired a 10 per cent equity share in the 1500 MAUD project. The finance was supplied by a group of nine banks led by the Bankers Trust Co. CITIC raised 98 MUSD in that way.

When the smelter starts production in 1987 CITIC will receive 15 kt and this figure will rise to 30 kt in 1988 [23].

The Chinese State organization China National Non-ferrous Industries Corporation (CNNC), has also been negotiating participation in a foreign aluminium smelter with equity. The Chinese have approached Icelandic Aluminium to participate in the planned 100 MGBP expansion of the ISAL smelter near Reykjavik in Iceland. This deal is not yet finalized [24].

23/ Mining Journal 28.02.86, 07.03.86, 23.05.96, 15.08.86.

24/ Mining Journal 08.11.85.

7.2. Soviet Union

The USSR is basically self-sufficient or even an important exporter of many minerals. The Soviet Union, however, imports high grade and high quality bauxite since this resource is not sufficient. Imports originate mostly in Third World countries and also in Hungary. The major project realized is the Guinean state-owned OBK bauxite mine. The operation was started in the middle of the 1970s. The whole project was financed by the USSR and the investment has been estimated to be approximately 100 MUSD. The production has been expanded to 3 Mt. Ninety per cent of the output is exported to the Soviet Union, 50 per cent as repayment of the credits supplied, 40 per cent as regular exports to the Soviet Union (detailed terms are not known) and the last 10 per cent can be exported by Guinea on the world market 25/.

The USSR has also financed smelters and alumina works in Algeria, Egypt, India and Turkey.

In the late 1970s the USSR made an agreement with Jamaica to build an alumina complex in Jamaica for exports to the USSR. This project was never finalized.

In 1985 a new 2.3 Mt bauxite project in India was announced. The mine in Andhra Pradesh would export most of its production to the USSR. The bauxite mine is to be supplemented by a 600 kt alumina plant 26/.

A recent joint project with USSR participation in Greece gives a little better insight into the financing practices of the USSR in foreign mining projects.

The project has been under negotiation since at least 1984 and the signing of the final agreement has been postponed several times. Participants are the USSR and the state-owned Hellenic Aluminium Industries SA (ELVA). Initially Bulgaria also took part in the negotiations. The total investment is estimated at 690 MUSD in a 600 kt alumina plant situated in the Corinthian Gulf area. Originally Bulgaria was to import 200 kt and the USSR 350 kt. Bulgaria pulled out and in 1986 the USSR offered to buy all the alumina production. The USSR trade group Tsvetmetpromexport will supply machinery and process equipment equal to 135 MUSD, and the company will carry out engineering and design work worth 25 MUSD. Further financing will be obtained from the Hellenic Development Bank and a minor part covering pollution control measures will be financed by the EEC. Production is due to begin in 1992.

The USSR loans will be repaid by delivery of alumina. In 1984 an agreement was reached on a 10-year contract. During the first three years the price would be 13 per cent of the Alcan aluminium price and it would

---

25/ Plundring eller planhushallning, Raw Materials Group 1980
26/ Engineering and Mining Journal, October 1985

decrease to 12.6 per cent during the rest of the decade. This deal had to be renegotiated when Alcan withdrew its market price. A new formula based on US and European producers prices has been agreed upon 27/, 28/.

The USSR has agreed to buy all the alumina production. Seventy per cent of the output will be paid in free currency but the necessary fuel for the production must be imported from the USSR. The remaining 30 per cent will be covered by export of equipment and machinery for the plant from the Soviet Union.

A feasibility study for bauxite mining and alumina production in Kibi, Ghana was completed early in 1987 by USSR experts. The project received USSR assistance in the construction of the plant in return for long-term bauxite and alumina deliveries 29/.

7.3. East Europe

The East European countries will have an increasing interest in importing mineral raw materials from sources other than the USSR when the cost of exploitation of Soviet mines in Siberia increases. This is true particularly for minerals which are in inadequate supply in the Soviet Union, such as bauxite. There have been negotiations between Surinam and Czechoslovakia to counter trade bauxite from the rehabilitated production facilities in Surinam.

Hungary, which has experience and know-how in bauxite mining and aluminium production has participated in several projects as technical consultant.

27/ Mining Journal 4.10.85, 24.01.86, 20.06.86, 5.09.86

28/ Engineering and Mining Journal, May 1984.

29/ Mining Magazine, April 1987.

D. Summary

The outlook for investments in Third World mining projects in general and in the copper and aluminium industry is gloomy. It is unlikely that this situation will change rapidly. The risk of running into financial problems or even financial failure will continue to be high. Several factors contribute to this situation of which the most important are:

- prices will most probably stay at a low level and the dramatic fluctuations will continue;
- capital costs will increase particularly since new ore bodies are often found in remote areas necessitating large infrastructure investments.

The demand and capacity forecasts however point to the fact that even if the overall picture is gloomy, some major projects will come on stream in the next decade.

The recent examples of financial problems make it important to make detailed appraisals of the difficulties encountered in the early 1980s. What went wrong? Was it bad management, low productivity, lack of funds, maintenance problems?

Projects likely to be realized are those smaller projects which can be developed at low cost. Those projects do not need large amounts of capital and could operate in weak mineral markets with low metals prices. Lenders will be more careful to approach highly leveraged borrowers. Third World countries need to explore new sources of funds and to generate more funds internally. Public international agencies will continue to play an important role primarily as catalysts for larger loans and for establishing co-financing schemes. Financing from the centrally-planned economies could grow in importance. Fiscal policies and the general investment climate will continue to be of prime importance to attract future financing.

Table 1

Copper mine capacity in the Third World

THIRD WORLD	1976 1/ kt	1976 1/ %	1984 2/ kt	1984 2/ %	1990 3/ kt	1990 3/ %
ASIA						
Indonesia	i.o. 4/		91		84	
Iran	10		106		151	
PNG	185		165		220	
Philippines	255		400		464	
Others	225		228		254	
Asia total	675	9.6	990	12.5	1173	13.5
AFRICA						
Zaire	520		705		676	
Zambia	774		640		674	
Others	103		142		163	
Africa total	1397	19.9	1487	18.8	1513	17.4
CENTRAL AND SOUTH AMERICA						
Brazil	8		50		68	
Chile	980		1352		1949	
Mexico	95		311		388	
Peru	375		381		380	
Others	15		18		12	
Central and South America total	1473	20.9	2112	26.7	2797	32.1
Third World total	3545	50.4	4589	58.0	5483	63.0
WESTERN WORLD total	7033	100.0	7902	100.0	8704	100.0

Notes:

1/ Copper: the next fifteen years, W. Gluschke et al.
2/ Z. Vukmanovic, CIPEC Quarterly Review Oct-Dec 1985
3/ Projected, op. cit. Vukmanovic
4/ Included in others

Table 2

Copper smelter capacity in the Third World

THIRD WORLD	1973 1/		1984 2/		1990 3/	
	kt	%	kt	%	kt	%
ASIA						
Indonesia	0		0		0	
Iran	0		145		145	
PNG	0		0		0	
Philippines	0		138		138	
Others	257 4/		348		368	
Asia total	257	3.2	631	7.1	651	7.0
AFRICA						
Zaire	530		488		488	
Zambia	840		695		733	
Others	65 4/		121		121	
Africa total	1435	17.7	1304	14.6	1342	14.3
CENTRAL AND SOUTH AMERICA						
Brazil	i.o. 5/		150		150	
Chile	900		1093		1201	
Mexico	100		129		379	
Peru	220		344		325	
Others	10		10		10	
Central and South America total	1230	15.1	1726	19.3	2065	22.1
Third World Total	2922	36.0	3661	41.0	4058	43.4
WESTERN WORLD total	8120	100.0	8921	100.0	9354	100.0

Notes:

1/ US Bureau of Mines, Mineral Facts and Problems 1975.
2/ Z. Vukmanovic, op. cit.
3/ Projected, op. cit. Vukmanovic
4/ Production Gluschke op. cit.
5/ Included in others.

