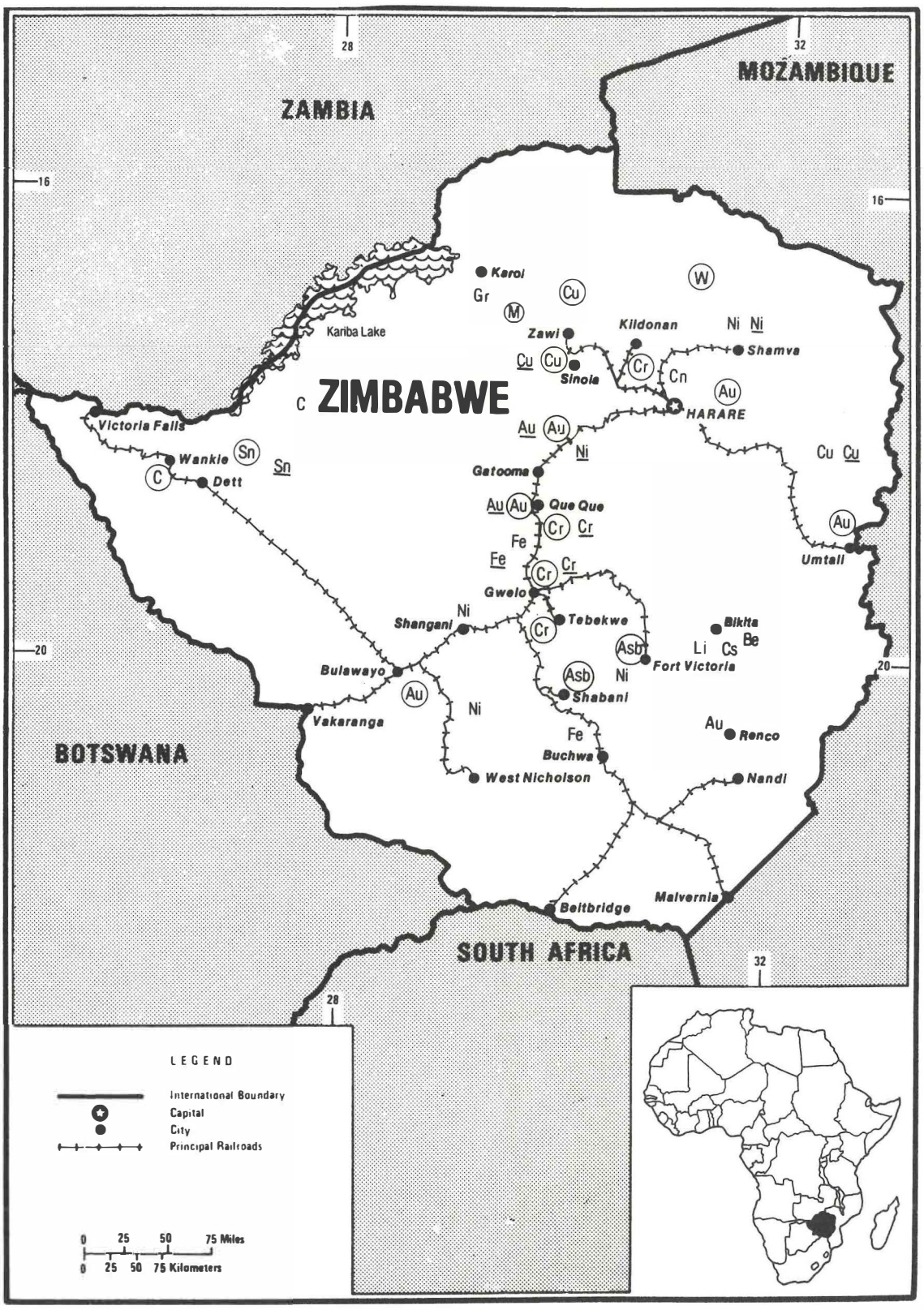
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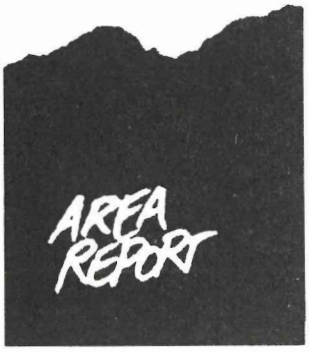

The non-ferrous metal industry in Zimbabwe

By Paul Jourdan

In the second article in our series on the mineral economies of the SADCC countries Paul Jourdan looks at Zimbabwe.

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Overview

Mining has long been an important industry in Zimbabwe. First mention of gold from the east coast of Africa is made by tenth century Arab geographers. In the sixteenth century the Portugese traded gold from the mines of the Monomatapas in present day Zimbabwe. Most gold and copper mines opened this century have been based on ancient mine sites. Over 1 000 ancient gold workings, 133 copper workings, four gold and copper workings and one copper and tin working have been found while iron ore has been mined and smelted in numerous locations over the last two millenia.[1]

European subjugation of the country late last century was not undertaken by Britain, but by a mining company, Cecil John Rhodes' British South Africa Company, in search of the fabled mineral riches of the Great Monomatapas, thought then to be on the scale of the Witwatersrand gold reefs of South Africa. Deposits of this scale were not discovered but a wide range of smaller mineral occurrences have been found over the years.

Today Zimbabwe mines a wide variety of minerals. The total value of mineral production in 1984 was 546.5 million Zimbabwean dollars (M ZWD) (363.8 M USD) excluding the value of ferrochrome, pig iron, steel, cement, ceramics and coke. In the same year the principal minerals produced, by value, were gold, asbestos, nickel, coal, copper, chromite, tin and iron ore, in that order.

Mineral exports in 1983 totalled 392.9 M ZWD representing 79.5 per cent of mineral production. Mineral exports as a percentage of total exports peaked in 1980 at 52 per cent, then fell to 31 per cent in 1982, before recovering slightly in 1983 at 37 per cent. The principal foreign exchange earners in 1983 were ferro-chrome (10 per cent of total exports), gold (9 per cent), asbestos (6 per cent), nickel 6 per cent, pig iron and raw steel (5 per cent) and copper (3 per cent) (Tables 3 and 4). Mining and quarrying contributed 9.6 per cent of the GDP in 1975 but had fallen to 8.0 per cent by 1983, a slight increase on the low of 7.4 per cent in 1981 during the recession (Tables 3, 4 and 5).

The mining industry is largely in the hands of transnational mining companies. The most important being Anglo American Corporation of South Africa (AAC): nickel and ferrochrome, Union Carbide (UC): ferrochrome and gold, Rio Tinto-Zinc (RTZ): gold, Lonrho: gold and copper, and Turner Newall (asbestos). Since independence, state participation has been on the increase. The state has the largest share holding in coal mining (though the AAC still provides management services), the iron and steel industry (Zisco), tin mining (Kamativi) and in 1984 the newly formed state enterprise, the *Zimbabwean Mining Development Corporation* (ZMDC) bought out the Zimbabwean mining interests of Messina of South Africa giving it control over most of the national copper production. The state has also set up the *Mineral Marketing Corporation of Zimbabwe* (MMCZ) which handles all mineral and metal with the exception of gold which is bought by the Reserve Bank of Zimbabwe.

Background

Zimbabwe gained independence in 1980 after a protracted liberation struggle against a minority settler regime which had declared UDI from Britain in 1965. This period of settler government, with the sanctions that werre imposed by the UN in the seventies, produced a mining industry that developed in an essentially different way to that of other colonies. Zimbabwe was not developed purely in the interests of the colonising country as a source for raw materials and a market for manufactured goods, but also in the interests of a national bourgeoisie, albeit a minority settler one. The settlers had effective control of government

from the twenties which resulted in a type of development more similar to that of South Africa than, say, Zambia or Zaire. The imposition of sanctions also had a profound effect on the mode of development by way of forcing national self-sufficiency in a large variety of products.

These factores resulted in several strategies regarding the mining industry, both in terms of upstream and downstream development. The shortage of foreign exchange, sanctions and the land-looked position of the country provoked a downstream development of the mining industry in order to increase value and decrease weight/volume. Most of the major metals produced are reduced to their pure form: Examples are copper cathodes, nickel cathodes, ferrochrome, pure tin and iron and steel. Processing and refining of minerals was also necessary for import substitution for the metal inputs to industry as a whole (e g copper for wire and cables). Also, several minerals are mined on a small scale purely as inputs for local industry (e g pyrites for sulphur and bauxite for aluminium sulphate). On the upstream side, a wide variety of inputs to the mining industry are manufactured locally. Mining equipment such as ball mills, conveyors, rail and rolling stock, pumps, headgear, ventilation, ducting and electrical equipment are made in the country.

Another effect of sanctions was that during UDI the TNCs had difficulty in repatriating their profits which meant that surplus generated by the mining industry was often reinvested in the industry or other parts of the economy. The original capital generally came from abroad but later investment was mainly raised locally.

The mining industry by mineral

Due to depressed real prices for most minerals over the last few years, there has been little expansion in mining except for gold and tin. From 1979 to 1983 real prices have fallen 39 per cent for copper and 40 per cent for nickel. Base metal prices stabilized somewhat in 1984/85, but are expected to continue their long-term decline in 1986/87[2].

Between 1979 and 1984 copper production fell 24 per cent, nickel production fell 30 per cent, chrome ore production fell 12 per cent, asbestos output fell 36 per cent and iron ore output dropped 23 per cent. In USD terms the total value of mineral production fell by 22 per cent over the same period against an increase of 75 per cent in ZWD terms.

Low world market prices have also provoked serious financial difficulties for the mining companies concerned, which have registered substantial losses and incurred heavy debts since the world recession set in (Tables 10 A, B). Although this situation improved slightly in 1984 and 1985, future prospects are not promising. During the worst period of the recession the state stepped in by supplying loans, with an option of converting their value into equity, on the condition that production continued.

Tin prices have held up fairly well, presumably due to the fact that it has an effective producer organization, the International Tin Council (ITC), but its continued ability to maintain tin prices in the face falling demand is doubtful. Tin production has risen from 969 tons in 1979 to 1 209 tons in 1984.