Table 3

Copper refinery capacity in the Third World

THIRD WORLD	1974 1/ kt	%	1984 2/ kt	%	1990 3/ kt	%
ASIA						
Indonesia	0		0		0	
Iran	0		102		152	
PNG	0		0		0	
Philippines	0		i.o. 4/		i.o. 4/	
Others	255 5/		340	6.0	340	
Asia total	255	3.0	452	4.8	492	5.0
AFRICA						
Zaire	430		250		350	
Zambia	755		660		725	
Others	30 5/		34		34	
Africa total	1215	14.4	944	10.3	1109	11.4
CENTRAL AND SOUTH AMERICA						
Brazil	i.o. 4/		185		185	
Chile	635		894		1198	
Mexico	72		165		185	
Peru	150 6/		238		208	
Others	40		0		0	
Central and South America total	897	10.2	1482	16.1	1776	18.2
Third World Total	2327	27.6	2868	31.2	3377	34.6
WESTERN WORLD total	8409	100.0	9177	100.0	9764	100.0

Notes:

1/ Gluschke op. cit.
2/ Z. Vukmanovic, op. cit.
3/ Projected, Vukmanovic op. cit.
4/ Included in others.
5/ Production Gluschke op. cit.
6/ US Bureau of Mines, op. cit.

Table 4

Investments in copper (MUSD) - Third World 1/

(mining, smelting and refining)

	1976		1977		1978		1979		1980		1981		1982		1983		1984		1985		1986		1987	
	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv
AFRICA																								
Zaire	3	1115	1	435	1	435	1	435													1	750		
Zambia	1	70	1	70					1	300			1	300			1	300	1	300	1	300	1	300
Others									2	138					3	70	2	20			1	120	1	120
Total	4	1185	2	505	1	435	1	435	3	438	0	0	1	300	3	70	3	320	1	300	3	1170	2	420
ASIA																								
India			5	241	2	166	1	103	1	103							1	25	1	25				
Indonesia									1	100	1	100					1	43						
Iran	1	500	1	893	2	1560	1	143																
Philippines	6	553	8	960	7	437	6	642	2	285	3	363	4	320	3	526	3	528	1	75				
Papua Guinea	1	6	1	5	2	490	1	50	1	50			1	1500	1	1500	1	1500	1	1500	1	1500	1	1500
Turkey																	1	55	1	60				
Others			2	500	4	432	3	174	3	244	3	244	1	120	1	97	1	98	1	91	1	4		
Total	8	1059	17	2599	17	3085	12	1112	8	782	7	707	6	1940	5	2123	8	2249	5	1751	2	1504	1	1500
LAT AMERICA																								
Brazil			2	1620	2	1620	3	1636	3	1636	3	2230	2	2400										
Chile	4	340	6	690	4	630	2	19	1	2000	4	231	4	231	2	116	3	138	3	138	4	967	5	939
Mexico	3	1075	5	854	3	470	3	470	3	470	3	670	3	670	3	670	1	250	3	670	3	670		
Peru	4	657	6	1000	4	384	3	395	3	442	3	402	2	282	3	567	3	567	1	317	2	126	2	126
Others	1	4	4	2605			1	1000	1	1100											1	13	1	13
Total	12	2276	23	6769	13	3024	12	3520	11	5648	13	3533	11	3523	8	1353	7	955	7	1125	10	1776	8	1078
I THIRD WORLD	24	4520	42	9873	31	6544	25	5067	22	6868	20	4240	18	5823	16	3546	18	3524	13	3176	15	4450	11	2998
I WEST WORLD	35	5987	56	11308	40	7594	36	6367	32	7626	31	5128	30	7201	28	4705	28	4754	20	4231	24	5380	19	3985

Source: EMJ op. cit.

Note: 1. Projects under construction.

Table 5

Investments in copper mining (MUSD) - Third World 1/

	1976		1977		1978		1979		1980		1981		1982		1983		1984		1985		1986		1987	
	No	Inv.	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv
AFRICA																								
Zaire	1	600																						
Zambia	1	70	1	70					1	300			1	300			1	300	1	300	1	300	1	300
Others															1	50					1	120	1	120
Total	2	670	1	70	0	0	0	0	1	300	0	0	1	300	1	50	1	300	1	300	2	420	2	420
ASIA																								
India			5	241	2	166	1	103	1	103							1	25	1	25				
Indonesia									1	100	1	100					1	43						
Iran					1	1400																		
Philippines	4	153	6	560	7	437	5	392	1	35	2	113	2	61	2	116	2	118	1	75				
Papua Guinea	1	6	1	5	2	490	1	50	1	50														
Turkey																	1	55	1	60				
Others					1	120	1	54	1	54	2	174	1	120										
Total	5	159	12	806	13	2613	8	599	5	342	5	387	3	181	2	116	5	241	3	160	0	0	0	0
LAT AMERICA																								
Brazil			1	810	1	810	2	853	2	853	1	300												
Chile	2	168	3	410	2	390			1	2000	3	171	3	171	1	16	2	38	2	38	2	373	3	427
Mexico	2	575	3	434	1	50	1	50	1	50	1	250	2	460	2	460	1	250	2	450	2	460		
Peru	2	735	3	161	2	144	1	134	1	181					1	327	1	327	1	317				
Others	1	4	2	805																	1	13	1	13
Total	7	1524	12	2620	6	1394	4	1037	5	3024	5	721	5	631	4	803	4	615	5	615	5	846	4	440
I THIRD WORLD	14	2353	25	3496	19	4007	12	1636	11	3726	10	1108	9	1112	7	969	10	1156	9	1275	7	1266	6	860
I WEST WORLD	20	2773	32	3994	24	4377	20	2296	19	4084	18	1746	18	1612	14	1182	17	1968	15	2389	15	2185	14	1767

Source: EMJ op. cit.

Note: 1.Projects under construction.

Table 6

Investments in copper smelting (MUSD) - Third World [1/]

	1976		1977		1978		1979		1980		1981		1982		1983		1984		1985		1986		1987	
	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv
AFRICA																								
Zaire																								
Zambia																								
Others									1	130					1	10	1	10						
Total	0	0	0	0	0	0	0	0	1	130	0	0	0	0	1	10	1	10	0	0	0	0	0	0
ASIA																								
India																								
Indonesia																								
Iran					1	160	1	143																
Philippines	1	200	1	200			1	250	1	250	1	250	2	259	1	410	1	410						
Papua Guinea																								
Turkey																								
Others			1	250			1	70	1	70	1	70												
Total	1	200	2	450	1	160	3	463	2	320	2	320	2	259	1	410	1	410	0	0	0	0	0	0
LAT AMERICA																								
Brazil					1	810	1	783	1	783			1	1200										
Chile	2	180	3	280	2	240	1	12							1	100	1	100	1	100	1	100	1	12
Mexico			1	210	1	210	1	210	1	210	1	210	1	210	1	210			1	210	1	210		
Peru											1	141	1	141	1	120	1	120			1	63	1	63
Others																								
Total	2	180	4	490	4	1260	3	1005	2	993	2	351	3	1551	3	430	2	220	2	310	3	373	2	75
I THIRD WORLD	3	380	6	940	5	1420	6	1468	5	1443	4	671	5	1810	5	850	4	640	2	310	3	373	2	75
I WEST WORLD	4	690	8	1230	7	1820	8	1908	6	1643	6	846	6	2260	9	1718	7	1058	2	310	3	373	2	75

Source: EMJ op. cit.