The real value of gold increased 356 per cent between 1970 and 1983. Although it has fallen over the last two years the real value is still well above that of ten years ago. Consequently gold production increased 30 per cent between 1974 and 1984, but is still 17 per cent down on the 1964 output.

Gold

In the 1 200 years preceeding European colonization, it is estimated that about 4 000 ancient mines produced between 600 and 800 tons of gold " . . . with a normal production during their heyday of about 20 000 oz a year"[3] In 1979 gold replaced asbestos as Zimbabwe's most valuable mineral produced and it competes with ferro-chromium as the premier mineral export.

Gold is still produced by numerous small mines but the bulk of production comes from a few medium sized mines. In 1983 11 producers of over 300 kg/year produced 60 per cent of the total national output of 14.1 tons, while 325 producers of less than 300 kg/year contributed the other 40 per cent.[4] Due to the large number of producers involved in gold mining only the larger ones will be described here.

The state gives comprehensive aid to the small-scale gold mines by providing expertise, assaying, loans, hire of equipment, a state roasting plant and by guaranteeing a fixed gold price (500 ZWD/oz in 1985).

Gold mining contributed 25 per cent of total mining capital expenditure on fixed assets in 1982 (19 per cent in 1975, see Table 6), and employed 20 616 people in 1984 constituting 41 per cent of the total mining industry workforce.[5] The net output of gold mining in 1982 was 85.7 M ZWD or 35 per cent of the total net output of mining (Table 9). Production per worker increased from 21.8 oz in 1975 to 23.1 oz in 1984.

Rio Tinto-Zinc RLC of the UK has a local subsidiary, Rio Tinto Zimbabwe Ltd, which operates the largest gold mine, Renco, in the southeast of the country. In 1984 1.85 tons of gold were produced from 227.3 kt of ore (grade: 8.14 g/t). At the end of 1984 reserves stood at 8.4 tons contained gold, compared to 3.1 tons in 1979 when it was operating as a small-scale plant. After the fall of the settler regime in 1980, the parent company in London invested 5 M GBP in its local subsidiary and operations were expanded considerably.

Rio Tinto also owns two smaller operations: Patchway and Brompton (501 kg of gold in 1984) and Cam dump retreatment plant (75 kg of gold in

1984). Reserves at the former stood at 1.4 tons contained gold in 1984.

Lonrho Plc of the UK produced 4.5 tons of gold in Zimbabwe in 1983/84 from eight mines. Five of the gold mines are owned via its subsidiary in Zimbabwe, Independence Mining (Pvt) Ltd, with the Athens, How, Shamva, Tiger Reef and Redwing mines. It also owns another three gold mines via its South African subsidiary, Coronation Syndicate Ltd, which in turn owns Corsyn Consolidated Mines Ltd operating the Arcturus, Mazowe and Muriel gold mines and Inyati copper mine in Zimbabwe. Lonrho Zimbabwe (Pvt) Ltd is the local holding company and Homestake Mining and Technical Services (Pvt) Ltd provides financial and technical services to all of these mines.

The three gold mines of Corsyn consolidated produced 1.5 tons of gold and 1.9 tons of silver in 1984 from 244 kt of ore. Ore reserves stood at 601 kt at 10.2 g/t (6.1 tons gold) in September 1985 and the mines are expected to run for twenty more years. The five gold mines of Independence Mining have ore reserves of 2.4 Mt at 5.5 g/t (13.2 tons of gold) and an expected life of thirty years.

Redwing mine produced roughly 920 kg of gold from about 270 kt of ore in the 1984/85 financial year making it Zimbabwe's largest gold mine in terms of ore milled, but second to Renco in terms of gold produced.

The total gold production forecasts for the group are: 4.8 tons for 1984/85. 5.2 tons for 1985/86 and 5.7 tons for 1986/87. Total group employment in mining is around 7 000 and the total turnover for mining in 1984/85 was 90 M ZWD.

Group capital expenditure for mining was 21 M ZWD in the year ended September 1985 and is projected at roughly 25 M ZWD for 1985/86. Most of this capital is internally generated.

Falcon Mines Plc of the UK owns two gold mines (Dalny and Venice mines), with one under development (Golden Oriole). These mines milled 346.7 kt of ore grading 5.89 g/t (2.1 tons of gold) in the year ended 31st of March 1984. At the same time reserves stood at 1 150 kt grading 11.05 g/t (12.7 tons of contained gold).

Union Carbide Corporation of the USA has a wholly-owned local subsidiary, Union Carbide Zimbabwe (Pvt) Ltd, and it in turn has a wholly-owned gold mining subsidiary in Zimbabwe: Mopane Mines (Pvt) Ltd, which operates three mines (Lennox, Camperdown and Gaika). These mines together mill about 240 kt of ore per year, producing roughly 340 kg of gold annually. Present reserves are considered to be good for 3 to 5 more years of production.

Falconbridge Nickel Corporation of Canada has gold mining interests in Zimbabwe via its subsidiary Falconbridge Investments Zimbabwe (Pvt) Ltd, which owns Blanker Mines (1983) Pvt Ltd, which runs two gold mines (Golden Kopje and Blanket mines). Golden Kopje was aquired at the end of 1983 after having been closed for 40 years.

Norman Levin Gold Mines (Pvt) Ltd is one of the larger numerous local gold mining companies. It operates three mines (Roma, Joyce and Indarama), has one mine under development (Broomstock) and one almost exhausted mine (BD mine). Mining at Joyce has ceased but its plant still treats ore from Roma. About 2.2 M ZWD has been invested in the development of Broomstock to date and is projected to increase to 5 M ZWD. About 500 kg of gold is produced annually from all mines and reserves are secured for 20 months of production.

There are numerous other local small gold mining companies with small individual outputs but which together make a significant contribution to gold production and to employment.

All gold bullion is bought by the Reserve Bank and refined by Rand Refineries in South Africa. A project for the setting up of a local refinery is at present under consideration.

Asbestos

In 1984 Zimbabwe produced 165.3 kt of chrysotile asbestos, a fall of 41 per cent from the peak of 281.4 tons in 1976. Between 1965 and 1978 asbestos was the country's principal mineral in terms of the value of production, but fell to second place behind gold from 1979. Due to falling world demand and prices, production has fallen substantially since 1979 but picked up slightly in 1984. From 1975 to 1983 asbestos exports fell from 9.2 per cent to 6.0 per cent of total exports and production fell from 6.2 per cent to 3.7 per cent of world output (Tables 2 and 4).

Asbestos mining employed 8 212 people in 1984, 16 per cent of the total mining industry workforce. In 1982 net capital expenditure on fixed assets was 9 per cent of the total for mining, downfrom 65 per cent in 1978 (Table 6). Turnover was 17 per cent of total mining in 1982 and net output was 22 per cent of the total in the same year (Table 9). Production per worker was 27 tons in 1975 and 20 tons in 1984 (—26 per cent). The value of stocks as a proportion of production was 26 per cent in 1975 and 60 per cent in 1982 (—130 per cent).

Turner Newall Plc of the UK controls all of the country's asbestos production via its wholly-owned subsidiary Shabanie and Mashaba Mines (Pvt) Ltd, which has three mines in the south of the country (Shabanie, Gaths and King mines). All data relating to asbestos mining in fact refer to this company as it is the only operator.

Asbestos has not only suffered falling demand, caused by the world recession, but is also increasingly being substituted due to its health hazards. But over the last few years chrysotile has been recognised as being a less dangerous variety.

All production is exported by the

MMCZ via South African ports to buyers world-wide. A small proportion of production is consumed locally for the manufacture of asbestos cement products and the possibility of local asbestos spinning for the manufacture of fire-proof material is under investigation.

Copper

Copper output steadily increased until 1973 when 52 kt were produced. From then on it has declined to a low of 21.6 kt in 1983 (—58 per cent). Copper exports in 1983 stood at 24.9 kt, worth 33.7 M ZWD down 41 per cent on 1975 exports. In 1984 employment in copper mining was 4 383, 8.7 per cent of total mining. The large majority is produced by companies under the parastatal *Zimbabwe Mining Development Corporation* (ZMDC), namely *MTD* (Mangula) and *Lomagundi Smelting & Mining* (LSM), with smaller amounts coming from the Lonrho copper mine (Inyati) and as a byproduct from the AAC nickel mines (Bindura). The Alaska smelter also takes Cu-Au concentrates from gold mines (Renco-RTZ, Jena-MTD).

The Zimbabwe Mining Development Corporation took over the interests of the Messina group of South Africa in 1982. The main reason for this intervention on the part of the state appears to have been the depressed price of copper, causing Messina to want to shut down some of the poorer mines or, failing that, to withdraw completely.

The aquired copper interests fall under two local companies: MTD-Mangula (ZMDC: 55 per cent) and LSM (ZMDC: 65 per cent). The MTD mines are Miriam and Norah and the LSM ones are Angwa and Shakleton. The Alaska smelter and refinery come under MTD. All the mines are in the centre-north part of the country in the Lomagundi district near Chinhoyi.

The original investment in the fifties was about 10 M GBP mainly from South Africa with small amounts from the UK and local sources. Later investment (5 M ZWD for the refinery in 1980) was locally generated.

The total cathode copper production of the group was 18 536 t for the year ended 30 September 1984. Sales of gold and silver were 258 kg and for the same period 25 540 kg of copper slimes which also contain platinum, palladium and selenium. These are air-freighted to Johnson Matthey in the UK. Separation of the precious metals was attempted at the refinery but the revovery was significantly lower than the content paid for by Johnson Matthey. The possibility of sending the slimes to Zambia where some of these metals are presently recovered by ZCCM does not appear to have been considered.

The initial reserves of contained copper were as follows:

- Miriam (1957) 156 kt, Norah (1974) 24 kt
- Shakleton, 25 kt, Angwa 9 kt

In 1984 reserves were 192 kt contained copper for all four mines, which amounts to 12 years at present production and prices.

MTD employs 2 220 people on their mines and 680 at the Alaska smelter and refinery, while LSM employs 820 on their mines giving a total for the group of 3 720. The overall skilled to unskilled ratio for the mining operations is 1:10.