Note: 1. Projects under construction.

Table 7

Investments in copper refining (MUSD) - Third World [1/]

	1976 No	1976 Inv	1977 No	1977 Inv	1978 No	1978 Inv	1979 No	1979 Inv	1980 No	1980 Inv	1981 No	1981 Inv	1982 No	1982 Inv	1983 No	1983 Inv	1984 No	1984 Inv	1985 No	1985 Inv	1986 No	1986 Inv	1987 No	1987 Inv
AFRICA																								
Zaire	2	515	1	435	1	435	1	435													1	750		
Zambia																								
Others									1	8					1	10	1	10						
Total	2	515	1	435	1	435	1	435	1	8	0	0	0	0	1	10	1	10	0	0	1	750	0	0
ASIA																								
India																								
Indonesia																								
Iran	1	500	1	893																				
Philippines	1	200	1	200																				
Papua Guinea													1	1500	1	1500	1	1500	1	1500	1	1500	1	1500
Turkey																								
Others			1	250	3	312	1	50	1	120					1	97	1	98	1	91	1	4		
Total	2	700	3	1343	3	312	1	50	1	120	0	0	1	1500	2	1597	2	1598	2	1591	2	1504	1	1500
LAT AMERICA																								
Brazil			1	810							2	1930	1	1200										
Chile							1	7			1	60	1	60							1	494	1	500
Mexico	1	500	1	210	1	210	1	210	1	210	1	210												
Peru	2	72	3	839	2	160	2	261	2	261	2	261	1	141	1	120	1	120			1	63	1	63
Others			2	1800			1	1000	1	1100														
Total	3	572	7	3655	3	370	5	1478	4	1571	6	2461	3	1401	1	120	1	120	0	0	2	557	2	563
I THIRD WORLD	7	1787	11	5437	7	1117	7	1963	6	1699	6	2461	4	2981	4	1727	4	1728	2	1591	5	2811	3	2063
I WEST WORLD	11	2454	16	6084	9	1397	8	2163	7	1899	7	2536	6	3329	5	1805	4	1728	3	1602	6	2822	3	2063

Source: EMJ op cit.

Note: 1. Projects under construction.

Table 8

Additional copper mining capacity planned in the Third World (kt)

THIRD WORLD	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
ASIA											
Indonesia	12	-	-	-	45	43	-	-	-	-	-
Iran	154	145	145	145	145	-	-	-	-	-	-
PNG	-	-	-	-	-	-	69	69	69	-	180
Philippines	140	161	173	80	126	135	58	58	33	4	4
Others	137	41	53	40	69	90	65	107	52	57	37
Asia total	443	347	371	265	385	268	192	234	154	61	221
AFRICA											
Zaire	236	35	-	-	-	-	-	-	-	-	-
Zambia	44	38	38	-	-	-	-	34	37	37	37
Others	73	15	10	13	18	24	3	1	2	22	32
Africa total	353	88	48	13	18	24	3	35	39	59	69
CENTRAL AND SOUTH AMERICA											
Brazil	30	30	45	75	80	12	12	-	-	-	-
Chile	214	159	145	95	48	111	104	18	87	84	376
Mexico	219	215	183	183	14	80	135	126	117	96	86
Peru	612	416	183	34	40	205	151	55	53	53	54
Others	272	74	70	-	2	2	1	-	1	2	1
C and S America total	1347	894	626	387	184	410	403	199	258	235	517
Third World total	2143	1329	1045	665	587	702	598	458	454	355	807
WESTERN WORLD TOTAL	3013	1773	1259	881	814	874	819	589	500	429	1105

Source: Mining Annual Review 1976-1986.

Table 9

Additional copper mine capacity planned in Third World
1976-1986

Region	Share of total planned capacity in Western world (per cent)										
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Africa	11.7	5.0	3.8	1.5	2.2	2.7	.4	5.9	8.4	13.8	6.2
Asia	14.7	19.6	29.5	30.1	47.3	30.7	23.4	40.1	30.8	14.2	20.0
Latin America	44.7	50.4	49.7	43.9	22.6	46.9	49.2	33.8	51.6	54.8	46.8
I Third world	71.1	75.0	83.0	75.5	72.1	80.3	73.0	79.8	90.8	82.8	73.0
Western world total (kt)	3013	1773	1259	881	814	874	819	589	500	429	1105

Table 10

Copper mine capacity growth rate 1976 and 1984 in the Third World
(Planned capacity in percent of total existing capacity)

	1976	1984
Asia	67	16
Africa	25	3
Latin America	91	12
Third World total	60	10
Western World total	43	6

Table 11

Changes in copper production capacities in the Third world between the mid-70s and 1984 and 1990 (per cent).

	Mid-70s to 1984	1984 to 1990
	%	%
MINE		
Asia	+ 47	+ 18
Africa	+ 6	+ 2
America	+ 43	+ 32
Total, Third world	+ 29	+ 19
Total, Western world	+ 12	+ 10
SMELTER		
Asia	+ 145	+ 3
Africa	- 9	+ 3
America	+ 40	+ 20
Total, Third world	+ 25	+ 11
Total, Western world	+ 10	+ 5
REFINERY		
Asia	+ 113	+ 16
Africa	- 22	+ 17
America	+ 73	+ 20
Total, Third world	+ 28	+ 18
Total, Western world	+ 9	+ 6

Table 12

Bauxite capacity in the Third World

	1973		1984		1990	
	Mt	%	Mt	%	Mt	%
ASIA						
India	2.0	2.5	2.4	2.2		
Indonesia	1.4	1.7	1.3	1.2		
Others	2.0	2.5	1.6	1.5		
Asia total	5.4	6.7	5.3	5.0	8	7
AFRICA						
Ghana	0.5	0.6	0.4	0.4		
Guinea	9.7	12.1	14.2	13.3		
Sierra Leone	0.9	1.2	0.8	0.7		
Others	-	-	-	-		
Africa total	11.1	14.0	15.4	14.4	21	17
SOUTH AND CENTRAL AMERICA						
Brazil	1.1	1.3	5.1	4.7		
Guyana	5.0	6.3	4.5	4.2		
Jamaica	16.1	20.1	16.1	15.1		
Surinam	7.1	8.9	5.7	5.4		
Venezuela	-	-	-	-		
Others	2.2	2.7	1.3	1.2		
South and central America total	31.5	39.3	32.7	30.6	36	30
Third World total	48.1	60.1	53.3	50.0	65	54
Developed countries total	31.9	39.9	53.2	50.0	56	46
Western world total	80.0	100.0	106.5	100.0	121	100