MTD is in the process of considering a new mine, Copper Queen, 90 km west-south-west of Alaska. The ore grades at 1.3 per cent Cu, 1 per cent Pb and 3.4 per cent Zn, with significant amounts of silver. Geological reserves stand at 8 Mt of sulphide ore and the cost of bringing the mine into production is estimated at 32 M ZWD, with a three year lead time. This would make the country self-sufficient in lead and zinc, which are presently imported from Kabwe in Zambia. As yet, no final decision has been taken on whether to go ahead with the project. The main problems appear to be the complex mineralogy and raising the capital.

Lonrho Plc owns a small copper mine, smelter and refinery via Corsyn Consolidated Mines in Zimbabwe, which is in turn owned by their subsidiary Coronation Syndicate incorporated in South Africa. The mine, Inyati, is situated in the eastern part of the country near Rusape. In the year ended 30 September 1984 the mine produced 2 885 t Cu, 1 652 kg Ag and 66 kg Au from 111 kt ore milled, and made an operating loss of 710 000 ZAR. In the same year reserves stood at 0.41 Mt at 2.86 per cent Cu after the cut-off grade had been increased from 1 per cent to 2 per cent due to depressed copper prices, which gives about 4 more years of operation at present production rates.

Negotiations are underway for the Inyati refinery to take on the Cu concentrate output of the Edmundian mine in Mocambique (approximately 300 t contained Cu/year).

Anglo American Corporation of South Africa (AAC) controls the Bindura Nickel Corporation, which produces a small amount of copper at their nickel smelter and refinery, BSR, at Bindura. In 1984 989 t of cathode copper were produced as a byproduct from 2.6 Mt of nickel ore milled.

All copper and Cu slimes are marketed by the MMCZ. The price is "LME related" and selling is done mainly through agents in the OECD countries, though some copper is sold direct to end users. A very small quantity is sold on the LME. The cathodes are railed to the South African ports of Durban and Port Elizabeth (a small amount goes through the Mozambican ports of Beira and Maputo), from there they are shipped to Europe and Japan.

About 2 500 t/year of cathode copper is consumed locally by Cafca (wire and cables) and various Cu alloy foundries.

Nickel

In 1983 nickel was the third mineral both in terms of production and exports (Tables 1 and 3). In that year 16 237 t of

nickel were exported valued at 67.8 M ZWD and 10 130 t were produced, the difference presumably being made up of held over stocks. Exports stood at 3.6 per cent of total exports in 1975, and rose to 5.9 per cent in 1983 (Table 4). Production was 1.6 per cent of world output in 1983.

Nickel mining employed 4 619 people in 1984. 9 per cent of the total mining labour force and turnover was 9 per cent of the total for mining in 1982 (Table 9). Production per employee was 1.7 t in 1980 and 2.3 t in 1984 (—35 per cent).

Rio Tinto-Zinc Corp Plc. Until 1982 nickel was produced by Rio Tinto Zimbabwe Ltd, but in that year the Empress Nickel Mine was shut down due to a combination of falling grades, depleted reserves and depressed prices. The operation had been making heavy losses in the years preceding the closure. The refinery at Eiffel Plats started processing Cu-Ni matte from BCL's Selebi Phikwe mine in Botswana in the second half of 1985 after having been closed for two years. The matte is refined on a toll basis at the rate of about 10 kt/year for BCL. Falconbridge Nickel of Canada have the rest contract of roughly 40 kt/year.

Anglo American Corporation of South Africa (AAC) has a majority share in Bindura Nickel Corporation (BNC) of Zimbabwe via Charter Consolidated in London and Minorco in Bermuda. BNC is managed by AAC Services of Zimbabwe.

BNC operates two nickel mines in the north-east of the country, namely, Trojan and Madziwa, and two in the south-west, Shangani and Epoch. They also operate a nickel smelter and refinery, BSR, at Bindura. In 1984 these mines produced the following tonnages of nickel in concentrates:

- Trojan, 3 922
- Shangani 3 630
- Madziwa, 1 610
- Epoch, 1 930.

This makes a total of 11 091 t from 2.59 Mt of ore milled. From this BSR produced 10 172 tons of cathode nickel, 989 tons of cathode copper and 101 tons of cobalt in cake.

At the end of 1984 proved ore reserves of contained nickel stood at: Trojan, 7.85 kt, Shangani, 4.4 kt, Madziwa, 8.4 kt, and Epoch, 7.1 kt. In the same year employment at these mines was 1 365, 970, 771 and 609 respectively. BSR employed 717 giving a total for the group of 4 663, compared to 4 871 in 1981.

The group had an accumulated loss of 9.9 M ZWD at the end of 1984 (15.4 M ZWD) carried over from 1983) and debts of 56.6 M ZWD (Tables 10 A and 10 B).

Marketing is done by the MMCZ in much the same way as for copper except that the nickel commands a premium over the LME price due to its high quality (99.98 per cent Ni).

Coal

Coal production over the last 20 years has remained fairly static between 3 and 3.5 Mt. Peak production was 3.59 Mt in 1976 after which it fell to 2.77 Mt in 1982. Production in 1984 was virtually the same as 1964 at 3.1 Mt. Coal mining employed 10 per cent of the total mining work force and coal sales of 58.3 M ZWD in 1984 were 11 per cent of total mineral production. In 1983 114 kt of coal and 135 kt of coke were exported constituting 1.4 per cent of total exports.

Wankie Colliery Company Ltd is 40 per cent owned by the state and 20 per cent by AAC of SA who still provide technical and management services. Wankie is the only coal producer at present. Nearly all coal production is for the local market (95 per cent). In 1984/85 12 per cent was consumed by the Hwange Power Station (HPS), 10 per cent was consumed within the company (7 per cent for coke production), and sales to farmers (tobacco curing) were 12.5 per cent of local standard grade sales in 1984/85. Most coke production is exported (65 per cent in 1984/85), mainly to Zambia. Coal production is scheduled to steadily increase to supply the HPS over the next few years. Sales to the power station were only 25 per cent of projected supply in 1984/85 due to an explosion in one of the furnaces. The high debt burden of the company (85.5 M ZWD, Table 10 B) is largely due to loans for the expansion to supply the HPS. 70 per cent of the loans are denominated in USD.

Byproducts from 114.8 kt of coke production for 1984/85 were: tar products 3.7 kt and benzene 841.5 m^3. Opencast reserves at Wankie in November 1983 were 216.5 Mt of thermal coal and 95.5 Mt of coking coal, while underground reserves were 330.1 Mt, giving a total of 642.1 Mt.

As low phosphorous and sulphur coal is presently imported to supply the ferro-chrome smelters, a coal deposit of this type in Sengwe is under consideration for future exploitation. Oil-from-coal projects have been considered on and off since the 1950s and are once again under investigation, as are possibilities for coal gasefication of Zimbabwe's substantial coal reserves for production of ammonia for fertilizers.

In 1983 16.6 kt of coal and 39.4 kt of coke worth 3.2 M ZWD were imported, mainly for the special needs of the metallurgical industry.

The total in situ coal reserves of Zimbabwe stand at of roughly 11.1 Gt. Reserves of opencast coal are estimated at 2.5 Gt and reserves of underground coal at 8.6 Gt. The major resource areas are:

- The Mid-Zambezi basin:
Gwai River Valley (3 675 Mt), Binga (3 604 Mt). Hwange (1 900 Mt). Gokwe (1 150 Mt)
- The Sabi-Limpopo basin:
Sabi-Lundi (379 kt) Bubye (291 kt) and Tuli (127 kt)[6].

Chromite

Chrome ore was first mined in 1906 and first exported in 1907. Production peaked in 1975 at 875.7 kt before falling to a 20 year low of 431.4 kt in 1983, a drop of 51 per cent. It then recovered slightly to 476.4 kt in 1984. Exports of ore have fallen off rapidly to a few tons in 1983, due to an increasing off-take by the ferro-chrome smelters. Presently almost all chromite production is smelted and exported in the form of ferro-chrome. In 1983 the value of ferro-chrome exports were higher than gold at 116.2 M ZWD or 10.1 per cent of total exports (Tables 3 and 4).

Employment in chromite mining in 1984 was 8.8 per cent of total employment in mining and the net output was 3.2 per cent of the total in 1982. Output per worker has fallen from 138 t in 1975 to 107 t in 1984 (—22 per cent) (Table 9).

Anglo American of SA has a local chromite mining and smelting subsidiary, Zimbabwe Alloys Ltd, which has five mines (Vanad, Sutton, Caesar, Netherburn and Inyala), a quartz quarry (Broadside), and a refinery which was commissioned in 1953 and is situated in Gweru. The mines fall under its wholly-owned subsidiary. Zimbabwe Alloys Mines Ltd. The Caesar mine has been closed, but a small amount of production continues from outcrops. Ore is also purchased from tributors and contractors. Production from a newly purchased mine, Inyala, began in 1985. All the mines, except Inyala, exploit the thin seams of the stratiform deposits of the Great Dyke, where mining is expensive and the friable chromite ore produced needs to be agglomerated before smelting, adding significantly to costs. The richer podiform deposits are cheaper to mine and the lumpy ore produced can be smelted directly.

Ore production for the group for the year ended 31 March 1985 was 41.2 kt contained chromite and 61.6 kt of quartz. Refinery production was: 25.8 kt of low carbon ferrochrome, 42.5 kt of ferrosilicon chrome and 1.85 kt of high carbon ferromanganese. The high carbon ferrochrome furnace, with a production capacity of 45 kt/year, was shut down in 1983 due to low world market prices and increasing production costs, especially electricity charges.

Employment at the refinery at 1985-03-31 was 980 and 1 202 on the mines, making a total for the group of 2 182.

Union Carbide Corporation's wholly-owned subsidiary. Union Carbide Zimbabwe (Pvt), has a chromite mining and smelting subsidiary. Zimbabwe Mining and Smelting Company (Pvt) Ltd, (Zimasco), which operates four mines (Shurugwa, Valley, Lalapanzi and Muturashanga) and a smelter in Kwe Kwe. Chromite production rates are 250 kt/year for Shurugwi, 72 kt/year for Valley, 32 kt/year for Lalapanzi and 70 kt/year for Muturashanga including tributors, giving an annual production rate for the group of 422 kt. Roughly 9 kt/year are purchased from cooperatives. Reserves are estimated to be good for 20 years at present production for all mines except for Valley, where seven more years of production are assured. Shurugwe and Valley are on podiform deposits while Lalapanzi and Muturashanga are on the Great Dyke stratiform deposits, but the overall ore mix from the group is such that agglomeration is not necessary for smelting.

The Zimasco smelter produces 150 kt/year of high carbon ferrochrome from five 18 MW furnaces. A sixth 12 MW furnace is not presently used. Roughly 100 tons/year is sold to local foundries.

All ferrochrome marketing is done through the MMCZ mainly to North America, Japan and the EEC. It is exported through South African ports.

Zimbabwe has the world's largest reserves of high-chromium ores (46 per cent Cr_2O_3 and Cr: Fe > 2:1) estimated at between 580 Mt and 3 Gt, the large majority of which are the stratiform ores of the Great Dyke. The latter figure represents 84 per cent of world high-chromium reserves. Reserves of high-iron ores (40—46 per cent Cr_2O_3 and Cr: Fe > 2:1) are 56 Mt or 5 per cent of world reserves. South Africa has over 90 per cent of world reserves of this grade. Due to technical advances the Zimbabwean high-cromium ores have lost their premium on the world market, but ferro-chromium alloys made from it are still favoured by steelmakers.[7]

Tin

Tin production of 1 209 t in 1984 was 4 per cent of total mineral production by value. Exports of 1 030 t in 1982 contributed 1 per cent of total exports. Employment in tin mining was 4 per cent of total mining in 1984 and the net output in 1982 was 3.2 per cent of total mining. Production per employee fell from 0.69 t in 1975 to 0.64 t in 1984.

Kamativi Tin Mine in the west of the country is responsible for almost all of the tin production. Small operations started on the pegmatite in 1936. In 1952 Billiton (Dutch) started the present mining operation. In 1970 the state Industrial Development Corporation (IDC) took a majority share and in 1974 Billiton sold out completely, leaving only one private holding in the company, that of the Oakes Trust with 5 per cent. At the moment control is being transferred from the IDC to the state mining enterprise, the ZMDC.

The present capitalization of the company is about 3 M ZWD and exports of high grade tin (99.93 per cent Sn) from the mine are worth about 20 M ZWD annually, at present prices and production rates. The mine also produces small amounts of tantalite and can potentially produce spodumene (Li) and beryllium.

The ore is processed, smelted and refined at the mine. Solder and white metal are also produced for the local market. A small amount of tin is also sold to local industries for tin plating, solder and white metal for alloys. The

smelter also treats concentrates from other workings (about 3 t/month).

The mine has 20 Mt of reserves at present prices grading on average 0.18 per cent Sn, equivalent to about 30 years at present production rates. The whole complex (mine, smelter and refinery) employs about 1 750 people.

The tin is marketed internationally by the state's Minerals Marketing Corporation of Zimbabwe (MMCZ) and is mainly sold to West Germany. It is railed to South Africa and shipped from Durban and Port Elizabeth to Europe.

Iron

Iron ore production peaked in 1976 at 1.35 Mt. It then fell to 0.84 Mt in 1982 (—38 per cent), before recovering slightly to 0.93 Mt (—10 per cent) in 1984, when the value of production was 2.7 per cent of total mining output. Employment in 1984 was 806 or 1.6 per cent of the total mining work force. Exports of iron ore ceased in 1968 and since then all ore has gone to Zisco.

The Zimbabwe Iron and Steel Company Ltd (Zisco) is 87 per cent state owned and started operations in 1948 at Redcliffe near Kwe Kwe in the centre of the country. All iron ore production is from its two mines (Buchwa and Ripple Creek), and is destined for its iron and steel works. In 1980 proved reserves of primary haematite ore at Buchwa were about 20 Mt and about 3 Mt of scree ore. Overall grade is 61.6 per cent Fe and 0.2 per cent Mn. Reserves of limonite ore at Ripple Creek were greater than 41 Mt in 1980, grading 51.4 per cent Fe and 2.1 per cent Mn.[8]

Roughly 80 per cent of iron and steel production is exported. In 1983 exports were: 144 tons of pig iron, 28.6 kt of ingots and billets, 16.4 kt of bar, rods and sections, and 18.2 kt of wire, with a total value of 61.2 M ZWD. Sisco has a maximum capacity of 1 Mt and is at present operating at about half of this due to depressed export markets.

Other minerals

The total value of the other minerals in 1984 was 34.7 M ZWD or 6.4 per cent of total mineral production. In 1983 (See Table 1) the most important by value were (in M ZWD):

- silver 10.6
- phosphates 6.7
- limestone 4.3
- graphite 2.4
- lithium minerals 1.9
- tantalum concentrates 1.1
- emeralds 0.9

The most important in terms of world output, is *lithium,* which accounted for approximately 6 per cent of world production in 1983 (Table 2). All lithium minerals are produced by Bikita Minerals (Pvt) Ltd, a subsidiary of BP Minerals of the UK, from one of the richest lithium pegmatites in the world (1.4 per cent Li) at Bikita in the southeast of the country. Reserves in 1980 were 113.5 kt of contained lithium.

Virtually all *silver* production, of 28.1 t in 1984, is a byproduct of other mining, mainly from copper and gold production.

Tantalum concentrate production comes from small-scale pegmatite workings and as a byproduct of tin mining. Production in 1983 was 35 t and exports were worth 115 k ZWD.

Antimony is produced as a byproduct of gold production and by some small mines such as Belingwe Star, Gothic and Pagamisa. Exports of antimony ore in 1983 were 298 t.

Tungsten concentrates worth 20 k ZWD were exported in 1983 and mainly come from small operations such as Sydkom, Buona Fortuna, Helen's Hope and Ma's Luck mines.

Platinum group mineral concentrates are produced from the residues of nickle-copper refining. In 1983 53 kg of platinum was produced from this source, but Zimbabwe has significant reserves of the PGM's in the Great Dyke, estimated at 1.68 Gt grading 5.54 g/ton PGM's, (86 per cent PGM and Au 14 per cent), as well as 0.2 per cent Ni and 0.15 per cent Cu. RTZ has been running a pilot plant on one of these deposits for several years at Zinca but this trial mining scheme has been unable to solve extraction problems and mining is considered to be uneconomic at present.[9]

In 1983 133 kt of *phosphate* rock were mined by Dorowa Mining (Pvt) Ltd in the Nyazura district. All production is for their mother company, Zimbabwe Phosphates Ltd (Zimphos), for fertilizer production. Phosphate rock output is 10—15 kt short of the needs of the fertilizer plant and the shortfall is imported. Zimphos produces single and triple phosphate (100 per cent of local demand) after treating the ore with sulphuric acid. They have two acid production plants, one which treats pyrites from the Iron Duke Mine and one which treats imported sulphur. Zimphos is a wholly-owned subsidiary of Chemplex Corporation Ltd, which is in turn owned by AECI of South Africa.

Most of the country's *graphite* production of 19.9 kt in 1983, is from Zimbabwe Germany Graphite Mines Ltd's Lynx mine in Hurungwe District. It is onwed by the Industrial Development Corporation. In 1983 output was 3.2 per cent of the world total.

Arsenic production of 153 t in 1983 is principally from gold roasting.

Bauxite production was 23 kt in 1983. All came from the Alumina mine belonging to E C Meikle Ltd, on the eastern border. Most of the output is for the production of aluminium sulphate for water treatment. Bauxite reserves in the Penhalonga area are virtually exhausted and a contract has been negociated with the Mozambique Government to mine the continuation of the deposit on the other side of the border. Zimbabwe imports about 3 kt/year of Al ingots, billets and sheet for local processing, valued at about 4 M ZWD in 1982.

In 1983 5.2 kt of *corundum* were produced. In 1965 Zimbabwe was the

worlds largest producer, but production has since declined. The producers are O'Brien Mine and Andrew Alluvial corundum claims.

Iron pyrites is mined at the Iron Duke mine, owned by Anglo American Corporation, near Mazowe. Output was 28.8 kt in 1983 and is all for the production of sulphur for sulphuric acid.

Magnesite production of 24 kt in 1983, is mainly destined for export (22.7 kt except for a small amount which is used by Sable Chemicals to produce fertilizer. It is mined by Kadoma Magnesite at the Barton Farm Magnesite Mine. Several other deposits are also known (Mat Mine Calac Deposit and Bukwa Magnesite). The possibility of producing magnesite refactory bricks is being investigated by the ZMDC and has been taken up by the SADCC Mining Sector for consideration as a regional project.

Gem stones come from numerous small workings and include aquamarine, beryl, chrystoberyl, citrine, amethyst, garnet, tourmaline, chalcedony and emeralds. The only large scale production is the Rio Tinto-Zinc emerald mine, Sandawana. In 1982 cut emerald production was worth 1.64 M ZWD.

Kyanite production stood at 2.2 kt in 1982. The ZMDC is investigating the development of this mineral. It is consumed locally by the ferrochrome smelters as a flux and is used for the manufacture of fire assay crucibles.

Limestone. The principal producers are Early Worm Mine (high grade), Chinhoyi Caves (several dolomite mines), Rushinga Dolomite, Sternblick (for cement), Cleveland (for cement). Pioneer Lime Works (high grade, for agriculture). Zisco (high grade, for flux) and Falcon Limestone. There are also several other known deposits with large reserves. In 1983 926 kt of limestone were produced, mainly for local consumption by the construction and metallurgical industries and for agriculture.

Clay production was 63.1 kt in 1983, valued at 126 k ZWD. There are two major producers: Korbut Mine (for cement) and the Gwai River Clay deposit (for ceramics).

Fireclay: 9.3 kt were produced in 1983 from the clay horizons in the lower Karroo coal measures at Wankie for the manufacture of refactory bricks by Clay Products Ltd in Bulawayo, mainly for the steel industry.