Source: US Bureau of Mines, IBA

Table 13

Alumina capacity in the Third World

	1975		1984		1990	
	kt	%	kt	%	kt	%
ASIA						
India	660	2.1	670	1.9		
Indonesia	-	-	-	-		
Others	280	0.9	360	1.0		
Asia total	940	3.0	1030	2.9	2500	6.7
AFRICA						
Ghana	-	-	-	-		
Guinea	700	2.2	700	2.0		
Sierra Leone	-	-	-	-		
Others	-	-	-	-		
Africa total	700	2.2	700	2.0	700	1.9
SOUTH AND CENTRAL AMERICA						
Brazil	330	1.0	1150	3.2		
Guyana	350	1.1	350	1.0		
Jamaica	3050	9.6	2830	7.9		
Surinam	1350	4.3	1350	3.8		
Venezuela	-	-	1000	2.8		
Others	-	-	-	-		
South and central America total	5080	16.0	6680	18.7	8500	22.6
Third World total	6720	21.2	8410	23.5	11600	31.3
Developed countries total	25020	78.8	27400	76.5	25900	68.7
Western world total	31740	100.0	35810	100.0	37600	100.0

Source: US Bureau of Mines

Table 14

Aluminium capacity in the Third World

	1975		1984		1990	
	kt	%	kt	%	kt	%
ASIA						
India	260	2.1	365	2.5	not avaiable	
Indonesia	-	-	225	1.5		
Others	290	2.4	495	3.4		
Asia total	550	4.5	1085	7.4		
AFRICA						
Ghana	155	1.3	200	1.4		
Guinea	-	-	-	-		
Sierra Leone	-	-	-	-		
Others	155	1.3	245	1.7		
Africa total	310	2.5	445	3.0		
SOUTH AND CENTRAL AMERICA						
Brazil	125	1.0	520	3.5		
Guyana	-	-	-	-		
Jamaica	-	-	-	-		
Surinam	65	0.5	60	0.4		
Venezuela	50	0.4	400	2.7		
Others	80	0.7	185	1.3		
South and central America total	320	2.6	1165	7.9		
Third World total	1180	9.6	2695	18.4		
Developed countries total	11070	90.4	11970	81.6		
Western world total	12250	100.0	14665	100.0		

Source : US Bureau of Mines

Table 15

Changes in aluminium production capacities in the Third world between the mid-70s and 1984 and 1990 (per cent).

	Mid-70s to 1984	1984 to 1990
	%	%
MINE		
Asia	- 2	+ 50
Africa	+ 37	+ 37
America	+ 4	+ 10
Total, Third world	+ 11	+ 22
Total, Western world	+ 33	+ 14
REFINERY		
Asia	+ 10	+ 243
Africa	± 0	± 0
America	+ 31	+ 27
Total, Third world	+ 25	+ 38
Total, Western world	+ 14	+ 5
SMELTER		
Asia	+ 97	na
Africa	+ 44	
America	+ 364	
Total, Third world	+ 228	
Total, Western world	+ 20	

Table 16

Investments in bauxite mining (M USD) in Third world
Projects under construction.

	1976		1977		1978		1979		1980		1981		1982		1983		1984		1985		1986		1987	
	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv
AFRICA																								
Ghana																								
Guinea																								
Others																								
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ASIA																								
India																								
Indonesia											1	2000												
Others																								
Total	0	0	0	0	0	0	0	0	0	0	1	2000	0	0	0	0	0	0	0	0	0	0	0	0
LAT AMERICA																								
Brazil	1	170	1	280	1	300	1	345																
Jamaica	1	6	1	6																				
Surinam	1	15																					1	150
Venezuela											1	500												
Others																								
Total	3	191	2	286	1	300	1	345	0	0	1	500	0	0	0	0	0	0	0	0	0	0	1	150
THIRD WORLD	3	191	2	286	1	300	1	345	0	0	2	2500	0	0	0	0	0	0	0	0	0	0	1	150
WEST WORLD	3	191	2	286	2	389	2	381	1	36	2	2500	0	0	0	0	0	0	0	0	0	0	1	150

Source: Engineering and Mining Journal Annual survey of mine and plant expansions in the Janauary issue each year.

Table 17

Investments in alumina refining (M USD) in Third world.
Projects under construction.

	1976		1977		1978		1979		1980		1981		1982		1983		1984		1985		1986		1987	
	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv
AFRICA																								
Ghana																								
Guinea																								
Others																								
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ASIA																								
India			2	441	2	450											1	190	1	190				
Indonesia			1	300	1	300							1	500	1	500	1	900	1	900				
Others					1	600	2	604																
Total	0	0	3	741	4	1350	2	604	0	0	0	0	1	500	1	500	2	1090	2	1090	0	0	0	0
LAT AMERICA																								
Brazil											1	400	1	715	1	715	1	715	1	715	1	715	1	715
Jamaica			1	200	1	200					2	850	2	850	2	850	2	950	2	950				
Surinam																								
Venezuela	1	212	1	212			1	650	1	650	1	650	1	650	1	1100								
Others							1	40	1	40	1	40												
Total	1	212	2	412	1	200	2	690	2	690	5	1940	4	2215	4	2665	3	1665	3	1665	1	715	1	715
I THIRD WORLD	1	212	5	1153	5	1550	4	1294	2	690	5	1940	5	2715	5	3165	5	2755	5	2755	1	715	1	715
I WEST WORLD	5	857	8	2328	9	3635	7	2164	6	1739	9	3719	11	5301	10	5762	9	4424	6	2925	1	715	1	715

Source: EMJ op. cit.

Table 18

Investments in aluminium smelting (M USD) in Third world.
Projects under construction.

	1976		1977		1978		1979		1980		1981		1982		1983		1984		1985		1986		1987	
	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	In	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv
AFRICA																								
Ghana			1	65																				
Guinea																								
Others	1	138	1	138							1	375												
Total	1	138	2	203	0	0	0	0	0	0	1	375	0	0	0	0	0	0	0	0	0	0	0	0
ASIA																								
India	2	279	2	279																				
Indonesia	1	1000	1	900	1	862	1	900	1	2000			1	195	1	1000	1	1000						
Others	1	50	3	466	3	626	2	513	4	1640	2	847											1	1000
Total	4	1329	6	1645	4	1488	3	1413	5	3640	2	847	1	195	1	1000	1	1000	0	0	0	0	1	1000
LAT AMERICA																								
Brazil	1	15	4	1475	3	375	3	415	1	15	3	1770	3	2770	2	2400	2	2400	2	2400	2	2400	2	2400
Jamaica																								
Surinam																								
Venezuela	1	200	1	250	2	705	2	705	2	830													1	400
Others	2	196	3	396			1	150	1	300	1	300	1	300					1	50	1	50		
Total	4	411	8	2121	5	1080	6	1270	4	1145	4	2070	4	3070	2	2400	2	2400	3	2450	3	2450	3	2800
I THIRD WORLD	9	1878	16	3969	9	2568	9	2683	9	4785	7	3292	5	3265	3	3400	3	3400	3	2450	3	2450	4	3800
I WEST WORLD	19	3324	26	5968	19	3885	13	3420	19	7774	21	7563	16	7411	9	5939	10	6543	9	7158	8	6700	7	5001

Source: EMJ op. cit.

Table 19

Investments in aluminium complexes (M USD) in Third world.

Aluminium complex = at least two of the stages in the process of mining - smelting - refining.
Projects under construction.