Mica production started in 1919, peaked in the early fifties and was virtually dead by 1960. In 1983 3 t of sheet mica and 544 t of scrap mica were produced, mainly by Turning Point Mine owned by Mitmar (Pvt) Ltd.[10]

Production of *kaolin* in 1983 was 4.5 kt worth 18 k ZWD, mainly from Tom Kaolin Mine and Gwai River Kaolin, for the ceramics industry.

Most of the *feldspar* production is as a byproduct of lithium production at Bikita. It is also produced by the Mistress Mine near Harare. In 1983 1 645 t were produced worth 144 k ZWD and is mainly used by the glass and ceramics industries.

Although the total value of industrial mineral production is low in comparison to the major export minerals, they are in some ways more vital to an integrated resource-based industrial development than the export minerals which are vertically integrated into the industrialized economies.

Marketing

The Minerals Marketing Corporation of Zimbabwe was set up by the government in 1982 to rationalize selling arrangement, remove restraints on the minerals trade and to reduce costs to producers. It was initially received with great foreboding by the industry, especially the TNC's. But recently it seems to have come to terms with it, particularly as, in some instances, higher prices have been obtained and middlemen have been eliminated. The Corporation is 100 per cent Zimbabwean staffed and the chairman of the board is the Permanent Secretary for Mines. In 1983 it made an operating loss of 207 484 ZWD, but in 1984 it had a surplus of 2 096 880 ZWD. Its income is derived from commissions on sales.

Problems facing the industry in Zimbabwe

By far the major problem for the mining industry has been and is the constantly *falling real value of their products,* except for tin and gold. The real value of copper fell by 54 per cent and nickel by 64 per cent from 1970 to 1983, while that of tin rose 37 per cent over the same period. The strong US dollar and the steady devaluation of the ZWD (58 per cent against the USD since 1981) has meant that in ZWD terms the profitability of the mining companies improved somewhat in 1984/85, though many still have debt burdens from the lean years (1980—1983).

The next is the *soaring energy costs* in Zimbabwe caused by the 1 G ZWD Hwange thermal power project. Electricity charges have increased three-fold since 1980. This has particularly hit the mining industry which consumed 45 per cent of total power supply by the ESC in 1982/83, if the ferrochrome producers are included (18 per cent).

As a land-locked country Zimbabwe has *logistic problems* in getting its mineral products to the nearest ports. These problems have been compounded by the security situation in Mozambique. Before the independence of Mozambique two-thirds of Zimbabwe's exports left via Maputo and Beira. Both of these routes are now hazardous, forcing exports to leave via more distant South African ports, at that country's discretion.

The *replacement of skilled personnel* has proved to be difficult, but this problem appears to being overcome on most mines and plants, principally by in-service training.

An important feature of mining in

Zimbabwe is that although the mining industry's dependence on expatriate technicians and managers is superficially low, professional and managerial staff generally come from the "settler" section of the population. Only a handful of indigenous mining professionals were trained before independence. This dependence on a small, culturally distinct, section of the population clearly poses certain limitations on the new government's policy options.

Local subsidiaries of foreign-owned companies are at present limited in their ability to raise capital for new projects. Local borrowing is limited in that if they borrow more than 15 per cent of the value of their share capital, permission is needed from the Reserve Bank and they lose their right to repatriate profits. If they expand their equity base locally to raise capital by issuing new shares the profits that they can repatriate decrease proportionately, and the holding of the parent company is clearly diluted, a situation that the parent company is not likely to accept. At present foreign companies can repatriate 50 per cent of their after-tax profits which are then subjected to a Non Residents Shareholders Tax of 20 per cent, resulting in an effective repatriation of 40 per cent of after-tax profits.

Discussion

Only a small fraction of the total mineral production in Zimbabwe is consumed by local industries. By far the majority is exported to the industrialized countries to be transformed into finished products, some of which will be reimported by Zimbabwe. The breakdown of exports in 1983 was:

- Agriculture and forestry 41.4 per cent
- Manufactures 12.5 per cent
- Mining and smelting 44.3 per cent

Mining is further broken down into the following: Crude minerals 8.9 per cent, refined metals and alloys, cement and coke 26.3 per cent and gold 9.1 per cent. Total foreign exhange generation by the mining and metals industry in 1983 was 509.6 M ZWD (44.3 per cent).

There are several projects for the further transformation of minerals in the country under consideration, e g the manufacture of refactory bricks, the spinning of asbestos fibre, the manufacture of stainless steel from local chromium, nickel and steel, and a coal-based chemical industry. As long as downsteam transformation is oriented towards import substitution for the local market, the primary goods sector (mining and agriculture) will continue to be the foreign exchange generator for the rest of the economy and the manufacturing sector will continue as a net foreign exhange user.

The real (terms of trade) prices of primary commodities have been constantly falling, even during periods of recovery in the advanced capitalist countries. This has forced countries like Zimbabwe to attempt to increase volumes to maintain essential foreign currency flows for the importation of relatively more expensive manufactures and other commodities, which are necessary for the rest of the economy to keep functioning. Falling real prices of raw material exports put pressure on local inputs costs to maintain profitability, especially labour costs. Low wages in the primary goods sector in turn limit the growth of the manufacturing sector due to the restricted market for its goods. Attempts to maintain the price of primary commodities by devaluing the local currency are only a partial and short-term panacea as the increased sales revenue will eventually be offset by the higher cost of imports to the economy as a whole.

Strategies for integrated economic development therefore need to increase exports of manufactures, decrease dependence on primary commodity exports and decrease dependence on imported capital goods by developing a local capital goods manufacturing capability. Given the limited possibilities of penetrating the world market for manufactures at the moment, economic integration (or collective self-reliance) of the region is the only viable method of breaking away from the present vertical integration with the developed world.

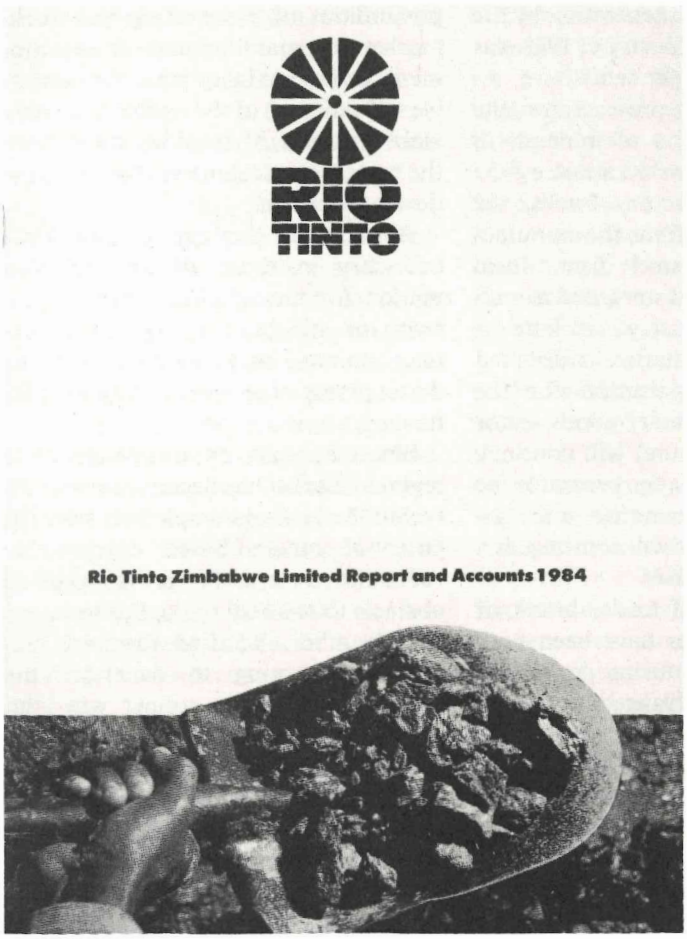
A regional strategy is not only necessary in terms of an increased market for manufactures, but also in terms of utilizing the larger resources base (human and material) for the development of primary industries, particularly capital goods.

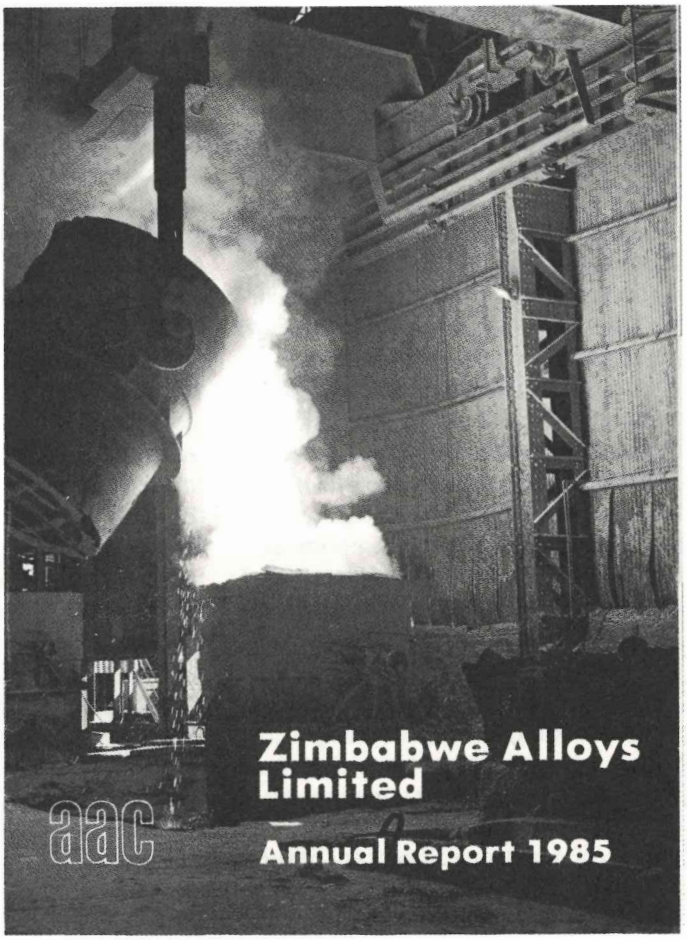
Since Zimbabwe's independence a regional market has become a possibility, but the lack of complementarity for potential mineral-based exports between the countries has proved to be an obstacle to regional trade. For instance, both Zambia and Zimbabwe are presently attempting to penetrate the regional market for copper wire and cable. The myriad of soft national currencies in the region also pose an obstacle to intraregional trade by necessitating the use of a third (hard) currency for payment. This problem can be in part overcome by the use of barter or "counter trade", but the dearth of hard currency in the region means that countries prefer to sell their goods on the world market for hard cash, rather than to barter them with their neighbours.

By overcoming the restriction on the development of metal transformation industries presented by the lack of economies of scale of any one country and by overcoming the shortage of credit facilities in regional trade, regional initiatives such as the Southern African Development Coordination Conference (SADCC) and the East and Southern African Preferencial Trade Area (PTA) may facilitate the development regional economic integration and hence a greater consumption of minerals and mineral-based products produced in the zone.

The SADCC could also provide a framework for a regional approach to

Rio Tinto Zimbabwe Ltd (left) and Zimbabwe Alloys Ltd are two of the most powerful mining companies in Zimbabwe. They are both controlled by major mining TNCs, Rio Tinto-Zinc in London and Anglo American in Johannesburg.





the world market in terms of cooperation in metals marketing, whereby one country with the experience and infrastructure for marketing a specific mineral could market the same mineral for other countries in the region. One example could be for Zambia to market copper on behalf of Zimbabwe and other copper producers.

Regional cooperation in metals refining has already taken place in the case of Cu-Ni matte from Botswana being refined in Zimbabwe, but there is a large potential for similar schemes in the region. For instance, Zambia could possibly refine Zimbabwe's copper slimes and cobalt hydroxide, and copper concentrates from Mozambique could be refined in Zimbabwe.

The SADCC Mining Sector, based in Lusaka, is presently commissioning studies on the following areas of regional interest:

- A regional survey of skilled manpower needs for mining
- The development of small scale mining in the region
- An inventory of geological and mining resources
- The development of foundry and fabrication facilities
- The expansion of mining machinery manufacture
- The production of mining chemicals and explosives
- The sharing of mineral processing facilities
- The establishment of a regional iron and steel industry
- The development of fertilizer minerals mining
- The manufacture of copper semi- and finished products
- The establishment of a regional refractory industry
- The establishment of a bauxite/alumina/aluminium industry
- The manufacture of diamond tools, and
- A study of the regional coal mining potential.

Most of these studies have still to be commissioned while some still lack funding. These projects address many of the problems pertinent to the development of mining and metals transformation in the region as well as resource-based development. Whether or not they will come up with appropriate and useful recommendations and whether or not action will arise from them remains to be seen.

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[2] Shearson Lehman Brothers Ltd, *Annual Review of the Metal Markets 1983/84,* London 1984. Mid-year Review of the Metals Markets 1985, London 1985.

[3] Summers R, ibid, p 218.

[4,5] Ministry of Mines of Zimbabwe (MMZ). *Report of the Secretary for Mines 1981 and 1983,* Harare, 1985, p 16.

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Sources:

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Abbreviations

MMZ:	Ministry of Mines of Zimbabwe.
RSM:	Report of the Secretary for Mines.
CSO:	Central Statistical Office.
QDS:	Quarterly Digest of Statistics.
SADCC:	Southern African Development Coordination Conference.
PTA:	Preferencial Trade Area.
RSA:	Republic of South Africa.
TNC:	Transnational Corporation.
GDP:	Gross Domestic Product.
t:	Metric tons.
g:	grams.
oz:	fine ounces.
/year:	per annum.
ZWD:	Zimbabwean dollars.
USD:	United States dollars.
ZMDC:	Zimbabwe Mining Development Company Ltd.
MTD:	MTD (Mangula) Ltd.
AAC:	Anglo American Corporation of South Africa Ltd.
BNC:	Bindura Nickel Corporation Ltd.
RTZ:	Rio Tinto Zimbabwe Ltd.
Zimasco:	Zimbabwe Mining and Smelting Company (Pvt) Ltd.

Note:

In the text reserves are often quoted in terms of contained metal, which is calculated from the amount of ore and the grade. It should be noted that recovery is usually well below the grade. It is as low as 50 per cent for nickel, about 75 per cent for copper, and up to 80 per cent for gold.

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Zimbabwe Mining Development Corporation, *Annuel Report 1984,* Harare 1985.

Table 1

Value and quantity of mineral production in Zimbabwe 1975, 1980 and 1983

Mineral	Rank value	Value thousand ZWD			Ton		
	1983	1975	1980	1983	1975	1980	1983
Antimony	25	197	128	124	400	150	143
Arsenic	—	—	19	—	—	79	—
Asbestos	2	41 701	70 201	69 335	261 542	250 949	153 221
Barytes	32	12	4	22	272	195	980
Bauxite	26	2	51	108	156	4 281	23 145
Beryl	36	16	2	12	291	9	48
Calcite	—	15			1 155		
Chromite	6	22 050	18 449	25 629	875 668	552 475	420 347
Clay	24	115	138	126	109 302	69 153	63 097
Coal (a)	4	18 677	28 001	42 174	3 300 385	3 134 000	3 326 000
Cobalt	20	24	2 724	231	18	115	74
Copper (metal)	5	24 686	35 389	32 953	47 579	26 901	21 560
Corundum	19	109	770	308	5 429	18 681	5 157
Diaspore	—	3			308		
Feldspar	22	40	56	144	1 499	1 263	1 645
Fireclay	30	24	32	41	17 557	17 005	9 255
Fluorspar	—	9	—	—	585	—	—
Gemstones (b)	23			1 066	—	—	—
Gold (kg)	1	31 956	144 875	193 914	11 328	11 444	14 101
Graphite	12	355	739	2 384	6 415	7 385	19 862
Iron ore	8	3 033	14 815	14 628	1 246 038	1 621 681	926 472
Kaolin	35	23	18	18	2 628	4 450	4 470
Kyanite	—	161	15	—	8 046	716	—
Limestone	11	2 394	3 048	4 305	1 368 069	1 217 878	1 305 130
Lithium minerals	13		1 901	1 877		21 030	19 193
Magnesite	15	1 840	1 452	577	99 360	78 217	24 072
Mica — cut	29	7	14	65	8	5	3
Mica — scrap	33	53	84	21	5 936	1 217	644
Nickel (metal)	3	19 616	55 572	43 100	9 121	15 075	10 140
Ornament stone	31	1	8	31	6	48	1 608
Palladium (kg)	18		646	327		211	74
Phosphates	10	2 960	4 030	6 719	150 772	130 337	132 911
Platinum (kg)	14		1 102	327		94	53
Pyrites	17	363	682	390	67 232	68 096	28 845
Quartz — rough	28	246	469	84	131 061	102 468	14 610
Quartz — sand	17	255	399	572	62 163	63 259	32 812
Silver (kg)	9	607	13 005	10 553	7 737	29 681	29 186
Talc	34	21	23	20	1 499	456	552
Tantalum conc	14	48	2 832	1 081	23	41	35
Tin (metal)	7	3 971	9 871	16 213	997	934	1 234
Tungsten conc	27	695	1 221	100	229	194	23
Other minerals			1 862	6 554	—	—	—
Total		**177 836**	**414 758**	**469 121**	—	—	—

Notes:

— = no production or not applicable. A blank space = no data available.

* = Exchange rates ZWD/USD: 1975 1.60, 1976 1.62, 1977 1.54, 1978 1.48, 1979 1.48, 1980 1.59, 1981 1.39, 1982 1.09, 1983 0.94, 1984 0.67.

(a) = The value is for coal sold and quantity is for coal raised.

(b) = Includes emerald, ornamental stone, garnets (gem), beryl (gem), citrine, tourmaline, chrystoberyl, amazonite, chalcedony, rose quartz, amethyst, iolite and agate.

Source:

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Fig 1

Zimbabwe: mineral production 1960 to 1984
Gold, nickel, copper and cobalt (in kt)

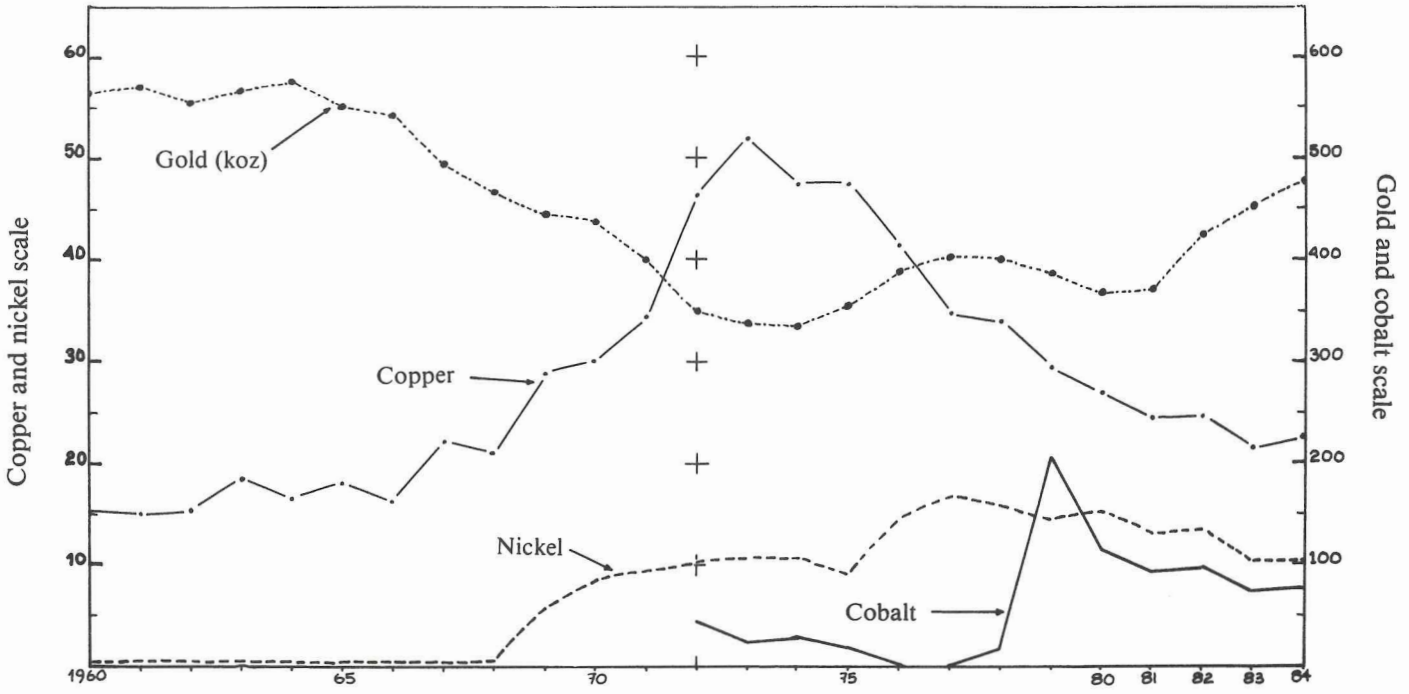

Fig 2

Zimbabwe: mineral production 1960 to 1984
Coal, iron ore, chromite, asbestos and tin (in kt)