	1976		1977		1978		1979		1980		1981		1982		1983		1984		1985		1986		1987	
	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv
■ AFRICA																								
Ghana															1	1000	1	1000						
Guinea							1	385	2	1385	1	1000												
Others			1	375	1	375	1	375	1	375														
Total	0	0	1	375	1	375	2	760	3	1760	1	1000	0	0	1	1000	1	1000	0	0	0	0	0	0
■ ASIA																								
India									1	3									1	2100	1	2100	1	2100
Indonesia																								
Philippines																								
Others																								
Total	0	0	0	0	0	3	0	0	1	3	0	0	0	0	0	0	0	0	1	2100	1	2100	1	2100
■ LAT AMERICA																								
Brazil					2	3090	1	90	1	100			1	1200	1	1500	1	1500						
Guyana																								
Jamaica											1	150	1	150	1	150	1	150	1	150				
Surinam																								
Venezuela			1	540																				
Others	1	400																						
Total	1	400	1	540	2	3090	1	90	1	100	1	150	2	1350	2	1650	2	1650	1	150	0	0	0	0
■ OCEANIA																								
Others																								
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I THIRD WORLD	1	400	2	915	3	3465	3	850	5	1863	2	1150	2	1350	3	2650	3	2650	2	2250	1	2100	1	2100
I WEST WORLD	2	840	3	1355	5	4205	5	1750	6	2163	2	1150	2	1350	3	2650	3	2650	2	2250	1	2100	1	2100

Source: EMJ op. cit.

Table 20

Investments in aluminium (M USD) in Third world. Mining, smelting and refining.
Projects under construction.

	1976		1977		1978		1979		1980		1981		1982		1983		1984		1985		1986		1987	
	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv	No	Inv
AFRICA																								
Ghana			1	65											1	1000	1	1000						
Guinea							1	385	2	1385	1	1000												
Others	1	138	2	513	1	375	1	375	1	375	1	375												
Total	1	138	3	578	1	375	2	760	3	1760	2	1375	0	0	1	1000	1	1000	0	0	0	0	0	0
ASIA																								
India	2	279	4	720	2	450			1	3							1	190	2	2290	1	2100	1	2100
Indonesia	1	1000	2	1200	2	1162	1	900	1	2000	1	2000	2	695	2	1500	2	1900	1	900				
Others	1	50	3	466	4	1226	4	1117	4	1640	2	847											1	1000
Total	4	1329	9	2386	8	2838	5	2017	6	3643	3	2847	2	695	2	1500	3	2090	3	3190	1	2100	2	3100
LAT AMERICA																								
Brazil	2	185	5	1755	6	3765	5	850	2	115	4	2170	5	4685	4	4615	4	4615	3	3115	3	3115	3	3115
Jamaica	1	6	2	206	1	200					3	1000	3	1000	3	1000	3	1100	3	1100				
Surinam	1	15																					1	150
Venezuela	2	412	3	1002	2	705	3	1355	3	1480	2	1150	1	650	1	1100							1	400
Others	3	596	3	396			2	190	2	340	2	340	1	300					1	50	1	50		
Total	9	1214	13	3359	9	4670	10	2395	7	1935	11	4660	10	6635	8	6715	7	5715	7	4265	4	3165	5	3665
I THIRD WORLD	14	2681	25	6323	18	7883	17	5172	16	7338	16	8882	12	7330	11	9215	11	8805	10	7455	5	5265	7	6765
I WEST WORLD	29	5212	39	9937	35	12114	27	7715	32	11712	34	14932	29	14062	22	14351	22	13617	17	12333	10	9515	10	7966

Source: EMJ op. cit.

Table 21

FINANCIAL SITUATION OF SELECTED METALS PRODUCERS IN THE DEVELOPED COUNTRIES (31st of December, current MUSD)[1/]

		1979			1983		
	Number of producers	LTD	Equity	Ratio	LTD	Equity	Ratio
USA	11	2337	6937	0.34	3006	7857	0.38
Canada	19	2596	6476	0.40	5180	7978	0.65
Europe	9	2193	3246	0.68	4486	5536	0.81
South Africa	9	1742	1907	0.91	1759	4123	0.43
Australia	10	4003	9227	0.43	3944	8552	0.46
Japan	3	1324	417	3.18	1595	646	2.34
Total	61	14195	28210	0.50	19970	34692	0.58

Source: M. Haug: Impact of International lending on metals, May 14th 1986, Arden House.

Note 1/ Aluminium producers excluded in all countries in South Africa also precious metals producers excluded.

Table 22

Financing pattern for a selected group of metals projects
1984 and 1985
(MUSD current values) 1/

	Equity	%	Gold loan	%	Official debt	%	Export credit	%	Commercial debt	%	Debt/Equity ratio
Gold	930	56	90	6	190	12	-	0	420	26	0.75
Others	300	15	-	0	600	31	400	21	650	33	5.5
Total	1230		90		790		400		1070		1.9

1/ M. Haug: Impact of international lending on metals, Arden House, 14 May 1986.

Table 23

Financing of major recent copper projects

Project	Capacity (kt)	Total inv. (GUSD)	Financing (MUSD) Bank	Exp. cred.	Int.ag.	Gov.	Eq/Int.
Ok Tedi	50	1.4 - 2.0	470	485	-	-	256
Gecamines	-	0.7	36	-	250		417
Escondida	250-325	1.1 - 1.5	350	400			450
Cerro Verde	25-80	0.03-0.16	130				
Olympic Dam	55	0.8					
Cerro Colorado	65	0.24	115	35	-	30	60
ZCCM TL3	35	0.25	130	65	55	-	-
Total 1/	455-530	4.5 - 5.5	1231	985	305	30	1183
			33%	27%	8%	1%	31%

Total Debt/Equity ratio: 2.05

1/ Cerro Verde not included in total.

Table 24

FINANCIAL SITUATION OF THE MAJOR COPPER PRODUCING COMPANIES IN THE THIRD WORLD (31st of December, current MUSD)[1/]

Company	1975 LTD[2/]	1975 Equity	1975 Ratio	1980 LTD	1980 Equity	1980 Ratio	1985 LTD	1985 Equity	1985 Ratio
Codelco	167	1197	0.14	52	1487	0.03	341	2134	0.16
Bougainville	139	374	0.37	40	906	0.04	52	581	0.09
SPCC	373	301	1.24	215[3/]	499	0.43	5	459	0.01
Gecamines	45	519	0.06	268	782	0.34	133	1440[4/]	0.09
ZCCM	270	941[5/]	0.29	205	1380[6/]	0.15	437	1245	0.35
TOTAL	994	3332	0.30	780	5054	0.15	968	5859	0.17

Source: Annual reports except otherwise stated

Notes: 1/ The fiscal years of ZCCM ends at 31st of March all ctners at 31st of December.

2/ Long Term Debt

3/ Mining International Yearbook 1983

4/ World Bank estimate

5/ 1977 figure, RCM and NCCM values are added

6/ RCM and NCCM values are added

Table 25

Financial situation of major aluminium companies

As at December 31. Current M USD (unless otherwise stated).