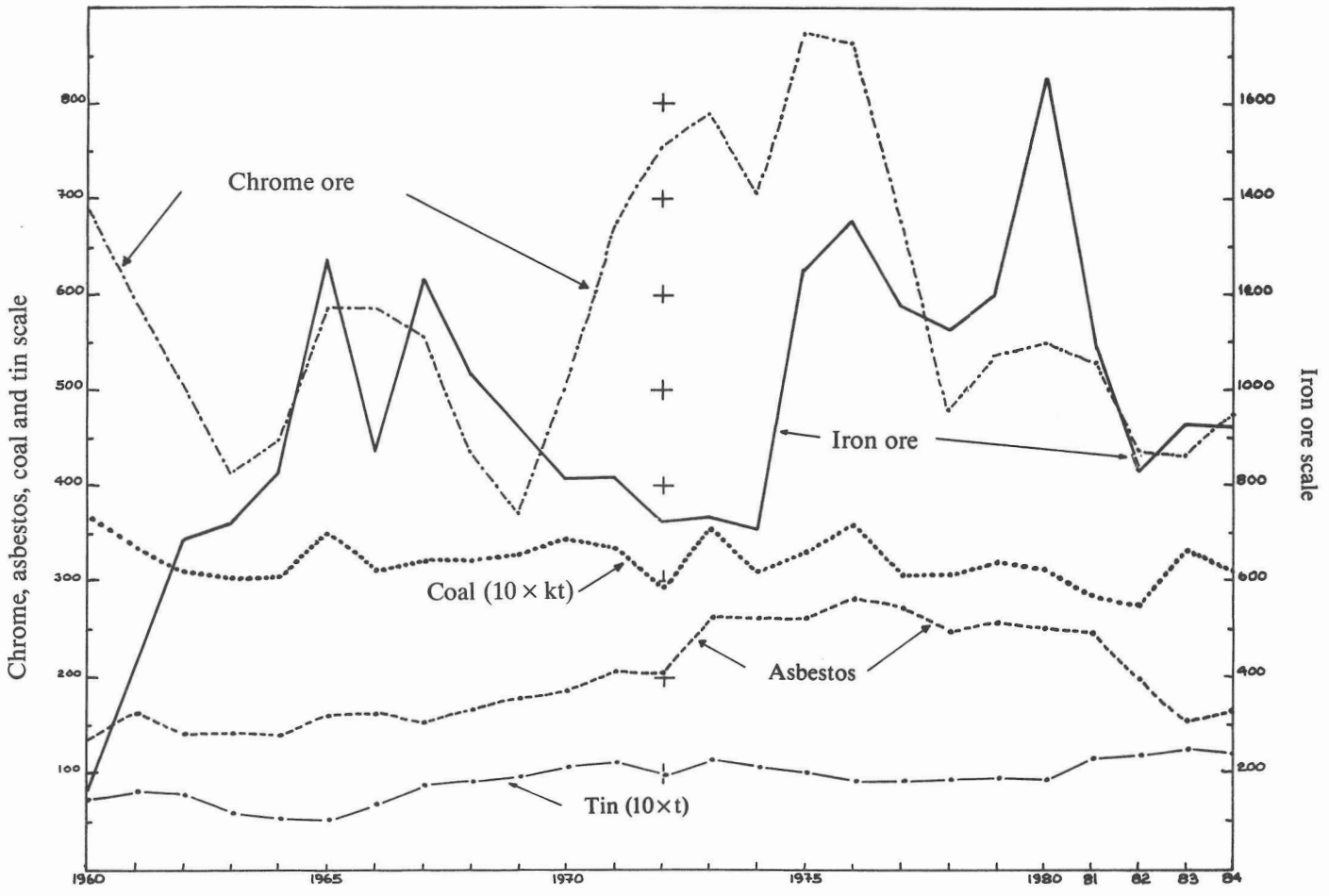

Table 2

Relative mineral production

Mineral	% SADCC (a)			%Africa (b)			% West (c)			% World		
	1975	1980	1983	1975	1980	1983	1975	1980	1983	1975	1980	1983
Antimony	100	100	100	2.5	1.5	2	1.6	0.9	1.6	0.6	*	*
Asbestos	87	88	84	40	45	36	15	13	12	6.2	5.2	3.7
Beryl	56	32	89	56	32	64	1039	45	200	9.5	*	1.6
Chromium	100	100	100	30	14	16	39	15	19	10	5.7	5.5
Coal	66	67	77	4.4	2.8	2.3	*	*	*	*	*	*
Cobalt	0.9	3.4	3.0	*	0.6	0.9	0.5	1.4	1.2	*	*	*
Copper	6.5	4.1	3.8	3.3	1.9	1.6	1.8	1.0	0.9	0.6	*	*
Gold	97	97	98	1.5	1.7	2.0	1.4	1.5	1.7	0.9	1.0	1e
Graphite	100	100	100	94	100	100		12	31	1.5	1.3	3.2
Iron ore	14	100	100	5.8	5.8	5.3	*	*	*	*	*	*
Li mins (d)	53e	100	100	2e	90e	96e	*	8e	9e	*	6e	6e
Magnesite	100	100	100	62	50	52	3.4	2.2	1.0	1.1	0.7	*
Nickel	59	50	36	25	27	21	2.4	4.8	4.3	1.2	2.0	1.6
Silver	19	56	51	3.0	7.2	8.3	*	0.8	0.6	*	*	*
Tantalum	11e	30e	36e	8e	18e	26e	3e	6e	15e	2e	2e	2e
Tin	100	100	100	11	12	17	5.4	4.7	6.7	*	*	0.6
Tungsten	100	100	100	13	42	41	*	0.6	0.5	*	*	*

* = less than 0.15 per cent.
e = estimated.
(a) = SADCC: Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe.
(b) = Southern Africa: SADCC plus Zaire, Namibia and South Africa.
(c) = West: USA, Canada, Europe (except CMEA), Japan, Australia, NZ, Israel and RSA.
(d) = Approximate lithium content.

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Table 3

Value and quantity of mineral exports

Mineral	Rank by value 1983	k ZAD 1975	k ZAD 1982	k ZAD 1983	% of prod*	Tonnage 1975	Tonnage 1980	Tonnage 1983
Antimony ore	12	79	651	137	110	179	187	298
Asbestos	2	48 827	80 083	68 590	99	278 000	274 258	161 088
(Cement) (a)	—	812	1 906	4 436			62 687	96 959
Chrome ore (b)	—	6 752	507	2	<.1	268 000e	14 828	—
(Ferro-chrome) (b)	—	40 840	88 071	116 186	99e	230 000	257 306	246 711
Coal (c)	7	3 011	3 916	3 505	8	327 000	229 496	113 761
(Coke) (c)	—	1 369	6 388	12 835	60e	50 000	113 388	135 272
Cobalt (cake)	10		2 854	357	155			78
Copper metal	4	29 345	24 617	33 676	102	41 906	22 735	24 898
Copper slimes	5	—	—	13 947	100	—	—	3 290
Corundum	15	87	432	68	22	4 372	10 344	398
Gold (kg)	1	31 858	115 200	104 300	54	11 293	9 100	7 585
Iron ore (d)	—	4	0	0	0	1 000	0	0
(Iron & steel) (d)	—	14 254	70 963	57 131	80e		341 586	286 407
Lithium mines	8	301	1 722	2 321	124	10 000	18 373	16 172
Magnesite	9	486	1 091	544	94	80 000	56 877	22 676
Nickel metal	3	19 583	52 754	67 771	157	8 641	14 449	16 237
Pyrites	—	—	141	—		—	9 345	—
Ag & Pt concs (kg)	—	—	1 236	—		—	336	—
Tin metal	6	3 436	8 610	6 402	40	861	891	427
Tantalum conc	14	43	2 847	115	11	—	—	—
Tungsten conc	13	706	1 254	120	120	—	201	24
Prec metal conc	11	—	3 486	339		—	—	—
Total minerals (e)		**214 200**	**470 300**	**372 900**	**79.5**	—	—	—

* = Exports as per cent of production in 1983 by value. This is not a reliable indicator of domestic consumption due to held-over stocks.
e = estimate.
(a) = Limestone is exported as cement.
(b) = Chrome is exported as ferro-chrome.
(c) = Coal is exported as coke and coal.
(d) = Iron ore is exported as pig iron and iron and steel ingots, billets, bar, rod and sections.
(e) = Excluding cement and coke.

Source:
Table 1.
CSO, *QDS, March 1985,* Harare 1985.
CSO, *Statement of External Trade 1975, 1980 and 1983,* Harare.