Company	1975			1980			1985		
	LTD	Equity	Ratio	LTD	Equity	Ratio	LTD	Equity	Ratio
Alcan	971	1 128	0.86	910	2 463	0.37	1 600	2 746	0.58
Alcoa	1 254	1 575	0.80	1 018	2 934	0.35	1 554	3 310	0.47
Kaiser	727	797	0.91	721	1 580	0.46	1 236	1 123	1.10
Reynolds	742	831	0.89	736	1 348	0.55	1 153	1 152	1.00
Alusuisse	3 210*	2 398*	1.34	3 016*	2 917*	1.03	1 830	917	2.00
Pechiney	1 474	1 483	0.99	2 032	1 959	1.04	1 319	1 293	1.02
Comalco	114	134	0.85	120	570	0.21	606	670	0.90
Total	5 282 •	5 948•	0.89•	5 537•	10 854•	0.51•	9 298	11 211	0.83

LTD = long-term debt. * = Swiss Francs. • = except Alusuisse

Table 26

SOURCES OF FINANCING FOR 27 MAJOR METALS PROJECTS 1968-1986
(MUSD current values)

			Debt											
Period	Equity	%	Local	%	IBRD/ IFC	%	Other Official	%	Commercial Bank	%	Suppliers Credits	%	Total	%
1968-74	638	38	10	1	253	15	120	7	442	26	223	13	1,686	100
1975-79	1,300	43	350	11	371	12	347	11	570	19	107	4	3045	100
1980-85	2,370	37	1,111	17	508	8	942	15	936	15	531	8	6,398	100
Total	4,308	39	1,471	13	1,132	10	1,409	13	1,948	18	861	8	11,129	100

Source: M Haug, op. cit.

Table 27

COMMITMENTS BY MINERAL

World Bank commitments by mineral 1975-1985

	Number of commitments	World Bank MUSD current values
Copper	5	255
Aluminium	1	98
Industrial minerals	9	104.1
Iron ore	4	387
Base metals	5	120.4
Total	24	964,5

Source: World Bank Annual Reports 1975-1985

World Bank Group commitments by mineral 1968-1986

Copper	8
Iron ore	5
Nickel	5
Bauxite/aluminium	4
Lead, zinc	3
Cobalt	1
Lithium	1

Source: M Haug op cit.

Table 28

MINING INVESTMENTS BY PUBLIC INTERNATIONAL AGENCIES

International Finance Corporation

IFC investments in the non-fuel minerals sector 1957-1985 (MUSD)[1/]

	1957-1978	1979-1985	Total	% of total IFC
Number of commitments	13	20	33	na
IFC gross	179	380	559	10.8
IFC net	116	215	331	10.2
Syndications	na	na	228	11.7
IFC equity	12	20	32	6.2
Total project cost	1599	1725	3324	15

Note 1 Current values

Table 29

IFC commitments by region 1957-1985 (MUSD current values)

	Number of commitments	Total cost	IFC gross	IFC net	IFC eq
Latin America	18	1525	288	139	10
Asia	7	877	103	68	14
Europe Middle East	1	85	11	11	3
Africa	7	837	157	113	5

Table 30

IFC commitments by mineral 1957-1985 (MUSD current values)

	Number of commitments	Total cost	IFC gross	IFC net	IFC eq
Copper	9	1569	130	105	13
Nickel	7	449	93	39	4
Iron and ferroalloys	5	328	94	52	85
Bauxite	1	330	15	15	0
Precious metals diamond	5	432	186	79	2
Zinc, tin	3	100	25	25	5
Others	3	116	16	16	3

Source: IFC Annual Reports

Table 31

MAIN MINERAL EXPORTS COVERED BY SYSMIN

Mineral	Producer	Dependence threshold average 1972-76 (%)	EEC share of exports (%)
Copper	Zambia	91	60
	Zaire	55	91
	PNG	52	40
Phosphates	Togo	59	92
	Senegal	18	54
Bauxite	Guinea	90	34
Alumina	Jamaica	67	19
	Surinam	70	29
	Guyana	40	9
Manganese	Gabon	15	32
Iron ore	Liberia	69	74
	Mauritania	71	75
Tin	Rwanda	13	

Source: The Courier No 58, 1979

Table 32

MAJOR MINERAL PROJECTS WITH JAPANESE PARTICIPATION

	Total investment MUSD	Equity MUSD	Japanese share of Equity %	Loan MUSD	Supplier' credits MUSD	Production %
Copper						
Ertsberg	na	na	13	24	-	65
Bougainville	406	na	10	30	20.3	50
Lornex	na	na	20	26.5	-	50
Mamut	122	na	100	88.5	14.3	100
Musoshi	194	6.0	100	143.6	44.0	100
Gunpowder	26	na	na	4.1	-	na
Toledo	33	0.6	na	17.6	14.3	na
Katanga	na	na	na	24.0	-	na
Qaleh Zari	na	na	na	7.3	-	na
Bauxite, alumina, aluminium						
New Zealand Aluminium Smelters	na	na	41	na	na	100kt Al
Venalum	na	na	20	na	na	58
Asahan	na	na	75	1700		100
Boyne	na	na	50	na	na	50
Albras	na	na	49	112		50
Worsley	na	na	10	na	na	100
Alunorte	700	63	39	97	-	na

Source:

Engineering and Mining Journal, October 1984

Japan's develop-for-import policy, TE Kolenda, Resources Policy, December 1984

Mining Journal 87 02 07

Table 33

THE EXIM BANK AND JAPANESE FOREIGN INVESTMENTS IN NATURAL RESOURCES

EXIM bank loans by type 1951-1980 (million current yen)

	Number of loans	Value of loans	
Loans to domestic corporations	13470	9797109	81%
Export suppliers' credits	9697	6385229	53%
Technical service credits	31	47665	0.4%
Import credits			
Natural resources	585	1345185	11%
Manufactured goods	113	513812	4%
Overseas investment			
Investment credits	2987	1294349	11%
Project loans	57	210969	2%
Loans to foreign governments and corporations	560	2352309	19%

Source; Japan's largest finacier of multinationalism, T Ozawa, Journal of World Trade Law Vol 20 No 6.

Table 34

Estimated proportions of EXIM bank's finance in Japan's overseas investment (%)

Period	Metals	Mineral/energy
1951-67	28.8	42.2 - 64.9[1]
1968-73	13.1	47.2 -104.8
1974-80	7.0	45.3 -147.8

Notes:

1. Lower figure includes only investment credits and project loans while higher figure includes all resources development related loans

Source: Ozawa op cit.

Table 35

EXIM BANK'S FINANCING OF OVERSEAS RESOURCE DEVELOPMENT PROJECTS 1950-1980 (million current yen)

Period	Export finance Goa formula	Import finance Loan and import	Investment Develop and import	Direct[1] loans	Total
1950-56	2300 85%	100 4%	300 11%	-	2700 14%[2]
1957-67	17800 18%	16500 16%	67900 66%	-	102200 6%
1968-73	114700 16%	288400 39%	330400 45%	-	733500 23%
1974-80	154300 7%	1040100 49%	527500 25%	389600 19%	2111400 30%

Source: T Ozawa op. cit.

Notes: 1. Direct loans to foreign governments
2. Percentage of Bank's total finance in all areas.

Appendix 1

Financing of major investments in copper production in the late 1980s

OK TEDI

Project

Final level of production to be reached in the early 1990s 50-60 kt of copper in concentrates. Copper production in 1987 10 kt and 15 kt in 1988. Originally much higher levels, 370 kt copper 1990.

Ownership

Broken Hill Pty	30%	Metallgesellschaft	7.5%
Standard Oil (Indiana)	30%	Degussa	7.5%
Papua New Guinea State	20%	Entwicklungsgesell.	5 %

Debt/Equity ratio

Original 2.3, equity 256 MUSD long term debt 599 MUSD.
In 1986 debt was rescheduled from 750 to 461 M Kina and D/E ratio is reportedly restored to the original level.