Table 4

Relative mineral exports

Mineral	% total exports				% SADCC			% Sn Africa		
	1975	1980	1983	Rank	1975	1980	1983	1975	1982	1983
Asbestos	9.2	8.8	6.0	3	87	90	84	40	40	42
Cement (a)	*	*	*							
Chrome	1.3	*	*		100	100	100	18	1.2	*
Fe-chrome (b)	7.7	9.7	10.1	1	100	100	100	45	31	28
Coal	0.6	*	*		37	49	46	9.1	0.8	*
Coke (c)	*	0.7	1.1	7	100	100	100			
Copper	4.8	2.7	2.9	6	6.1	3.4	4.0	3.1	1.7	1.8
Gold	6.0	13	9.1	2		97			1.3e	1e
Fe & steel (d)	2.7	7.8	5.0	5	100	100	100	81**	66**	52**
Li mins	*	*	*		91e	100	100	61e	87e	
Nickel	3.6	5.8	5.9	4	50	31	38	23	12	17
Tin	0.7	1.0	0.6	8	96	98	39	11	15	7.5
Total mins (e)	**40**	**52**	**37**							

Sources:
Table 3.
CSO, *Monthly Digest of Statistics, Feb/March 1985,* Lusaka.
CSO, *Statistical Bulletin, Dec 1984,* Gaborone.
SADCC Mining Sector, *Analysis of Mineral Resources Development and Opportunities in the SADCC Region,* Lusaka 1985.
WBMS, *WBMSYB 1984,* London 1984.
BGS, *WMS 1975—79 and 1979—83,* London 1980, 1984.

* = < 0.5 %.
e = estimate.
** = pig iron, ingots, billets and blooms only.
(a), (b), (c), (d), (e) = see Table 3.

Table 5

Mineral dependence: GDP, exports, taxes

	Breakdown of GDP by sector (% at constant 1980 prices)				Mineral exports as %	Income tax paid by mining companies		
	Agriculture	Mining (a)	Manufacturing	Total (M ZWD)	of total export (t)	Tax k ZWD	% (c) % (c)	Royalty M ZWD (d)
1975	14.7	9.6	23.3	3 130	40.3			1.5
1976	16.5	10.5	22.1	3 104	44.1			1.3
1977	14.0	10.7	22.7	2 882	40.0	2 237	1.8	1.2
1978	15.6	10.2	22.0	2 856	42.8	3 981	3.0	1.0
1979	10.1	24.1	2 898	47.8	14 021	7.4	0.4	
1980	14.2	8.8	24.9	3 226	51.7	29 256	9.9	0.5
1981	13.6	7.4	24.2	3 645	38.2	17 643	5.8	0.5
1982	13.7	7.8	24.1	3 646	31.3			0.5
1983	13.3	8.0	24.2	3 522	36.9			0.4

(a) "mining" = mining and quarrying which includes processing (smelting and refining) of minerals except for iron and steel, ferro-chrome, cement, ceramics and coke.
(b) Exluding cement and coke.
(c) As a % of total company tax for financial year April to March.
(d) Mining fees and royalties paid to government.

Source:
CSO, *QDS March 1985,* Harare.
CSO, *Income Tax Statistics 1978/79 to 1981/82,* Harare.
CSO, *National Accounts of Zimbabwe 1978,* Harare.
CSO, Unpublished data on taxes, Harare.
MMZ, *RSM, 1981 and 1983,* Harare.

Table 6

**Net capital expenditure on fixed assets for mining*
(k ZWD)**

Year	Chrome	Cu & Ni	Gold	Quarrying	Asbestos	Other ming	Total ming
1975	3 112	18 869	9 116	684	8 152	8 832	48 763
1976	2 949	20 134	6 636	229	16 494	14 949	61 390
1977	2 041	9 545	3 756	376	34 378	15 516	65 614
1978	724	7 960	5 455	328	38 570	6 323	59 360
1979	1 083	37 884	7 966	611	33 594	4 449	85 587
1980	2 053	13 786	34 374	870	26 639	5 564	83 286
1981	3 970	37 083	47 541	3 141	21 770	19 435	132 940
1982	2 836	3 792	23 662	2 575	8 372	53 071	94 308

Table 7

**Gross fixed capital formation
(Constant 1980 prices, M ZWD)**

Year	Mining*	Total	% mining of total
1975	77	899	8.6
1976	102	728	14.0
1977	97	559	17.4
1978	76	418	18.2
1979	92	443	20.8
1980	83	528	19.4
1981	114	723	15.6
1982	72	780	9.2
1983	54	649	8.3

* "mining" — see Table 5.

Source:
CSO, *Census of Production 1982/83,* Harare 1985.

Table 8

**Investment quotient
(Current prices M ZWD)**

Year	GDP (a)	GCF (b)	% GCF of GDP
1975	1 902	525	27.6
1976	2 064	368	18.8
1977	2 069	347	16.8
1978	2 166	268	12.4
1979	2 539	337	13.3
1980	3 226	539	16.7
1981	4 049	1 017	25.1
1982	4 609	1 085	23.5
1983	5 081	771	15.2

(a) GDP = Gross Domestid Product.
(b) GCF = Gross Capital Formation: gross fixed capital formation less increases (decreases) in stocks.

Source:
CSO, *QDS March 1985,* Harare 1985.

Table 9

Profile by mineral

Mineral	Year	Turnover	Gross output (a)	Net output (b)	Average number employed	Stocks	Net capital expend
Mining industry							
Chrome	1975	16 478	17 076	12 703	6 342	2 905	3 116
(mining)	1980	15 090	16 501	10 139	5 204	8 427	2 103
	1982	14 853	18 123	7 840	4 299	11 497	2 836
Copper and	1975	64 434	70 837	37 250	12 457	24 857	18 869
Nickel (incl)	1980	122 382	126 395	69 101	11 100	39 400	14 043
smelting)	1982	92 409	95 349	31 142	10 801	60 228	3 792
Gold	1975	36 389	37 092	24 594	16 226	3 909	9 116
	1980	143 652	144 497	113 210	21 533	8 304	26 992
	1982	128 105	129 577	85 700	20 592	11 251	23 662
Quarrying	1975	5 398	5 525	3 123	1 613	505	684
	1980	8 152	8 095	4 849	1 045	945	1 608
	1982	13 040	12 888	8 213	1 121	1 108	2 575
Asbestos	1975	49 540	47 933	36 339	9 602	10 806	8 152
	1980	82 840	79 598	51 610	11 617	20 509	26 762
	1982	70 489	81 701	53 696	10 678	45 618	8 372
Tin	1975	(c)	4 077	2 844	1 439	1 136	1 078
	1980	(c)	12 225	9 577	1 870	2 277	1 223
	1982	(c)	12 304	7 901	1 903	3 869	3 245
Other mining	1975	35 491	33 872	19 381	10 132	3 979	7 754
	1980	77 046	65 221	39 662	8 760	8 065	4 676
	1982	95 582	86 009	51 678	7 922	12 399	49 826
Total mining	1975	207 730	216 390	136 211	57 811	48 097	48 763
and quarrying	1980	449 162	452 581	298 148	61 129	87 927	77 413
	1982	415 478	435 951	246 167	57 316	145 970	94 308
Metals industry							
Iron & Steel							
and ferro-chrome	1975	132 577	131 513	62 801	12 852	57 186	37 383
	1980	265 333	262 960	125 009	14 286	129 897	12 583
	1982	241 218	225 656	78 445	14 393	150 618	7 951
Non-ferrous	1975	(d)	17 450	6 195	1 892	1 937	7 802
metals: basic	1980	(d)	15 461	4 747	874	2 906	302
processing	1982	(d)	22 880	10 821	1 102	5 775	825

(a) excluding sales of goods not produced on premises.
(b) gross output less total purchases and changes in stocks.
(c) included in "Other mining" (7).
(d) included in "Iron & steel and ferrochrome" (9).

Source:
CSO, *Census of Production 1982/83,* Harare 1985.
CSO, Unpublished data on tin mining and metals industry, Harare.

Table 10 A

Profile of selected public companies
(1984, MZs)

Company: mineral	Capital employed	Turnover profit	Operating	Tax	Interest and other items	Profit (loss)	Dividends
R T Zimbabwe: Au a)	55 102	55 119	9 130	15	3 039	6 076	2 585
Bindura Nickel b)	178 552	76 861	12 720	0	22 617	(9 897)	0
MTD: Cu, Au c)	34 326	46 199	1 903	0	2 523	(620)	0
Wankie colliery d)	152 816	74 384	14 761	0	8 672	6 089	2 235
Zim Alloys: Fe-Cr e)	94 560	66 000	19 405	0	9 099	10 306	4 000

* including directors renumeration and retained profit (loss) from 1983.
a) Rio Tinto Zimbabwe Ltd (RTZ): year ended 31st December 1984.
b) Bindura Nickel Corporation Ltd (BNC): year ended 31st Decemb er 1984.
c) MTD (Mangula) Ltd (MTD): year ended 30th September 1984.
d) Wankie Colliery Company Ltd (Wankie): year ended 28th February 1985.
e) Zimbabwe Alloys Ltd (Zim Alloys): year ended 31st March 1985.
For Note and Sources see Table 10 B.

Table 10 B

Evolution of selected company debt and profit (loss)

Year	RTZ*		BNC*		MTD*		Wankie*		Zim.Alloys*	
	D	P	D	P	D	P	D	P	D	P
1981	16.0	1.4	16.6	3.6		(1.5)	11.5	1.7	18.4	3.9
1982	30.3	(5.0)	39.8	(6.4)	9.6	(8.0)	42.5	2.0	23.6	(6.7
1983	26.4	5.8	53.0	(15.4)	12.2	3.3	82.0	3.8	31.1	(7.7)
1984	23.7	7.1	56.6	(9.9)	10.0	(0.6)—	85.5	4.5	15.3	10.3

* see Table 10 A for financial years.
— for the 9 months ended 30.06.85 MTD showed a profit of 1.6 M ZWD.
D = long and medium term debt.
P = profit after tax, extraordinary items and loss brought forward.
Note: Nunion Carbide, Turner Newall and Lonrho have wholly owned mining subsidiaries which do not publish public accounts.

Sources:
Rio Tinto Zimbabwe Ltd, Report and Accounts 1983 and 1984.
Bindura Nickel Corp Ltd, Annual Report 1983 and 1984.
Zimbabwe Alloys Ltd, Annual Report 1984 and 1985.
Wankie Colliery Co Ltd, Annual Report 1984 and 1985.
MTD (Mangula) Ltd, Annual Report 1983 and 1984. ■