Loans

Bank loans	150 MUSD	Consortium led by Citicorp International
	50 MUSD	US Overseas Private Investment Corp.
	102 MUSD	Bank of America
	100 MUSD	Kreditanstalt für Wiederaufbau
	68 MUSD	Source not known
	470 MUSD	
Export credits	242 MUSD	Australia Export Finance (EFIC)
	100 MUSD	UK Exports Credit (ECGD)
	55 MUSD	Oesterreichische Kontrollbank (OKB)
	88 MUSD	Export Development Corp. of Canada (EDC)
	485 MUSD	
Total	955 MUSD	

Total investment

1.4 - 2.0 GUSD (billion)

GECAMINES

Project

Maintain production capacity at present level - 470 kt/year.

Ownership

Zaire State 100%

Debt/Equity ratio

Original 0.69 the debt can be increased to 1.0 as cost increases.
Internal funds in local currency 267 MUSD and 151 MUSD in foreign exchange.

Financing

International agencies		
	110 MUSD	IBRD
	65 MUSD	African Development Bank (ADB)
	27 MUSD	SYSMIN
	48 MUSD	European Investment Bank
	250 MUSD	
Bank loans	29 MUSD	Caisse Centrale de Coopération Economique
	7 MUSD	Italian source
	36 MUSD	
Total	286 MUSD	

Total investment

703 MUSD of which 267 in local currency (38%).

Comment

The project should start in 1987 and continue into 1991.

CERRO COLORADO

Project

Production of 65 kt of copper in concentrates per annum for 14 years.

Ownership

Rio Algom (RTZ)	75%
Outokumpu	25%

Debt/Equity ratio

3.0. Equity from Rio Algom 45 MUSD and from Outokumpu 15 MUSD.

Financing

Bank loans	80 MUSD	Kreditanstalt für Wiederaufbau, in exchange for 2/3 of production to Norddeutsche Affinerie
	35 MUSD	VTL, Finnish Government agency in exchange for 1/3 of production to Outokumpu (state-owned)
	115 MUSD	
Export credits	35 MUSD	UK Exports credit (ECGD)
Government assistance	30 MUSD	Chilean Industrial Development Co. (CORFO)
Total	180 MUSD	

Total investment

240 MUSD

Comment

The whole package was turned down and the project postponed in April 1986 when the Finnish group withdraw after political pressure not to invest in Chile. Original start-up 1986. Rio Algom is sole owner in 1987.

ESCONDIDA

Project

Production of 250-300 kt copper in concentrates with start up in 1989.

Ownership

Broken Hill Pty	60%	
Rio Tinto Zinc	30%	
Japan Escondida Corp.	10%	Mitsubishi 60%, Mitsubishi Metal 10%, Nippon Mining 10%.

It is reported that IFC will take a 5% equity share from Broken Hill (Utah).

Debt/Equity ratio

1.67. Equity financing will be between 400-450 MUSD of which half is direct equity and the rest non-registered equity, in the form of subordinated debt provided by banks but funded by deposits from equity holders.

Financing

RTZ has paid 48 MUSD for its equity stake.

Total investment

1.1 GUSD - 1.5 GUSD (billion). In late 1986 1.2 GUSD.

Comment

Financial package has been announced for late 1986 or early 1987 but negotiations are not yet finished.

It has been reported that apart from equity financing most of the necessary capital will be raised from customers willing to contract for deliveries of two thirds of the concentrate production. A group of Japanese smelters supported by the EXIM bank (350 MUSD), the Finnish state-owned company Outokumpu (40 MUSD), and the German Norddeutsche Affinerie in cooperation with KFW. The participants are largely the same as in the Rio Tinto Zinc Cerro Colorado project which was turned down in 1986.

CERRO VERDE II

Project

25 kt/annum copper in concentrates (A) or
80 kt/annum copper in concentrates (B)

Debt/Equity ratio

not known

Financing

Bank loans (B)	130 MUSD	Syndicate led by Toronto Dominion Bank, Canadian International Development Agency has been involved.

Total investment

A 33 MUSD
B 157 MUSD

Ownership

Minero Peru 100% (Peruvian State 100%).

Comment

The project originally called for an investment of 298 MUSD with British banks, Balfour Beatty and Lazard Brothers, to finance 130 MUSD, Marubeni and Mitsui 130 MUSD, Canada's Export Development Corp. (EDC) and the US Export-Import Bank were also involved. Production was aimed at 55 kt copper in concentrates. The two new options were presented by Kaiser Engineers (A) and Wright Engineers (B). Start up in 1988 when decided in 1985. In late 1985 the Peruvian Government finally decided to stop the entire project, due to problems to secure funding and to the depressed copper price.

OLYMPIC DAM

Project

Production of 55 kt copper in 1988.

Ownership

BP Group	49%
Western Mining Corp.	51%

Debt/Equity ratio

not available.

Financing

BP has agreed to cover all costs for the project without getting any equity. So far BP has contributed 11.6 MUSD.

Total investment

800 MUSD.

ZCCM

Project

Tailings leach plant (TL3).
35 kt copper/year. Total production 550 kt copper during 15 years.

Ownership

Zambian State	60%
Anglo American	27%
RST International	7%
Public	5%

Debt/Equity ratio

The project was planned in the early 1980s and was entirely financed by external debt. The D/E ratio of ZCCM was supposed to raise to 0.30 - 0.35.

Financing

International agencies		
	30 MUSD	International Finance Corporation
	25 MUSD	European Investment Bank
	55 MUSD	
Bank loans	25 MUSD	Standard Chartered Bank
	30 MUSD	Overseas private Investment Corp. (OPIC)
	30 MUSD	Commonwealth Development Corporation
	85 MUSD	
Export credits	65 MUSD	ECGD, Standard Charter Merchant Bank
Total	205 MUSD	

40 million Zambian Kwacha was borrowed from a consortium of Zambian banks.

Total investment

250 MUSD of which 45 in local currency (18%).

Comments

The project should have been completed in 1985 but was delayed until August 1986. Rescheduling of the loans was made in late 1986. The European Investment Bank made another loan to ZCCM of 23 MUSD in 1986.

Conclusions on financing of major copper projects

- The major projects planned but not yet finalized require at least 2170-2700 MUSD.

- One major problem is the funding of the necessary equity. For example in the case of Ok Tedi the PNG Government obtained a loan from the European Investment Bank of 12 MECU to finance its raised equity in the rescheduling of the Ok Tedi financing package.

- The LTD/Equity ratio of the projects is high, 2.05. Compared to the base metals projects of 1984 and 1985 with a LTD/Equity ratio of 5.5 the copper projects are economically more viable.

- When the financing structure of the copper projects is compared to the overall financing structure of all projects with participation from the World Bank Group it is obvious that the international public agencies play a less important role in copper than in general. Export credits seem to be used to a greater extent in the case of copper, but local financing has not been as easily available.

Appendix 2

South American aluminium industry

The growth of the South American bauxite, alumina and aluminium industry is likely to continue until the end of the 1980s. There are major projects planned and underway in Venezuela, Brazil and Surinam. Bauxite capacity is projected to reach 17 Mt/year in 1990 and the smelter capacity could exceed 2 Mt annually.

Venezuela

The aluminium industry of Venezuela was originally set up in the late 1960s to use the cheap electric power available. When the Pijiguaos bauxite mine is opened in 1988 the local industry will comprise the complete production chain from bauxite to extrution and foil plants. The most important companies are:

- CVG Bauxita Venezolana CA (Bauxiven)
- Interamericana de Alumina CA (Interalumina)
- Aluminio del Caroni SA (Alcasa)
- Venezolana de Aluminio CA (Venalum)
- Alusur

The industry is almost completely state-controlled through the state-owned Corporación Venezolana de Guyana (CVG) and the Venezuelan Investment Fund, Fondo de Inversiones de Venezuela (FIV). It is only in the newly formed Alusur, which the Government do not have a majority share. Foreign minority interests are established in all companies except Bauxiven. Also in this respect Alusur is an exception in that the Austrian interest control as much as 40 per cent of the shares. See Table A2:1.

The Pijiguaos bauxite project close to the Colombian and Brazilian borders expects to start mining 1 Mt annually in 1988 and reach its design capacity of 3 Mt in 1990. The 360 MUSD project is partly financed by a loan from the IADB.

Interalumina started producing alumina in 1984. It reached its installed capacity in the same year and plans to invest 300 MUSD to increase capacity from 1 Mt to 1.3 Mt/year. No details of how this project will be financed are known.

Alcasa plans to invest 421 MUSD to construct a new potline and increase capacity to 280 kt/year [1/]. A capacity expansion is also planned for the Venalum smelter in Ciudad Guyana, which would add 140 kt and double its present capacity. The estimated total investment is slightly less than 600 MUSD. This project is not yet finalized but will, according to company sources, be financed together with the Alcasa expansion. One third will be funded by FIV and/or CVG, one third by the companies themselves and one third by foreign

---

1/ Engineering and Mining Journal, May 1986

capital 2/. Considering the strong balance sheet, which, according to the Venalum president, it is one of the best in the industry, with long-term debt of 72 MUSD in foreign currency and 600 M in local bolivars (approximately 80 MUSD) and a LTD/E ratio of 0.88, it should be possible to attract the foreign loans which are planned 3/. Compare Table 25. Banque Indosuez of France has already granted a 110 MUSD loan guaranteed by the French export credit agency 4/. Reynolds has invested between 13-15 MUSD as its share of the project 5/. Local banks have supplied loans amounting to 520 M bolivars (70 MUSD) 6/. CVG hopes to include counter trade agreements when seeking further financing.

A project to construct a new aluminium smelter has also been started. It is the Alusur venture which will invest 300 MUSD in a smelter to be completed in 1989. If all these plans are realized, Venezuela will become one of the most important aluminium producers with a total capacity of 1 Mt towards the end of the century.

Surinam

Surinam derives approximately 80 per cent of its foreign exchange earnings from the aluminium industry.

A 150 MUSD programme to reconstruct and rehabilitate the industry by the early 1990s, without adding new capacity, has been announced. The financing is to be supplied by the two transnational mining companies which are active in the aluminium industry of the country: Alcoa and Billiton with 85 and 65 MUSD respectively. To attract this investment the Government has agreed to temporarily suspend its bauxite levy. The Government hopes to offset this loss by several measures as a countertrade bauxite deal with Czechoslovakia 7/.

Brazil

In Brazil the joint Japanese-Brazilian Alunorte alumina project is encountering severe problems. It was originally intended to start production with 0.8 Mt/year in 1988 but the Japanese withdrew in early 1987. The Japanese consortium, Nippon Amazon Aluminium Co Ltd (NAAC), which is owned by 32 private companies and the state-owned Japan's Overseas Economic Cooperation Fund had a 39 per cent share in Alunorte together with CVRD which held the remainder. NAAC had invested 63 MUSD and lent 97 MUSD to the project 8/. CVRD is at present looking for new partners to continue the project. NAAC keeps its interest in the Albras aluminium plant. As another example of financing in this branch of industry the Alumar alumina and aluminium complex

---

2/ Mining Journal 16-05-86
3/ Mining Magazine, December 1986
4/ Mining Journal 24-10-86
5/ Mining Journal 21-03-86
6/ Mining Journal 11-07-86
7/ Mining Journal 31-10-86
8/ Mining Journal 07-02-87.

could be mentioned. It is owned by Alcoa 60 per cent and Shell 40 per cent. It is the largest private investment in Brazil and started production in 1984. Capacity is 200 kt alumina and 30-40 kt of aluminium in the present stage. Total investment cost 1.2 (billion) GUSD 9/. Of this amount 450 MUSD was supplied by a consortium of 15 banks led by Lloyds Bank International. The loan was guaranteed by Royal Dutch/Shell 10/.

Jamaica

Jamaica has been trying to establish a South-South joint venture to exploit its bauxite reserves together with Colombia. A protocol was signed in September 1984 to construct a jointly owned smelter in Colombia, fuelled by Colombian coal and supplied with bauxite from Jamaica. The 140 kt smelter should have come on stream in 1990. In 1986 it was reported that the Jamaican Government had dropped the project due to slow progress 11/.

9/ Engineering and Mining Journal, September 1984
10/ Chemical Week 24-03-82
11/ Mining Journal 10-01-86.

Table A2:1

OWNERSHIP STRUCTURE OF THE VENEZUELAN ALUMINIUM INDUSTRY (%)

Company	State CVG [1]	FIV [2]	Local private	Foreign private
Bauxiven	55	45	-	-
Interalumina	4	92	-	Alusuisse 4
Venalum	19	61	-	Japanese [3] 20
Alcasa	8	77	-	Reynolds 15
Alusur	20	-	Sural [4] 40	Austria Metall 40

[1] Corporación Venezolana de Guyana

[2] Fondo de Inversiones de Venezuela

[3] Consortium with

Showa Aluminium	7%
Kobe Steel Ltd	4%
Sumitomo Aluminium Smelting Co. Ltd.	4%
Mitsubishi Metal Corporation	2%
Ryoka Light Metal Industries	2%
Marubeni Corporation	1%

[4] Suramericana de Aluminio.

Table A2:2

PIJIGUAOS

Project

Bauxite mine with 1 Mt production in 1988 expansion to 3 Mt in 1990.

Ownership

Corporación Venezolana de Guyana (CVG)	55% state-owned
Fondo de Inversiones de Venezuela (FIV)	45% state-owned

Debt/Equity ratio: 1.48

Financing

International Agencies		
	108 MUSD	Inter-American Development Bank
Bank loans	94 MUSD	FIV
	9 MUSD	Local loans
	211 MUSD	
Suppliers' credits		
	4 MUSD	
Equity	145 MUSD	59 MUSD from CVG, 86 MUSD from FIV
Total	360 MUSD	

Total investment

360 MUSD

Comment

The above figures were supplied by the IADB. In the April 1986 issue of Engineering and Mining Journal the following figures were reported: total cost 462 MUSD, CVG equity 85 MUSD, FIV equity 72 MUSD, internally generated 9 MUSD and 296 MUSD debt. D/E ratio 1.88.

Table A2:3

BIDCO- GUYMINE

Project

Technical assistance to propose a full scale rehabilitation project, submitted to the IDA in 1986.

Ownership

The Bauxite Industry Development Company (BIDCO) is wholly state-owned. It has four operating subsidiaries, one of which is Guyana Mining Enterprise Ltd (Guymine). Guymine operates three mines and plants.

Financing

Guymine had some very difficult years in the early 1980s. Cash operating losses were high and the Central Bank of Guyana gave equity contributions to Guymine equal to 144 MUSD between 1982 and 1986. To operate the company until 1988 it is projected that 26 MUSD will be needed.

International agencies		
	7 MUSD	IDA
	5 MUSD	EEC funds
	12 MUSD	
Suppliers' credit		
	10 MUSD	
Equity	4 MUSD	Government

Total investment

A comprehensive rehabilitation programme will cost approximately 90 MUSD. Funding has not yet been discussed but the EEC has some of the Sysmin funds still available and further financing could be discussed with the World Bank group.